

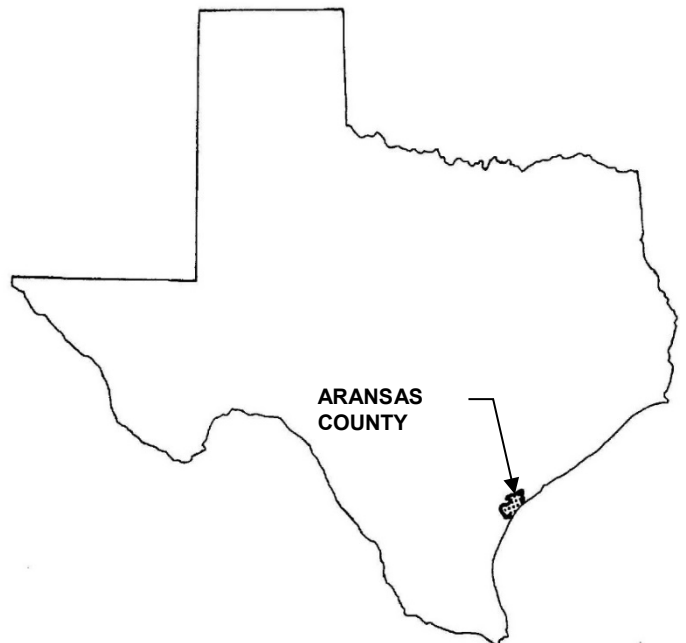
FLOOD INSURANCE STUDY



VOLUME 1 OF 2

ARANSAS COUNTY, TEXAS AND INCORPORATED AREAS

Community Name	Community Number
ARANSAS COUNTY (UNINCORPORATED AREAS)	485452
ARANSAS PASS, CITY OF	485453
FULTON, TOWN OF	480012
PORT ARANSAS, CITY OF	485498
ROCKPORT, CITY OF	485504



Revised: December 20, 2019

Federal Emergency Management Agency
FLOOD INSURANCE STUDY NUMBER
48007CV001B

**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 may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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

<u>Old Zone</u>	<u>New Zone</u>
A1 through A30	AE
V1 through V30	VE
B	X
C	X

Part or all of this Flood Insurance Study may be revised and republished at any time. In addition, part of this Flood Insurance Study may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the Flood Insurance Study. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current Flood Insurance Study components.

This FIS report was revised on December 20, 2019. Users should refer to Section 10.0, Revisions Description, for further information. Section 10.0 is intended to present the most up-to-date information for specific portions of this FIS report. Therefore, users of this FIS report should be aware that the information presented in Section 10.0 supersedes information in Section 1.0 through 9.0 of this FIS report.

Initial Countywide FIS Effective Date: February 17, 2016

Revised Dates: December 20, 2019. Changes to Special Flood Hazard Areas as a result of Levee Analysis and Mapping Procedures.

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Transect 5	Panels	06T – 08T
Transect 6	Panels	09T – 12T
Transect 7	Panels	13T – 16T
Transect 8	Panels	17T – 20T
Transect 9	Panels	21T – 24T
Transect 10	Panels	25T – 28T
Transect 11	Panels	29T – 32T
Transect 12	Panels	33T – 36T
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Transect 14	Panels	41T – 43T
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Volume 2

EXHIBITS (Continued)

Exhibit 1 – 0.2-Percent-Annual-Chance Wave Envelopes (Continued)

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Transect 28	Panels	84T – 86T
Transect 29	Panels	87T – 88T
Transect 30	Panels	89T – 90T
Transect 31	Panels	91T – 92T
Transect 32	Panel	93T
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Exhibit 2 – Flood Insurance Rate Map Index
Flood Insurance Rate Maps

**FLOOD INSURANCE STUDY
ARANSAS COUNTY, TEXAS AND INCORPORATED AREAS**

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 Aransas County, Texas; including the Cities of Aransas Pass, Port Aransas, and Rockport; the Town of Fulton; and the unincorporated areas of Aransas County (referred to collectively herein as Aransas County), 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.

Please note that the City of Aransas Pass is geographically located in Aransas, Nueces, and San Patricio counties. See the separately published FIS reports and Flood Insurance Rate Maps (FIRMs) of San Patricio County, Texas and Incorporated Areas and Nueces County, Texas and Incorporated Areas for countywide map dates and flood hazard information for the City of Aransas Pass outside of Aransas County.

Please note that the City of Port Aransas is geographically located in Aransas and Nueces counties. See the separately published FIS report and Flood Insurance Rate Maps (FIRMs) of Nueces County, Texas and Incorporated Areas for countywide map dates and flood hazard information for the City of Port Aransas outside of Aransas County.

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.

1.2 Authority and Acknowledgments

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

Aransas County

The hydrologic and hydraulic analyses for the previous FIS dated September 4, 1984 were performed by Espey, Huston and Associates, Inc., for the Federal Emergency Management Agency (FEMA), under Contract No. 4786. That study was completed in July 1983 (Reference 1).

City of Aransas Pass

The hydrologic and hydraulic analyses for the previous FIS dated September 4, 1984 were performed by Espey, Huston and Associates, Inc., for FEMA, under Contract No. 4786. That study was completed in August 1983 (Reference 2).

City of Port Aransas

The hydrologic and hydraulic analyses for the previous FIS dated September 18, 1984, and the Flood Insurance Rate Map (FIRM) dated March 18, 1985, (hereinafter referred to collectively as the City of Port Aransas 1985 revision) were performed by Espey, Huston and Associates, Inc., for FEMA, under Contract No. 4786. That study was completed in August 1983 (Reference 3).

In the September 30, 1992 revision, the hydrologic and hydraulic analyses were revised to include the effects of erosion and were prepared by Dewberry & Davis, for FEMA, under Contract No. EMW-89-C-2906. That work was completed in August 1991. Also, the University of Texas Bureau of Economic Geology and local engineering consultants were contacted to obtain historical flood data and recent topography (Reference 3).

City of Rockport

The hydrologic and hydraulic analyses for the previous FIS dated September 4, 1984 were performed by Espey, Huston and Associates, Inc., for FEMA, under Contract No. 4786. That study was completed in August 1983 (Reference 4).

For this first time countywide study, the projection used in the preparation of this map was Texas State Plane South Central Zone (FIPS zone 4204), Feet. The horizontal datum was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Base map information shown on this FIRM was provided in digital format by the Texas Natural Resources Information System (TNRIS). This information was photogrammetrically compiled at a scale of at least 1:24,000 from aerial photography dated 2004.

Coastal analysis was conducted for FEMA by Halff and Associates and completed June 2012. Implementation of Seclusion for the Aransas Pass levee and Post-Preliminary processing was conducted for FEMA by Risk Analysis, Planning and Mapping Partners (RAMPP) under contract No. HSFEHQ-09-D-0369, Task Order HSFE06-10-J-0003 and HSFE06-11-J-0001.

1.3 Coordination

The initial Consultation Coordination Officer (CCO) meeting was held on April 10, 2006, and attended by representatives of FEMA, Aransas County, Aransas County Environmental Health, the Town of Fulton, the City of Rockport Building & Development, Texas Department of Transportation (TxDOT), and Halff Associates, Inc.

The results of the study were reviewed at the final CCO meeting held on September 24, 2014, and attended by representatives of FEMA, Aransas County, all incorporated areas, and RAMPP. All problems raised at that meeting have been addressed in this study.

2.0 **AREA STUDIED**

2.1 Scope of Study

This FIS report covers the geographic area of Aransas County, Texas, including the incorporated communities listed in Section 1.1. 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 December 2011. The primary flooding source for this County is the Gulf of Mexico.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon, by FEMA and community officials.

2.2 Community Description

Aransas County is located on the Gulf of Mexico in south-central Texas, one of the 13 counties in the Coastal Bend Region of South Texas. Much of the area above sea level is divided among three land masses: the Live Oak Peninsula to the south, the Blackjack Peninsula to the north, and the San Jose Island to the east. This island is one of a long chain of barrier islands which stretch from the City of Port Arthur to the City of Brownsville along the Texas Coast. Aransas County is surrounded by Refugio County to the north and west, Calhoun County to the east, and both Nueces and San Patricio counties to the southwest (References 1 and 5).

According to U.S. census 2010 figures, the population of Aransas County was 23,158. This represents an increase in population of 2.9 percent since the 2000 census (Reference 6). There are four incorporated communities in the county. Their U.S. census 2010 population are as follows: City of Aransas Pass (8,204), Town of Fulton (1,358), City of Port Aransas (3,480), and City of Rockport (8,766) (Reference 7).

State Highway 35, running north-south through the county and crossing over open water on several causeways, is the principal traffic artery in the county. It connects the City of Rockport with the Town of Fulton 2 miles to the north and the City of Aransas Pass. The Intercoastal Canal and the Harbor Island Ship Channel run through Aransas Bay and provide ocean-going vessels access to the deepwater port facilities at the City of Aransas Pass. A line of Southern Pacific Railway running parallel to the beach front terminates downtown of the City of Rockport, near Main Street (References 1 and 4).

The Aransas National Wildlife Refuge, wintering grounds for the federally protected whooping crane, draws thousands of visitors a year. Other recreational areas which are important to the tourist industry in the county are Goose Island State Park and the Texas-State Marine Lab, located in the City of Rockport, where an extensive collection of saltwater life in large aquariums is on view to the public (References 1 and 2).

The economic vitality of Aransas County centers on mineral production. Oil was first discovered in Aransas County in 1936. Commercial shrimping and fishing, manufacturing, shipbuilding, seasonal tourist industry, and agribusiness, principally beef cattle and grains, are also major producers of revenue (References 1 and 2).

Aransas County is mainly composed of coastal plains, with elevation ranging from mean sea level (MSL) to 32 feet above National American Vertical Datum of 1988 (NAVD) (Reference 5). The Cities of Aransas Pass and Rockport are located in what is known as the Marsh Belt of the Great Coastal Prairie. Their predominant natural vegetation is seashore salt grass (References 2 and 4). Near the City of Port Aransas, the Live Oak Peninsula is composed of dorsal ridge running north to south along the midline of the land mass. Natural drainage patterns run away from the ridge to the shoreline on the eastern and western sides (Reference 3).

Within the Cities of Aransas Pass, Port Aransas, and Rockport the soil is moderately permeable fine Galveston Sand with a percolation rate from 2 to 20 inches per hour depending on elevation. The water table is very shallow, within a few inches of the surface near the shoreline, and limits the ability of the soil to absorb ponded runoff. The dune line along the beach has natural vegetation of salt grass and sea oats (References 2, 3, and 8).

The hottest month of the year is July having an average temperature of 90 degrees Fahrenheit (°F). The coldest month of the year is January having an average temperature of 45°F (Reference 5).

Yearly rainfall totals in Aransas County may vary widely due to the intermittent passage of tropical storms which are the outstanding meteorological feature of the area. Rainfall amounts may be unevenly distributed throughout the county in any given year as well. Thunderstorms are numerous and generally occur during the spring and fall. The annual average rainfall for Aransas County is 35.96 inches based on a 29-year record. The wettest month is September with 5.53 inches. The driest month is April having an average rainfall of 2.07 inches (References 1, 5, and 9).

2.3 Principal Flood Problems

Aransas County lies within the San Antonio-Nueces River Coastal Drainage Basin. Aransas River, Chiltipin Creek, Copano Creek, and Mission River enter Copano Bay from the north and west (Reference 1).

However, the principal cause of flooding in Aransas County is tidal water from the Gulf of Mexico, rather than riverine, induced flooding. Local rainfall events, although often intense, usually are not the cause of extensive property damage. San Jose Island is one of a long chain of coastal barrier islands. The City of Aransas Pass opens directly onto a large coastal body of water and is extremely vulnerable to inundation from hurricane induced storm tide surges. The Cities of Port Aransas and Rockport are located on the tip of a barrier island only a few hundred yards from the open gulf. Geologically, these barrier islands are huge sandbars which have been built up by the action of storm waves carrying sand scoured from the ocean floor by the immense force of a wind driven storm tide. The resulting beaches, dunes, and mudflats are unstable and extremely susceptible to erosion, storm induced wash over, and flooding (References 1, 2, 3, and 4).

The first major tropical storm which resulted in loss of life and economic catastrophe in the county occurred in 1919. Other major tropical storms which have caused extensive damage were Hurricanes Carla (1961), Beulah (1967), and Fern (1971). The most serious flooding conditions occur when wind generated high tides combine with large amounts of rainfall. Tidal influx then blocks any drainage towards natural outlets into the bays and gulf (Reference 1).

Stormwater runoff problems in many areas of Aransas County are not generated by drainage conditions in the problem area itself. Under widespread conditions of intense rainfall, sheet flow from the southwest and northwest collects at points of lowest elevation, generally along the coast, and may cause extensive flooding even though precipitation levels in the flooded areas may be less than in areas further inland (Reference 1).

Most drainage throughout the county still occurs through shallow open ditches which were originally constructed to drain agricultural land. Soil characteristics, a shallow water table, and little topographic relief render these channels very ineffective as flood control devices. The loose sandy soil which covers most of the beaches and the peninsulas creates extremely unstable side slopes in excavated ditches unless protected by established vegetation. The shallow water table in most areas is a source of constant low flows in the deeper channels. The sides and bottom widths of open channels in and around the City of Aransas Pass are constantly widening as the light soils characteristic of the area are eroded away by surface runoff. Maintenance of these channels is a continuous problem as well. The sandy banks quickly erode into broad shallow channels and siltation is a major problem (References 1 and 2).

Due to the extremely limited topography, natural drainage patterns are often indefinite. Different volumes of runoff have been observed to vary their natural pathways in the same location under varying tidal and meteorological conditions. Several communities have inadequate runoff drainage when intense rainfall occurs. Interbasin flow is a common occurrence, further complicating efforts at flood control in the county (Reference 1).

The seawall, while protecting the City of Aransas Pass from flooding caused by hurricane storm tides, has itself become a cause of flooding problems during localized rainfall events. Outlets to relieve accumulated stormwater runoff from behind the seawall were installed when the structure was built. Continued urban development has rendered these outlets insufficient to drain the land behind the seawall quickly enough to prevent water from rising in the streets of the city (Reference 2).

The history of tropical storms in the Gulf of Mexico extends back more than 400 years. However, historical storm data records for the Gulf Coast provide only limited information for periods earlier than 1900. Between 1900 and 1984, U.S. Weather Bureau records show that 67 tropical cyclones struck some point of the Texas Coast. Of these, 38 were of hurricane severity and 29 of lesser severity were classified as tropical storms. Approximately 19 of the Texas hurricanes between 1900 and 1984 made landfall within or in close proximity (within 75 miles) to the study area. Hurricane tides exceeding 8 feet MSL were experienced in the study area during 14 of these storms. During the more severe of these hurricanes, maximum tides in excess of 20 feet were reported in the narrow arms of some inland bays (Reference 1).

Historical description of past hurricanes and related damage are plentiful for this area. Descriptions of the most significant storms follow (Reference 1).

1919 Storm (September 2 - 15, 1919). This storm was first noticed in the tropical storm stage in the extreme eastern portion of the Caribbean Sea. It was moving in a generally northwesterly direction toward the eastern portion of the Dominican Republic. From there it moved into the Atlantic Ocean before turning to a more westerly course, passed between the tip of Florida and Cuba, and entered the gulf on a generally westerly course before striking the Texas Coast in the vicinity of Baffin Bay. The eye of the storm moved inland over the City of Kingsville and then turned west-northwestward towards the City of Laredo.

Prior to Hurricane Carla (1961), the 1919 Storm was considered the largest known hurricane to strike the Texas Coast. Based on observations from various locations along the coast, the 1919 Storm mass had an unusually large diameter as did Carla. Inadequate data for the 1919 Storm prevents conclusive comparisons between the big storms.

Maximum sustained wind velocity recorded at the City of Corpus Christi was 80 miles per hour. Surge elevations of up to 16 feet were recorded as the storm surge swept across the barrier islands and through the passes, piling water upon the landward shores of Corpus Christi and Nueces Bays. Highest recorded surge elevations along the coast were approximately 11.1 feet. Surges of 6.6 feet or greater were experienced along almost the entire Texas Coast.

The City of Port Aransas on the north end of Mustang Island was entirely destroyed. The Corpus Christi Beach, or North Beach as it was known, was swept clean of all but three badly battered buildings. A section of the City of Corpus Christi located below the 35-foot high bluff and having ground elevations ranging from 4 to 7 feet was almost totally destroyed. This area was about three blocks wide and ten blocks long and contained warehouses, businesses, hotels, the electric power and light plant, two ice plants, and many residences. All of the development was totally destroyed except two one-story

brick buildings, the upper floor and power plant of the six-story Nueces Hotel, and some machinery of the city power and light plant. The storm left 350 people dead, and the damages exceeded \$20 million (References 1, 2, 3, and 4).

1942 Storm (August 21-31, 1942). This was the second storm in two weeks to hit the Texas Coast. The first, a much smaller storm, crossed the coastline on Bolivar Peninsula just east of Galveston Island. However, the second storm was much more severe and larger in area. This storm was first discovered in the extreme western portion of the Atlantic near the Windward Islands on August 21. It gained strength as it proceeded across the Caribbean Sea on a west-northwesterly course and was classified as a hurricane on August 24. It continued along the same course, striking the Yucatan Peninsula on August 27, and moved into the Gulf of Mexico. The storm continued on a direct course toward the mid-Texas Coast and San Antonio Bay. The eye of the storm moved across Matagorda Island on August 30 and passed over the City of Seadrift as it moved inland. The peak hurricane surges recorded on the open coast were 11.8 feet at the City of Freeport, 6.2 feet at the City of Galveston, 5.0 feet at the Town of High Island, 3.4 feet at the City of Port Aransas, and 5.5 feet at the Town of Sabine. Corpus Christi Bay had maximum tides of about 2 feet and a depressed tide of -1.4 feet as the winds shifted and blew gulfward across the bay. This big storm killed eight people, resulted in approximately \$11.5 million in property damages, and caused an additional \$15 million in crop damage (Reference 10).

1945 Storm (August 24 - 29, 1945). This tropical cyclone was first reported in the southwestern part of the Gulf of Mexico on August 24, moving steadily northward. The storm moved in a northerly direction to within about 40 miles of the City of Port Isabel by August 25 and continued northward, skirting the Texas Coast before moving inland in the vicinity of San Jose Island on the morning of August 26. The storm continued in a northeasterly direction with the eye passing just north of the Village of Port O'Connor, across Matagorda Bay, and struck the City of Palacios on the morning of August 27 as it moved inland towards the City of Bay City.

The storm was unusual in the coastal path it maintained, thereby raking essentially the entire Texas Coast, and also because of its slow forward movement, traveling at less than 5 miles per hour. The area between the City of Port Aransas and the mouth of the Colorado River received the maximum force of the hurricane.

The maximum storm surge varied considerably along the coast with about 3.2 feet at the City of Corpus Christi, 6.6 feet at the Town of Olivia, 7 feet at the City of Palacios, 3.7 feet at the City of Port Aransas, 3 feet recorded at the City of Port Isabel, 14.5 feet at the City of Port Lavaca, and 8 feet at the Village of Port O'Connor. Maximum wind velocities were estimated at 85 miles per hour at the City of Palacios, 100 to 125 miles per hour at the City of Port Aransas, 76 miles per hour at the City of Port Isabel, and 135 miles per hour at the Town of Olivia, the City of Port Lavaca, the Village of Port O'Connor, and the City of Seadrift.

The storm caused extensive beach erosion throughout the affected area and severely eroded the western Matagorda Bay shores. Several miles of the shore receded 50 feet as a result of the storm. The storm killed three people, injured 25, and caused damages exceeding \$20 million (References 1, 2, 3, 4, 10, and 11).

Hurricane Carla (September 11, 1961). Hurricane Carla originated in the Caribbean Sea, and when it passed through the Yucatan Peninsula, the storm was packing winds of 110 miles per hour. The large, unusually slow-moving hurricane strengthened with its cyclonic winds covering the entire Gulf of Mexico. Carla moved inland over the Village of Port O'Connor northward through the Cities of Port Lavaca and Point Comfort. Maximum sustained wind velocities at the City of Port Lavaca were estimated at 115 miles per hour with gusts estimated at more than 170 miles per hour. High-water marks indicate surge heights reached elevations of up to 22 feet at the City of Port Lavaca, 7.5 feet at the City of Rockport, and 10.3 feet along the eastern Aransas County line near the Aransas County National Wildlife Refuge, as the storm swept across the barrier islands and piled water upon the landward shores of Matagorda Bay. Highest recorded surge elevations along the open coast were approximately 12.3 feet.

This hurricane also spawned a rash of 26 tornadoes which took several lives in Texas and caused extensive damage. Although rainfall accompanying the hurricane was heavy in several local areas, the total volume of precipitation was not unusually high. At the City of Freeport, the 4 day rainfall was about 10 inches. Carla is significant because of the large area that was affected and the length of time the abnormal water levels prevailed. The effects of the big storm were felt as far east as Louisiana. Approximately 1,700,000 acres of Texas coastal land, including entire communities, were inundated, 32 people were killed, and damage from wind and surge was estimated at \$408 million. Normal activities were disrupted for several weeks. Damages from hurricane flooding were estimated to be \$78.7 million, and total damages were \$149.3 million for the five county Matagorda Bay study area (References 1, 4, 10, and 12).

Hurricane Beulah (September 5 - 22, 1967). Beulah began innocently as a weak tropical depression east of the Windward Islands. Moving into warm Caribbean waters, the storm intensified to the category of a hurricane. Beulah was disrupted temporarily near Jamaica, and then regained intensity. Beulah moved inland just east of the City of Brownsville. Torrential rains fell on south Texas and northeastern Mexico. Storm rainfall amounts ranged from 10 to 20 inches over much of the area. The total rainfall exceeded 30 inches in some areas. The storm surge reached 20 feet along lower sections of Padre Island, 6.0 to 6.5 feet in the City of Rockport and the Town of Fulton. Thirty one cuts were made completely through the island. An amazing 115 tornadoes were spawned by the system, the most ever known to be generated by a tropical system. Most of the tornadoes were confined to the entire coast of Texas. Although considerable damage resulted from strong wind and high tides, the majority of the destruction was due to torrential rains and resultant flooding. Some damage was also caused by hurricane connected tornadoes (References 1, 12, and 13).

Hurricane Fern (September 9 - 13, 1971). Fern slowly paralleled the Texas Coast while a hurricane and made landfall as a tropical storm on September 11. Large amounts of rain fell primarily along the Coastal Bend causing the worst flooding since Hurricane Beulah, especially near the City of Beeville which experienced 26 inches of rain. Amounts in excess of 15 inches deluged Bee, Refugio, and San Patricio counties. Hurricane Fern brought tides about 2 to 3 feet above normal to the area (References 1, 4, and 13).

Hurricane Celia (July 30 – August 5, 1970). Celia originated as a tropical depression in the northwestern Caribbean Sea on July 30. The depression developed into a hurricane on August 1 after entering the Gulf of Mexico. The relatively small storm mass moved moderately fast and erratically across the gulf toward the Texas Coast. Celia lost strength on the morning of August 3 as the storm rapidly increased in size, but as Celia neared the coast, the eye of the storm became smaller and more concentrated and the wind speeds increased. When Celia was located about 30 miles east-southeast of the City of Corpus Christi, the storm had regained strength with highest winds estimated at 115 miles per hour. The storm continued to intensify as it moved inland across Mustang Island and into Corpus Christi Bay at a forward speed of 17 miles per hour. The anemometer at the weather station in the City of Aransas Pass was blown away after measuring wind gusts of 150 miles per hour. Subsequent peak gusts were estimated to have reached 180 miles per hour. Maximum gusts of 160 miles per hour were recorded at the City of Corpus Christi National Weather Service Office.

The metropolitan area of the City of Corpus Christi; the Cities of Robstown, Port Aransas, and Aransas Pass; and the small towns along Corpus Christi Bay suffered the most damage. Although considerable damage resulted from storm surge, the majority of the destruction resulted from high winds. A surge of 9.2 feet was recorded on the Gulf Beach at the City of Port Aransas, and a surge of 11.4 feet was recorded on the south side of the City of Aransas Pass. At the City of Corpus Christi, the stillwater surge elevation ranged from 3.9 to 5.6 feet. Celia's flood waters rose to 4.3 feet at the Town of Lamar, 5.2 feet at the Town of Fulton, and 8.4 feet south of the City of Rockport. Hurricane surge waters eroded beaches and roads and stalled communications and utility systems over much of the coastal communities. In addition, most of San Jose Island was inundated during the storm with the exception of a high central ridge.

Celia was among the costliest storm in the state's history, having caused an estimated total damage of \$470 million. Wind damage accounted for \$440 million of this total. There were 13 people killed and over 450 injured. More than 9,000 homes were destroyed, while 14,000 other homes were damaged. In addition, 250 businesses and 300 farm buildings were damaged or destroyed (References 1 and 14).

Hurricane Allen (August 9 - 10, 1980). Hurricane Allen was one of the most intense hurricanes when it was over the open waters of the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. Allen reached category 5 status. Allen lost strength near the Yucatan Peninsula but regained it over the open waters of the Gulf of Mexico with a central pressure of 909 millibar (mb) (26.84 inches) on August 9.

On August 9, the eye of Hurricane Allen did not cross any land until it moved inland north of the City of Brownsville bringing highest tides and winds over the least populated section of the Texas Coast.

The strongest winds of 129 miles per hour were measured at the Village of Port Mansfield. Only two deaths were directly attributed to Hurricane Allen. A storm surge up to 12 feet along Padre Island caused numerous barrier island cuts and washouts (Reference 15).

Hurricane Gilbert (September 16 - 17, 1988). Even though Gilbert struck south of the border in northeast Mexico, gusty winds and 29 tornadoes were seen with the system in Texas. Gusts to 83 mph were measured near the City of Brownsville. Heavy rains fell along the Texas Coast causing flooding and damage to the area. South Padre Island was flooded by its storm surge. This hurricane had high-water marks at approximately 3.7 feet near the City of Port Aransas. Damages totaled \$50 million and 3 people perished due to tornadoes (References 3 and 13).

Hurricane Jerry (October 15-16, 1989). Hurricane Jerry crossed the east end of Galveston Island with winds of 75 mph gusting to 100 mph at Scholes Field. Tides were as high as 8 feet near the entrance of the Houston Ship Channel. Hurricane Jerry spawned 6 tornadoes. The flood elevations experienced along the Gulf Coast at the Galveston Point Pleasant Gage No. 8771510 were comparable to a 10-percent-annual-chance flood. The elevations observed on the bay side of the Barrier Island at the Galveston Gage No. 8771450 and the Town of Sabine Pass, North Gage No. 8770570, were comparable to 20- and 50-percent-annual-chance flood elevations, respectively. When Jerry hit during an astronomical high tide, Highway 87 between the Towns of Sabine Pass and High Island was destroyed. Damages totaled \$70 million and 3 people passed away due to Hurricane Jerry (References 3 and 13).

Hurricane Bret (August 21 - 23, 1999). The hurricane developed off the coast of Nicaragua on August 16. Bret moved northwest, becoming a broad low pressure system over the Yucatan Peninsula on August 16 and 17. It formed into a tropical depression within the Bay of Campeche the morning of August 18. By noon, ship reports indicated it formed into a tropical storm. Bret remained nearly stationary through August 20, as upper level winds from an upper level low passing to the north countered the easterly winds at the surface.

As the upper low moved to the west, winds aloft became favorable for development and the system rapidly became a hurricane, moving northward. This motion continued until the night of August 21, when the upper low moved further to the west and southwest, steering Bret on a more westward track. Peaking in intensity as a category 4 hurricane as it made its turn toward Texas; the storm began encountering much cooler sea surface temperatures near the coast. Weakening quickly, Bret made landfall in the sparsely populated Kennedy County on the evening of August 22. The system became a tropical storm on the morning of August 23 and a tropical depression that evening as it crossed the Rio Grande near the City of Laredo, into Mexico. Highest sustained winds reached 73 miles per hour from the northwest before power failure at Rincon Del San Jose. The City of Falfurrias measured gusts to 98 miles per hour in the late evening of August 22 before power failure. Gale-force winds extended from the City of Corpus Christi to the City of Brownsville (Reference 13).

Hurricane Rita (September 22 - 26, 2005). Rita was an intense, destructive, and deadly hurricane that significantly impacted the Florida Keys and devastated extreme southeast Texas and southwest Louisiana. It formed off an old frontal zone, and developed into a tropical depression on September 17 just east of the Turks and Caicos Islands and moved westward, becoming a tropical storm on the afternoon of September 18 and a hurricane on September 20 as it moved through the Florida Straits. As it emerged into the Gulf of Mexico, Rita began to rapidly intensify.

Maximum sustained winds increased to 175 miles per hour on September 22 while moving through the central Gulf of Mexico. A significant shearline aloft lured Rita more northwesterly, and the tropical cyclone weakened as it moved away from the warm waters of the loop current. Landfall occurred between the Town of Sabine Pass and Johnsons Bayou, LA as a category 3 hurricane. Rita slowly weakened as it accelerated inland and maintained at least tropical storm strength when it crossed back into northwest Louisiana. The cyclone moved northeast and merged with a frontal wave on September 26. A total of four direct and 55 indirect fatalities were associated with Hurricane Rita in Texas. Damages totaled \$10 billion (Reference 13).

Hurricane Ike (September 12 - 15, 2008). A tropical wave left the coast of Africa on August 28. The system slowly evolved into a cyclone moving westward for much of its lifetime. On September 7, Ike moved through the southeast Bahamas into eastern Cuba. The large system strengthened into a category 2 hurricane, which moved west-northwest through the Gulf of Mexico.

On August 12, Ike developed a banding-type eye, moved into Galveston County, and weakened as it moved through eastern Texas and Arkansas. The system became an extratropical cyclone as it approached the Mid-Mississippi Valley and rapidly accelerated northeast through southeast Canada on August 14 and 15.

A large storm surge accompanied Hurricane Ike, particularly along the western Louisiana and the upper Texas coastlines. The worst damage was seen in Galveston and Chambers counties. The Towns of Crystal Beach, Gilchrist, and High Island experienced near total destruction of property. The storm knocked out power to 2.6 million people across Texas and Louisiana. There were 20 direct and 64 indirect deaths associated with Hurricane Ike. Damages totaled \$19.3 billion (Reference 13).

2.4 Flood Protection Measures

Existing hurricane flood protection within the study area is limited to a few locally constructed seawalls and flood gates in the more populated urban areas, as well as several earthen and concrete dikes constructed by private industries (Reference 1).

