FLOOD INSURANCE STUDY

CITY OF HOMER, ALASKA

KENAI PENINSULA BOROUGH

REVISED PRELIMINARY: APRIL 20, 2012

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
020107V000B

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) report may not contain all data available within the Community Map Repository. Please contact the Community Map Repository for any additional data.

The Federal Emergency Management Agency (FEMA) may revise and republish part or all of this FIS report at any time. In addition, FEMA may revise part of this FIS report by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS report. Therefore, users should consult with community officials and check the Community Map Repository to obtain the most current FIS report components.

Selected Flood Insurance Rate Map (FIRM) panels for this community contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map (FBFM) panels (e.g., floodways, cross sections). In addition, former flood hazard zone designations have been changed as follows:

Old Zone(s)	New Zone
Al through A30	AE
Vl through V30	VE
B	X
C	X

Initial FIS Effective Date: June 16, 1999

Revisions: September 25, 2009 – Redelineate coastal flooding extents within the City of Homer

April 13, 2012 – 8 miles of revised Coastal Hazard Analysis

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FLOOD INSURANCE STUDY
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1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of the City of Homer and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State or other jurisdictional agency will be able to explain them.

The Digital Flood Insurance Rate Map (DFIRM) and FIS report for this countywide study have been produced in digital format. Flood hazard information was converted to meet the Federal Emergency Management Agency (FEMA) DFIRM database specifications and Geographic Information System (GIS) format requirements. The flood hazard information was created and is provided in a digital format so that it can be incorporated into a local GIS and be accessed more easily by the community.

1.2 Authority and Acknowledgments

The sources of authority for this FIS are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analysis for original June 16, 1999 study were performed by the U.S. Army Corps of Engineers (USACE), Anchorage District, for FEMA, under Interagency Agreement No. EMW-95-4759, Project Order No. 7. This study was completed in October 1996.

The redelineation for the September 25, 2009 revision was performed by Northwest Hydraulic Consultants (NHC) for FEMA, under IDIQ Contract EMS-2001-CO-0067 Task No. 21. This work was completed by NHC in August 2008.

For this revision, coastal hazard analysis was performed by the Strategic Alliance for Risk Reduction (STARR) (a joint venture between Greenhorne & O'Mara, Inc., CDM, Stantec and Atkins) for the FEMA Region X, under Contract No. HSFEHQ-09-D-0370, Task Order HSFE10-10-J-0106. Work on this revision was completed by STARR in June 2011.

The digital base map information was provided by the the City of Homer and developed by the U.S. Department of Commerce (DOC), National Oceanic and Atmospheric

Administration (NOAA), National Ocean Service (NOS), National Geodetic Survey (NGS), Remote Sensing Division. This information was compiled at a scale of 1:6,000 in 2008. The coordinate system used for the production of the FIRM is Universal Transverse Mercator Zone 5, North American Datum of 1983, CLARKE1866. Differences in the datum and spheroid used in the production of FIRMs for adjacent counties may result in slight positional differences in map features at the community boundaries. These differences do not affect the accuracy of information shown on this FIRM.

1.3 Coordination

An initial Consultation Coordination Officer's (CCO) meeting is held typically with representatives of FEMA, the community, and the study contractor to explain the nature and purpose of a FIS and to identify streams to be studied by detailed methods. A final CCO meeting is held typically with the same representatives to review the results of the study.

The results of the September 25, 2009 revision were reviewed at the final CCO meeting held on December 11, 2008, and attended by representatives of FEMA and the City of Homer. All problems raised at that meeting have been addressed.

For this revision, the final CCO meeting was held on ___________, and attended by representatives of ______________. All problems raised at that meeting have been addressed.

2.0 **AREA STUDIED**

2.1 Scope of Study

This FIS covers the incorporated area of the City of Homer, Kenai Peninsula Borough, Alaska.

The areas studied by detailed methods were selected with priority given to all known flood hazards and areas of projected development or proposed construction through October 1996.

For the September 25, 2009 revised FIS, previously issued Letters of Map Revision (LOMRs) were incorporated, Special Flood Hazard Areas (SFHAs) were changed, corporate limits were updated, map format was updated, roads and road names were updated, and elevations were converted to the North American Vertical Datum of 1988 (NAVD88). The method of conversion was digital capture of effective flooding and redelineation utilizing new topography data. NHC used five foot contour topography developed by the City of Homer to redelineate coastal flooding extents within the City and to add Beluga Lake to the SFHA.