A 2.5-mile long earthen seawall was constructed in the City of Aransas Pass in 1927 to protect the city from tidal surges. Composed of local dredged material, the levee ranges from 16 to 21 ft MSL and extends along the waterfront of most of the developed portions of the city. The levee has prevented the community from being significantly inundated during past storms, although the structure was breached on the southeast side during Hurricane Celia causing minor tidal flooding (References 1 and 2). This levee does not meet the requirements of NFIP regulation 65.10 regarding its ability to provide protection from the 1% annual chance flood event. Please refer to Section 10.0 for more information.

Apart from publicly financed flood protection works, various private industries near the coast have constructed levees. The DuPont Company and, to a lesser extent, Brown and Root in the City of Aransas Pass have constructed 5- to 7-foot high earthen and concrete dikes around storage tanks and equipment areas (Reference 1).

Most industries along the waterfront operate under hurricane protection plans when the need arises for evacuation and securing the plants in the event of a hurricane. The only other flood protection measures in the study area consist of a few facilities which have constructed bulkheads such as a waterfront housing development in the City of Rockport (Reference 1).

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, 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-, 50-, 100-, 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 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 Coastal Analyses

The hydraulic characteristics of the Gulf of Mexico coastal flood source was analyzed to provide estimates of flood elevations for 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 in the coastal data tables and flood profiles provided in the FIS report.

3.1.1 Storm Surge Analyses and Modeling

For areas subject to coastal flood effects, the 10-, 2-, 1-, and 0.2-percent-annual-chance stillwater elevations were taken directly from a detailed storm surge study documented in "Flood Insurance Study: Coastal Counties, Texas Intermediate Submission 2 – Scoping and Data Review" prepared by the U.S. Army Corps of Engineers (USACE) (Reference 16). This storm surge study was completed in November 2011.

The Advanced Circulation (ADCIRC) model for coastal and ocean hydrodynamics was applied by USACE to calculate stillwater elevations for coastal Texas. The ADCIRC model uses an unstructured grid and is a finite element long wave model. It has the capability to simulate tidal circulation and storm surge propagation over large areas and is able to provide highly detailed resolution in areas of interest along shorelines, open coasts, and inland bays. It solves three dimensional equations of motion, including tidal potential, Coriolis, and non-linear terms of the governing equations.

The model is formulated from the depth-averaged shallow water equations for conservation of mass and momentum which result in the generalized wave continuity equation.

In performing the coastal analyses, nearshore waves were required as inputs to wave runup and overland wave propagation calculations, and wave momentum (radiation stress) was considered as contribution to elevated water levels (wave setup). The Steady State Spectral Wave (STWAVE) model was used to generate and transform waves to the shore for the Texas Joint Storm Surge (JSS) Study. STWAVE is a finite difference model that calculates wave spectra on a rectangular grid. The model outputs zero-moment wave height (H_s), peak wave period (T_p), and mean wave direction at all grid points and two-dimensional spectra at selected grid points. STWAVE includes an option to input spatially variable wind and storm surge field. Storm surge significantly alters wave transformation and generation for the hurricane simulations in shallow-flooded areas.

STWAVE was applied on five grids for the Texas JSS: NE, CE, SW, NEn, and CEn. Three large grids (NE, CE, SW) with offshore boundaries at depths near 100 feet encompassed the entire coast of Texas and applied the efficient half-plane version of STWAVE (which must approximately align with the shoreline). Two nested grids (NEn and CEn) covered Galveston Bay and Corpus Christi Bay and applied the full-plane version of STWAVE to allow generation of wind waves in all directions. Notably, memory requirements for the full-plane model precluded its use for the large grids with offshore boundaries. The input for each grid includes the bathymetry (interpolated from the ADCIRC domain), surge fields (interpolated from ADCIRC surge fields), and wind fields (interpolated from the ADCIRC wind fields, which apply land effects to the base wind fields). The wind and surge applied in STWAVE are spatially and temporally variable for all domains. STWAVE was run at 30-minute intervals for 93 quasi-time steps (46.5 hours).

The ADCIRC model computational domain and the geometric/topographic representation developed for the Joint Coastal Surge effort was designated as the TX2008 mesh. This provided a common domain and mesh from the Texas-Mexico border to western Louisiana, extends inland across the floodplains of Coastal Texas (to the 30- to 75-foot contour NAVD88), and extends over the entire Gulf of Mexico to the deep Atlantic Ocean. The TX2008 domain boundaries were selected to ensure the correct development, propagation, and attenuation of storm surge without necessitating nesting solutions or specifying ad hoc boundary conditions for tides or storm surge. The TX2008 computational mesh contains more than 2.8 million nodes and nodal spacing varies significantly throughout the mesh. Grid resolution varies from approximately 12 to 15 miles in the deep Atlantic Ocean to about 100 feet in Texas. Further details about the terrain data as well as the ADCIRC mesh creation and grid development process can be found in "Flood Insurance Study: Coastal Counties, Texas Intermediate Submission 2 – Scoping and Data Review" (Reference 16).

3.1.2 Statistical Analyses

The Joint Probability Method (JPM) is a simulation methodology that relies on the development of statistical distributions of key hurricane input variables such as central pressure, radius to maximum wind speed, maximum wind speed, translation speed, track heading, etc., and sampling from these distributions to develop model hurricanes. The resulting simulation results in a family of modeled storms that preserve the relationships between the various input model components, but provides a means to model the effects and probabilities of storms that historically have not occurred.

Due to the excessive number of simulations required for the traditional JPM method, the JPM-Optimum Sampling (JPM-OS) was utilized to determine the stillwater elevations associated with tropical events. JPM-OS is a modification of the JPM method and is intended to minimize the number of synthetic storms that are needed as input to the ADCIRC model. The methodology entails sampling from a distribution of model storm parameters (e.g., central pressure, radius to maximum wind speed, maximum wind speed, translation speed, and track heading) whose statistical properties are consistent with historical storms impacting the region, but whose detailed tracks differ. The methodology inherently assumes that the hurricane climatology over the past 60 to 65 years (back to 1940) is representative of the past and future hurricanes likely to occur along the Texas Coast.

A set of 446 storms (two sets of 152 low frequency storms plus two sets of 71 higher frequency storms) was developed by combining the “probable” combinations of central pressure, radius to maximum winds, forward speed, angle of track relative to coastline, and track. Tracks were defined by five primary tracks and four secondary tracks. Storm parameters for synthetic storms are provided in Table 11 of USACE "Flood Insurance Study: Coastal Counties, Texas Intermediate Submission 2 – Scoping and Data Review" (Reference 16). The estimated range of storm frequencies using the selected parameters was between the 10- and 0.2-percent-annual-chance storm events. The ADCIRC-STWAVE modeling system was validated using five historic storms: Hurricanes Carla (1961), Allen (1980), Bret (1999), Rita (2005), and Ike (2008).

3.1.3 Stillwater Elevations

The results of the ADCIRC model and JPM-OS provided 10-, 2-, 1-, and 0.2-percent-annual-chance stillwater elevations which include wave setup effects. Stillwater elevations are assigned at individual ADCIRC mesh nodes throughout the Texas Coast. Triangular Irregular Networks (TINs) and raster datasets were built from these nodes for use in wave analysis and floodplain mapping.

An Independent Technical Review (ITR) was performed on the overall storm surge study process. This review process was performed in

accordance with USACE regulations. The ITR team was composed of experts in the fields of coastal engineering and science, and was engaged throughout the study. The separate USACE's Technical Source Data Notebook (TSDN) "Flood Insurance Study: Coastal Counties, Texas Intermediate Submission 2 – Scoping and Data Review" includes all comments received from the ITR panel, as well as responses to those comments (Reference 16).

3.1.4 Wave Height Analyses

Using storm surge study results, wave height analysis was performed to identify areas of the coastline subject to overland wave propagation or wave runup hazards. Figure 1 shows a cross section for a typical coastal analysis transect, illustrating the effects of energy dissipation and regeneration of wave action over inland areas. This figure shows the wave crest elevations being decreased by obstructions; such as buildings, vegetation, and rising ground elevations; and being increased by open, unobstructed wind fetches. Figure 1 also illustrates the relationship between the local stillwater elevations, the ground profile, and the location of the Zone VE/AE boundary at the limit of 3 feet breaking waves. This inland limit of the coastal high hazard area is delineated to ensure that adequate insurance rates apply and appropriate construction standards are imposed, should local agencies permit building in this coastal high hazard area.

It has been shown in laboratory tests and observed in field investigations that wave heights as little as 1.5 feet can cause damage to and failure of typical Zone AE construction. Therefore, for advisory purposes only, a Limit of Moderate Wave Action (LiMWA) boundary has been added in coastal areas subject to wave action. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave.

The effects of wave hazards in the Zone AE between the Zone VE (or shoreline in areas where Zones VE are not identified) and the limit of the LiMWA boundary are similar to, but less severe than, those in Zone VE where 3-foot breaking waves are projected during a 1-percent-annual-chance flooding event.

In areas where wave runup elevations dominate over wave heights, such as areas with steeply sloped beaches, bluffs, and/or shore-parallel flood protection structures, there is no evidence to date of significant damage to residential structures by runup depths less than 3 feet. However, to simplify representation, the LiMWA was continued immediately landward of the VE/AE boundary in areas where wave runup elevations dominate. Similarly, in areas where the Zone VE designation is based on the presence of a primary frontal dune or wave overtopping, the LiMWA was also delineated immediately landward of the Zone VE/AE boundary.

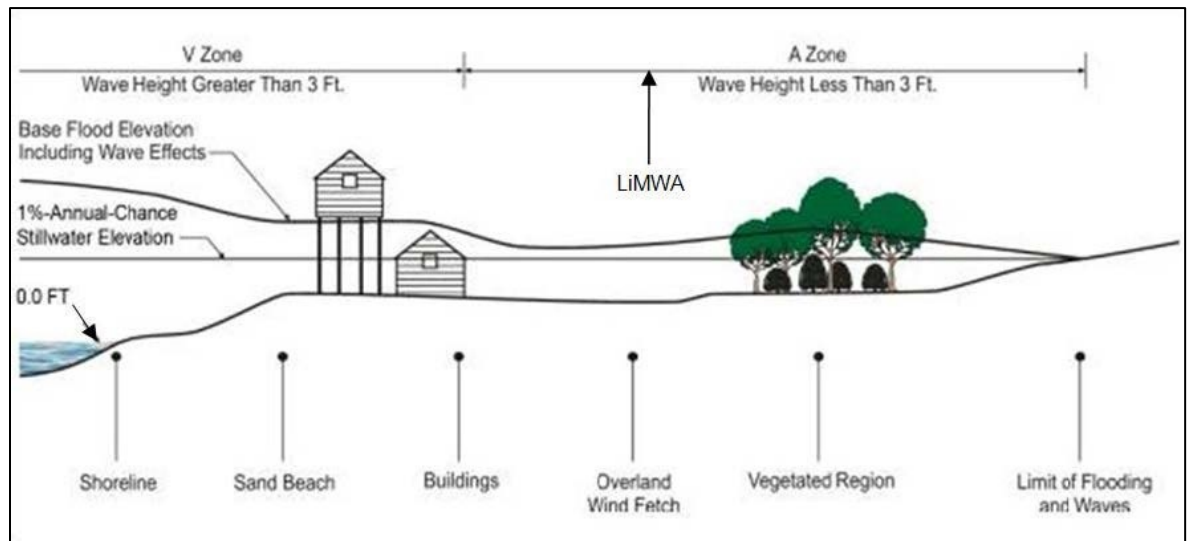


Figure 1: Transect Schematic

Transect locations and spacing is determined by considerations of physical and land use characteristics of the coast. The transects are located to adequately represent the dominant direction of overland wave propagation. The transects are closely spaced in areas of changing topography or land use and, conversely, spread further apart in areas of similar topography or land use. Transects are also located in areas where unique flooding existed and in areas where computed wave heights varied significantly between adjacent transects. Where transects crossed, the largest wave height value was delineated on the FIRM panel. Transects are shown on the respective FIRM panels for the county.

This study applied topographic data from 2006 Texas National Resources Information System (TNRIS) Light Detection and Ranging (LiDAR) (Reference 17). In 2011 National Oceanographic and Atmospheric Administration (NOAA) modified and updated some areas of the data. The topographic data is referenced to NAVD88.

The combination of three land use data sources comprised the data used to identify areas of vegetative cover (forest, marsh grass, etc), buildings (density and spacing), and open water. The three sources are: aerial photos from the U.S. Department of Agriculture (Reference 18), U.S. Fish and Wildlife Service's National Wetland Inventory maps (Reference 19), and NOAA's "Coastal Change Analysis Program" (C-CAP) data (Reference 20). Complete metadata for these data are found in the Technical Support Data Notebook (TSDN). In addition, Taylor Engineering collected detailed information about the features, such as building types, density, and vegetation types during a ground field reconnaissance.

Taylor Engineering performed storm-induced erosion analyses for this study. Erosion of the primary frontal dune was calculated along the county's shoreline

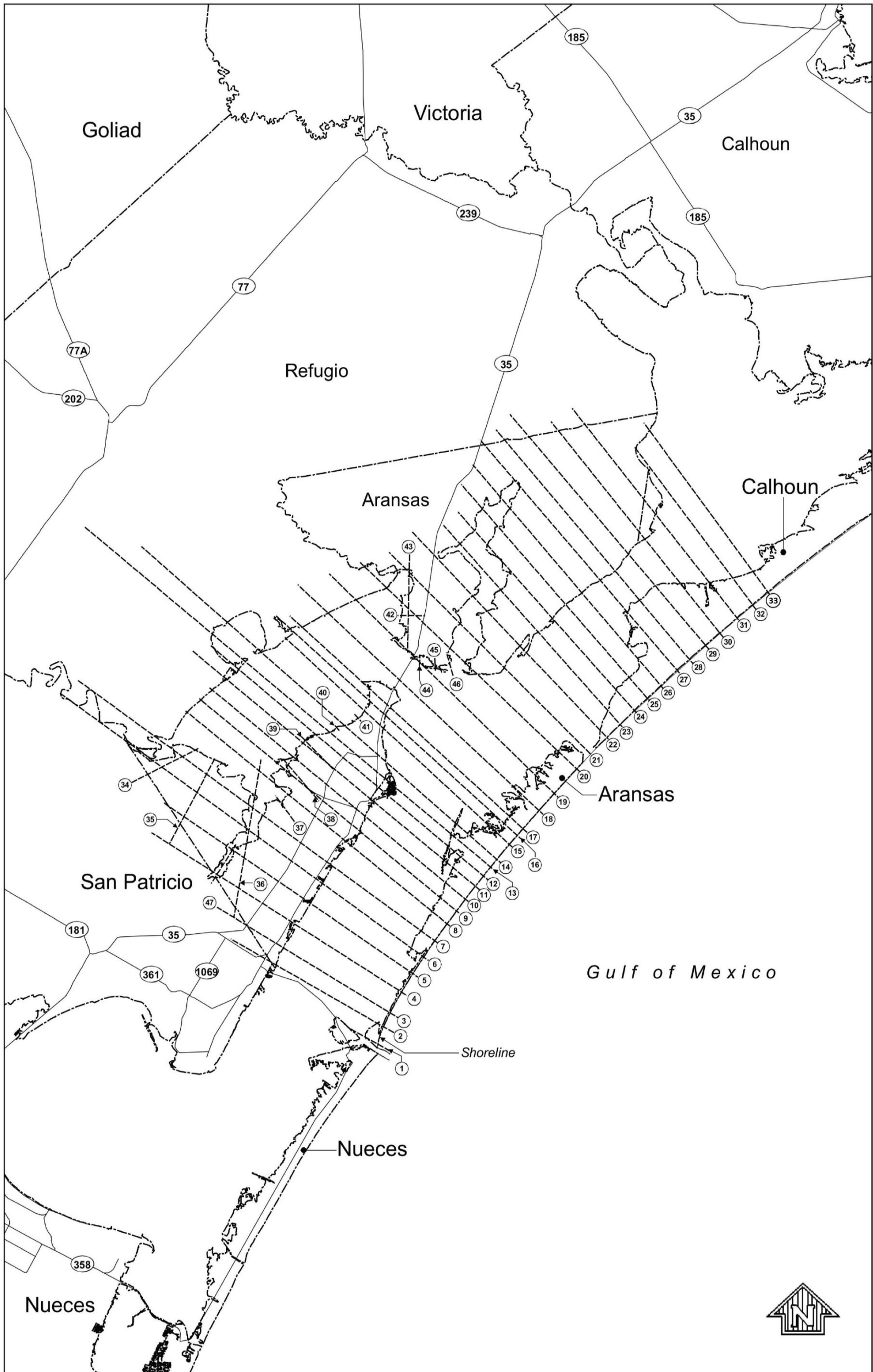
with the Gulf of Mexico, using the 540 square feet method per FEMA's "Atlantic Ocean and Gulf of Mexico Coastal Guidelines Update, 2007" (Reference 21).

Wave height calculation used in this study follows the methodology described in the "Atlantic Ocean and Gulf of Mexico Coastal Guidelines Update, 2007" (Reference 21). Calculations of overland wave height propagation, using Wave Height Analysis for Flood Insurance Studies (WHAFIS), version 4.0, included both the 1- and 0.2-percent-annual-chance events (Reference 22). The 0.2-percent-annual-chance wave height results are not included on the FIRMs but are provided as wave-transect profiles in the TSDN.

Each transect calculates wave heights based on stillwater elevations (from the 1-percent- annual-chance surge modeling), ground elevations at each station along a transect, and land use properties. Wave setup was not calculated separately because wave setup was included in the base stillwater elevations from the storm surge analysis.

This study used default WHAFIS initial wave conditions based on fetch for each transect. Open water transects (primarily along the open gulf) used the maximum 24 miles of open fetch and interior transects used measured fetch lengths (Reference 22).

Figure 2, "Transect Location Map," shows the transect layout used for the overland wave analyses. Along each transect, wave envelopes were computed considering the combined effects of changes in ground elevation, stillwater surface elevation (including wave setup), vegetation, and physical features. Between transects, elevations were interpolated using LiDAR topographic data, land use and land cover data, and engineering judgment to determine the aerial extent of flooding (Reference 17). The transect data for each transect in the county, including the flood hazard zone, base flood elevations, transect location description, 10-, 2-, 1-, and 0.2-percent-annual-chance stillwater elevations at the start of the transect and the range found along the length of the transect is provided in the TSDN. Table 1, "Coastal Data," presents a summary of stillwater elevations along each transect.

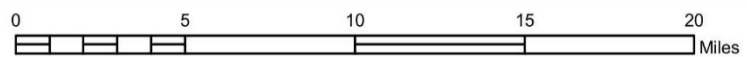


Coastal Transects #1 and #47 are not shown on the Flood Insurance Rate Maps but are included in this graphic and tables in the Flood Insurance Study Report for reference.

FIGURE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

**ARANSAS COUNTY, TX
AND INCORPORATED AREAS**



TRANSECT LOCATION MAP

Table 1: Coastal Data

Transect No.	Description	Latitude & Longitude at Start of Transect	Starting Stillwater Elevations (feet)				Zone Designation and BFE (feet) NAVD
			Range of Stillwater Elevations (feet)				
			10%-Annual-Chance NAVD	2%-Annual-Chance NAVD	1%-Annual-Chance NAVD	0.2%-Annual-Chance NAVD	
1	From the Gulf of Mexico extends inland to the county boundary	97°2'41.466"W 27°50'30.772"N	5.0 4.4 - 5.1	8.0 5.9 - 8.1	9.5 7.1 - 9.6	11.6 9.6 - 11.8	AE9 VE10-11,13,15
2	From the Gulf of Mexico extends inland to the county boundary	97°2'22.828"W 27°51'18.076"N	5.0 4.1 - 5.0	8.0 5.9 - 8.0	9.5 6.9 - 9.6	11.6 8.5 - 11.8	AE8-10 VE10-11,13,15
3	From the Gulf of Mexico extends inland to the county boundary	97°2'1.219"W 27°51'55.941"N	5.0 3.3 - 5.0	8.2 5.3 - 8.1	9.5 5.7 - 9.7	11.6 8.0 - 12.0	AE8-10 VE9-11,13,15
4	From the Gulf of Mexico extends inland to the county boundary	97°1'24.059"W 27°52'52.555"N	5.0 3.1 - 5.2	7.9 5.4 - 7.9	9.5 6.3 - 9.6	11.7 7.8 - 12.0	AE10-11 VE9-11,13,15
5	From the Gulf of Mexico extends inland to the county boundary	97°0'47.058"W 27°53'42.637"N	5.0 3.4 - 5.0	8.0 4.8 - 8.0	9.5 6.1 - 9.8	11.8 7.4 - 12.1	AE8-10 VE8-11,13,15
6	From the Gulf of Mexico extends inland to the county boundary at the Aransas River	97°0'12.129"W 27°54'27.553"N	5.0 3.4 - 5.2	7.9 5.0 - 8.0	9.6 5.9 - 9.7	12.1 7.0 - 12.1	AE8-10 VE8-13,15
7	From the Gulf of Mexico extends inland to the county boundary at the Aransas River	96°59'35.832"W 27°55'11.115"N	5.1 3.3 - 5.1	7.8 4.2 - 8.0	9.6 5.1 - 9.7	12.6 6.9 - 12.3	AE9-10 VE8-13,15

Table 1 – Coastal Data (Continued)

Transect No.	Description	Latitude & Longitude at Start of Transect	Starting Stillwater Elevations (feet)				Zone Designation and BFE (feet) NAVD
			Range of Stillwater Elevations (feet)				
			10%- Annual- Chance NAVD	2%- Annual- Chance NAVD	1%- Annual- Chance NAVD	0.2%- Annual- Chance NAVD	
8	From the Gulf of Mexico, crosses Copano Bay and extends inland at Bayside to the county boundary	96°58'56.118"W 27°55'57.307"N	5	8	9.6	12.3	AE6-9
			3.0 - 5.1	4.9 - 8.0	5.2 - 9.4	6.8 - 12.2	VE8-13,15
9	From the Gulf of Mexico, crosses Copano Bay and extends inland at Bayside to the county boundary	96°58'25.967"W 27°56'31.623"N	5.1	7.7	9.6	12.1	AE7-9
			3.4 - 5.1	3.9 - 8.1	5.0 - 9.6	6.9 - 12.2	VE8-13,15
10	From the Gulf of Mexico, crosses Copano Bay and extends inland northeast of Bayside to the county boundary	96°57'57.526"W 27°57'4.033"N	4.9	7.9	9.6	12.3	AE6-9
			3.2 - 5.1	4.6 - 8.1	5.7 - 9.6	6.9 - 12.3	VE8-13,15
11	From the Gulf of Mexico, crosses Copano Bay and extends inland to the county boundary	96°57'25.593"W 27°57'39.235"N	4.9	8.0	9.6	12.5	AE7-9
			3.0 - 5.1	4.4 - 8.1	4.8 - 9.7	6.9 - 12.4	VE8-13,15
12	From the Gulf of Mexico, crosses Copano Bay and extends inland at Mission Bay to the county boundary	96°56'59.639"W 27°58'6.82"N	5.1	8.0	9.6	12.2	AE6-9
			3.4 - 5.1	3.9 - 8.1	5.3 - 9.5	6.9 - 12.2	VE8-13,15
13	From the Gulf of Mexico, crosses Copano Bay and extends inland at Mission Bay to the county boundary	96°56'36.609"W 27°58'31.144"N	5.1	8.2	9.6	12.1	AE6-8
			3.3 - 5.1	4.7 - 8.2	4.9 - 9.7	6.9 - 12.9	VE8-13,15
14	From the Gulf of Mexico, crosses Copano Bay and extends inland at Mission Bay to the county boundary	96°56'16.139"W 27°58'51.633"N	5.1	8.1	9.6	12.9	AE8-9
			2.6 - 5.1	4.7 - 8.1	5.6 - 10.0	6.9 - 12.9	VE8-13,15

Table 1 – Coastal Data (Continued)

Transect No.	Description	Latitude & Longitude at Start of Transect	Starting Stillwater Elevations (feet)				Zone Designation and BFE (feet) NAVD
			Range of Stillwater Elevations (feet)				
			10%-Annual-Chance NAVD	2%-Annual-Chance NAVD	1%-Annual-Chance NAVD	0.2%-Annual-Chance NAVD	
15	From the Gulf of Mexico, crosses Copano Bay and extends inland northeast of Mission Bay to the county boundary	96°55'35.354"W 27°59'31.932"N	5.1	8.1	9.6	12.5	AE6-9
			2.3 - 5.1	4.7 - 8.1	5.7 - 9.4	6.9 - 12.5	VE8-13,15
16	From the Gulf of Mexico, crosses Copano Bay and extends inland to the county boundary	96°55'10.237"W 27°59'56.387"N	5.1	8.1	9.6	12.6	AE7-9
			3.4 - 5.1	5.0 - 8.1	5.4 - 9.5	6.9 - 12.9	VE8-13,15
17	From the Gulf of Mexico, crosses Copano Bay and extends inland to the county boundary	96°54'51.217"W 28°0'14.21"N	5.1	8.1	9.6	12.2	AE7-8,10
			3.2 - 5.1	4.6 - 8.1	5.5 - 9.7	6.9 - 13.0	VE8-13,15
18	From the Gulf of Mexico, crosses Copano Bay and extends inland to the county boundary	96°53'59.594"W 28°1'3.373"N	5.1	8.2	9.6	12.2	AE7-8,10
			3.3 - 5.1	4.4 - 8.2	5.2 - 9.8	6.9 - 12.6	VE8-13,15
19	From the Gulf of Mexico, crosses Copano Bay and extends inland to the county boundary	96°53'11.274"W 28°1'49.699"N	5.1	8.2	9.7	12.3	AE6-8,10
			3.4 - 5.2	4.0 - 8.2	5.2 - 9.7	6.9 - 13.0	VE8-13,15
20	From the Gulf of Mexico, crosses Vinson Slough, Saint Charles Bay and extends inland to the county boundary	96°51'58.764"W 28°2'55.935"N	5.2	8.3	9.8	12.4	AE6-10
			2.1 - 5.2	4.2 - 8.3	5.1 - 9.9	7.2 - 13.0	VE8-13,15
21	From the Gulf of Mexico, crosses Vinson Slough, Saint Charles Bay and extends inland	96°51'14.416"W 28°3'36.225"N	5.2	8.3	9.9	12.4	AE7-10
			2.9 - 5.2	4.6 - 8.6	5.0 - 10.2	7.4 - 13.5	VE8-10,12-13,15

Table 1 – Coastal Data (Continued)

Transect No.	Description	Latitude & Longitude at Start of Transect	Starting Stillwater Elevations (feet)				Zone Designation and BFE (feet) NAVD
			Range of Stillwater Elevations (feet)				
			10%-Annual-Chance NAVD	2%-Annual-Chance NAVD	1%-Annual-Chance NAVD	0.2%-Annual-Chance NAVD	
22	From the county boundary crosses Vinson Slough, Saint Charles Bay and extends inland	96°50'21.531"W 28°4'20.574"N	5.1 ¹	8.2 ¹	10.0 ¹	12.9 ¹	AE5-10
			3.1 - 4.7	2.3 - 7.6	3.6 - 9.6	6.5 - 13.1	VE8-11
23	From the county boundary extends inland	96°49'38.828"W 28°4'55.394"N	5.2 ¹	8.1 ¹	10.0 ¹	13.0 ¹	AE7-9
			3.1 - 4.3	4.7 - 6.8	6.1 - 8.0	8.1 - 10.7	VE8-11
24	From the county boundary extends inland	96°48'52.219"W 28°5'32.405"N	5.2 ¹	8.4 ¹	10.1 ¹	12.6 ¹	AE7-10
			3.6 - 4.0	4.4 - 6.3	5.5 - 8.0	8.0 - 11.1	VE9-11
25	From the county boundary extends inland	96°48'10.495"W 28°6'4.877"N	5.2 ¹	8.5 ¹	10.1 ¹	12.6 ¹	AE7-10
			3.3 - 4.0	5.2 - 6.4	6.2 - 8.1	7.8 - 11.3	VE9-11
26	From the county boundary extends inland	96°47'27.125"W 28°6'39.03"N	5.2 ¹	8.5 ¹	10.2 ¹	12.9 ¹	AE7-10
			3.6 - 4.1	4.5 - 6.5	6.2 - 8.2	7.8 - 11.1	VE9-11
27	From the county boundary extends inland to county boundary	96°46'34.551"W 28°7'19.923"N	5.2 ¹	8.5 ¹	10.2 ¹	12.9 ¹	AE7-10
			3.4 - 4.3	4.8 - 6.5	6.3 - 8.2	7.9 - 11.1	VE9-11
28	From the county boundary extends inland to county boundary	96°45'55.03"W 28°7'49.422"N	5.2 ¹	8.5 ¹	10.2 ¹	12.7 ¹	AE7-10
			3.9 - 4.3	4.7 - 6.5	6.0 - 8.2	8.5 - 10.9	VE10-11

¹Starting stillwater elevation for transect does not lie within this county

Table 1 – Coastal Data (Continued)

Transect No.	Description	Latitude & Longitude at Start of Transect	Starting Stillwater Elevations (feet)				Zone Designation and BFE (feet) NAVD
			Range of Stillwater Elevations (feet)				
			10%-Annual-Chance NAVD	2%-Annual-Chance NAVD	1%-Annual-Chance NAVD	0.2%-Annual-Chance NAVD	
29	From the county boundary extends inland to county boundary	96°45'3.775"W 28°8'27.923"N	5.1 ¹	8.5 ¹	10.2 ¹	12.7 ¹	AE7-10
			4.0 - 4.3	5.6 - 6.3	7.1 - 8.0	9.0 - 10.6	VE10-12
30	From the county boundary extends inland to county boundary	96°44'18.699"W 28°9'1.354"N	5.2 ¹	8.5 ¹	10.3 ¹	12.9 ¹	AE7-9
			3.1 - 3.1	5.5 - 5.7	6.2 - 7.5	9.2 - 10.1	
31	From the county boundary extends inland to county boundary	96°43'23.102"W 28°9'41.664"N	5.2 ¹	8.5 ¹	10.2 ¹	12.9 ¹	X
			-- ²	-- ²	-- ²	9.4 - 9.4	
32	From the county boundary extends inland across San Antonio Bay	96°42'32.696"W 28°10'16.595"N	5.2 ¹	8.5 ¹	10.4 ¹	13.2 ¹	VE9-11
			3.9 - 4.1	5.6 - 5.8	6.9 - 7.3	9.1 - 9.6	
33	From the county boundary extends inland across San Antonio Bay	96°41'43.739"W 28°10'49.99"N	5.2 ¹	8.5 ¹	10.3 ¹	13.0 ¹	AE9
			3.8 - 3.8	5.4 - 5.4	6.7 - 6.9	8.9 - 9.2	VE9-11
34	From Copano Bay across Egery Island inland	97°12'2.492"W 28°4'6.245"N	4.2	6.1	7.0	8.8	AE9-11
			4.1 - 5.1	6.0 - 7.8	7.0 - 7.6	8.7 - 10.4	VE9-11
35	From Copano Bay inland	97°11'3.238"W 28°3'38.685"N	4.1	5.9	6.8	8.4	AE7-8
			4.1 - 4.4	5.9 - 6.4	5.5 - 7.4	8.4 - 11.3	VE10-11