For this revision, STARR conducted 8 miles of revised Coastal Hazard Analysis that included computing wave runup. STARR utilized 25 transects in this study.

No LOMRs were recorded for this study.

2.2 Community Description

The City of Homer is located approximately 230 road miles to the south of Anchorage, at the mouth of Kachemak Bay on the east side of Cook Inlet. The City itself is on high ground above the bay, but its distinguishing feature is its spit, which extends for 4.5 miles into Kachemak Bay.

The average annual temperature in the City of Homer is 36 degrees Fahrenheit (ºF), ranging from 14°F to 27°F during the winter and from 45°F to 60°F during the summer. The average annual precipitation is 24 inches, with most precipitation occurring during September and October. Climatological data for the City of Homer are taken from a coastal record station, which is at an elevation of more than 1,000 feet.

The City of Homer is primarily a fishing, fish-processing, and trade center, and enjoys a considerable seasonal tourist industry. During the summer months, the population of the City of Homer, approximately 4,000, swells with the influx of students and others seeking cannery or fishery employment. Tourism has grown considerably, with visitors coming to enjoy the scenery, hiking, or fishing. The city has also become a haven for a large number of artists as evidenced by the number of art festivals held during the summer months.

2.3 Principal Flood Problems

There are no rivers or significant streams in the City of Homer, but several small streams and drainage ditches may cause localized minor flooding problems. The principal flooding in the City of Homer is caused by storms that generate extreme wave and storm surges in Cook Inlet and Kachemak Bay. Because most of the City of Homer is situated on a hill, the area most susceptible to flooding is the spit.

The area around the City of Homer is in a zone that has a relatively high probability of strong earthquakes, which can result in the generation of tsunamis. A teleseismic tsunami is defined as a tsunami resulting from an earthquake, usually caused by displacement of the ocean floor. It generally occurs as a series of waves from the open seas. Local tsunamis, generated from massive earth or rock slides (either above or below water), ice falls, seiches, and similar phenomena, are an ever-present threat. However, there is no way that a frequency can be assigned to an unpredictable event in Alaska due to the relatively short period of record. Tsunamis are, therefore, not included as elevation figures in this study. Local tsunamis should always, however, be considered before beginning any construction in the coastal areas.

The frequency of the 1964 teleseismic tsunami has been studied by the USACE Waterways Experiment Station in Vicksburg, Mississippi, and has been determined to exceed the 0-2-percent-annual-chance event. The Waterways Experiment Station determined the 1- and 0.2-percent-annual-chance teleseismic tsunami waves for the City of Homer (Reference 1). The 0.2-percent-annual-chance level of inundation by a teleseismic tsunami at the City of Homer was calculated to be below the 1-percent-annual-chance storm event.

2.4 Flood Protection Measures

At the southern end of the spit, near the State Ferry Terminal, the State has constructed a reinforced earthen and timber wall to protect the ferry terminal building (Reference 2). The USACE has constructed several rock revetments at the southern tip to protect buildings and surrounding roads (Reference 3).

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 2-, 1-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 2-, 1-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent-annual-chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance (100-year) flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the community.

The stillwater elevation for the base flood was determined by considering the effects from tide and storm surges (Reference 4). The annual tide curve follows an 18.6-year cycle, with high-tide elevations for any 1 year closely approximating that for the 18.6-year cycle. In determining the stillwater elevation, the probability of the simultaneous occurrence of a high tide and a storm event was first determined. The design condition is based on the probability of a high tide and major storm occurring simultaneously. The probabilities of these two independent events are combined so that there is a 1-percent chance of occurrence in a given year (base flood event). For this analysis, it was assumed that storms are independent of tides. A storm is also assumed to last 12 hours, thereby capturing a high-tide event. This is a conservative assumption based on wave records collected at the site. The analysis can be modeled as a Binomial Distribution Function, in which one storm of three will combine with a tide exceeding the critical tide. The critical tide is defined as the tide stage with a 0.4-percent chance of being exceeded and was determined based on tide records collected at Homer Spit. The critical tide corresponds to 18.7 feet NAVD88. Note that because the tide data are observed, storm surge is included in the tide record.

Storm-surge data for the City of Homer were not found. However, the report entitled “Storm Surge Climatology and Forecasting in Alaska,” published by the Arctic Environmental Information and Data Center, and dated August 1981 (Reference 5), estimates that the highest surge would be less than 3 feet near the City of Homer because the hydrographic and topographic conditions are not conducive to high surges. Because the tide data also incorporate storm surge, a 1-foot surge was added to the computed tide level as a conservative assumption, to produce a stillwater elevation of 19.7 feet NAVD88. The elevations for floods of selected recurrence intervals on Cook Inlet and Kackemak Bay are shown in Table 1, "Summary of Elevations".

Table 1 – Summary of Elevations

	PEAK DISCHARGES (CFS)			
FLOODING SOURCE AND LOCATION	**10%-ANNUAL-CHANCE**	**2%-ANNUAL-CHANCE**	**1%-ANNUAL-CHANCE**	**0.2%-ANNUAL-CHANCE**
COOK INLET				
At Homer, West End	26.6	*	32.4	*
At Homer, Fronting Beluga Lake	28.1	*	33.7	*
At West Base of Homer Spit	27.8	*	33.6	*
At Homer Spit	26.8	*	32.5	*
KACHEMAK BAY				
At East Base of Homer Spit	19.8	*	22.5	*
At Homer, East End	18.4	*	20.0	*

* Data Not Available

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data Tables in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of ± 1.0 foot for floods of the selected recurrence intervals. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross section locations are also shown on the FIRM (Exhibit 2). Unless specified otherwise, the hydraulic analyses for these studies were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

For those study reaches subject to tidal inundation, the flood profiles were extended downstream to the limit of the coastal velocity zone or to where the mean high tide exceeded normal depth from a riverine only flood, whichever occurred farthest upstream.

All elevations shown on the Flood Profiles and FIRM (Exhibits 1 and 2) are referenced to the NAVD88.

3.3 Wave Height Analysis

The City of Homer is subjected to waves and resulting wave runup from Cook Inlet and Kachemak Bay. The wave climate for both Cook Inlet and Kachemak Bay was determined using methodology outlined in the 1984 version of the USACE "Shore Protection Manual (SPM)" (Reference 6). The under-water and above-water topography were determined using the National Geodetic Data Center Homer 1 arc-second DEM (Reference 7) and Light Detection And Ranging (LiDAR)-derived topography produced by Aero-Metric, Inc. (Reference 8). Because Cook Inlet and Kachemak Bay do not share the same storm exposure, an analysis of the wave climate was performed for each water body (Reference 4).

Wave conditions in Kachemak Bay are based on wind-generated waves traveling down the main axis of the bay. The wave growth is limited by the available fetch length. The wind data used to predict the wave conditions are taken from wind velocity-duration curves developed from 8 partial years of measurements at Homer Spit. Because the data sample is drawn from a short record, the velocity values were adjusted upwards by 10 percent. The 1-hour sustained wind speed having a 1-percent chance of being equaled or exceeded in any given year was used. Kachemak Bay is highly irregular in shape; therefore, the fetch length was developed using the restricted fetch methodology. The effective fetch length for the bay was determined to be approximately 8.5 miles. Using Figure 3-24 from the USACE SPM, in conjunction with the effective fetch length and 1-hour wind duration-wind speed, results in a wave height of 8.5 feet and an associate wave period of 5.25 seconds.

For Cook Inlet, extensive wind and deep-water wave analyses were performed by the USACE, Coastal Engineering Research Center (Reference 9). These analyses yielded a wave height of 30 feet associated with a wave having a 1-percent chance of being equaled or exceeded in any given year. These deep-water conditions cannot reach Homer Spit due to the shallowness of the area. This site is depth limited for extreme events. The largest wave that could reach the site is the breaking wave. The breaking-wave height depends on the wave period and depth. Field measurements and observations show that the wave period ranges from 7 to 9 seconds. A 10-second wave period was assumed to be the upper limit and was used in the wave-runup calculations.