¹Starting stillwater elevation for transect does not lie within this county

²Length of transect within county is above stillwater elevations

Table 1 – Coastal Data (Continued)

Transect No.	Description	Latitude & Longitude at Start of Transect	Starting Stillwater Elevations (feet)				Zone Designation and BFE (feet) NAVD
			Range of Stillwater Elevations (feet)				
			10%- Annual- Chance NAVD	2%- Annual- Chance NAVD	1%- Annual- Chance NAVD	0.2%- Annual- Chance NAVD	
36	From Copano Bay across Port Bay inland	97°8'42.117"W 28°3'6.467"N	4.1	6.1	6.9	8.3	AE8-11
			3.9 - 4.6	5.6 - 7.5	6.5 - 9.4	7.8 - 11.8	VE10-12
37	From Port Bay inland	97°7'33.771"W 28°1'35.672"N	4.1	6.1	6.9	8.3	AE7,9
			3.0 - 4.2	5.4 - 6.8	7.0 - 7.9	7.4 - 9.9	VE9-10
38	From Copano Bay inland	97°7'24.82"W 28°3'36.762"N	3.9	5.6	6.3	7.7	AE6-8
			3.4 - 3.9	4.8 - 5.9	5.5 - 6.8	7.7 - 8.6	VE9
39	From Copano Bay inland	97°6'15.318"W 28°4'27.732"N	3.8	5.5	6.3	7.7	AE6-8
			3.8 - 3.8	4.3 - 5.5	5.3 - 6.3	7.7 - 8.8	VE9
40	From Copano Bay inland	97°4'35.914"W 28°5'2.124"N	3.8	5.5	6.3	7.7	
			3.8 - 3.8	5.5 - 5.5	6.3 - 6.3	7.7 - 7.8	VE9
41	From Copano Bay inland	97°3'26.881"W 28°5'26.578"N	3.8	5.4	6.3	7.8	AE7
			3.8 - 3.8	5.4 - 5.5	6.3 - 6.3	7.8 - 7.8	VE9
42	From Copano Bay inland	97°1'2.915"W 28°10'6.614"N	3.9	5.5	6.5	8.2	AE6-8
			3.4 - 3.9	4.5 - 5.5	5.1 - 6.4	7.7 - 8.7	VE10

Table 1 – Coastal Data (Continued)

Transect No.	Description	Latitude & Longitude at Start of Transect	Starting Stillwater Elevations (feet)				Zone Designation and BFE (feet) NAVD
			Range of Stillwater Elevations (feet)				
			10%-Annual-Chance NAVD	2%-Annual-Chance NAVD	1%-Annual-Chance NAVD	0.2%-Annual-Chance NAVD	
43	From Copano Bay inland	97°0'46.793"W 28°8'30.204"N	3.7	5.3	6.2	7.9	AE6-9
			3.6 - 4.1	5.0 - 5.8	5.2 - 7.0	7.9 - 9.1	VE9-10
44	From Aransas Bay inland at Lamar	97°0'9.665"W 28°7'57.72"N	3.7	5.4	6.3	8.0	AE7
			3.7 - 3.7	5.3 - 5.4	6.2 - 6.3	7.9 - 8.1	VE9-11
45	From Aransas Bay inland across Goose Island	96°59'20.31"W 28°7'39.876"N	3.6	5.3	6.2	7.9	AE6-7
			3.6 - 3.7	5.3 - 5.3	6.1 - 6.2	7.8 - 7.9	VE10
46	From Aransas Bay inland at Lamar	96°58'35.209"W 28°7'53.97"N	3.6	5.2	6.1	7.9	AE6-7
			3.6 - 3.6	5.2 - 5.3	5.9 - 6.1	7.8 - 7.9	VE9-10
47	From Highway 188 west across Capano Bay to the county boundary	97°10'1.200"W 27°59'38.400"N	4.7	7.1	8.2	10.0	AE10
			4.7 - 5.2	7.1 - 7.7	8.1 - 9.1	9.8 - 11.4	VE11-12

3.2 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 National Geodetic Vertical Datum of 1929 (NGVD). With the completion of the North American Vertical Datum of 1988, many FIS reports and FIRMs are now prepared using NAVD as the referenced vertical datum.

Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD. 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. The datum conversion factor from NGVD29 to NAVD88 in Aransas County is -0.44 feet.

For information regarding conversion between the NGVD and NAVD, visit the National Geodetic Survey (NGS) website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

NGS Information Services,
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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 www.ngs.noaa.gov.

4.0 **FLOODPLAIN MANAGEMENT APPLICATIONS**

The NFIP encourages state and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS report provides 1-percent-annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent-annual-chance flood elevations; delineations of the 1- and 0.2-percent-annual-chance floodplains; and a 1-percent-annual-chance floodway. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevations Tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local community 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 interpolated using topographic data from 2006 TNRIS LiDAR based mass points suitable for a contour interval of 2 feet (Reference 17).

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. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are 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.

For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM.

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 base flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water surface elevation (WSEL) of the base flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 3.

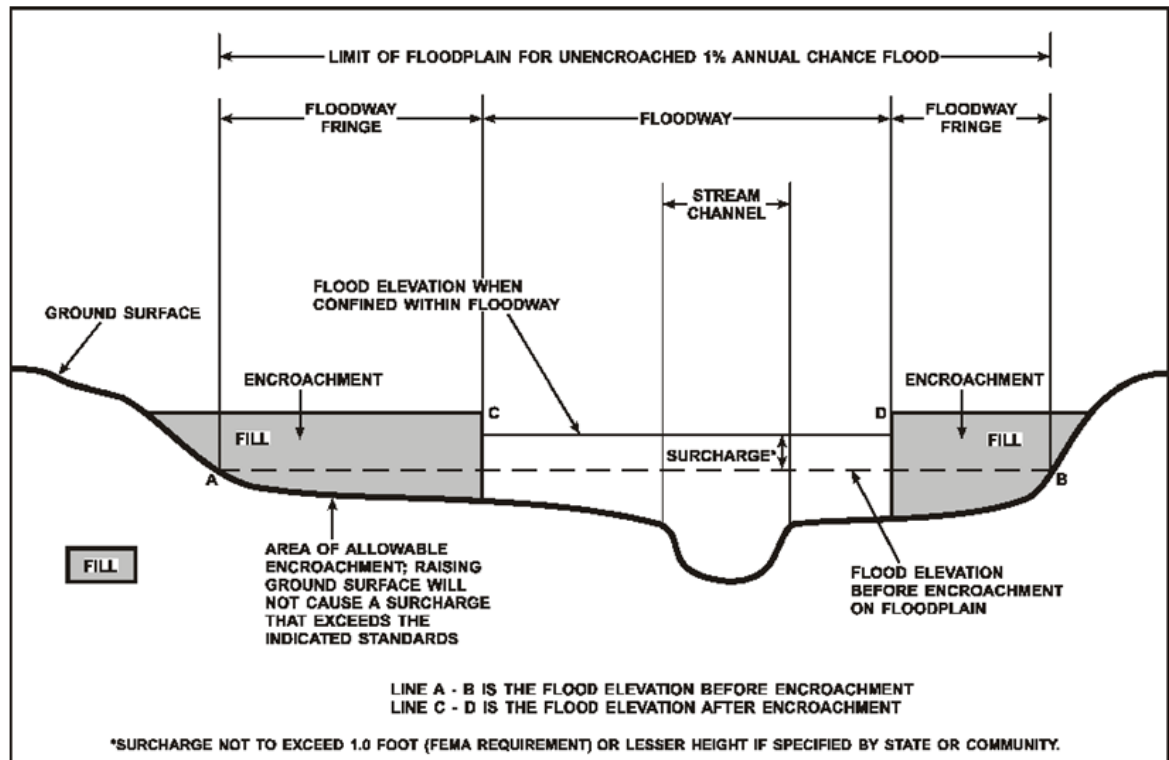


Figure 3: Floodway Schematic

No floodways were computed for Aransas County because the riverine flooding is controlled by the coastal storm surge flooding.

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 rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no Base Flood Elevations (BFEs) or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by detailed methods. 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 rate 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 depths derived from the detailed hydraulic analyses are shown within this zone.

Zone VE

Zone VE is the flood insurance rate 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 rate 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 base flood by levees. No BFEs or depths are shown within this zone.

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 rate 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 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, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The countywide FIRM presents flooding information for the entire geographic area of Aransas County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the county identified as flood-prone. This countywide FIRM also includes flood hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community are presented in Table 2, "Community Map History."

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISIONS DATE
Aransas County, (Unincorporated Areas)	June 17, 1970	None	August 6, 1971	September 26, 1975 October 1, 1983 March 4, 1985 September 18, 1986 May 4, 1992
Aransas Pass, City of	June 17, 1970	None	June 25, 1971	July 1, 1974 November 7, 1975 March 4, 1985 May 4, 1992
Fulton, Town of*	June 17, 1970	None	August 6, 1971	September 26, 1975 October 1, 1983 March 4, 1985 September 18, 1986 May 4, 1992

*Dates for this community were taken from Aransas County (Unincorporated Areas)

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISIONS DATE
Port Aransas, City of	June 17, 1970	None	June 26, 1971	September 8, 1972 November 23, 1973 July 1, 1974 August 13, 1976 December 8, 1976 March 18, 1985 September 30, 1992
Rockport, City of	July 2, 1971	None	July 2, 1971	July 1, 1974 September 9, 1977 January 16, 1979 March 4, 1985

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
 AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

The Aransas County Study is in agreement with the studies completed or on-going for the adjacent counties.

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.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting FEMA Region VI, Federal Insurance and Mitigation Division, 800 North Loop 288, Denton, Texas 76209.

9.0 BIBLIOGRAPHY AND REFERENCES

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10.0 REVISIONS DESCRIPTION

This section has been added to provide information regarding significant revisions made since the original FIS report and FIRM were printed. Future revisions may be made that do not result in the republishing of the FIS report.

10.1 First Revision (December 20, 2019)

a. Acknowledgements

The first-time countywide FIRM and FIS production for Aransas County and incorporated areas began in 2004 with an update for coastal hazards. During the update, the Aransas Pass Levee and Seawall was identified and was not able to be certified under 44 CFR 65.10. As new levee mapping guidance for regulatory products was being developed with the Levee Analysis and Mapping Procedure (LAMP), the preliminary FIRM and FIS for Aransas showed a Seclusion area on the landward side of the levee. Risk Assessment, Mapping and Planning Partners (RAMPP) performed a natural valley analysis according to LAMP guidance. A final CCO meeting was held on April 19, 2018.

b. Scope

The LAMP study resulted in modifications to the mapped floodplains based on the natural valley analysis. The natural valley scenario represents the most conservative mapping of flood risk in Aransas Pass. Due to the levee's unaccredited status, areas that were previously shown as protected by the levee were modeled under the scenario of the levee providing no protection from flood events.

Floodplain mapping was developed for the 1% and 0.2% annual chance flooding events using automated tools and manual processes. The mapped floodplains were utilized in the creation of water surface elevation (WSEL) and depth grids for the 1% and 0.2% chance events within the natural valley extent.

c. Hydrology and Hydraulics

Subcatchments were delineated based on topography within the City. Curve numbers for the sub-catchments were obtained using NRCS websoil survey and National Landuse Classification Database (NLCD), 2011 data. Times of concentration were determined using the subcatchment topography. Rainfall depths for the hydrologic analysis was determined based on TP-40 and Hydro-35 data for the region. SCS Type III distribution was used for the analysis. It is important to note that the HMS model was used exclusively to develop the peak discharges, which were used as flow boundaries in a 2D model (XPSWMM) developed to determine the inundation impacts due the rainfall events.

For coastal levees, the natural valley approach includes removing the entire levee

from the wave height analysis. The Stillwater elevation on the seaward side of the levee is extended landward until it intersects with natural ground.

Calculations of overland wave height propagation, using Wave Height Analysis for Flood Insurance Studies (WHAFIS), version 4.0, included both the 1- and 0.2-percent-annual-chance events. Coastal analysis was conducted prior to LAMP and 1% WSEL values (7 to 8 ft at the levee locations) were taken from the effective FIS.

d. Additional Considerations

This revision to the Aransas Countywide FIS incorporates new analysis and mapping information the FIRM panels shown in Table 3. This section presents important considerations for using the information contained in this FIS Report and in the FIRM panels updated by this revision. These considerations include changes in format and content. Figures 4 and 5 present information that applies to using the updated FIRM panels and FIS Report.

Each FIRM panel may contain specific notes to the user that provide additional information regarding the flood hazard data shown on that map. However, the FIRM panel does not contain enough space to show all the notes that may be relevant in helping to better understand the information on the panel. Figure 4 contains the full list of these notes.

Table 3: Panels Updated by this Revision (December 20, 2019)

48007C0320H	Aransas County
48409C0470F	San Patricio County

Figure 4: FIRM Notes to Users

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Flood Map Service Center website or by calling the FEMA Map Information eXchange.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to Table 2 in this FIS Report.

To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

The map is for use in administering the NFIP. It may not identify all areas subject to flooding, particularly from local drainage sources of small size. Consult the community map repository to find updated or additional flood hazard information.

BASE FLOOD ELEVATIONS: For more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, consult the Flood Profiles and Floodway Data and/or Summary of Non-Coastal Stillwater Elevations tables within this FIS Report. Use the flood elevation data within the FIS Report in conjunction with the FIRM for construction and/or floodplain management.

Coastal Base Flood Elevations shown on the map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Coastal flood elevations are also provided in the Coastal Transect Parameters table in the FIS Report for this jurisdiction. Elevations shown in the Coastal Transect Parameters table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on the FIRM.

FLOODWAY INFORMATION: Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the FIS Report for this jurisdiction.

FLOOD CONTROL STRUCTURE INFORMATION: Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 "Flood Protection Measures" of this FIS Report for information on flood control structures for this jurisdiction.

Figure 4: FIRM Notes to Users (continued)

PROJECTION INFORMATION: The projection used in the preparation of the map was Texas State Plane South Central Zone (FIPS Zone 4204). The horizontal datum was the North American Datum of 1983 NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

ELEVATION DATUM: Flood elevations on the FIRM are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov. Local vertical monuments may have been used to create the map. To obtain current monument information, please contact the appropriate local community listed in Section 10.0 of the FIS Report.

BASE MAP INFORMATION: Base map information shown on the FIRM was derived from data on the previous effective FIRM, dated 2016.

The map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables may reflect stream channel distances that differ from what is shown on the map.

Corporate limits shown on the map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after the map was published, map users should contact appropriate community officials to verify current corporate limit locations.

SPECIAL NOTES FOR SPECIFIC FIRM PANELS

This Notes to Users section was created specifically for Aransas County, Texas, effective December 20, 2019.

LIMIT OF MODERATE WAVE ACTION: Zone AE has been divided by a Limit of Moderate Wave Action (LiMWA). The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between Zone VE and the LiMWA (or between the shoreline and the LiMWA for areas where Zone VE is not identified) will be similar to, but less severe than, those in Zone VE.

Each FIRM panel contains an abbreviated legend for the features shown on the maps. However, the FIRM panel does not contain enough space to show the legend for all map features. Figure 5 shows the full legend of all map features. Note that not all of these features may appear on the FIRM panels in Aransas County.

Figure 5: Map Legend for FIRM

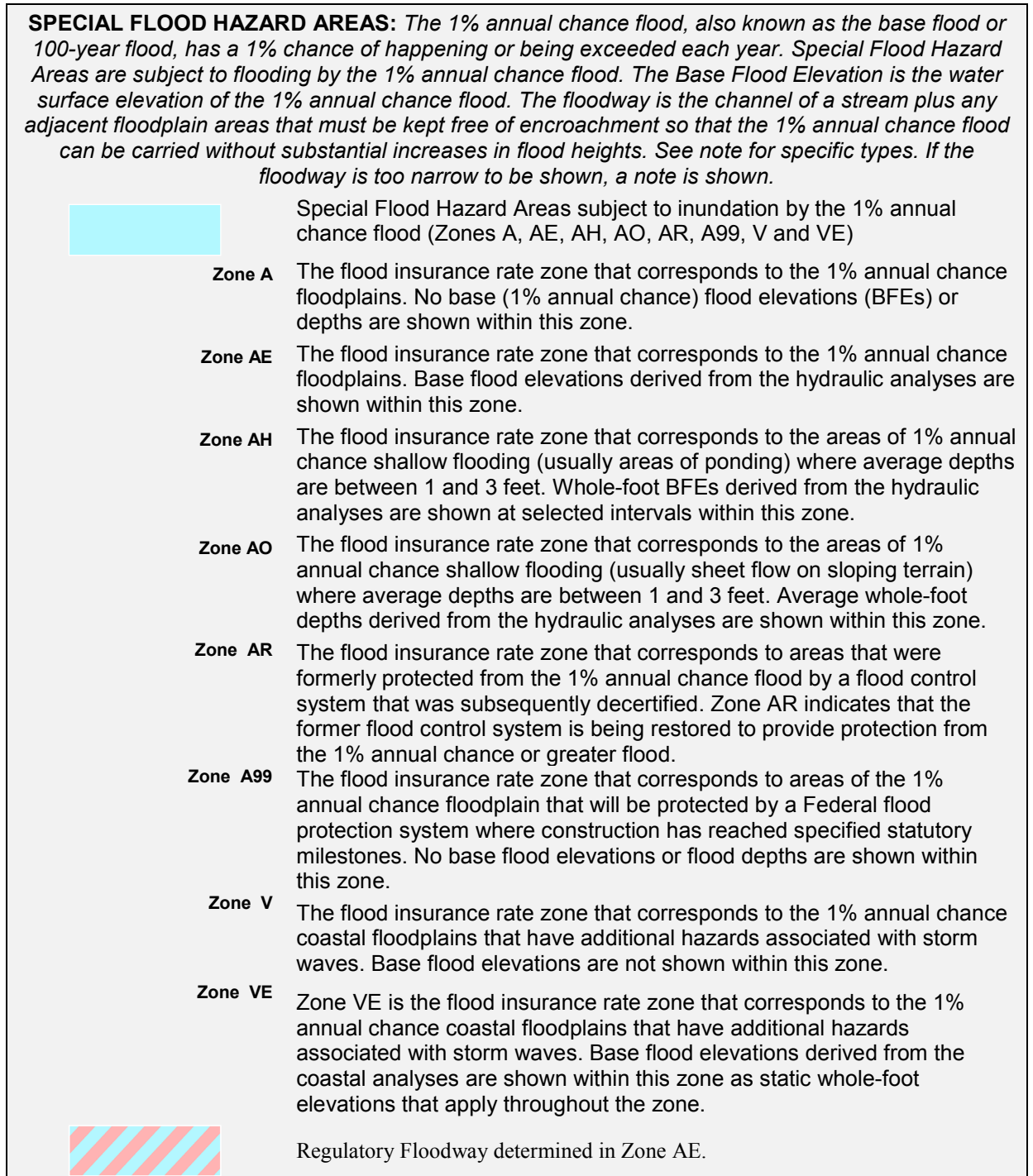


Figure 5: Map Legend for FIRM (continued)














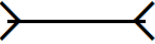
OTHER AREAS OF FLOOD HAZARD	
	Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.
	Future Conditions 1% Annual Chance Flood Hazard – Zone X: The flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined based on future-conditions hydrology. No base flood elevations or flood depths are shown within this zone.
	Area with Reduced Flood Risk due to Levee: Areas where an accredited levee, dike, or other flood control structure has reduced the flood risk from the 1% annual chance flood.
	Area with Flood Risk due to Levee: Areas where a non-accredited levee, dike, or other flood control structure is shown as providing protection to less than the 1% annual chance flood.
OTHER AREAS	
	Zone D (Areas of Undetermined Flood Hazard): The flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.
	Unshaded Zone X: Areas of minimal flood hazard.
FLOOD HAZARD AND OTHER BOUNDARY LINES	
 (ortho) (vector)	Flood Zone Boundary (white line on ortho-photography-based mapping; gray line on vector-based mapping)
	Limit of Study
	Jurisdiction Boundary
	Limit of Moderate Wave Action (LIMWA): Indicates the inland limit of the area affected by waves greater than 1.5 feet
GENERAL STRUCTURES	
 <i>Aqueduct Channel Culvert Storm Sewer</i>	Channel, Culvert, Aqueduct, or Storm Sewer
 <i>Dam Jetty Weir</i>	Dam, Jetty, Weir
	Levee, Dike, or Floodwall
 <i>Bridge</i>	Bridge

Figure 5: Map Legend for FIRM (continued)


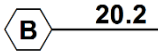
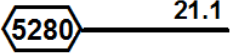
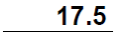
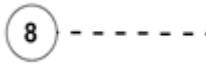


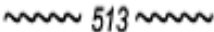










REFERENCE MARKERS	
	River mile Markers
CROSS SECTION & TRANSECT INFORMATION	
	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
	Numbered Cross Section with Regulatory Water Surface Elevation (BFE)
	Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)
	Coastal Transect
 	<p>Profile Baseline: Indicates the modeled flow path of a stream and is shown on FIRM panels for all valid studies with profiles or otherwise established base flood elevation.</p> <p>Coastal Transect Baseline: Used in the coastal flood hazard model to represent the 0.0-foot elevation contour and the starting point for the transect and the measuring point for the coastal mapping.</p>
	Base Flood Elevation Line
<p>ZONE AE (EL 16)</p> <p>ZONE AO (DEPTH 2)</p> <p>ZONE AO (DEPTH 2) (VEL 15 FPS)</p>	<p>Static Base Flood Elevation value (shown under zone label)</p> <p>Zone designation with Depth</p> <p>Zone designation with Depth and Velocity</p>

Figure 5: Map Legend for FIRM (continued)

BASE MAP FEATURES	
	River, Stream or Other Hydrographic Feature
	Interstate Highway
	U.S. Highway
	State Highway
	County Highway
	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile
	Railroad
	Horizontal Reference Grid Line
	Horizontal Reference Grid Ticks
	Secondary Grid Crosshairs
Land Grant	Name of Land Grant
7	Section Number
R. 43 W. T. 22 N.	Range, Township Number
$4276^{000m}E$	Horizontal Reference Grid Coordinates (UTM)
365000 FT	Horizontal Reference Grid Coordinates (State Plane)
80° 16' 52.5"	Corner Coordinates (Latitude, Longitude)

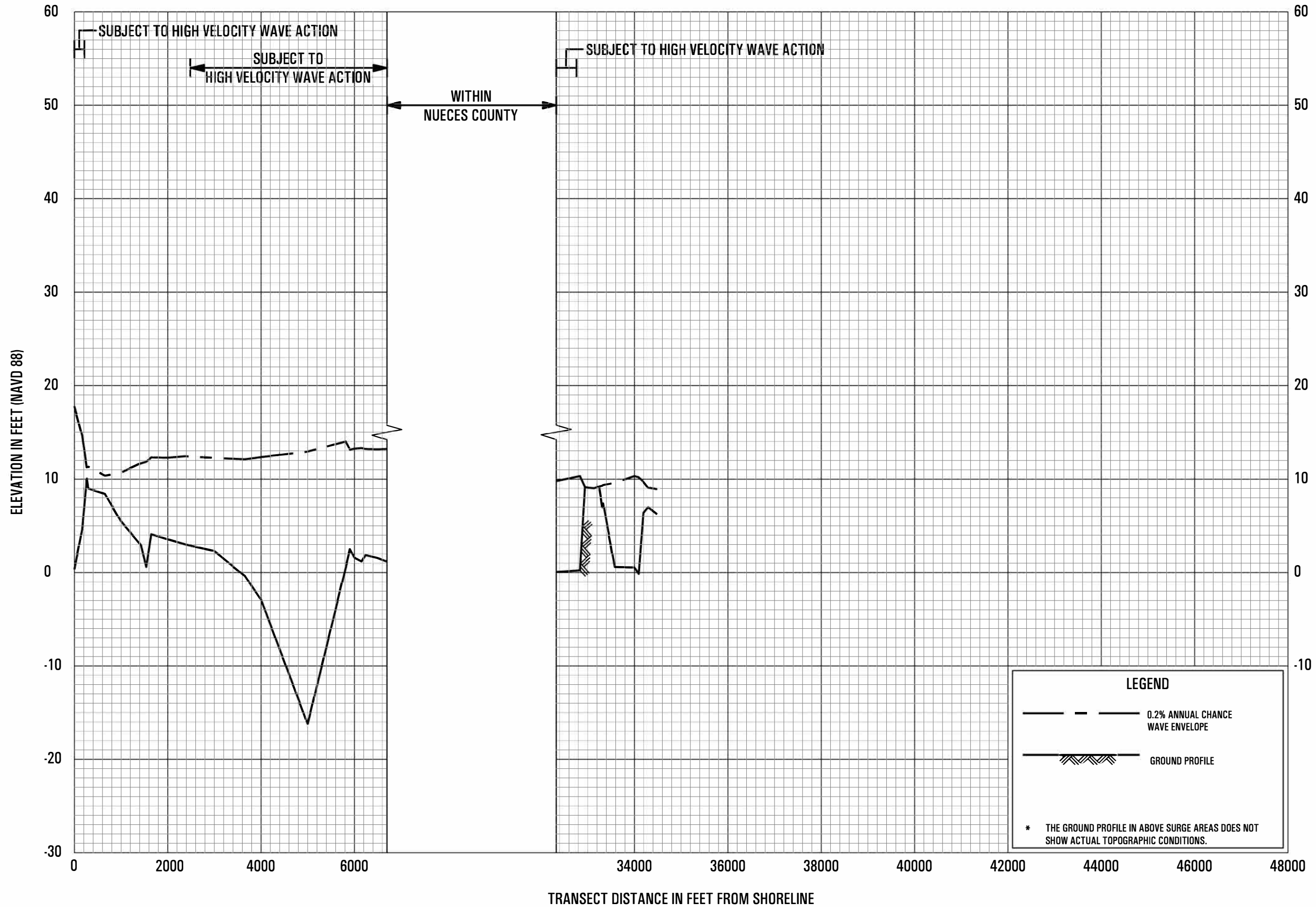


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 1

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

01T



LEGEND

--- 0.2% ANNUAL CHANCE WAVE ENVELOPE

— / / / / / GROUND PROFILE

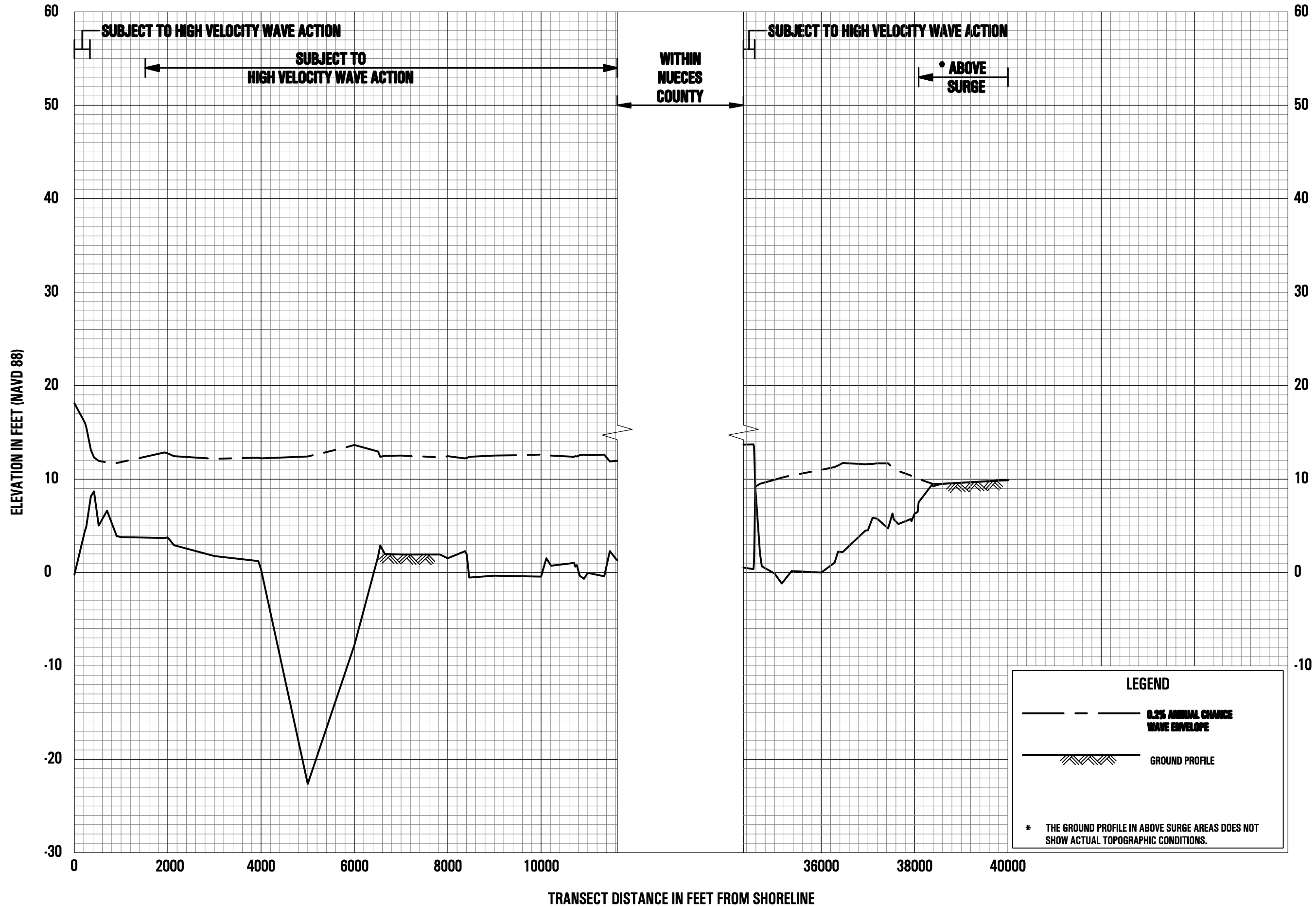
* THE GROUND PROFILE IN ABOVE SURGE AREAS DOES NOT SHOW ACTUAL TOPOGRAPHIC CONDITIONS.

0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
 ARANSAS COUNTY, TX
 AND INCORPORATED AREAS

02T



0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 3

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

03T

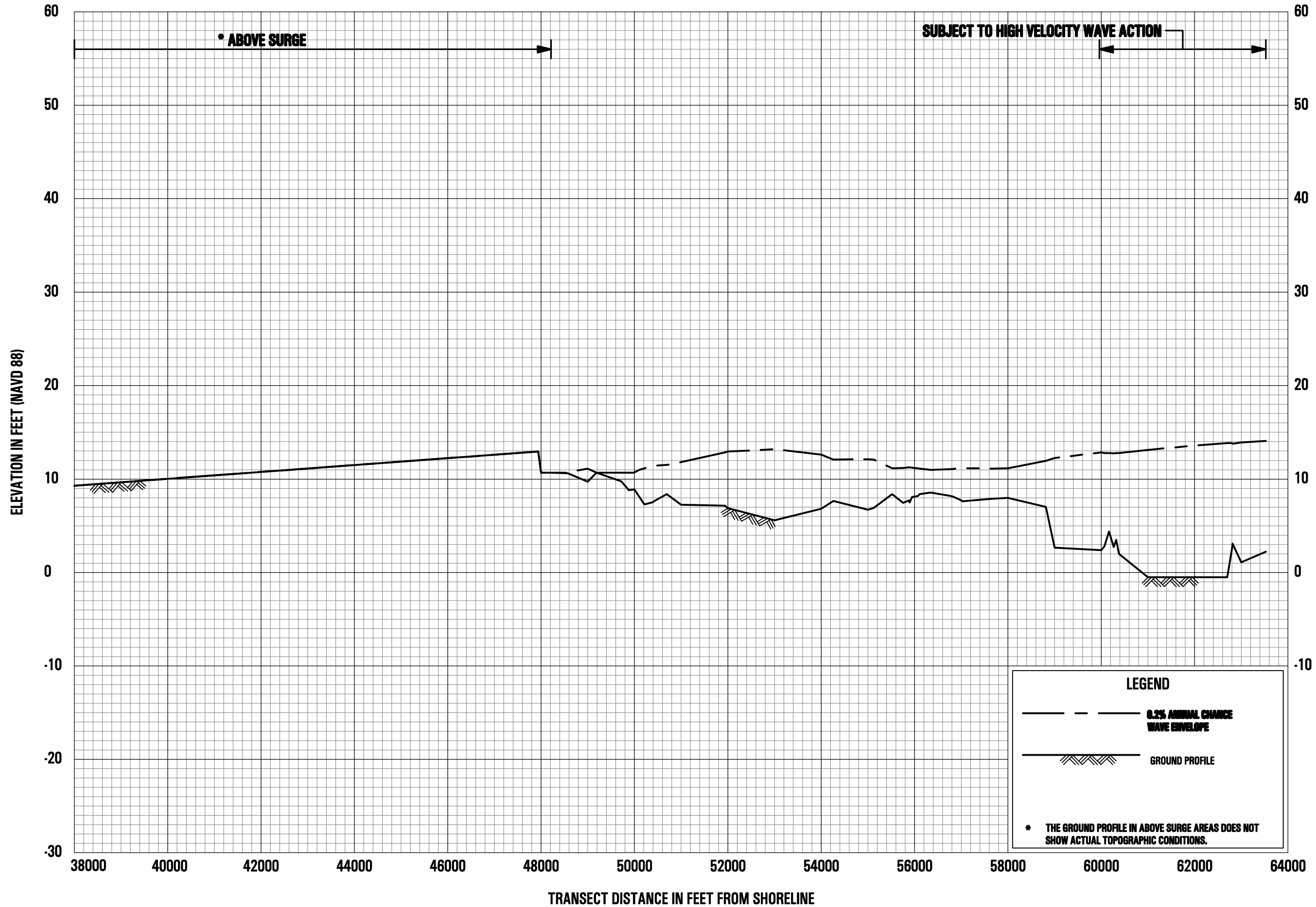


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 4

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

04T

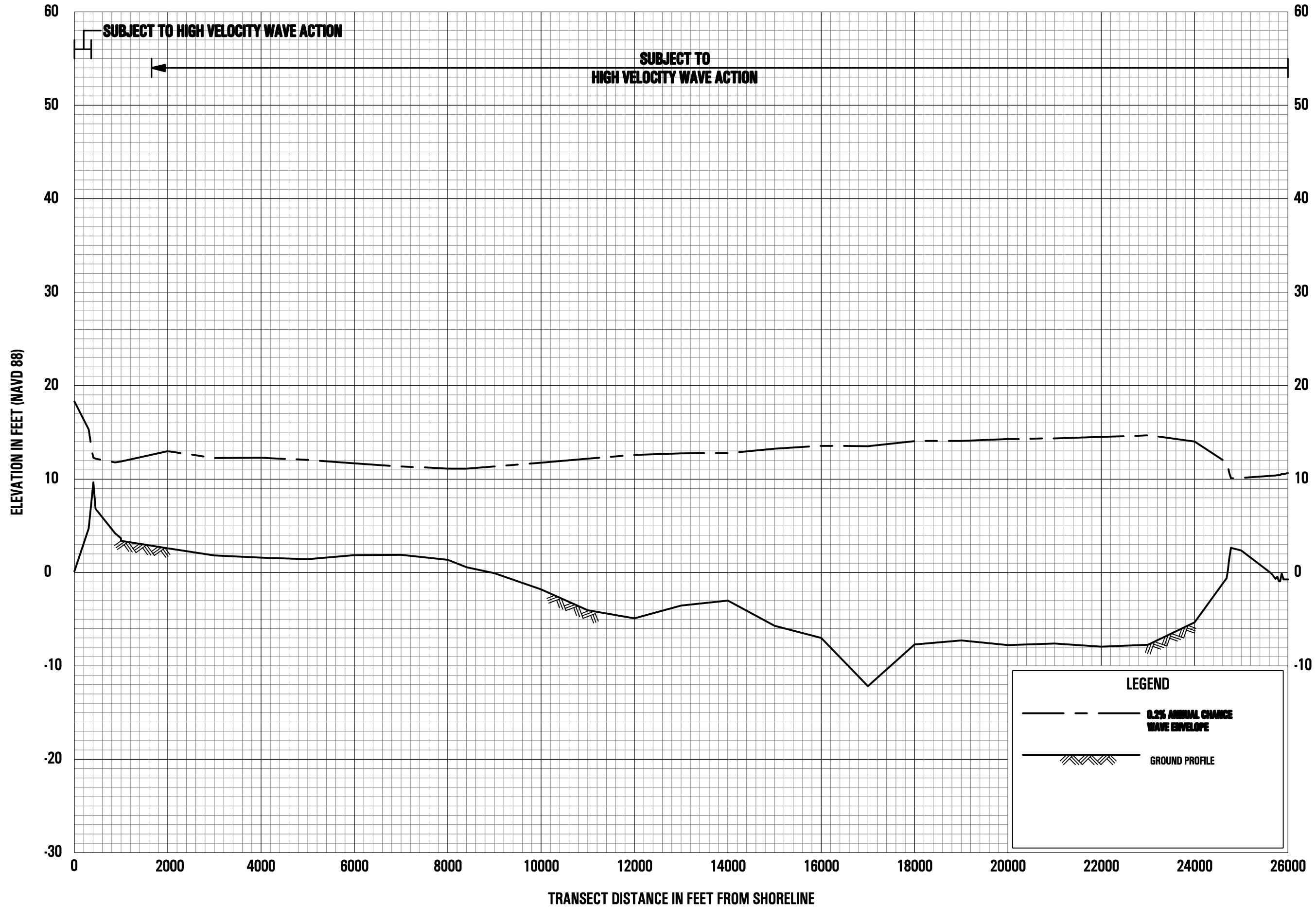


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 4

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

05T

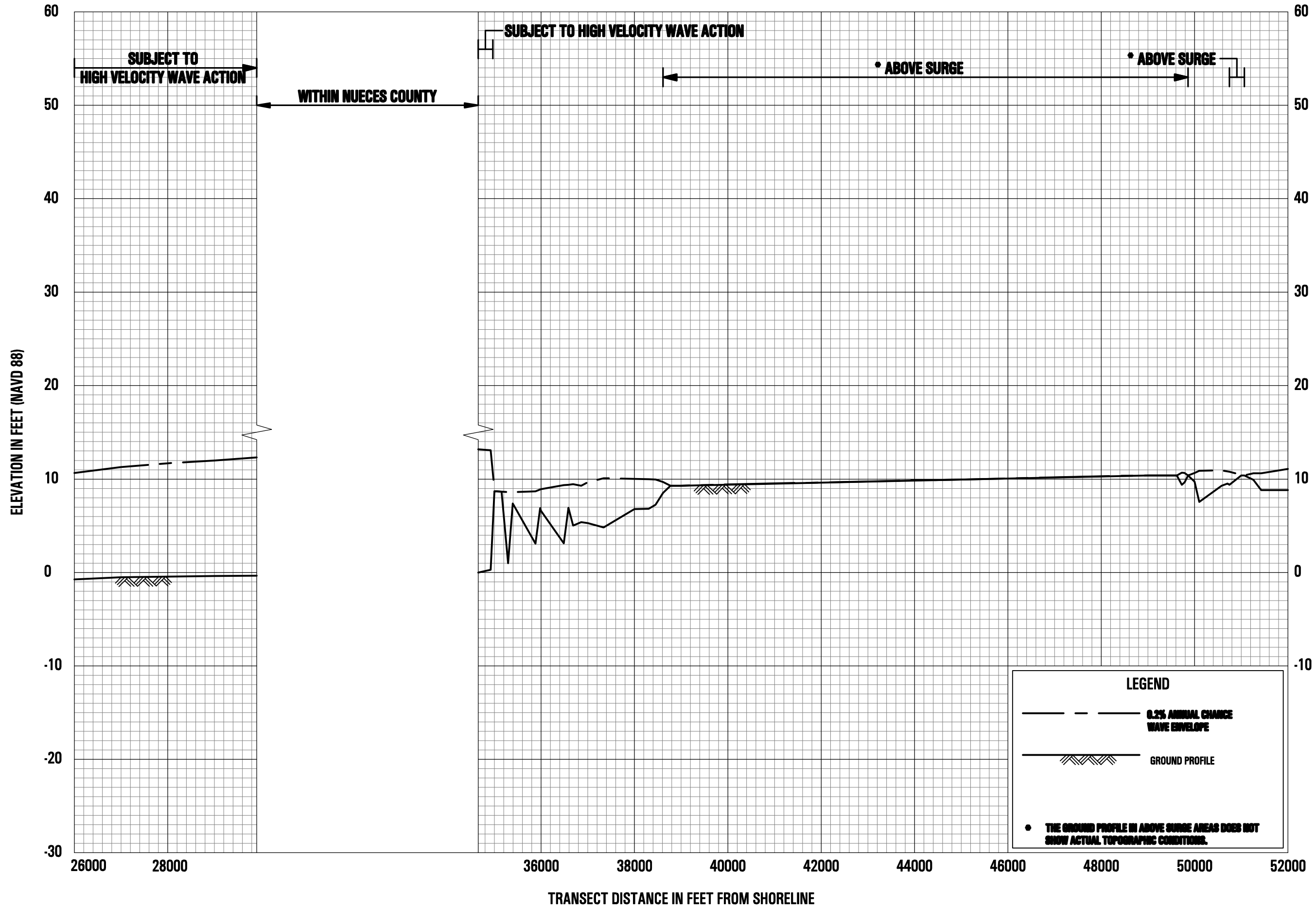


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 5

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

06T

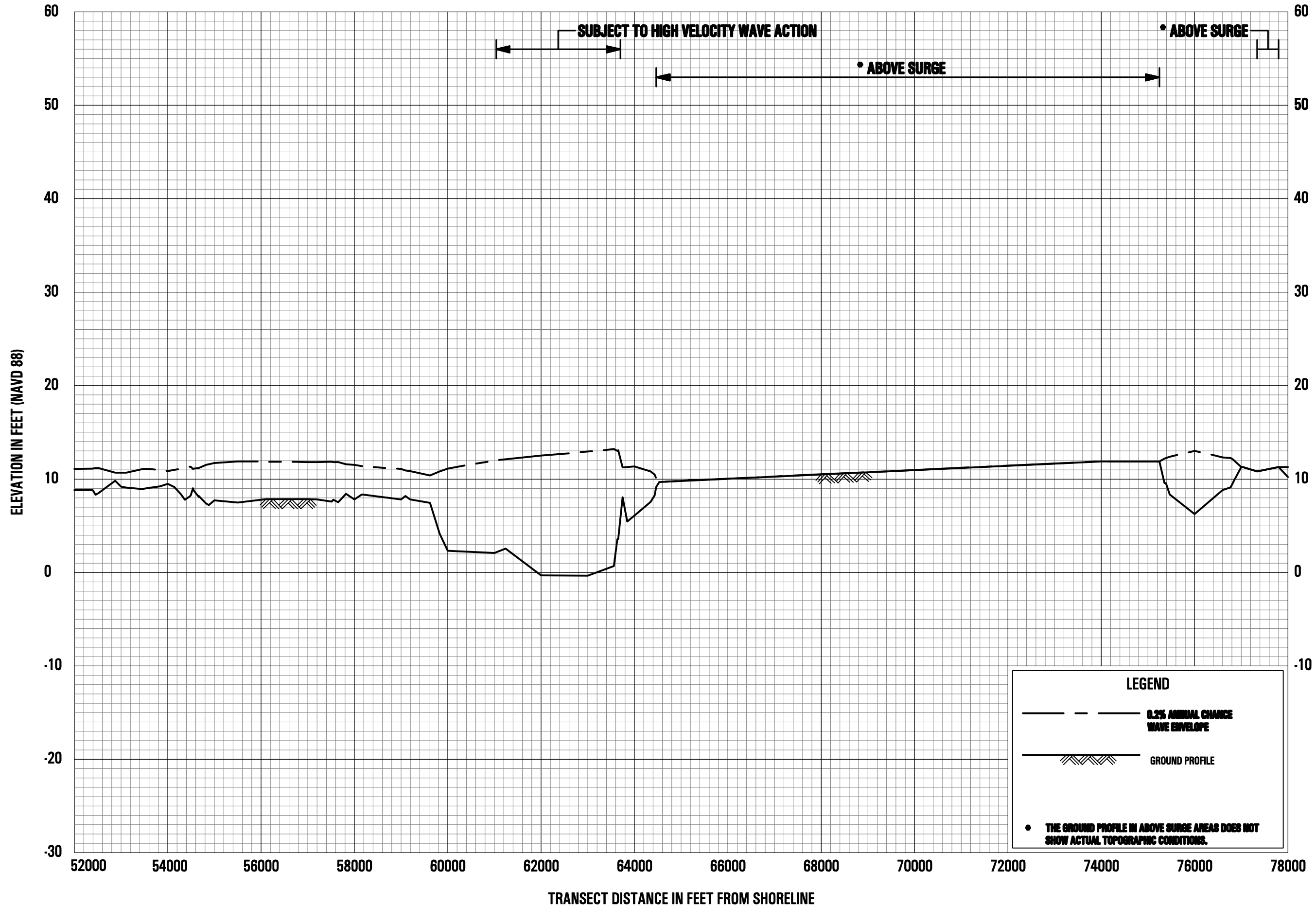


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 5

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

07T

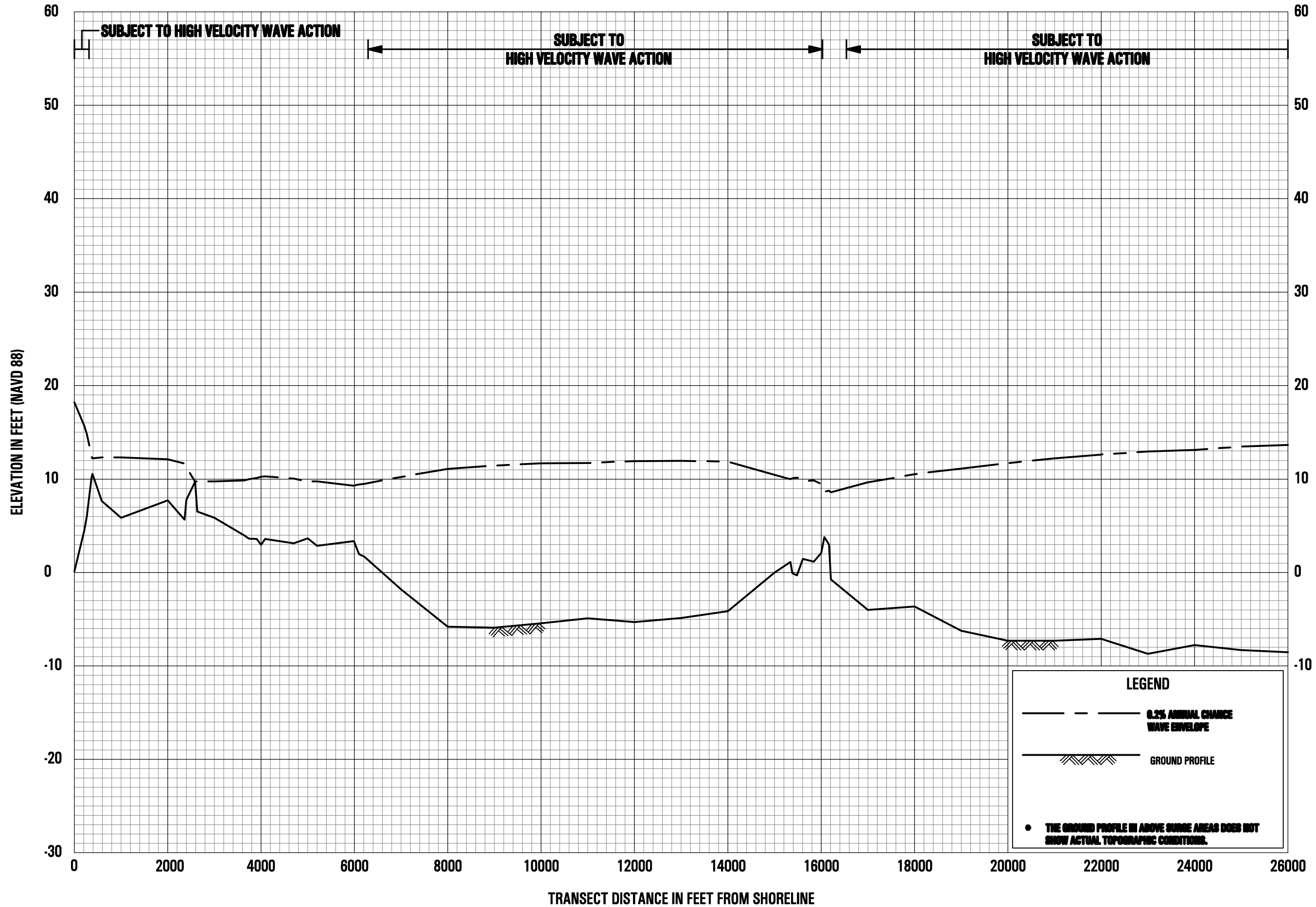


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 5

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

08T

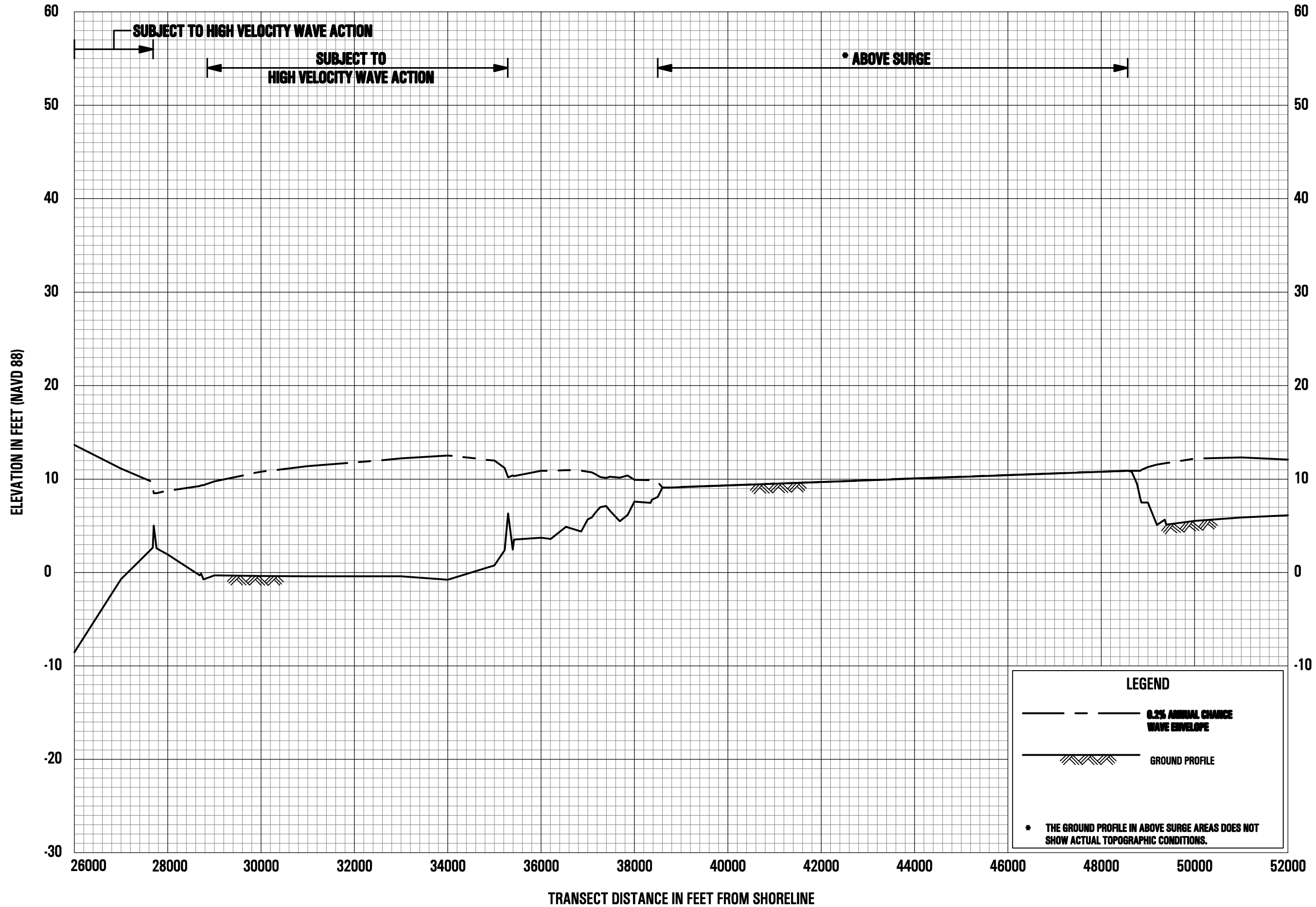


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 6

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

09T

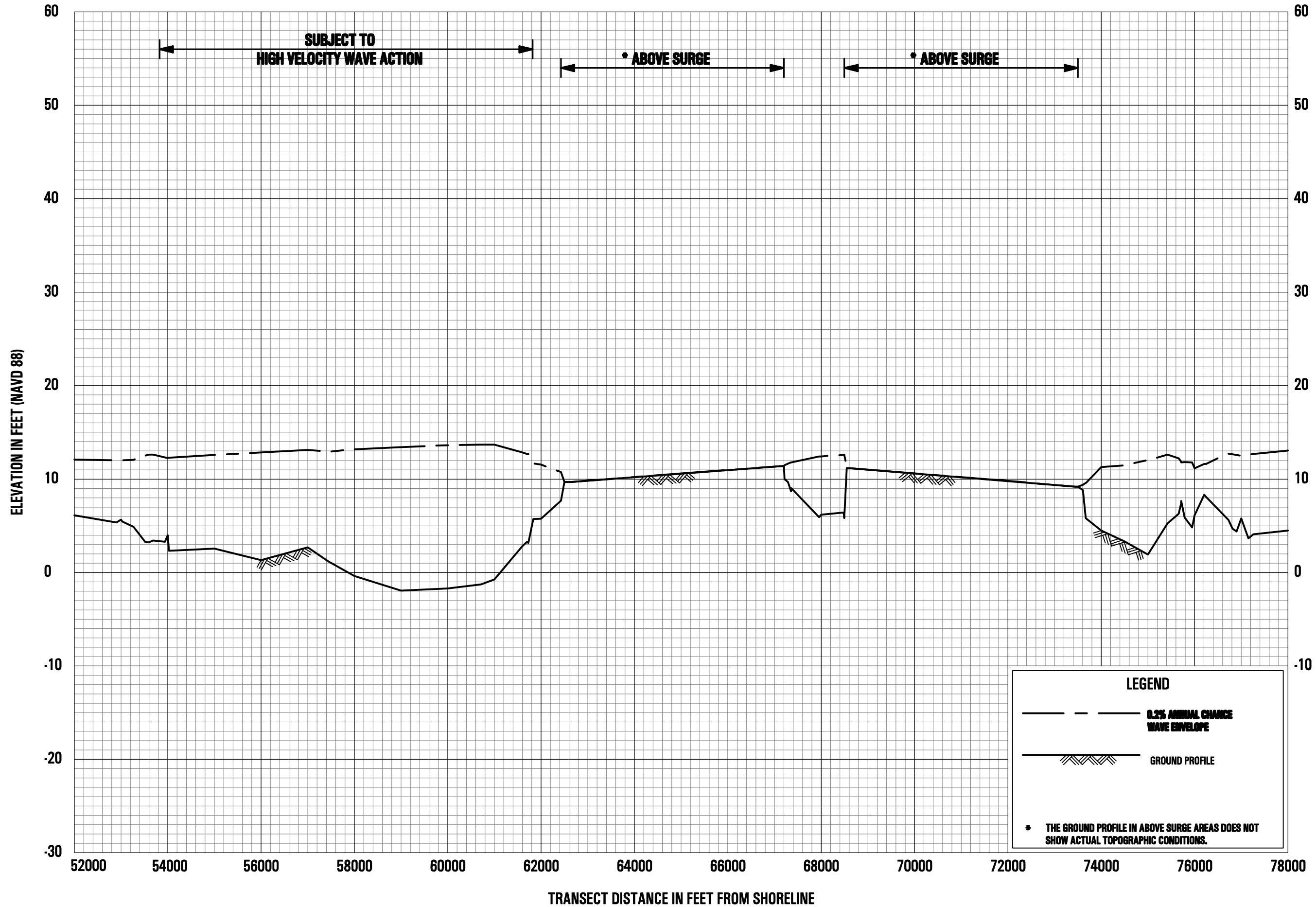


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 6

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

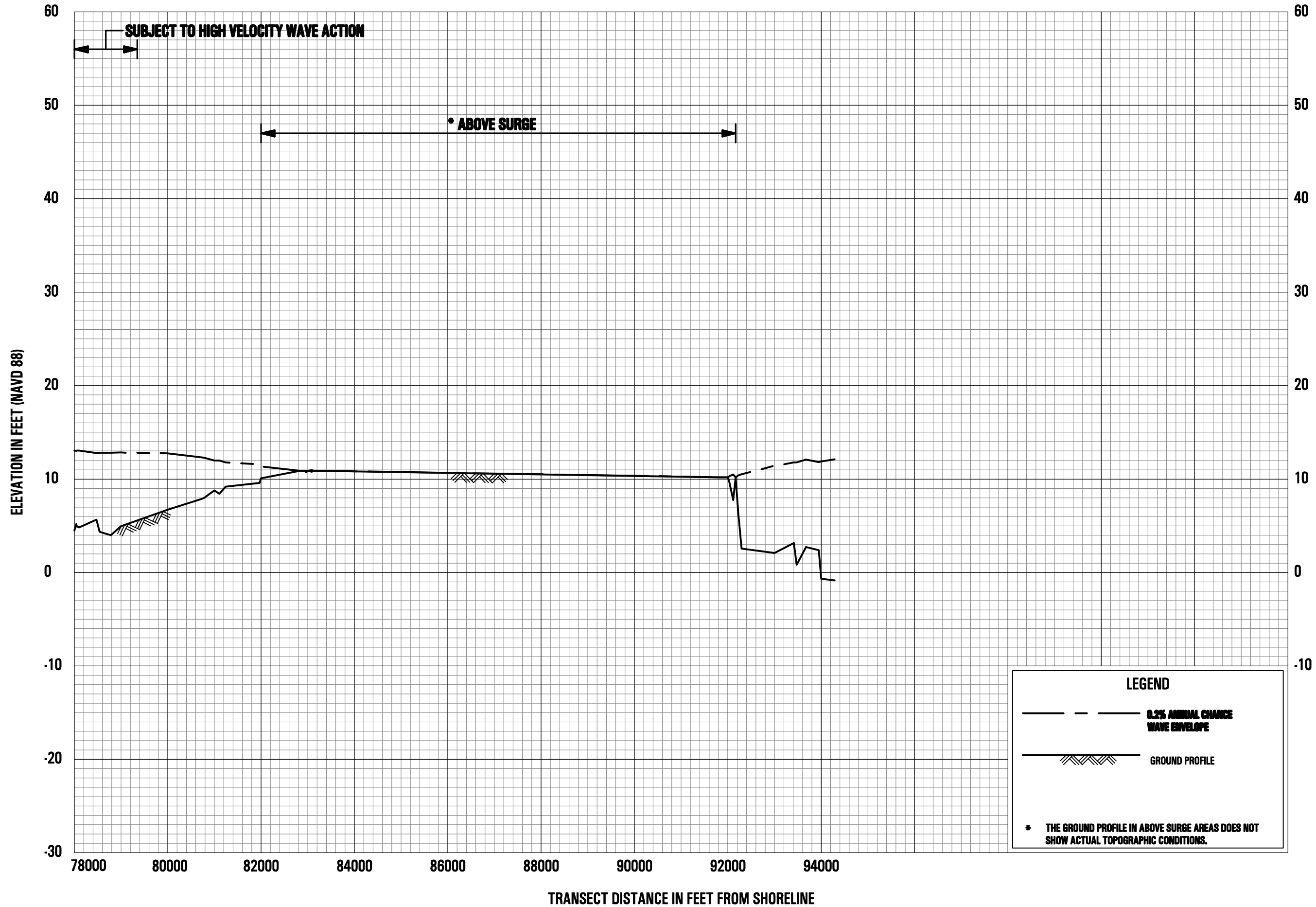
10T



0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 6

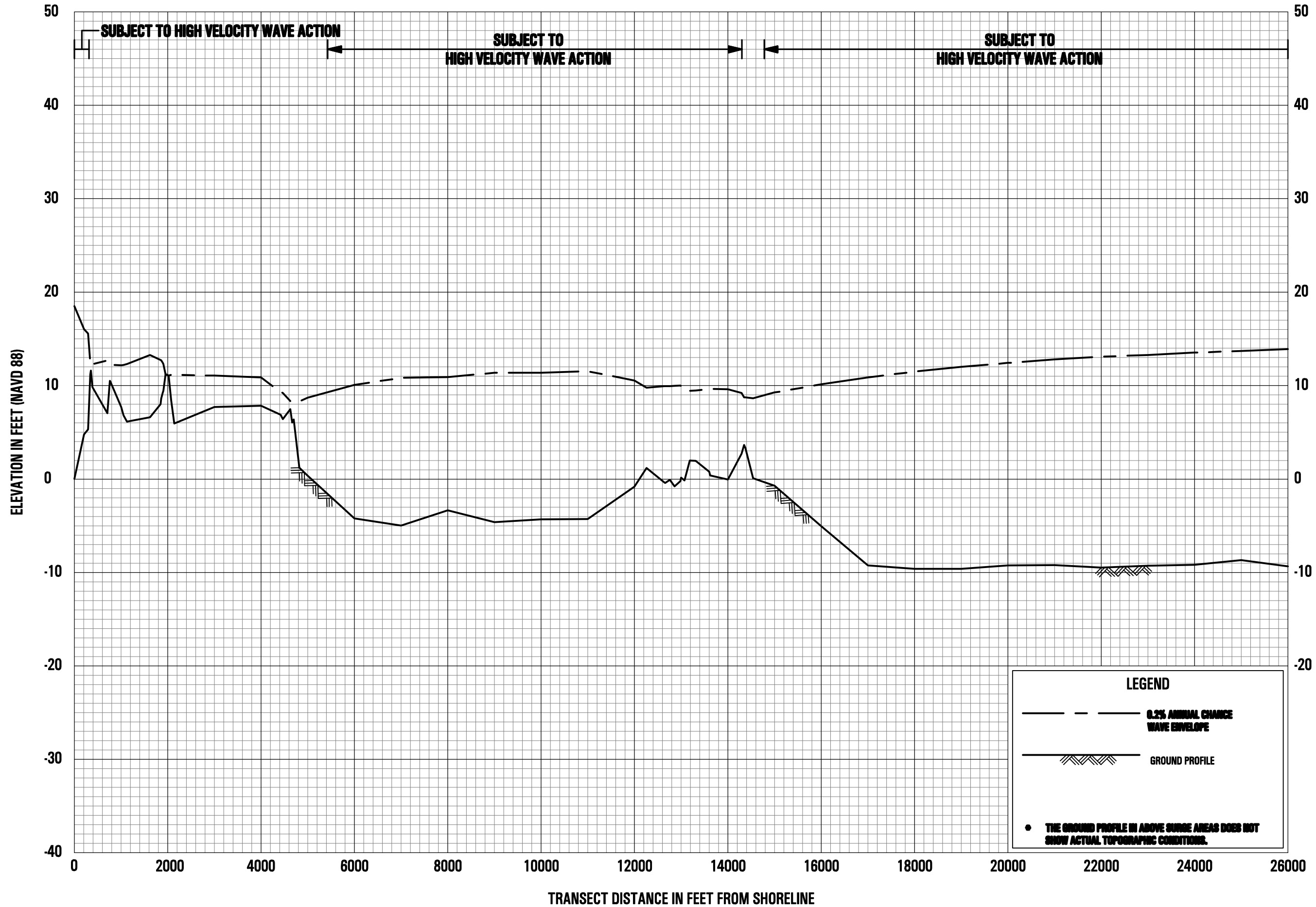
**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**