Figure 1 is a profile for a hypothetical transects showing the effects of energy dissipation on a wave as it moves inland. This figure shows the wave elevations being decreased by obstructions, such as buildings, vegetation, and rising ground elevations and being increased by open, unobstructed wind fetches. Actual wave conditions may not necessarily include all of the situations shown in Figure 1, "Transect Schematic".

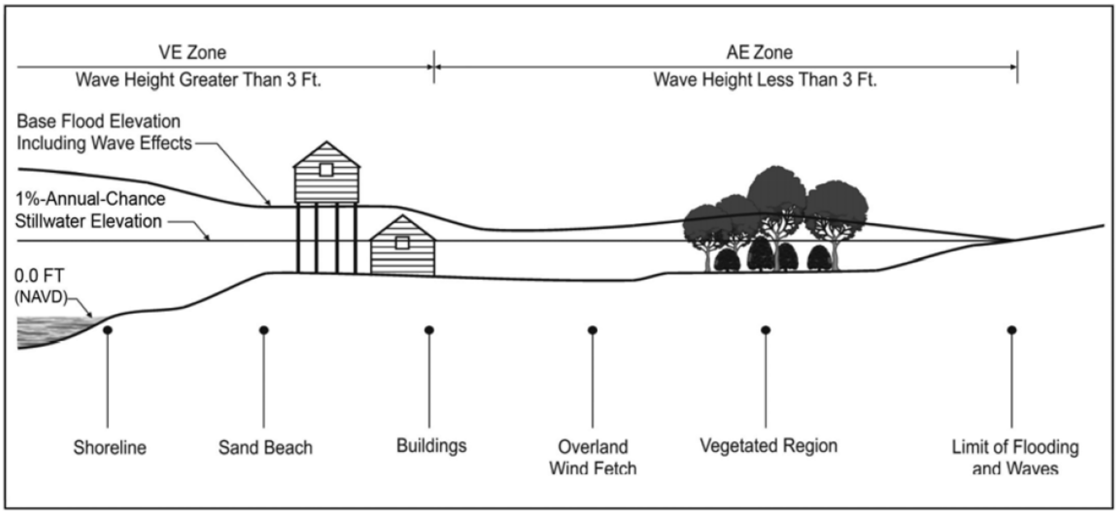

Figure 1 – Transect Schematic

The base flood elevation (BFE), the elevation associated with a storm having a 1-percent chance of being equaled or exceeded in any given year, is based on the combination of the stillwater and wave-runup elevations. Wave runup was computed for storms from both the Cook Inlet and Kachemak Bay sides of Homer Spit using the methodology outlined in the USACE SPM and the super-position principle. Transects along the spit were developed at which runup was calculated. A runup adjustment (Casco Bay method) was applied at the profile crest, where the slope becomes much more gradual. The transects were representative of the various reaches of the spit and included armored and natural beach areas. Five natural beach transects and eight armored sections were developed along the Cook Inlet side, and eight natural beach transects and four armored sections were developed along the Kachemak Bay side.

Transect for the coastal flooding sources were taken perpendicular to the coastline and extended to a point where wave action ceased. Figure 2, “Transect Location Map,” shows the location of the 25 transects along the Homer Spit.

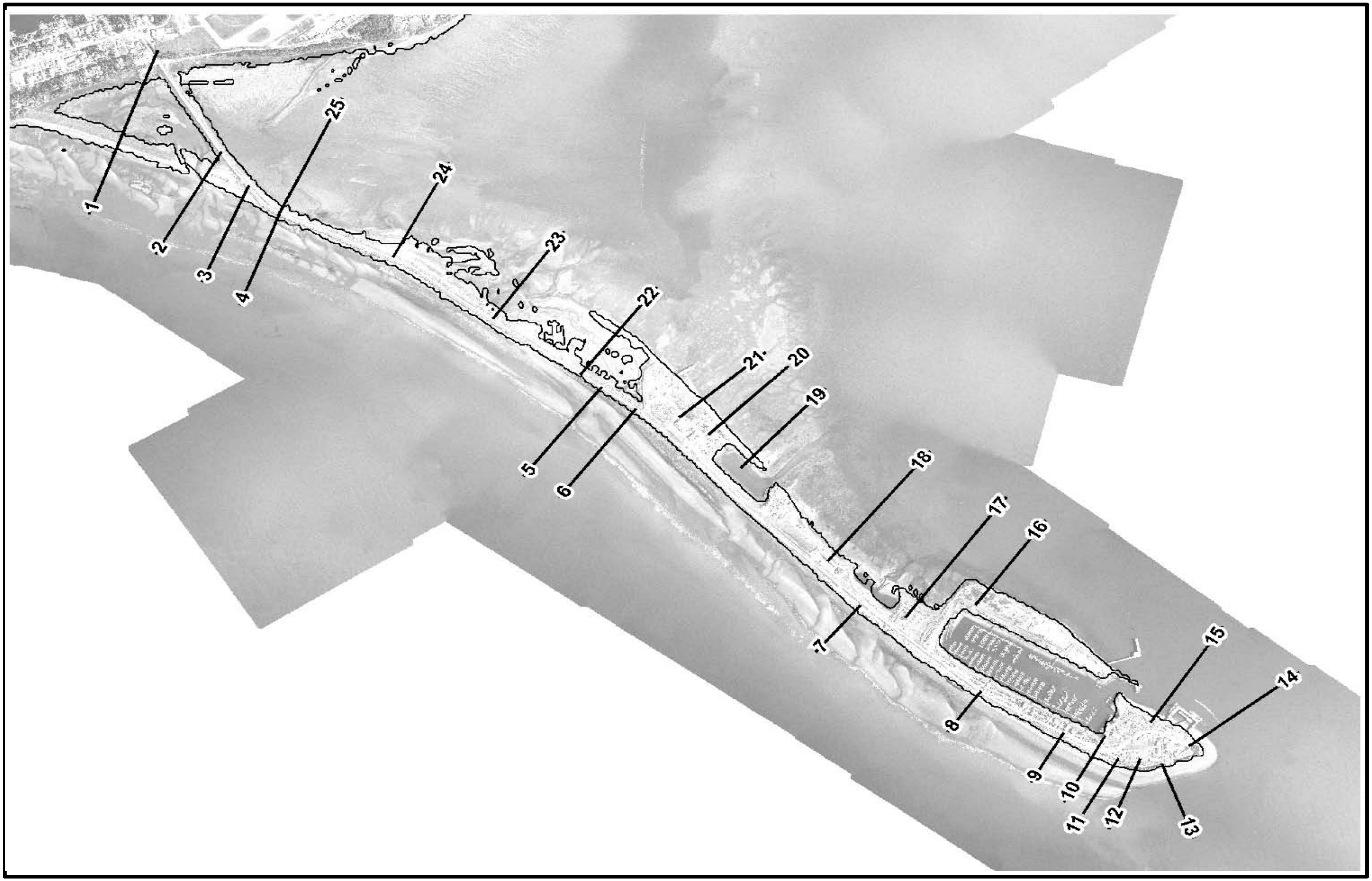

FIGURE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF HOMER, AK

(KENAI PENINSULA BOROUGH)

TRANSECT LOCATION MAP

BFEs for Cook Inlet and Kachemak Bay are summarized in Table 2, "Transect Descriptions."

Table 2 – Transect Descriptions

		ELEVATION (feet NAVD88)	
Transect	Description	1-Percent-Annual-Chance Stillwater Elevation	1-Percent-Annual-Chance Maximum Runup
FLOODING EFFECTS FROM COOK INLET:			
1	Mariner Park Lagoon; approximately 1,000 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	25
2	Mariner Park, NW; approximately 2,200 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	33
3	Mariner Park, SE; approximately 2,900 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	25
4	Right of gazebo at tsunami warning signal; approximately 3,600 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	44
5	Approximately 9,900 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	29
6	Southeast of Houseboat; approximately 10,600 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	27
7	At pole left of Log Cabin; approximately 15,900 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	26
8	Right side of Lucky Pierre Charters; approximately 18,500 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	27
9	Salty Dawg Saloon lighthouse; approximately 20,100 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	29
10	Seafarer's Memorial; approximately 20,700 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	27
11	Homer Spit Campground; approximately 21,000 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	23

Table 2 – Transect Descriptions (Continued)