0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 6

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

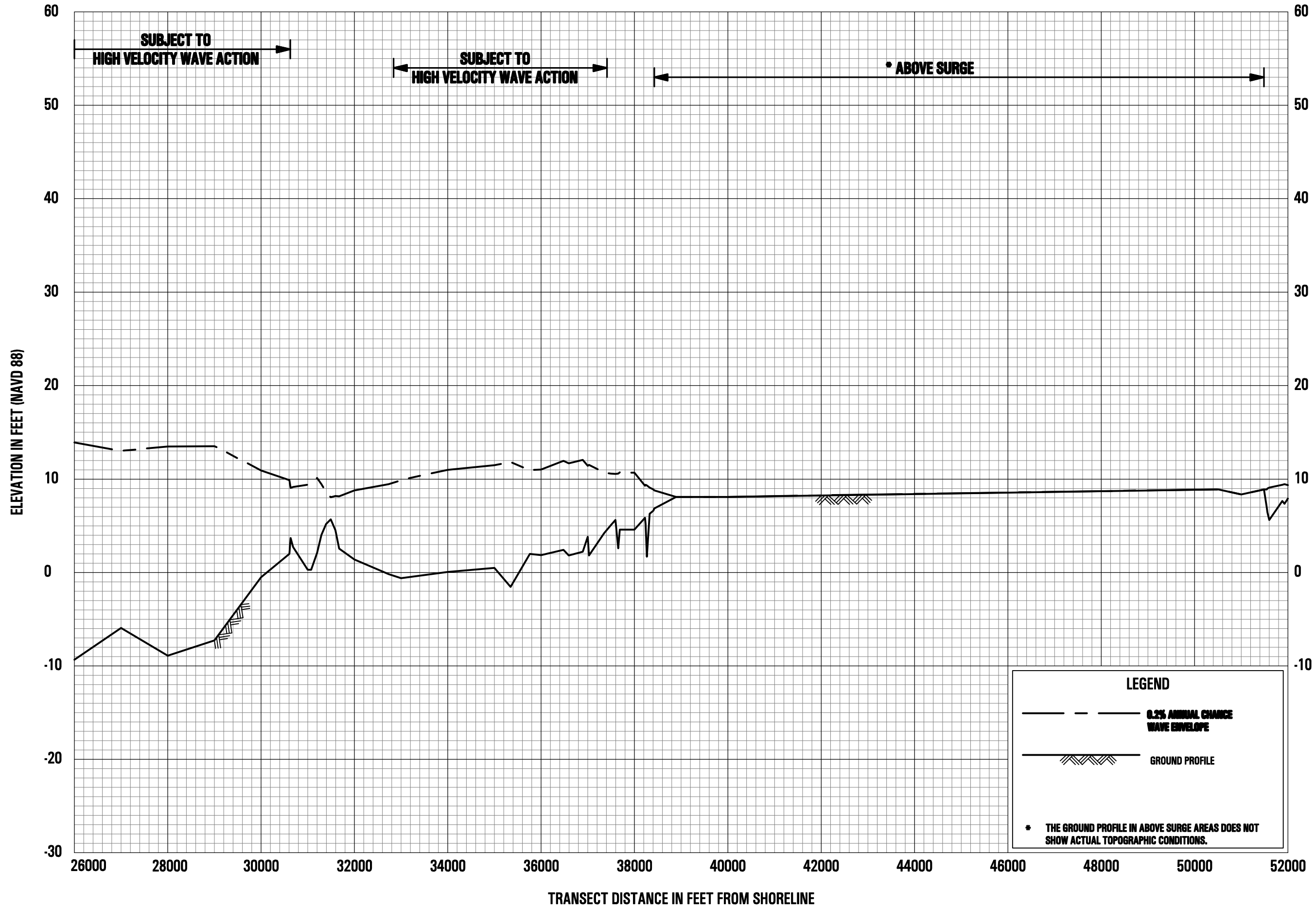


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 7

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

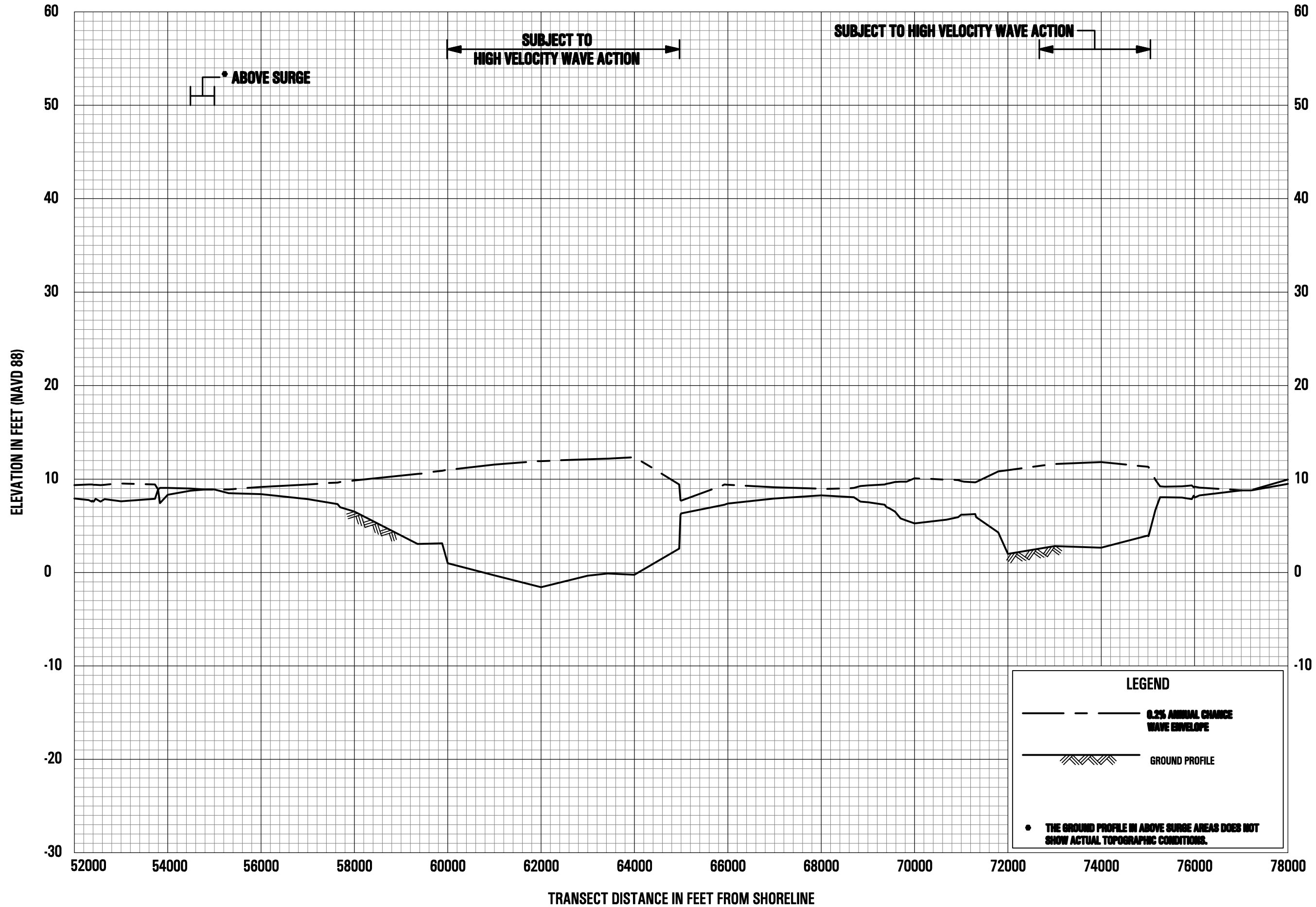
13T



0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 7

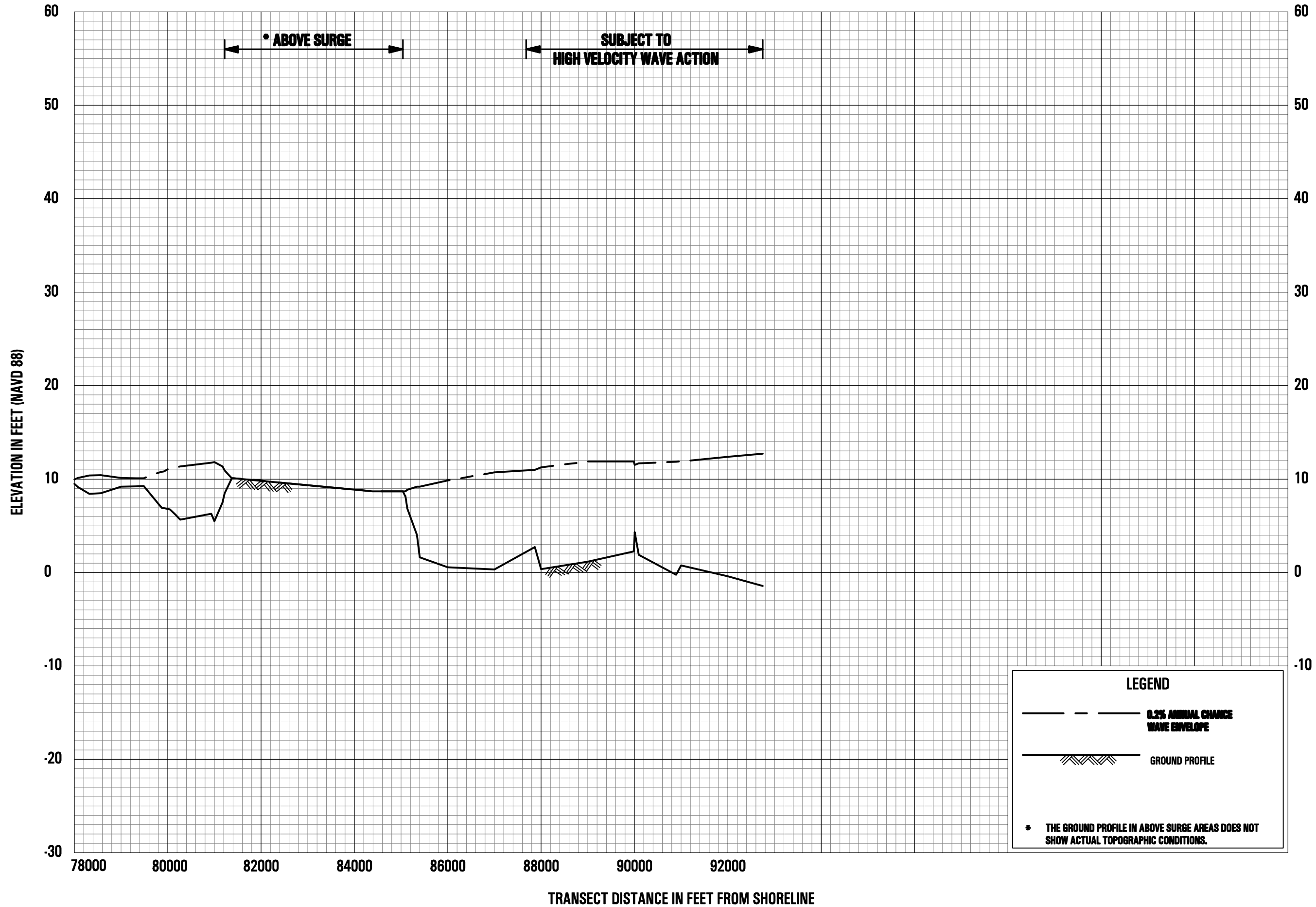
**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**



0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 7

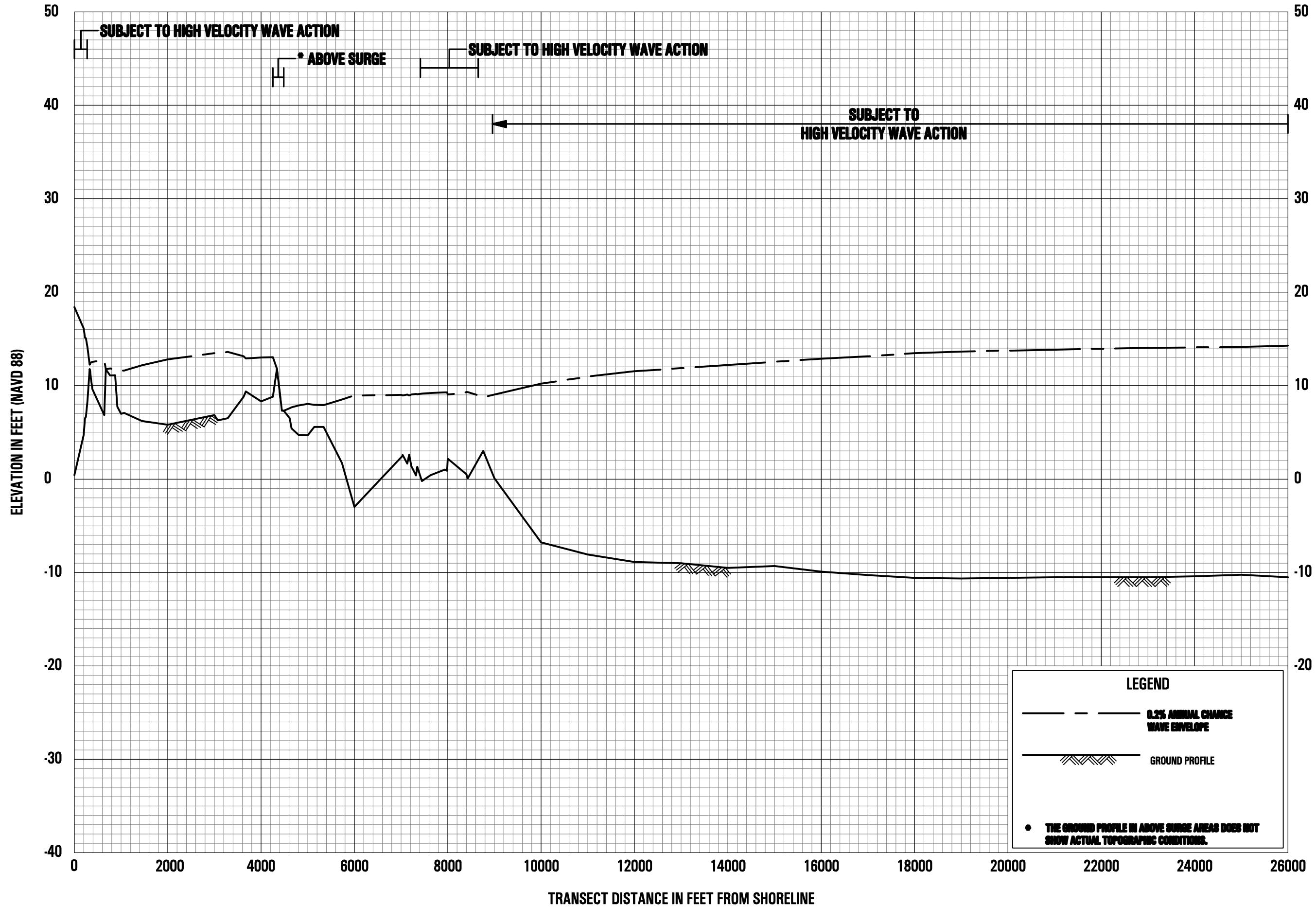
**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**



0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 7

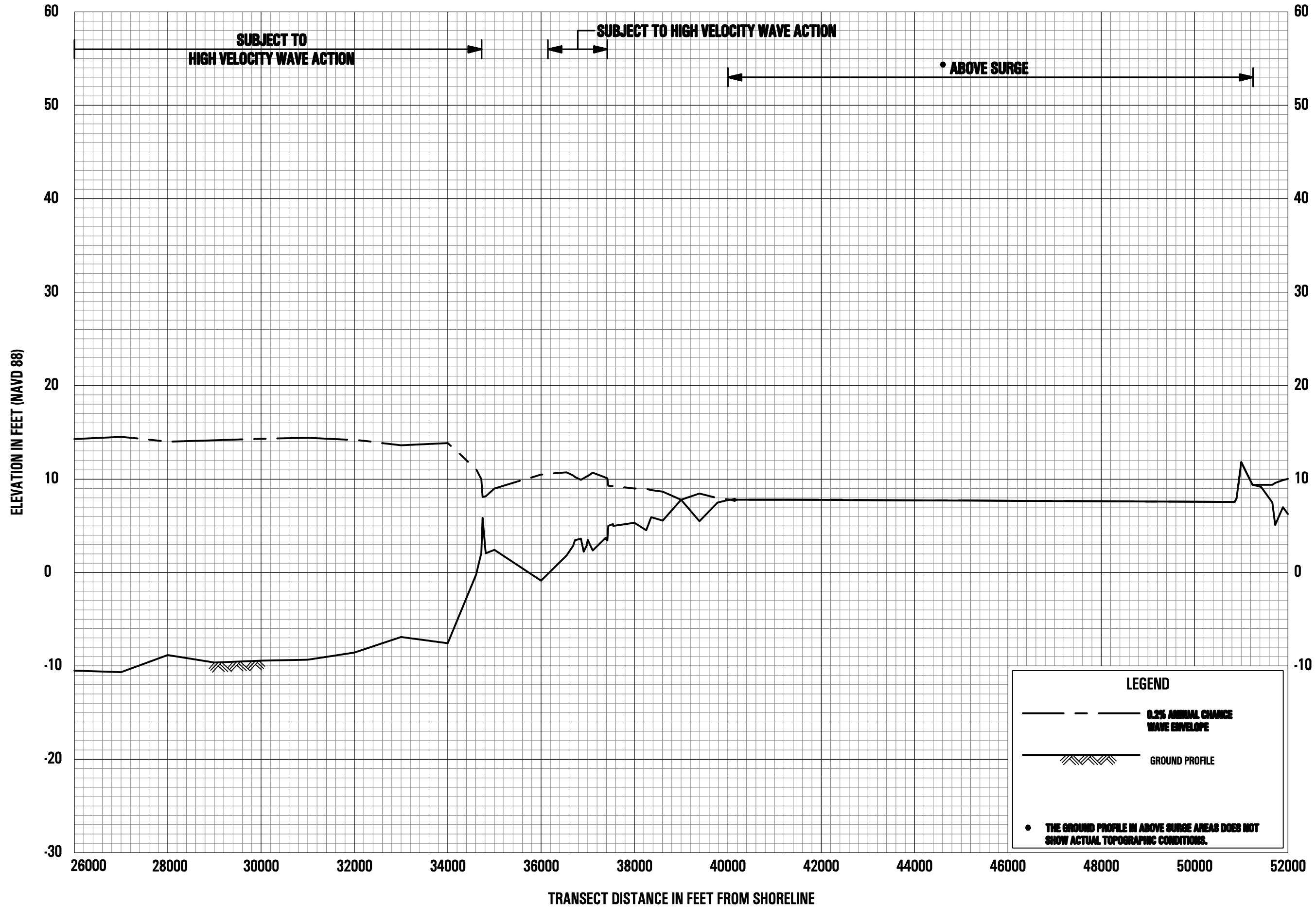
**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**