Transect	Description	ELEVATION (feet NAVD88) 1-Percent-Annual-Chance Stillwater Elevation	1-Percent-Annual-Chance Maximum Runup
12	Lodges at Land's End condominiums, left; approximately 21,100 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	37
13	Lodges at Land's End condominiums, right; approximately 22,300 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	30
FLOODING EFFECTS FROM KACHEMAK BAY:			
14	Behind Land's End Restaurant; approximately 22,500 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	25
15	Ferry Terminal; approximately 21,800 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	28
16	Port of Homer; approximately 17,300 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	34
17	Pier One Theater; approximately 16,600 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	23
18	Heritage RV Park; approximately 14,900 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	25
19	North Star Terminal & Stevedore Co LLC (2); approximately 12,600 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	31
20	North Star Terminal & Stevedore Co LLC (1); approximately 11,800 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	33
21	Kevin Bell Ice Arena; approximately 11,200 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	23
22	Embayment labeled "Coal Bay" in effective FIRM; approximately 9,500 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	35

Table 2 – Transect Descriptions (Continued)

Transect	Description	ELEVATION (feet NAVD88) 1-Percent-Annual-Chance Stillwater Elevation	1-Percent-Annual-Chance Maximum Runup
23	2664 Homer Spit Rd; approximately 7,700 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	21
24	South of 2170 Homer Spit Rd; approximately 5,600 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	34
25	North of Tsunami Warning Signal (Bayside); approximately 3,500 feet from the intersection of Homer Spit Road and Kachemak Drive.	19.7	27

Table 3, "Transect Data," includes the flooding source and a summary of the stillwater elevations, flood hazard zone designations, and BFEs at each transect. Stillwater elevations are not available for the 10-, 2- and 0.2-percent-annual-chance floods. Additionally, neither Cook Inlet nor Kachemak Bay possesses any primary frontal dunes.

Table 3 – Transect Data

Flooding Source	1-Percent-Annual-Chance Stillwater Elevation (feet NAVD88)	Zone	Base Flood Elevation (feet NAVD88)
COOK INLET			
Transect 1	19.7	VE	25
		AE	20
Transect 2	19.7	VE	21
Transect 3	19.7	VE	21
Transect 4	19.7	VE	21
Transect 5	19.7	VE	21
Transect 6	19.7	VE	21
Transect 7	19.7	VE	21
Transect 8	19.7	VE	21
Transect 9	19.7	VE	21
Transect 10	19.7	VE	21
Transect 11	19.7	VE	21

Table 3 – Transect Data (Continued)

Flooding Source	1-Percent-Annual-Chance Stillwater Elevation (feet NAVD88)	Zone	Base Flood Elevation (feet NAVD88)
COOK INLET (Continued)			
Transect 12	19.7	VE	25
		AE	20
Transect 13	19.7	VE	25
		AE	20
KACHEMAK BAY			
Transect 14	19.7	VE	25
		AE	20
Transect 15	19.7	VE	25
		AE	20
Transect 16	19.7	VE	25
		AE	20
Transect 17	19.7	VE	25
		AE	20
Transect 18	19.7	VE	25
		AE	20
Transect 19	19.7	VE	25
		AE	20
Transect 20	19.7	VE	25
		AE	20
Transect 21	19.7	VE	25
		AE	20
Transect 22	19.7	VE	25
		AE	20
Transect 23	19.7	VE	21
Transect 24	19.7	VE	21
Transect 25	19.7	VE	21

All qualifying benchmarks within a given jurisdiction that are catalogued by the NGS and entered into the National Spatial Reference System (NSRS) as First or Second Order Vertical and have a vertical stability classification of A, B or C are shown and labeled on the FIRM with their 6-character NSRS Permanent Identifier.

Benchmarks catalogued by the NGS and entered into the NSRS vary widely in vertical stability classification. NSRS vertical stability classifications are as follows:

- Stability A: Monuments of the most reliable nature, expected to hold position/elevation (e.g. mounted in bedrock)
- Stability B: Monuments which generally hold their position/elevation (e.g. concrete bridge abutment)
- Stability C: Monuments which may be affected by surface ground movements (e.g. concrete monument below frost line)
- Stability D: Mark of questionable or unknown vertical stability (e.g. concrete monument above frost line, or steel witness post)

In addition to NSRS benchmarks, the FIRM may also show vertical control monuments established by a local jurisdiction; these monuments will be shown on the FIRM with the appropriate designations. Local monuments will only be placed on the FIRM if the community has requested that they be included, and if the monuments meet the aforementioned NSRS inclusion criteria.

To obtain current elevation, description, and/or location information for benchmarks shown on the FIRM for this jurisdiction, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their Web site at www.ngs.noaa.gov.

3.4 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the NGVD29. With the completion of the NAVD88, many FIS reports and FIRMs are now prepared using NAVD88 as the referenced vertical datum.

Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. Some of the data used in this revision were taken from the prior effective FIS reports and FIRMs and adjusted to NAVD88.

For this FIS report and FIRM, elevations were converted from NGVD29 to NAVD88 by adding 5.7 feet to the NGVD29 elevations. All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum.

NAVD88 = NGVD29 + conversion factor

To convert elevations referenced to mean lower low water (MLLW) to the NAVD88, subtract **4.90 feet**. This conversion was derived from information on the “Datums” sheet for NOAA tide gage no. 9455557, “Homer, AK.” Verified data for this station is available for the period May 1, 1964 through Dec 31, 1967. Local residents may be accustomed to referencing the Seldovia tide gage (NOAA station no. 9455500) datum. Unfortunately, the datum sheet for this tide gage does not include the NAVD88 datum.

However, as a first approximation, for nontechnical purposes, the change of 4.90 feet could be applied to Seldovia's datum.

The BFEs shown on the FIRM represent whole-foot rounded values. For example, a BFE of 102.4 will appear as 102 on the FIRM and 102.6 will appear as 103. Therefore, users that wish to convert the elevations in this FIS to NGVD29 should apply the conversion factor to elevations shown on the Flood Profiles and supporting data tables in this FIS report, which are shown at a minimum to the nearest 0.1 foot.

For additional information regarding conversion between the NGVD29 and NAVD88, visit the National Geodetic Survey website at http://www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

Vertical Network Branch, N/CG13
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

To obtain current elevation, description, and/or location information for benchmarks shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at http://www.ngs.noaa.gov.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each FIS provides 1-percent-annual-chance (100-year) flood elevations and delineations of the 1- and 0.2-percent-annual-chance (500-year) floodplain boundaries and 1-percent-annual-chance floodway to assist communities in developing floodplain management measures. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles and Floodway Data Table. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were redelineated using LiDAR generated contours with a horizontal accuracy of 60 centimeters, a vertical accuracy of 30 centimeters, and a contour interval of 5-feet (Reference 10).

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM. On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AO, and VE), and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards (Zone X). In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are very close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations, but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

During the September 25, 2009 revised FIS, NHC used five foot contour topography developed by the City of Homer to redelineate coastal flooding extents within the City and to add Beluga Lake to the SFHA. Flood levels within Kachemak Bay/Beluga Slough (Zone VE) are at an elevation of 34ft. Because it would be unreasonable to assume that the 34ft elevation would continue in Beluga Lake, the decision was made to show the lake as an Approximate A Zone. Topographic data show that Lake Street, which separates Beluga Lake from Beluga Slough, is at an elevation lower than 25ft., thus there is nothing to stop flood water from entering the lake across Lake Street from Beluga Slough. Beluga Lake was added to the SFHA and delineated at the 25ft. contour. Clearly, however, a detailed study is required to refine this elevation.

The primary intent of this revision was to re-delineate existing flood levels on the new topographic data. However, NHC agreed to take a qualitative look at the VE Zone flood elevations within Beluga Slough to determine if they could or should be refined. Based upon the review, it is recommended that at some point in the future, re-mapping the entire coastline using the new Pacific Coast procedures should be considered. There was not enough evidence to suggest that the mapped elevation within Beluga Slough is either right or wrong and the only way to determine this would be through a new study.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

No floodways were computed for the City of Homer because only coastal flood hazards have been identified.

4.3 Base Flood Elevations

Areas within the community studied by detailed engineering methods have BFEs established in AE and VE Zones. These are the elevations of the 1-percent-annual-chance (base flood) relative to NAVD88. In coastal areas affected by wave action, BFEs are generally at their maximum at the normal open shoreline. These elevations generally decrease in a landward direction at a rate dependent on the presence of obstructions capable of dissipating the wave energy. Where possible, changes in BFEs have been shown in 1-foot increments on the FIRM. However, where the scale did not permit, 2- or 3-foot increments were sometimes used. BFEs shown in the wave action areas represent the average elevation within the zone. Current program regulations generally require that all new construction be elevated such that the first floor, including basement, is elevated to or above the BFE in AE and VE Zones.