0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 8

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

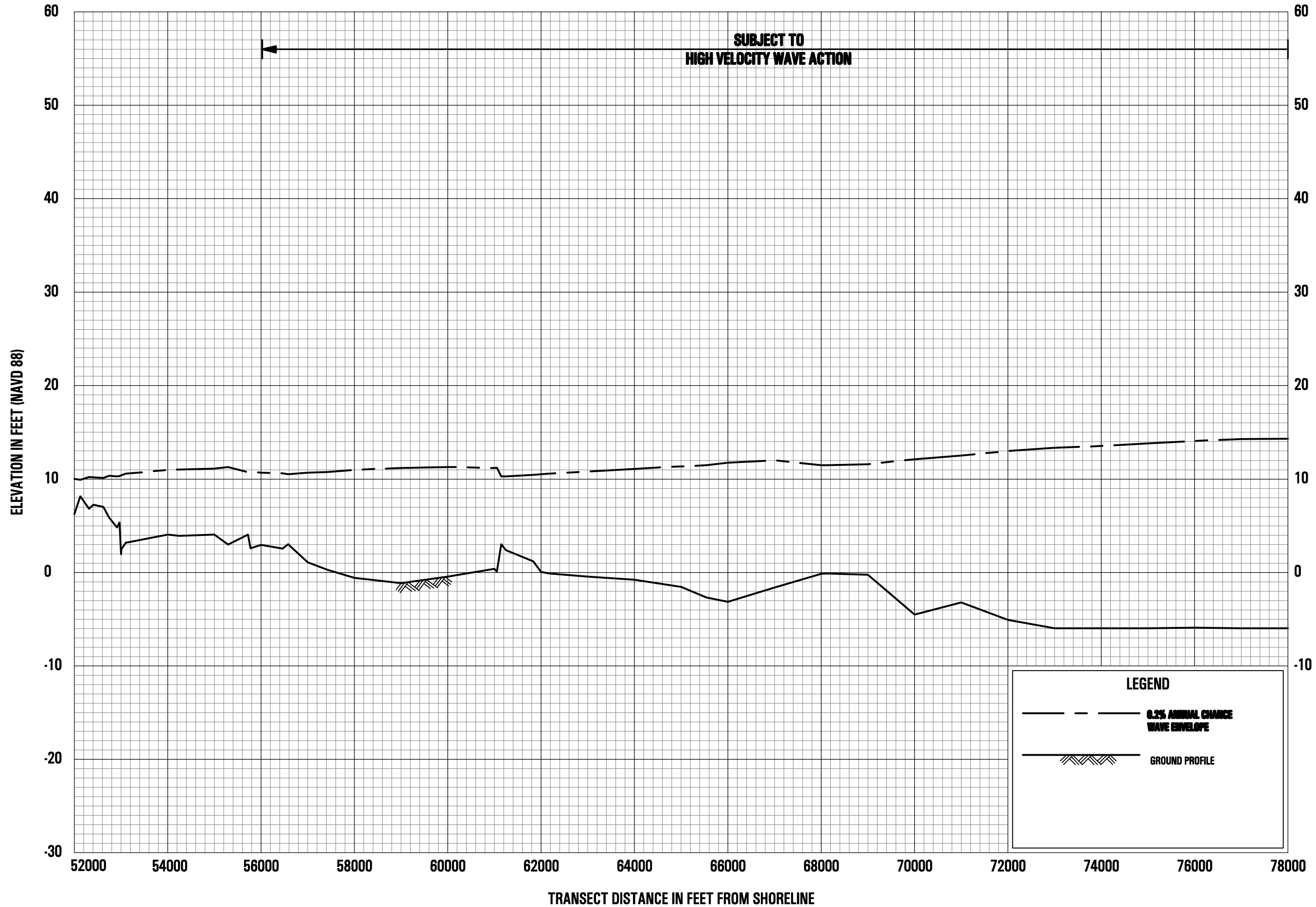


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 8

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

18T

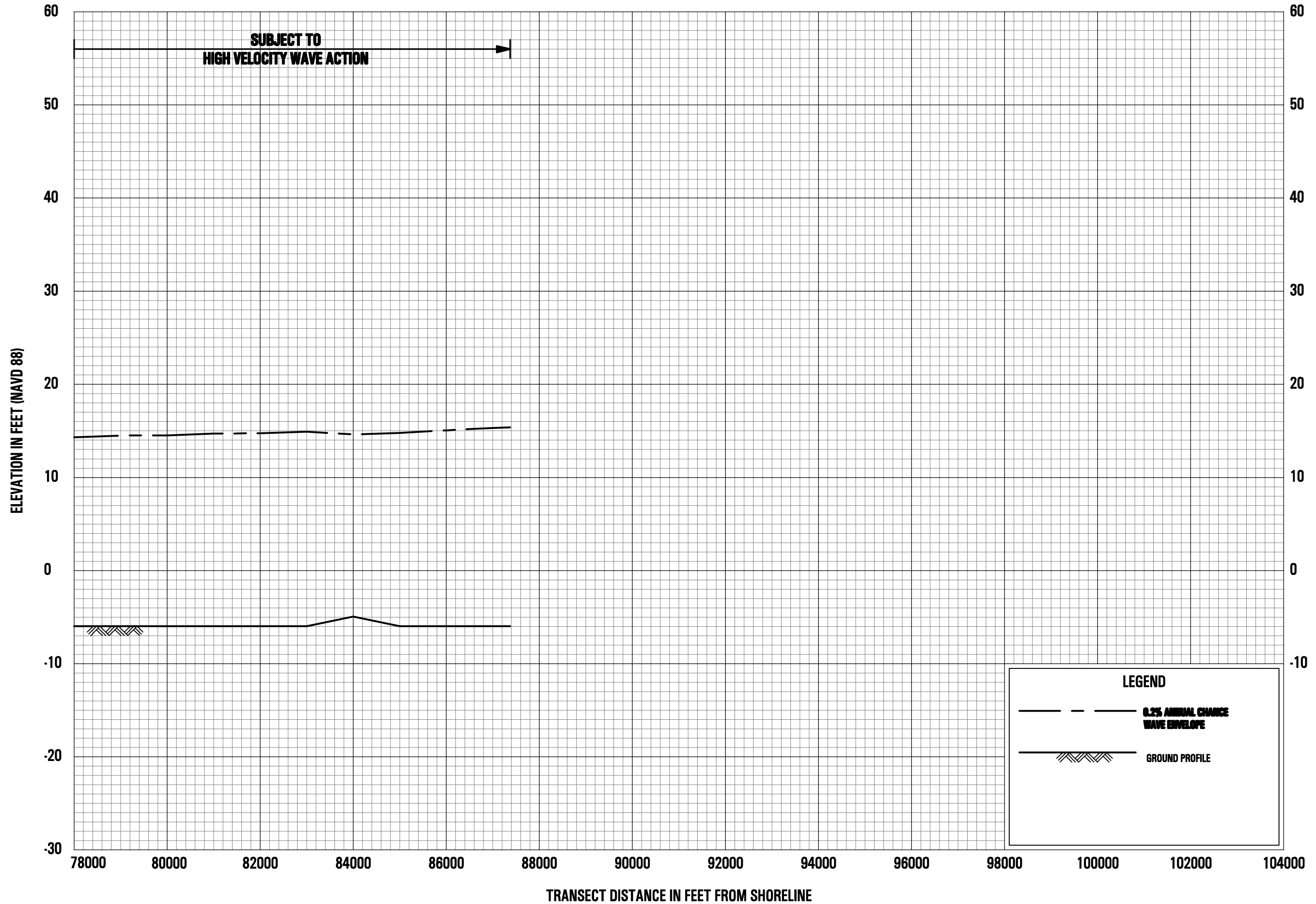


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 8

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

19T



**SUBJECT TO
HIGH VELOCITY WAVE ACTION**

LEGEND

--- 0.2% ANNUAL CHANCE WAVE ENVELOPE

— GROUND PROFILE

0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 8

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

20T

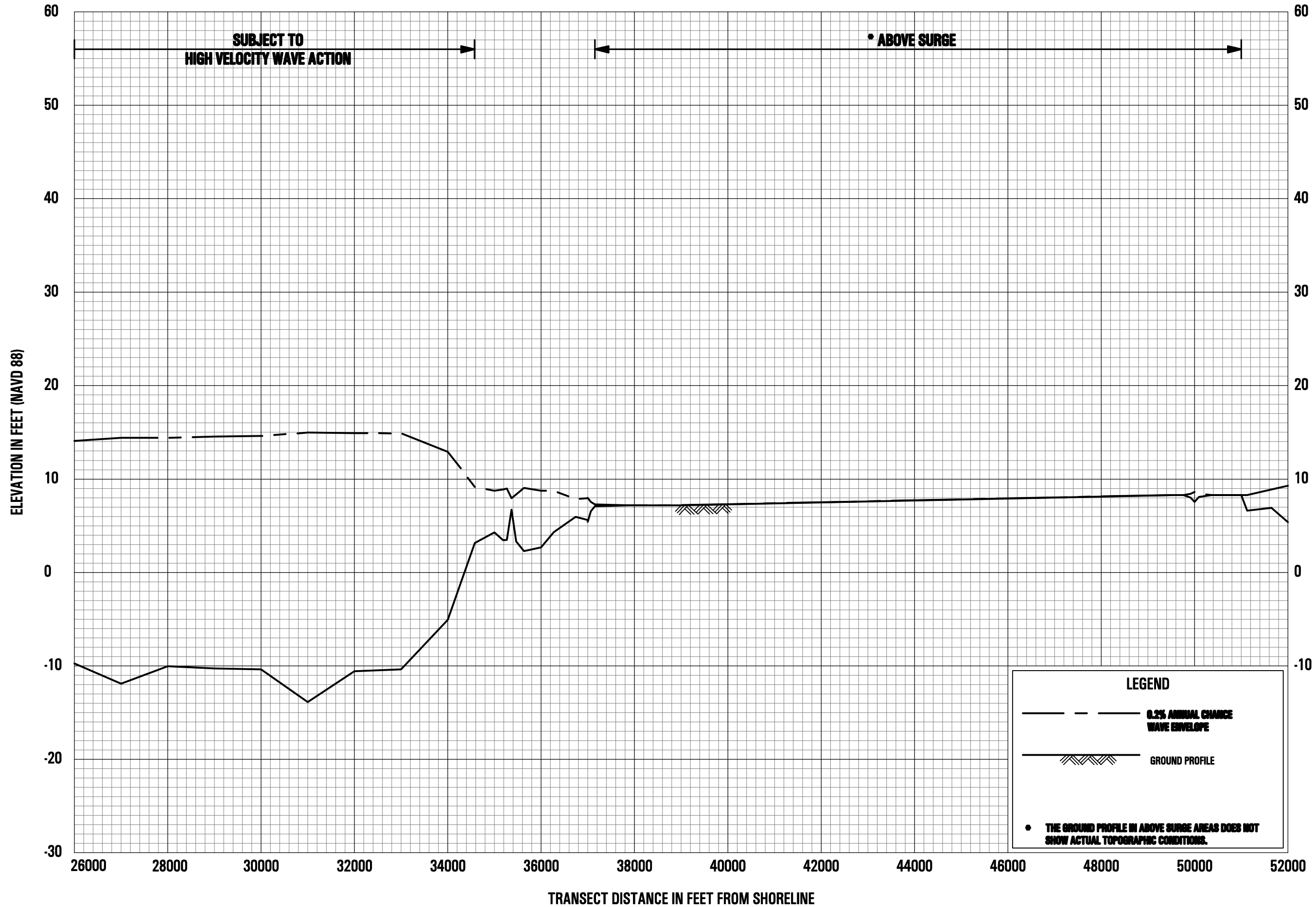


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 9

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

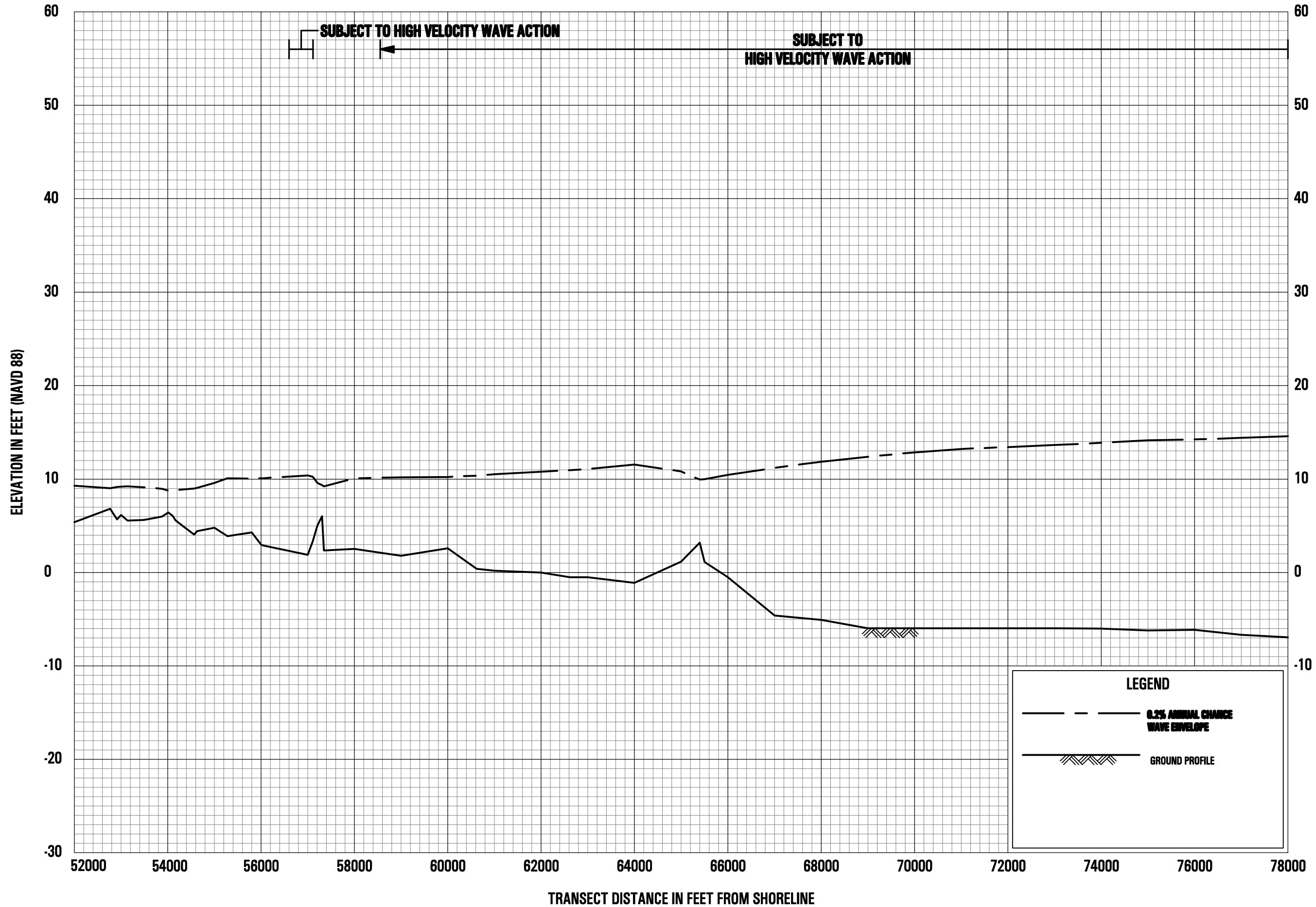
21T



0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 9

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

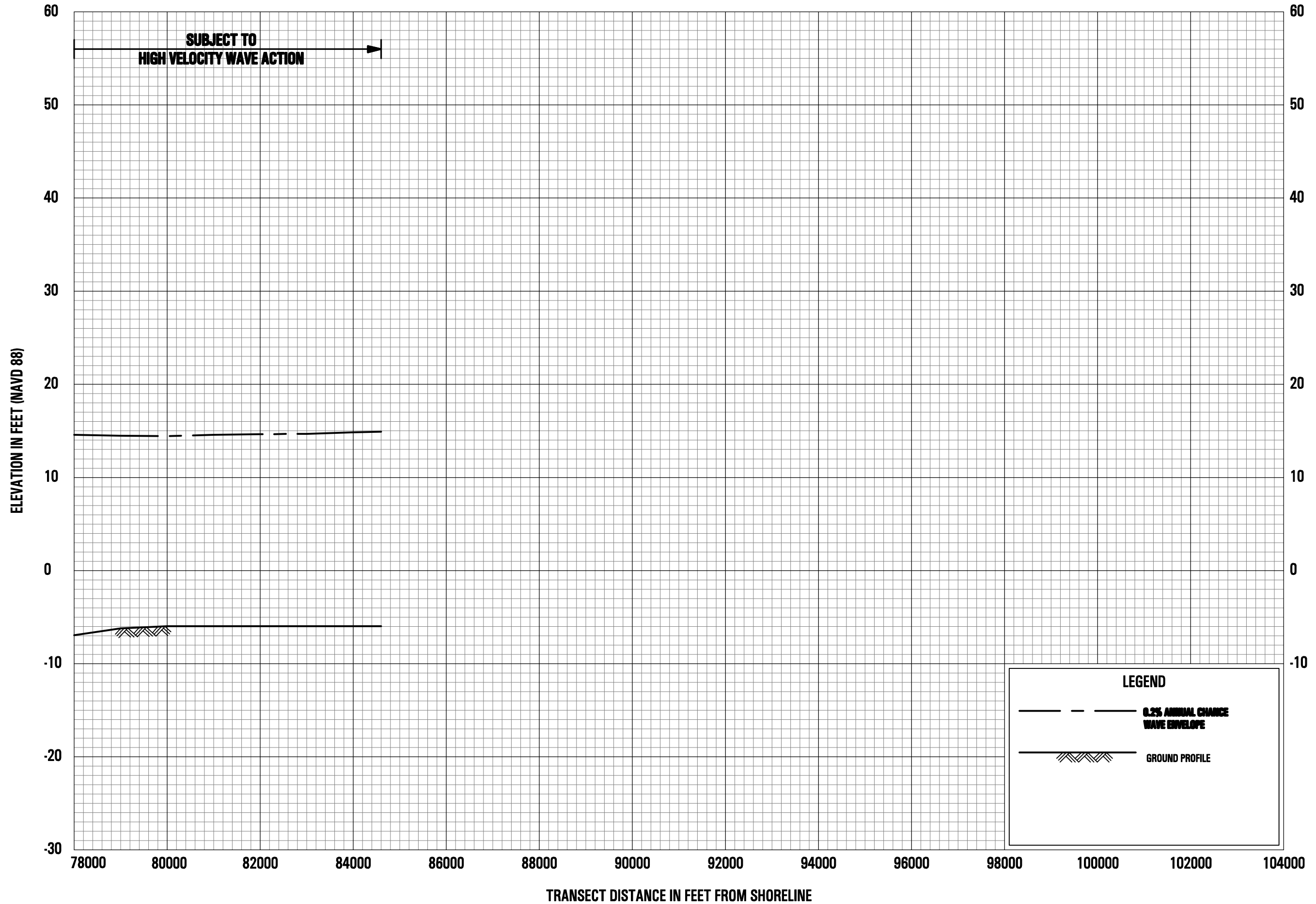


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 9

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

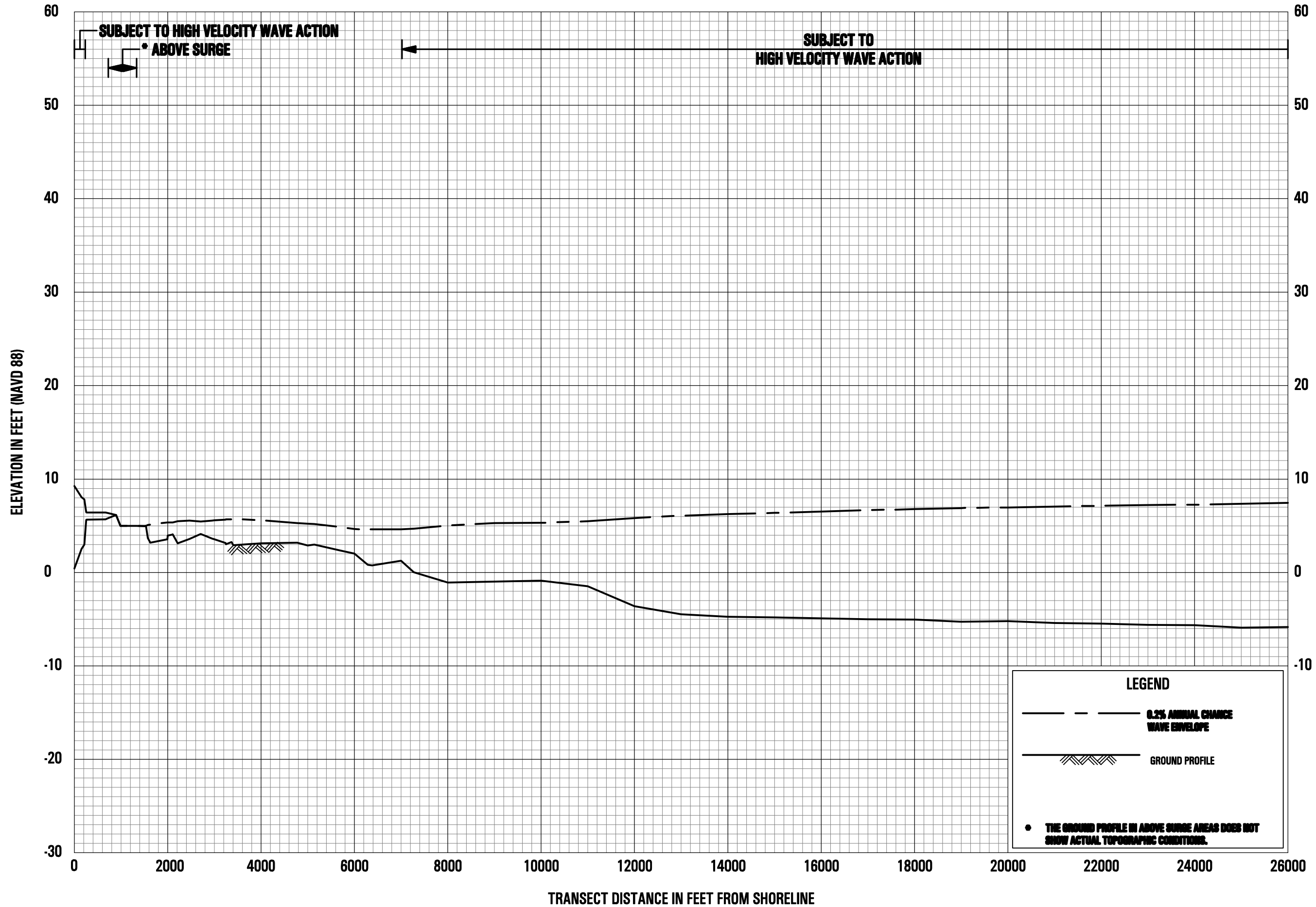
23T



0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 9

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

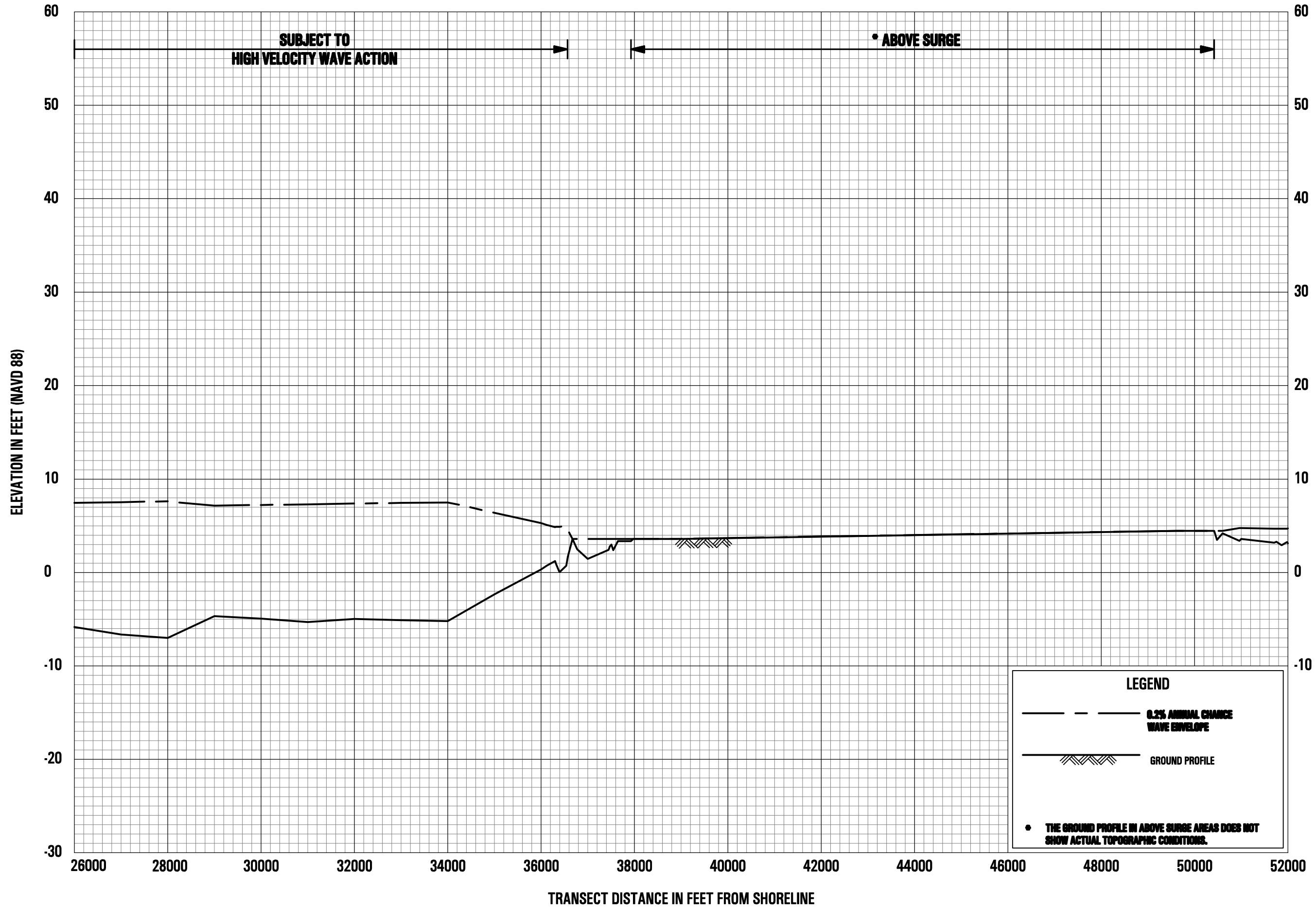


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 10

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

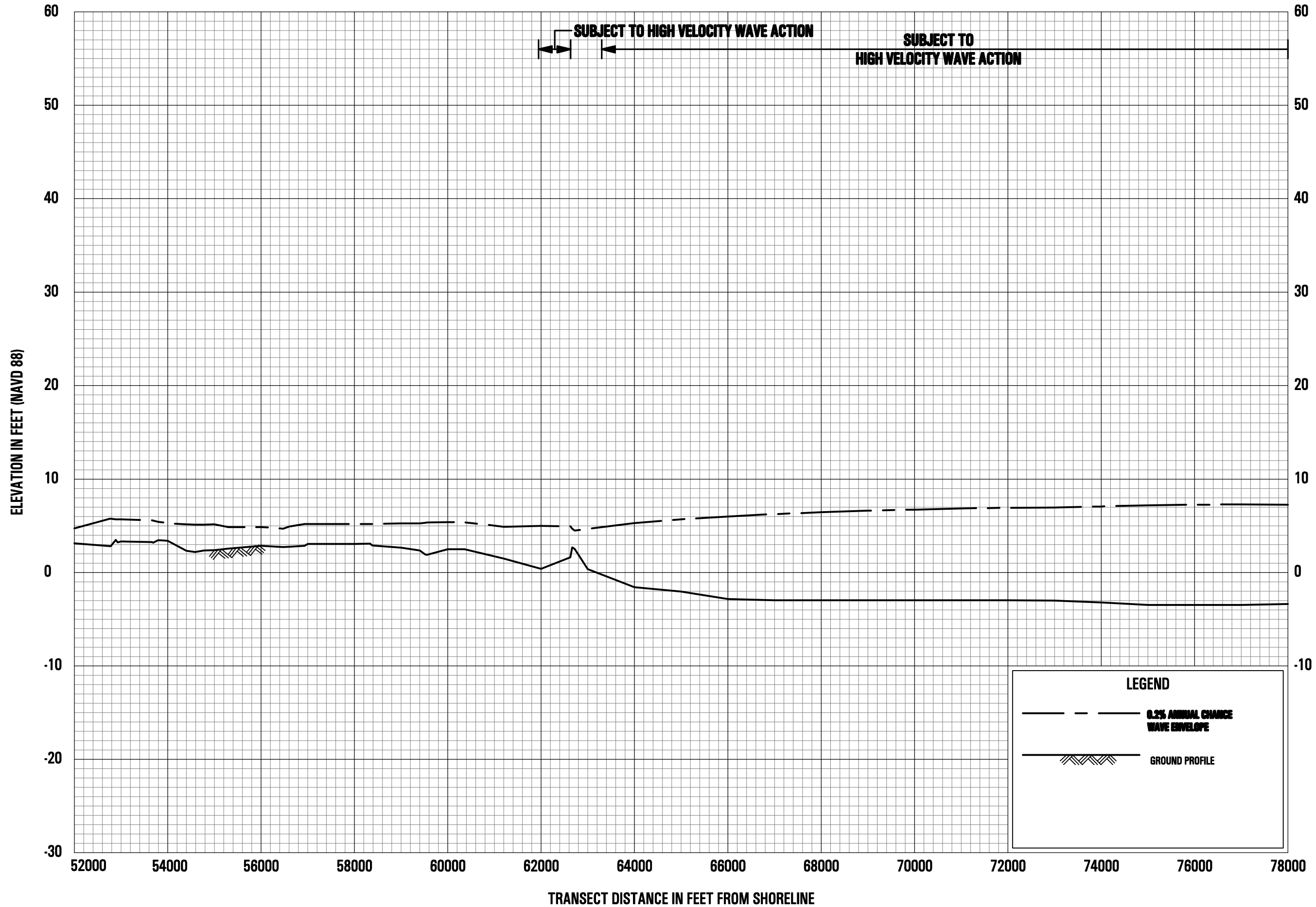
25T



0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 10

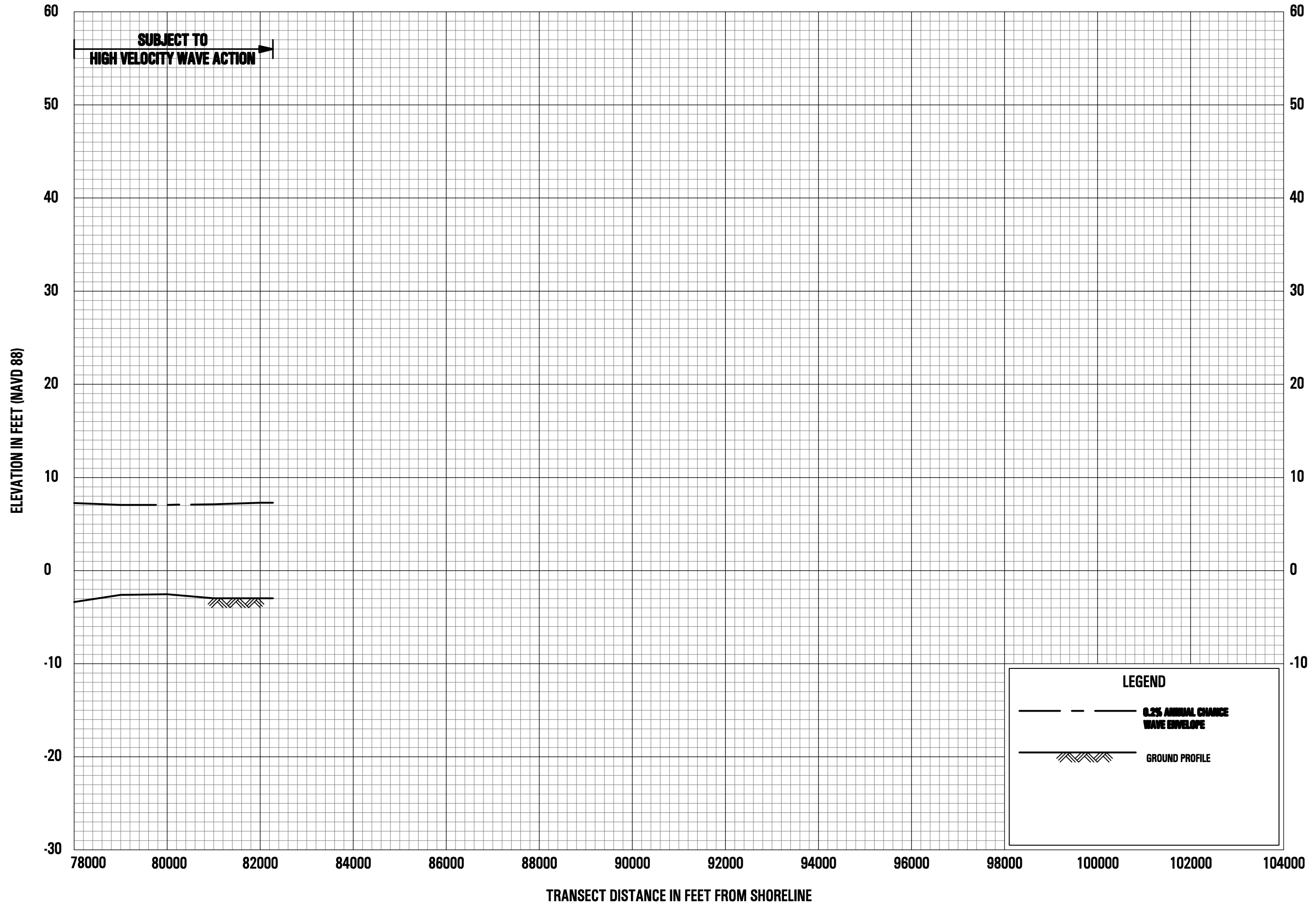
**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**