4.4 Velocity Zones

The USACE has established the 3-foot wave height as the criterion for identifying coastal high hazard zones (Reference 11). This was based on a study of wave action effects on structures. This criterion has been adopted by FEMA for the determination of VE zones. Because of the additional hazards associated with high-energy waves, the NFIP regulations require much more stringent floodplain management measures in these areas, such as elevating structures on piles or piers. In addition, insurance rates in VE zones are higher than those in AE zones.

The location of the VE zone is determined by the 3-foot wave as discussed previously. The detailed analysis of wave heights performed in this study allowed a much more accurate location of the VE zone to be established. The VE zone generally extends inland to the point where the 1-percent-annual-chance stillwater flood depth is insufficient to support a 3-foot wave.

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no (1-percent-annual-chance) BFEs or base flood depths are shown within this zone.

Zone AE

Zone AE is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by detailed methods. In most instances, whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance risk zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot base flood depths derived from the detailed hydraulic analyses are shown within this zone.

Zone VE

Zone VE is the flood insurance risk zone that corresponds to the 1-percent-annual-chance coastal floodplains that have additional hazards associated with storm waves. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance risk zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1-foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by levees. No BFEs or base flood depths are shown within this zone.

Zone D

Zone D is the flood insurance risk zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance risk zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use the zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent-annual-chance floodplains.

7.0 OTHER STUDIES

This FIS report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the NFIP.

FIS reports for the surrounding Alaskan communities of Lake and Peninsula Borough (2010), and Matanuska-Susitna Borough (2011) have already gone effective (References 12 and 13).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, Federal Insurance and Mitigation Division, Federal Regional Center, 130 228th Street, SW, Bothell, Washington 98021-9796.

9.0 BIBLIOGRAPHY AND REFERENCES

1. U.S. Department of the Army, Corps of Engineers, Waterways Experiment Station, Technical Report H-74-3, Vicksburg, Mississippi, May 1974.

2. Peratrovich, Nottingham and Drage, Inc., Geotextile Retaining Wall Plan and Sections, State Ferry Terminal, Homer, Alaska, August 1991.

3. U.S. Department of the Army, Corps of Engineers, Alaska District, Typical Drawings and Specifications for Armored Revetments, February 1996.

4. U.S. Department of the Army, Corps of Engineers, Alaska District, Homer Spit Flood Level Determination, October 1996.

5. Arctic Environmental Information and Data Center, Storm Surge Climatology and Forecasting in Alaska, August 1981.

6. U.S. Department of the Army, Corps of Engineers, Coastal Engineering Research Center, Shore Protection Manual, 1984.

7. NOAA Center for Tsunami Research (2010) Homer 1 arc-second DEM. Retrieved 17 Nov 2010. www.ngdc.noaa.gov/mgg/inundation

8. Aero-Metric, Inc. (2008)

9. U.S. Department of the Army, Corps of Engineers, Coastal Engineering Research Center, Technical Letter 87-15.

10. TerraPoint, Inc., “Project Report Kenai Alaska” Soldotna, Alaska, January 2005.

11. U.S. Department of the Army, Corps of Engineers, Hydraulic Laboratory, Waterways Experiment Station, Technical Report H-75-17, <u>Type 16 Flood Insurance Study: Tsunami Predictions for Monterey and San Francisco Bays and Puget Sound</u>, A. W. Garcia and J. R. Houston, Vicksburg, Mississippi, November 1975.

12. Federal Emergency Management Agency, Flood Insurance Study, Lake and Peninsula Borough (And Incorporated Areas), Alaska, February 3, 2010.

13. Federal Emergency Management Agency, Flood Insurance Study, Matanuska-Susitna Borough (And Incorporated Areas), Alaska, March 17, 2011.

U.S. Army Corps of Engineers, Guidelines for Identifying Coastal High Hazard Zones, Galveston District, Galveston, Texas, June 1975.

Federal Emergency Management Agency, Flood Insurance Study, City of Homer, Kenai Peninsula Borough, Alaska, June 16, 1999.