0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 10

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

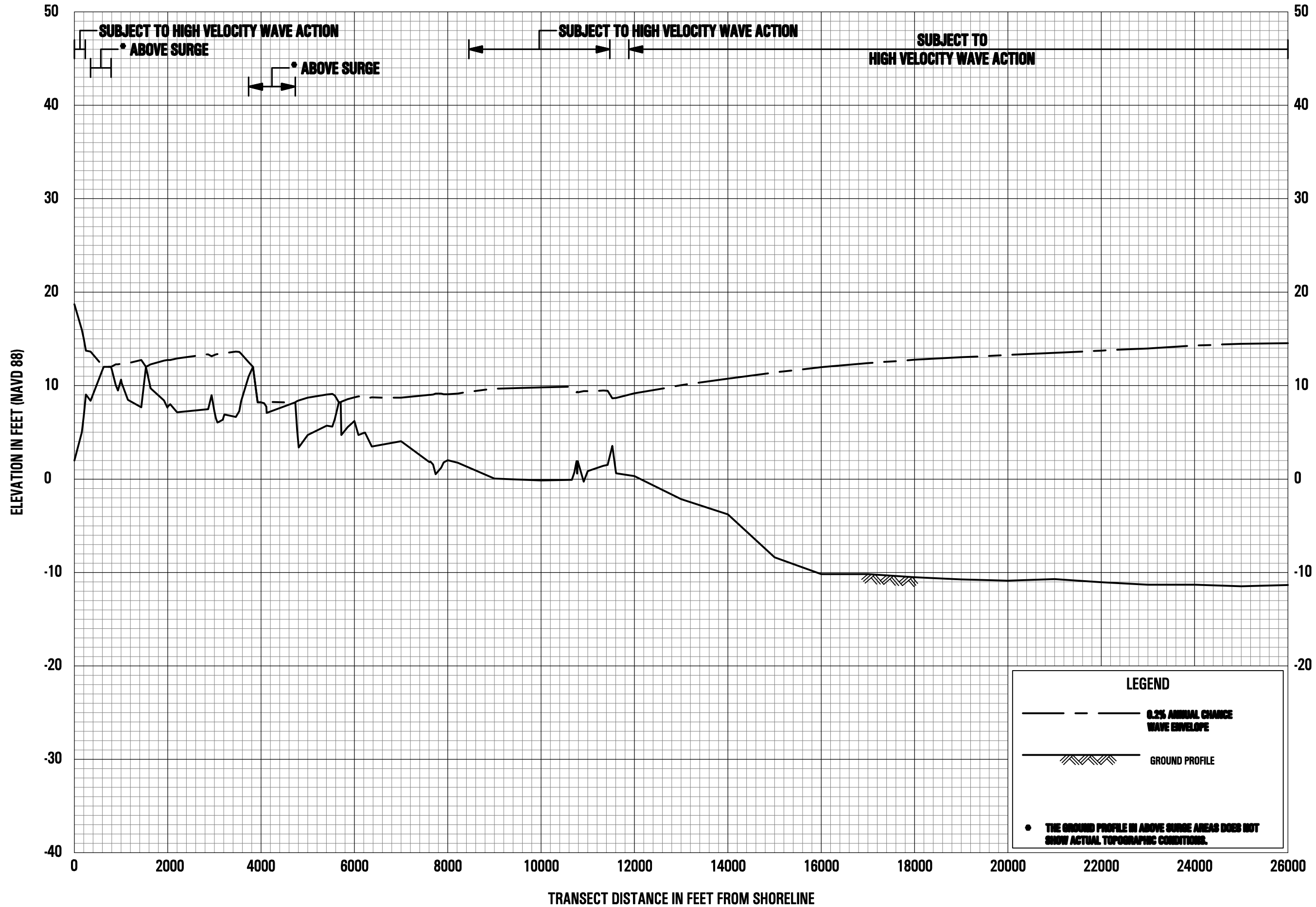


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 10

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

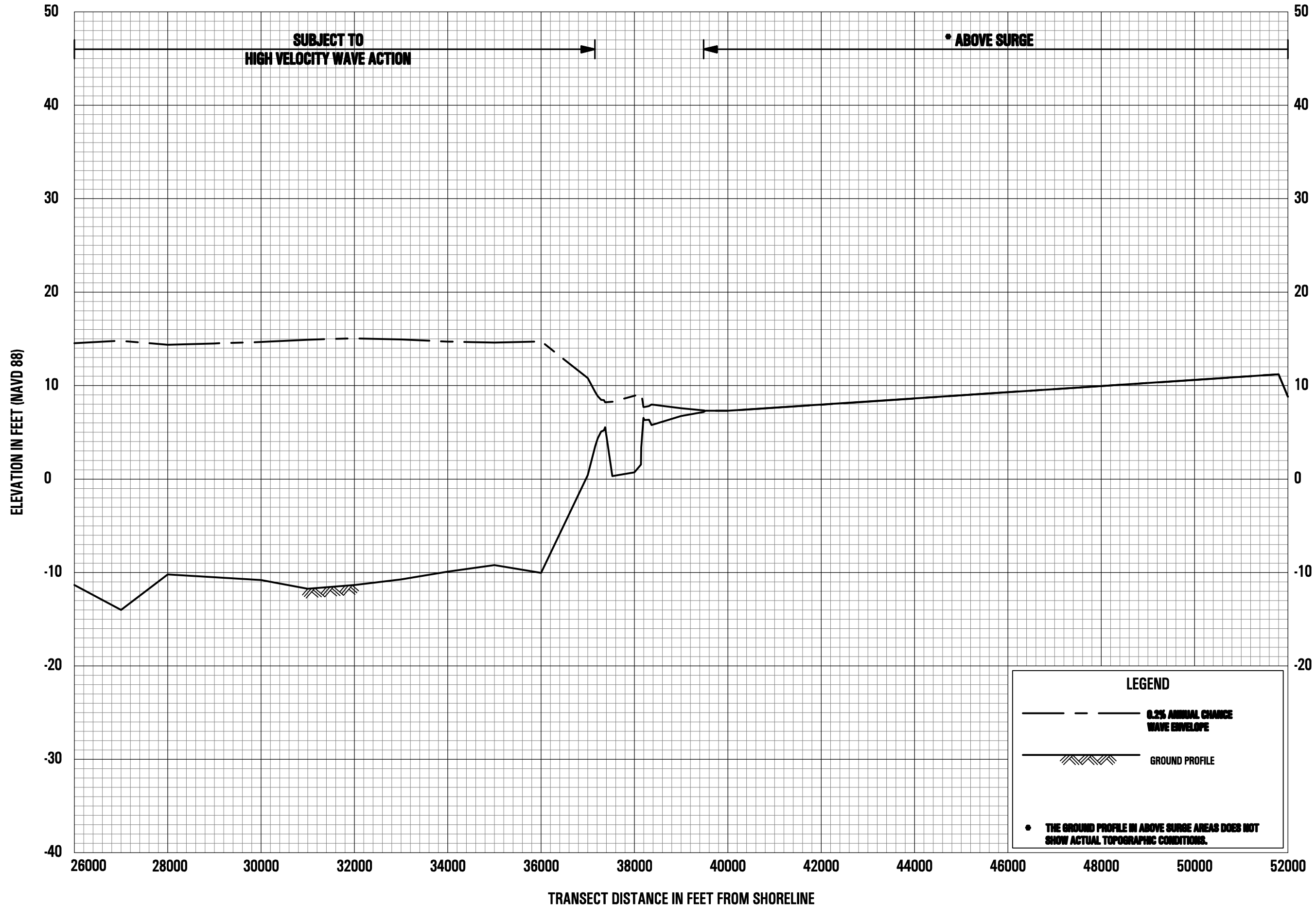
28T



0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 11

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

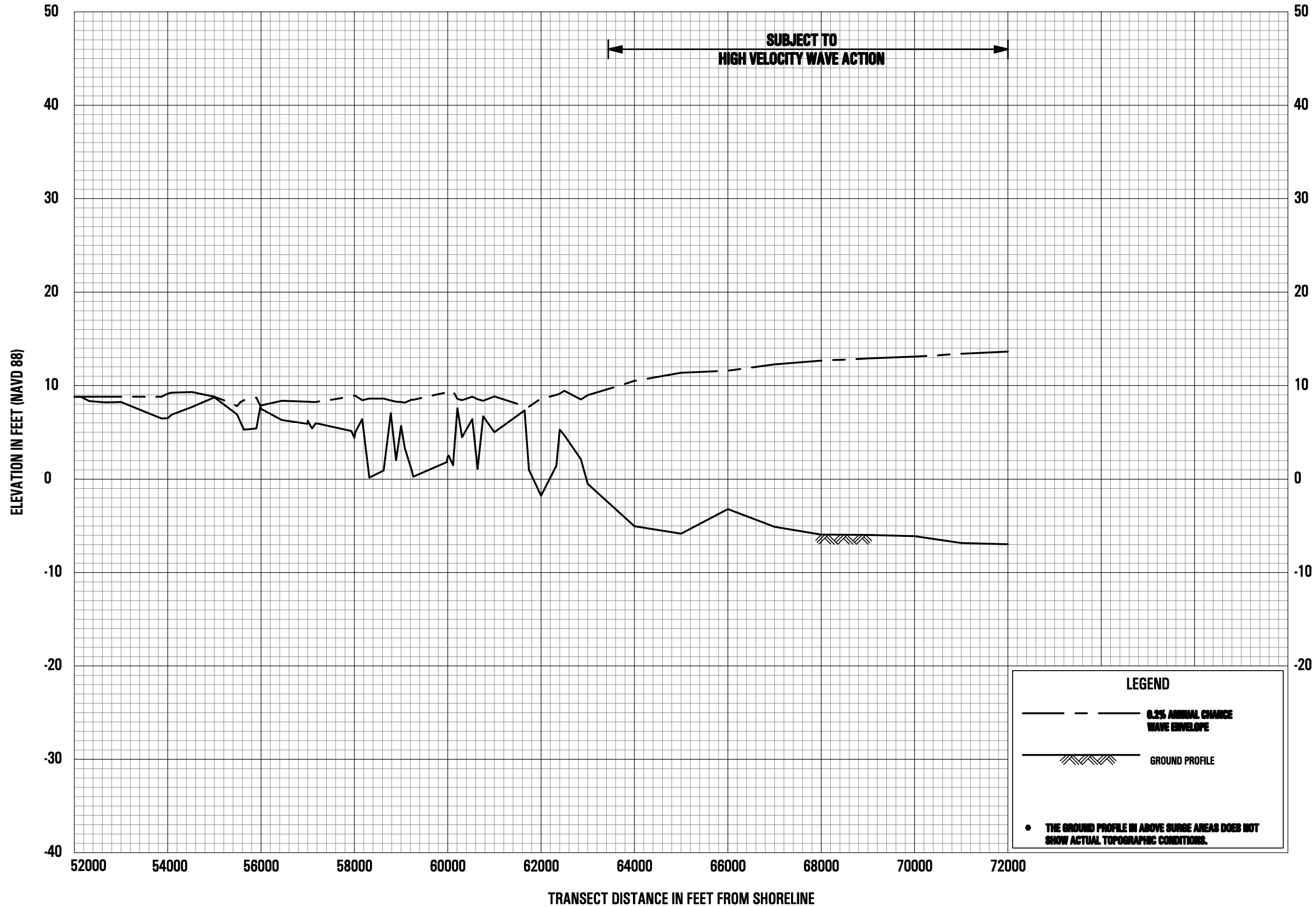


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 11

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

30T

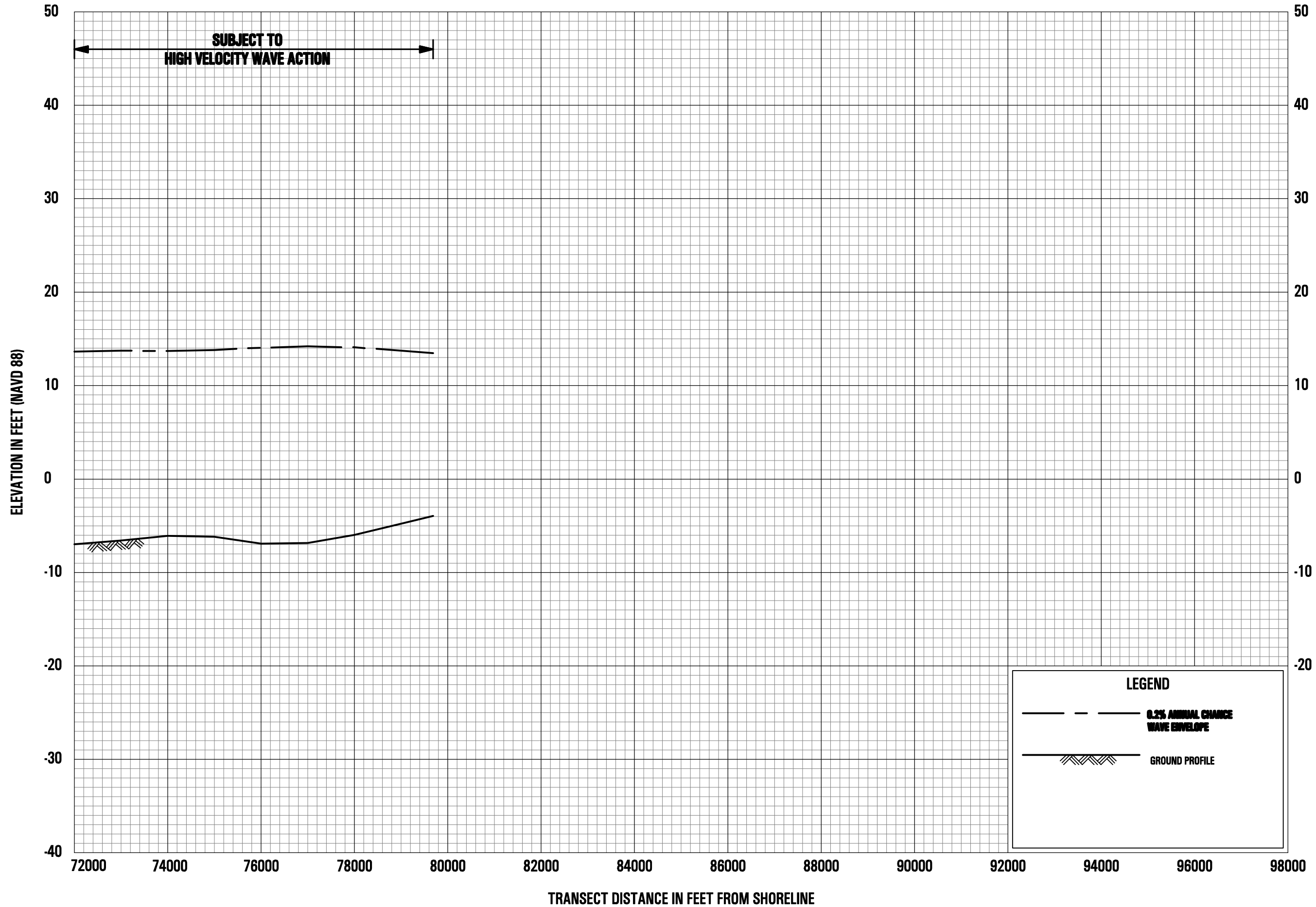


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 11

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

31T

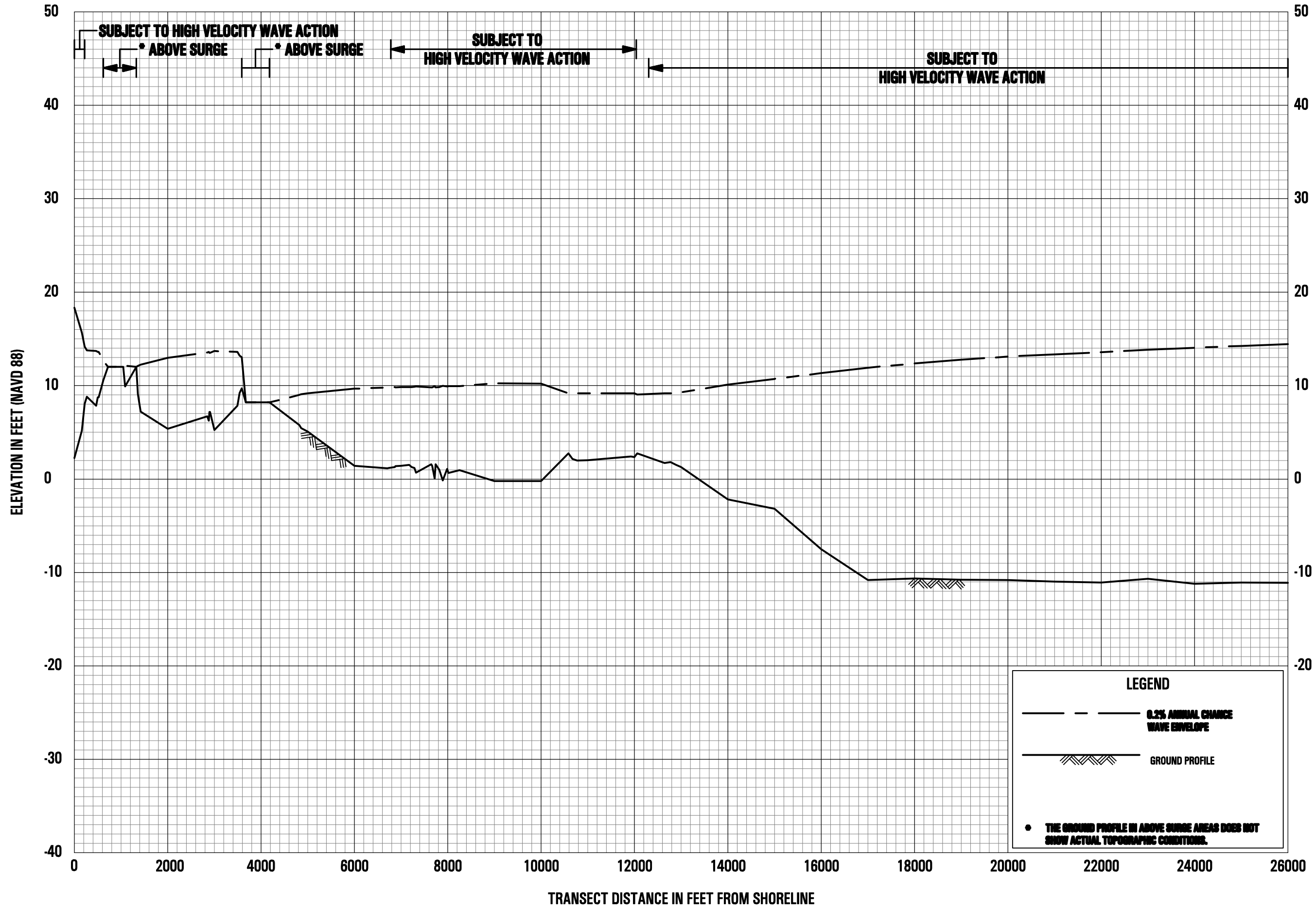


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 11

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

32T

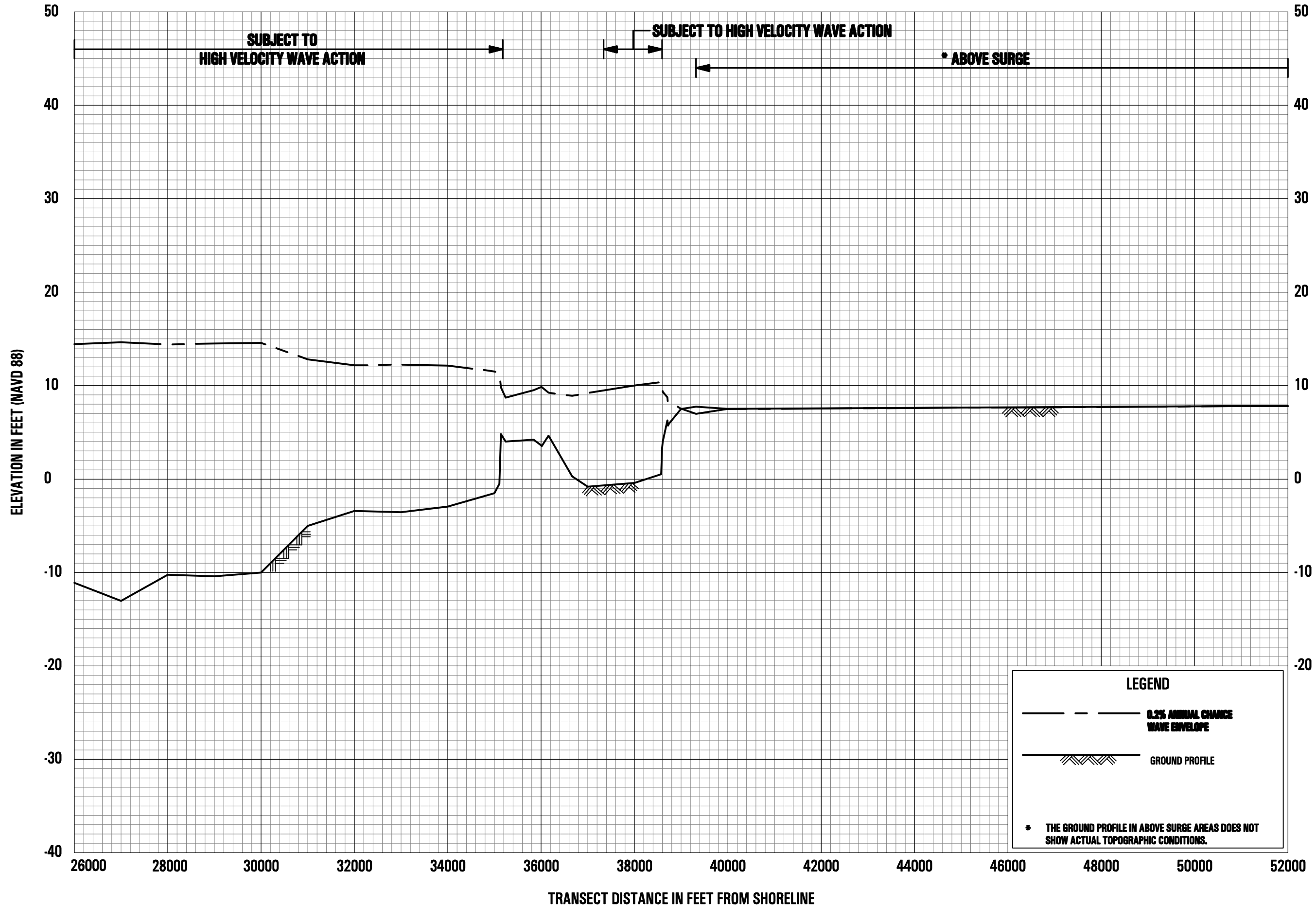


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 12

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

33T



LEGEND

— — — — — 0.2% ANNUAL CHANCE WAVE ENVELOPE

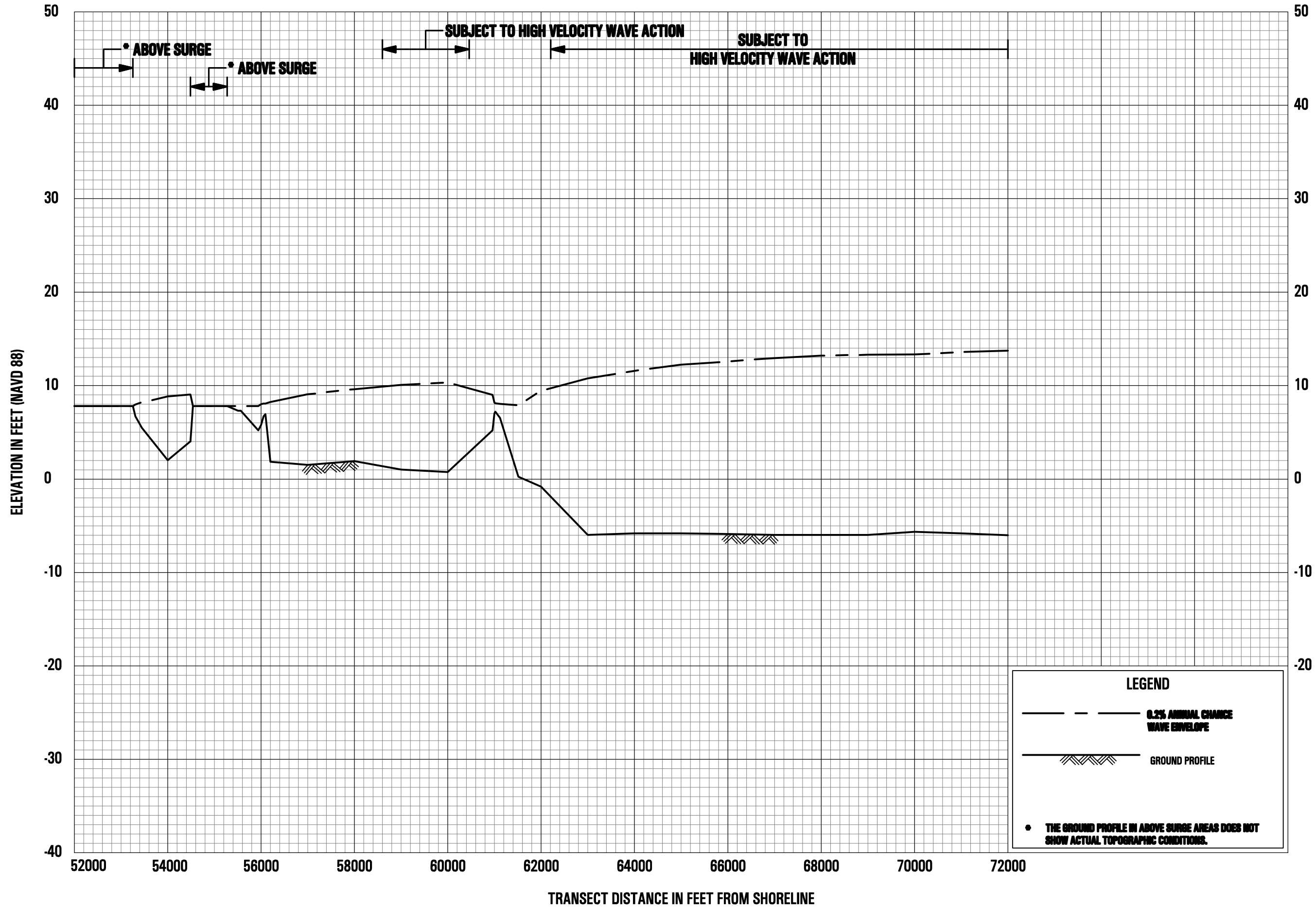
— / / / / / — GROUND PROFILE

* THE GROUND PROFILE IN ABOVE SURGE AREAS DOES NOT SHOW ACTUAL TOPOGRAPHIC CONDITIONS.

0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 12

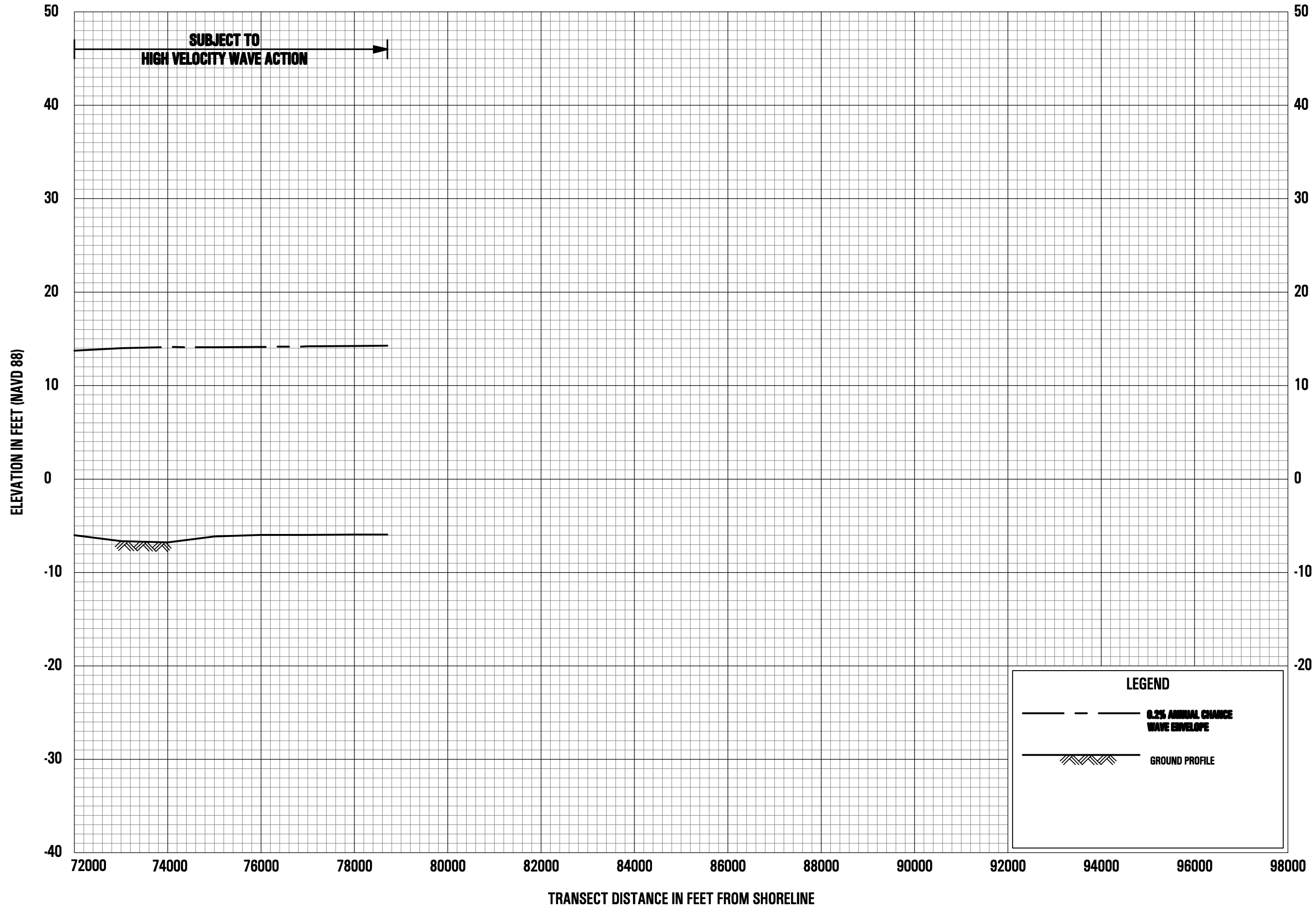
FEDERAL EMERGENCY MANAGEMENT AGENCY
 ARANSAS COUNTY, TX
 AND INCORPORATED AREAS



0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 12

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

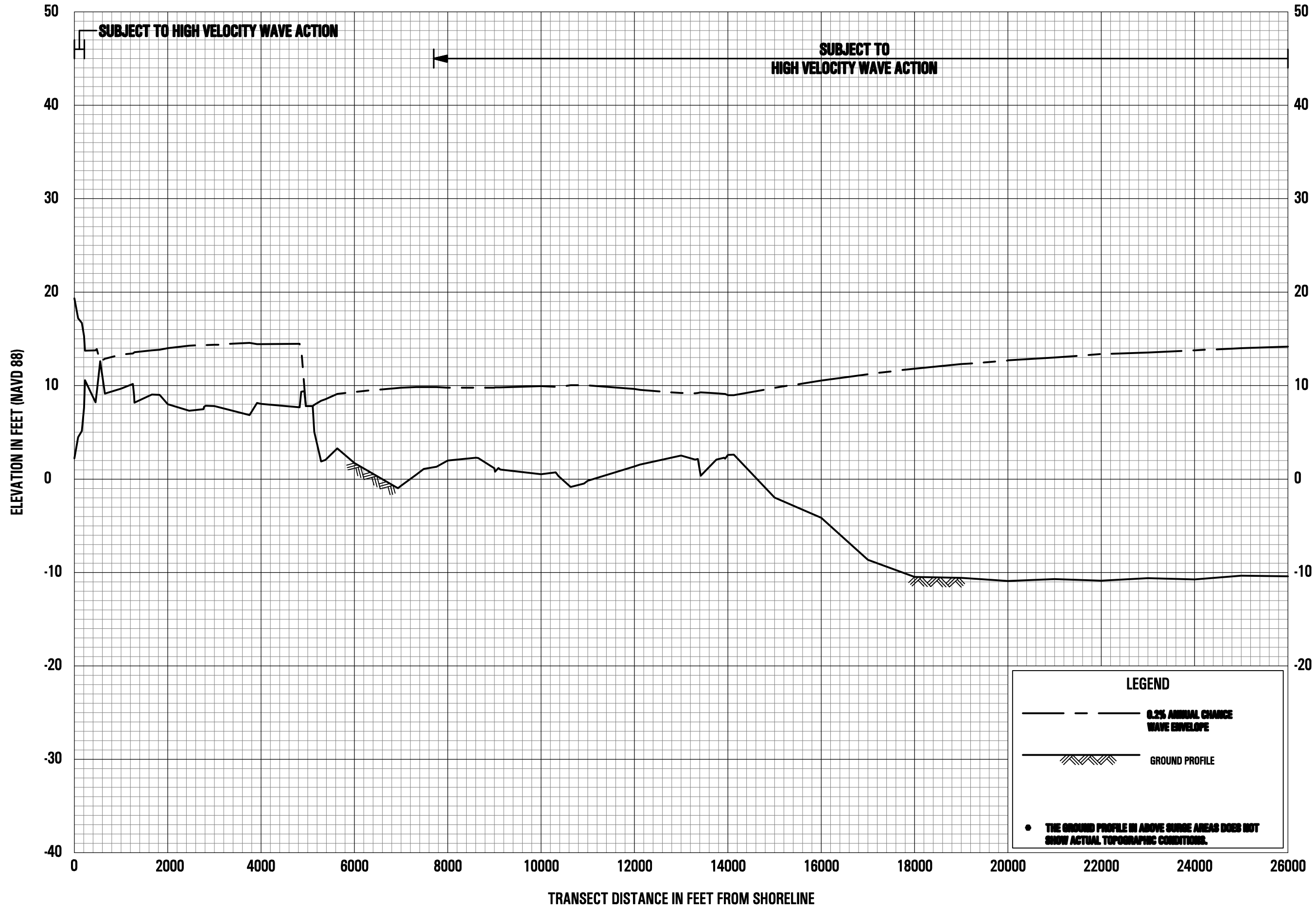


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 12

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

36T



LEGEND

— — — — — 0.2% ANNUAL CHANCE WAVE ENVELOPE

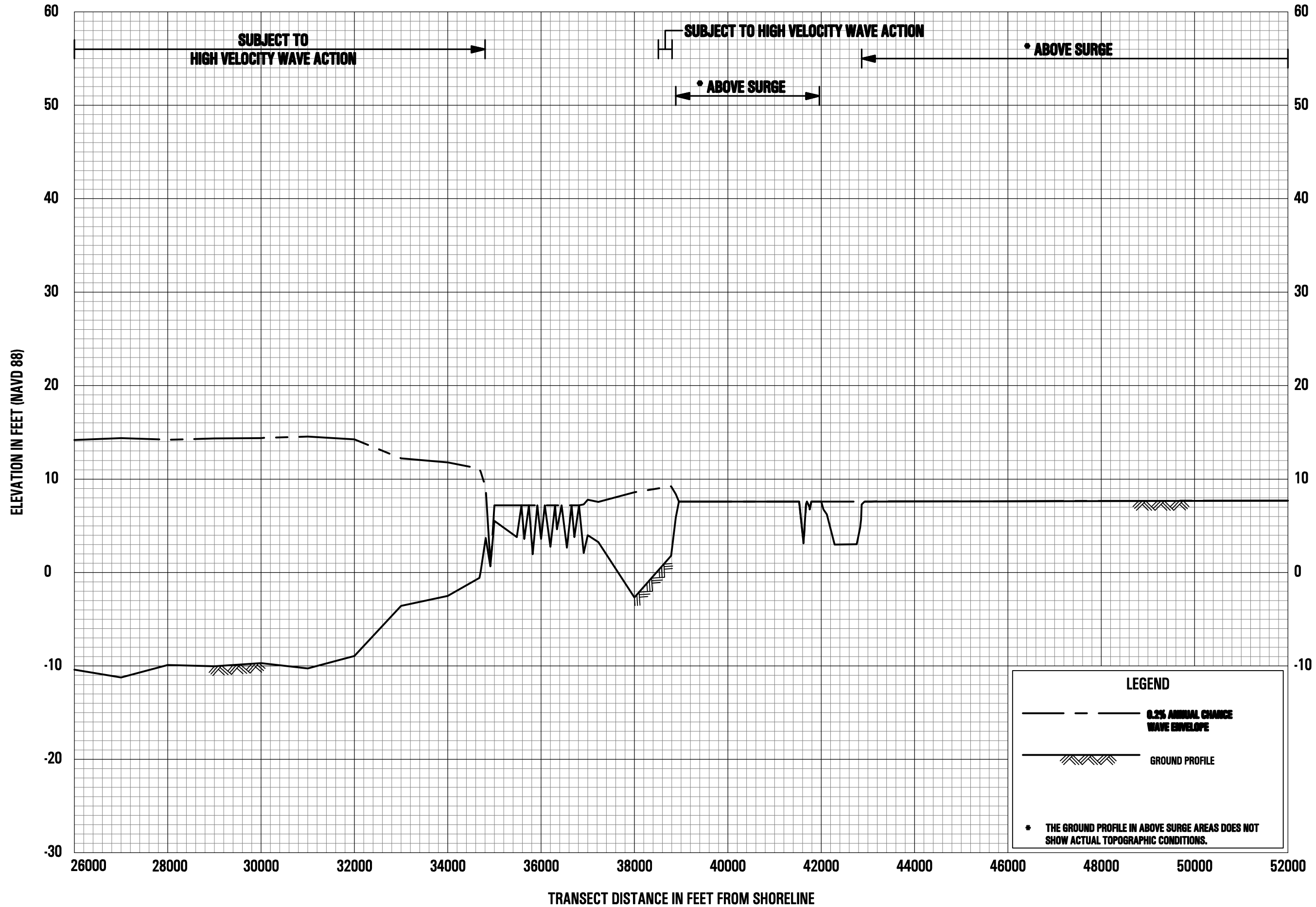
— / / / / — GROUND PROFILE

• THE GROUND PROFILE IN ABOVE SURGE AREAS DOES NOT SHOW ACTUAL TOPOGRAPHIC CONDITIONS.

0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 13

FEDERAL EMERGENCY MANAGEMENT AGENCY
 ARANSAS COUNTY, TX
 AND INCORPORATED AREAS

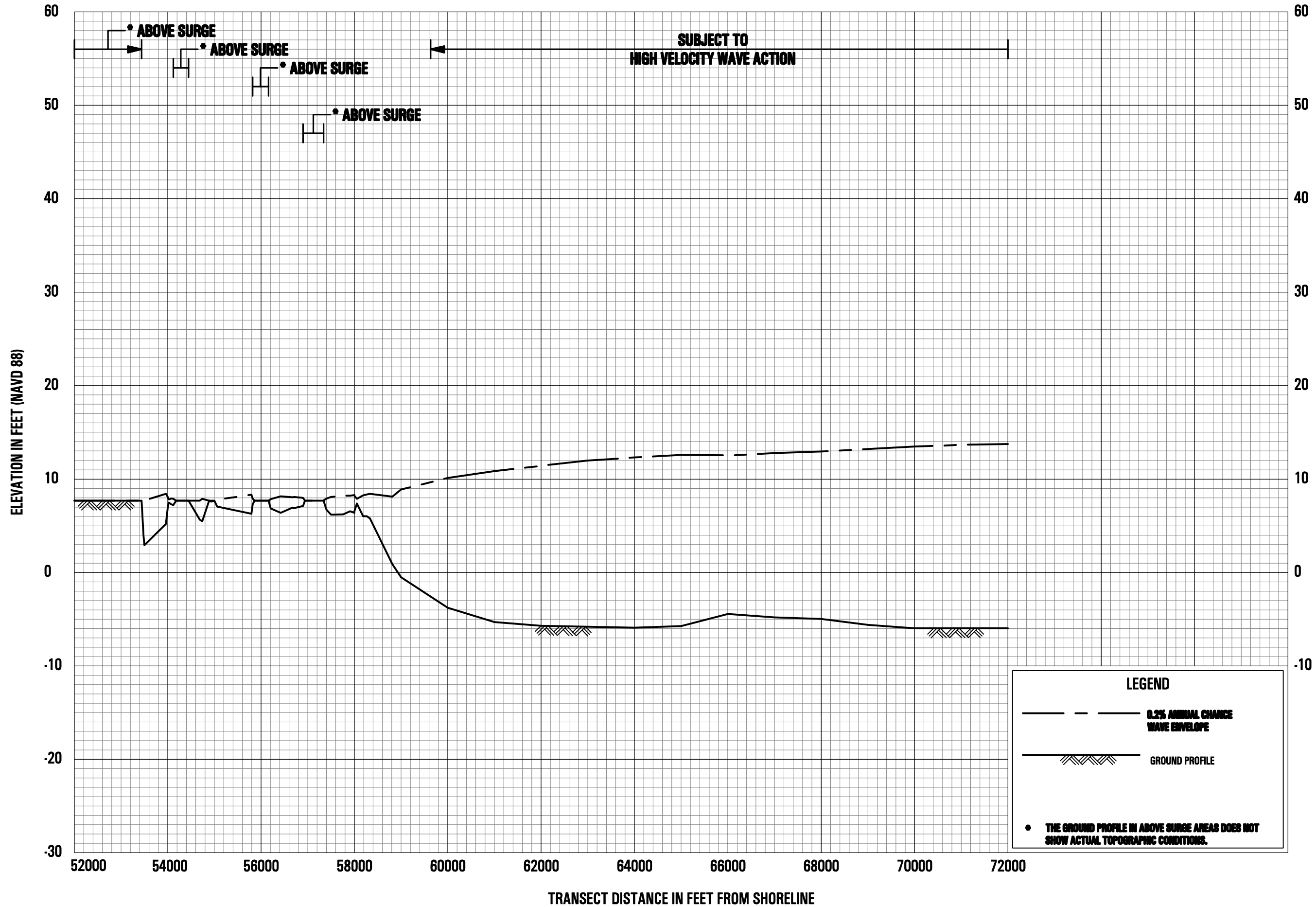


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 13

FEDERAL EMERGENCY MANAGEMENT AGENCY
 ARANSAS COUNTY, TX
 AND INCORPORATED AREAS

38T

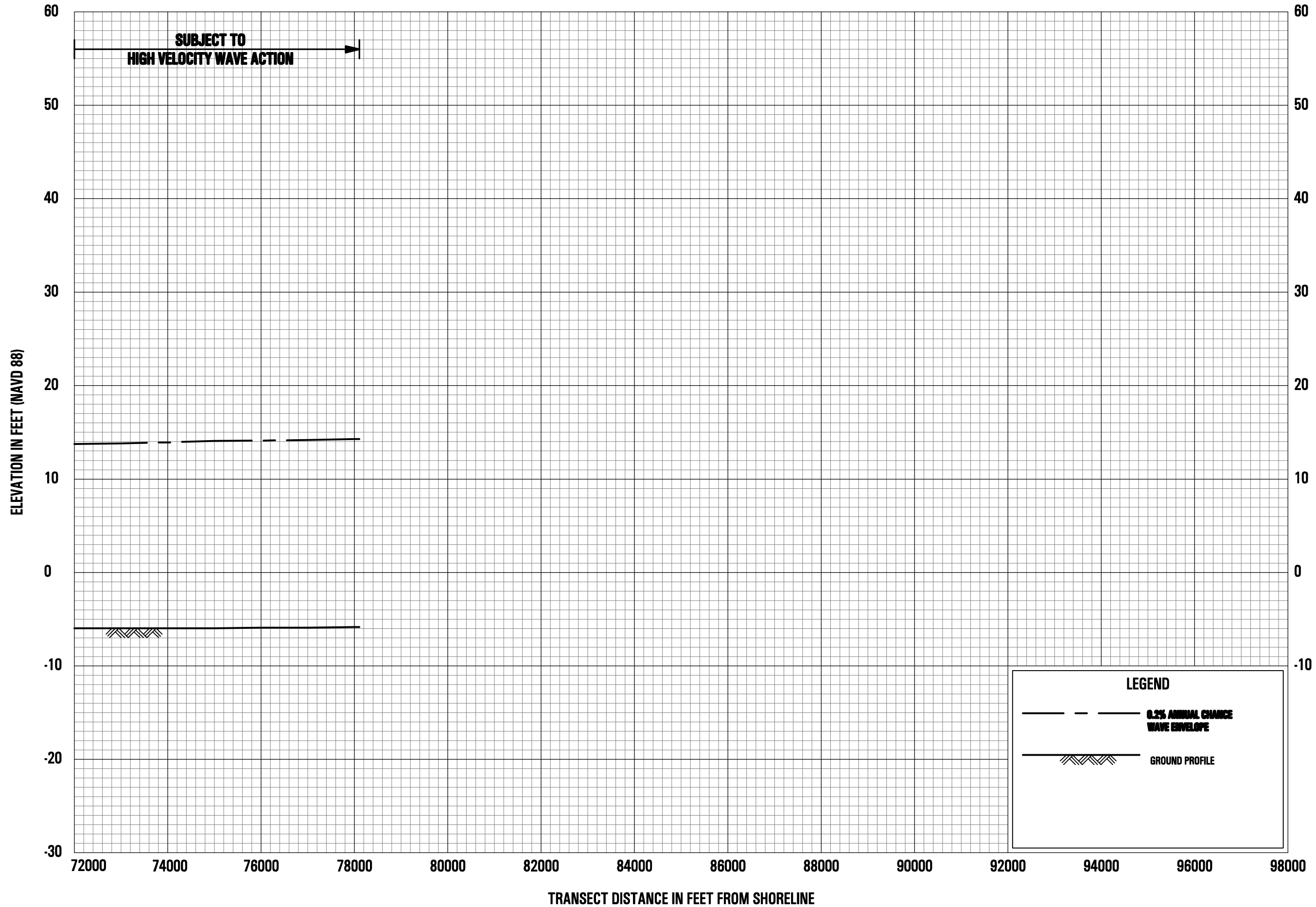


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 13

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

39T

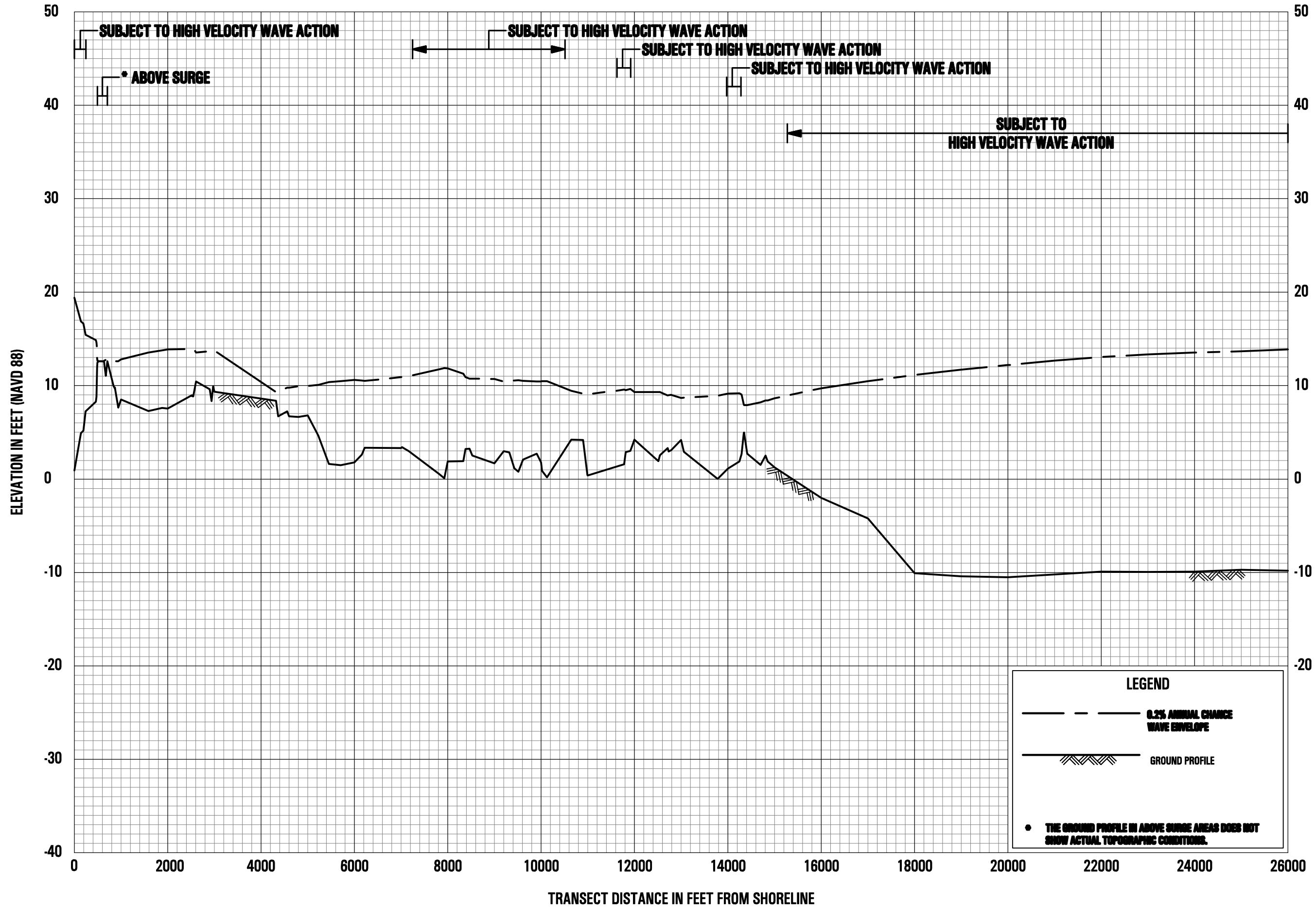


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 13

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

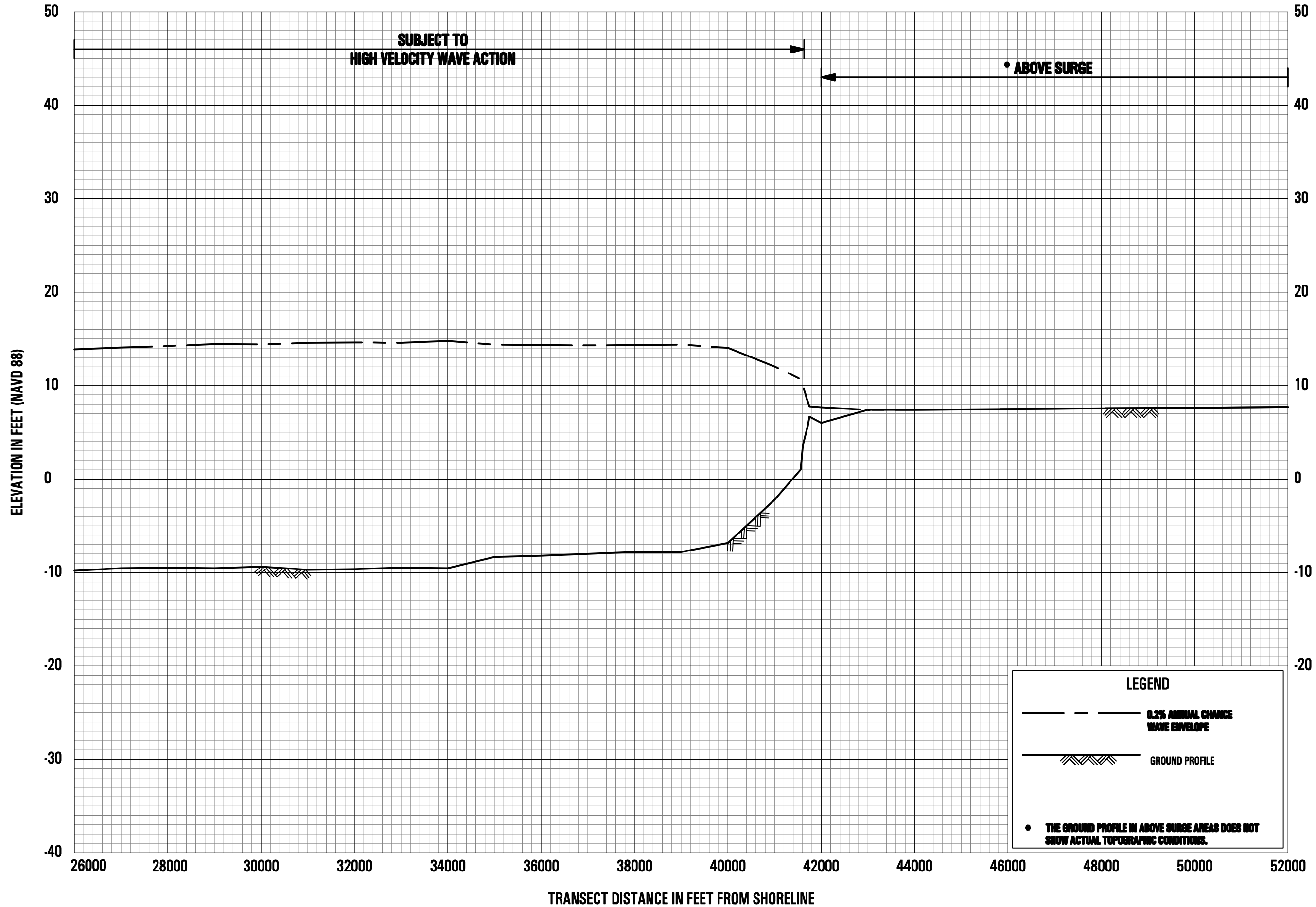
40T



0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 14

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

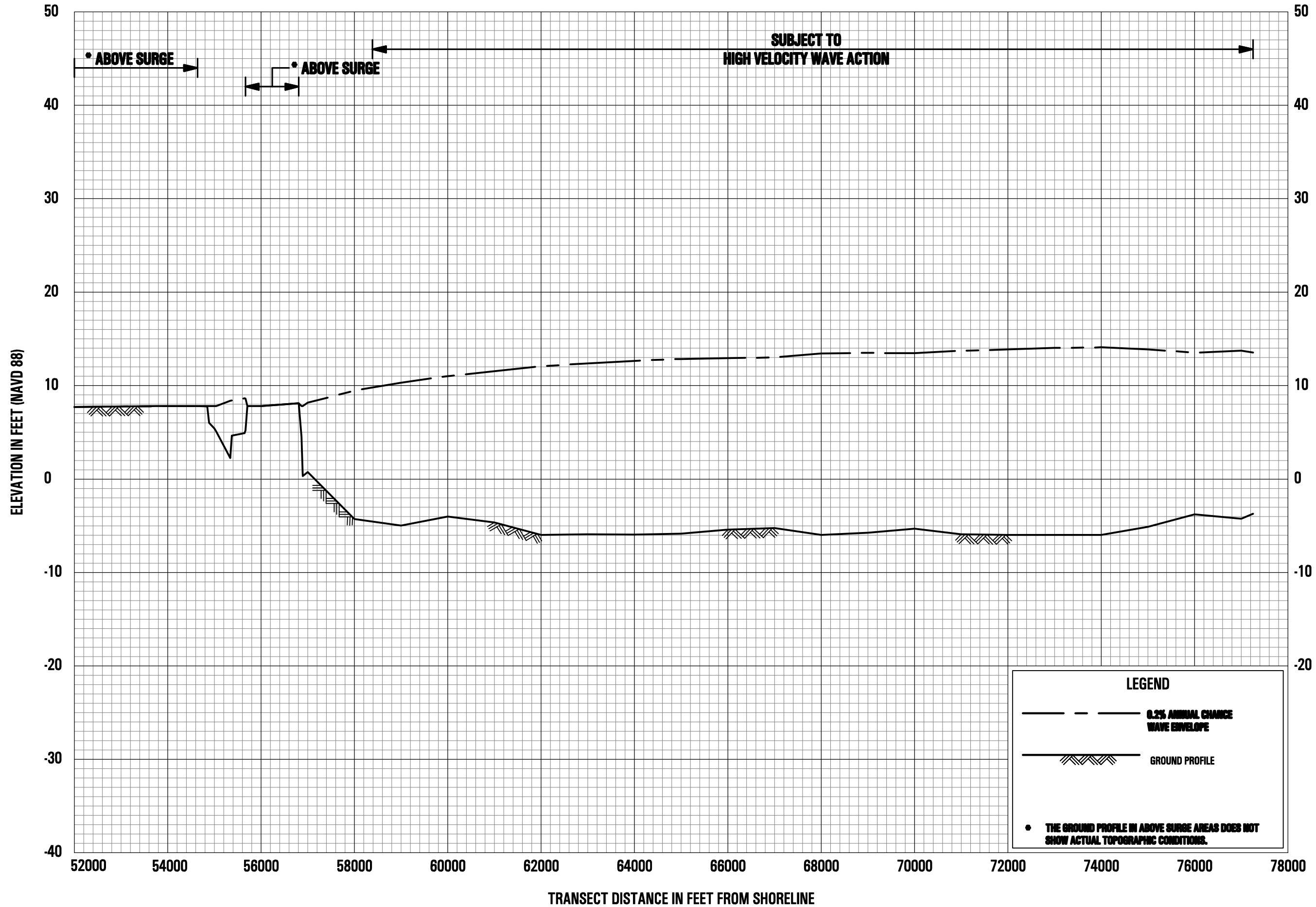


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 14

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

42T

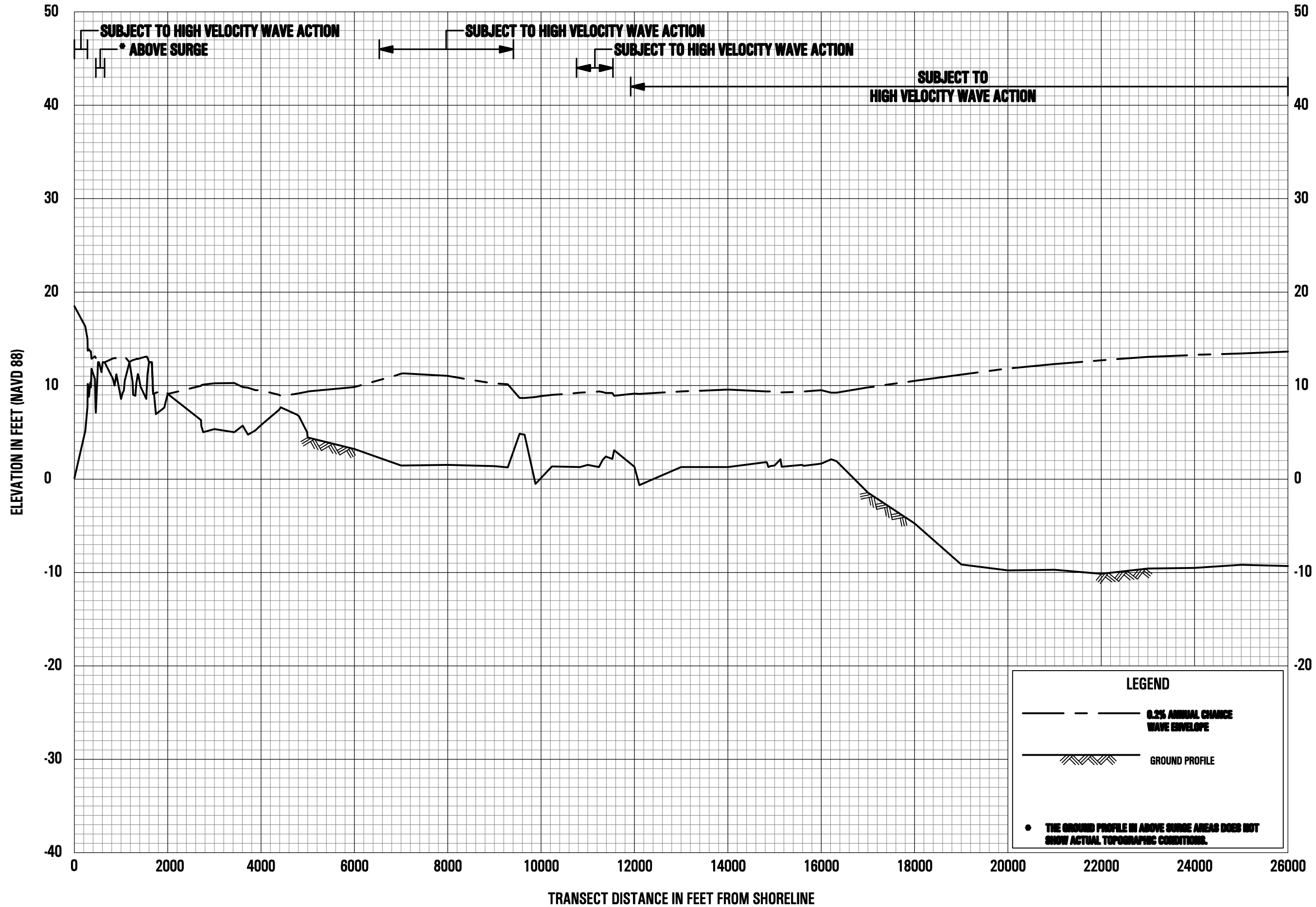


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 14

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

43T

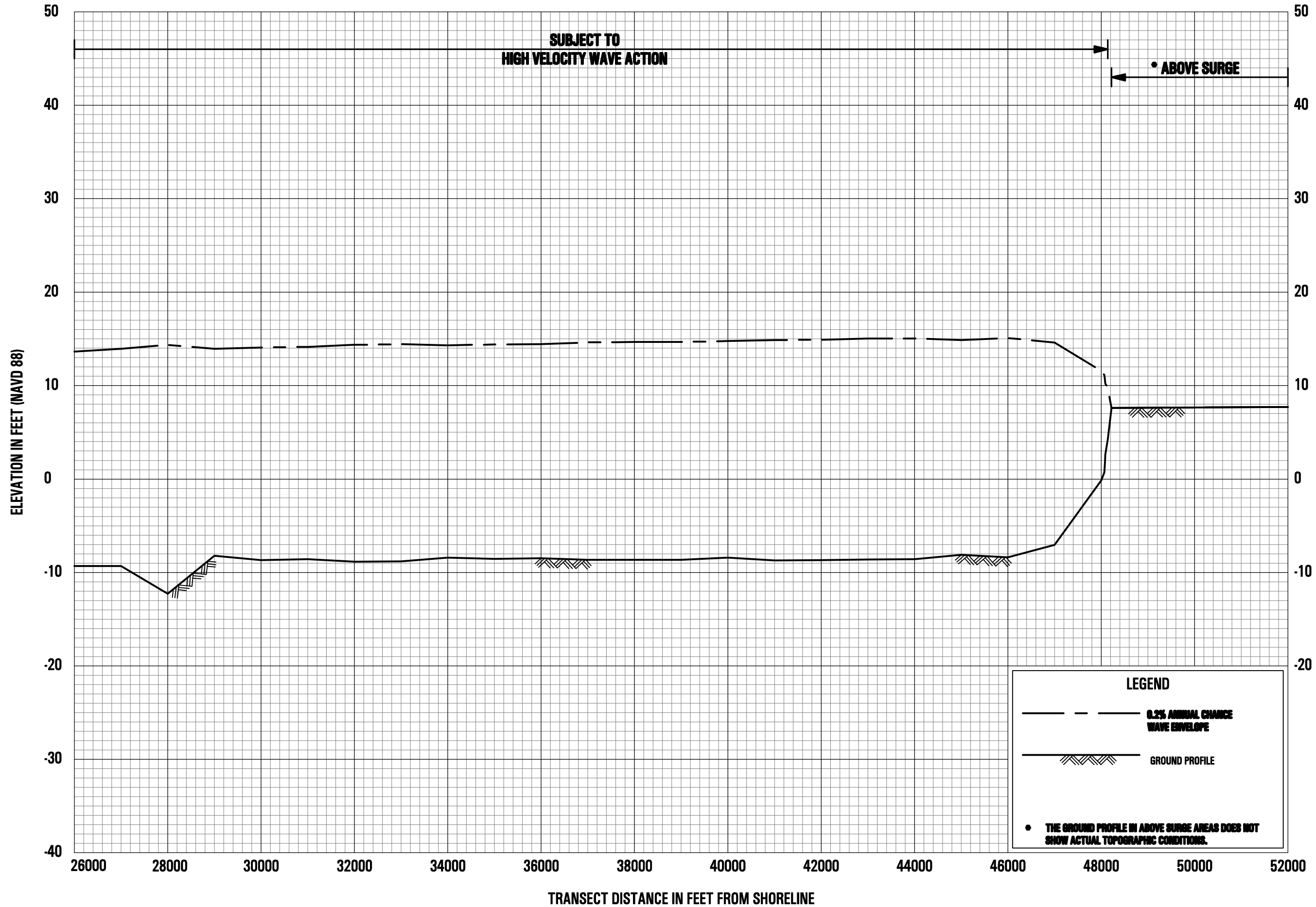


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 15

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

44T

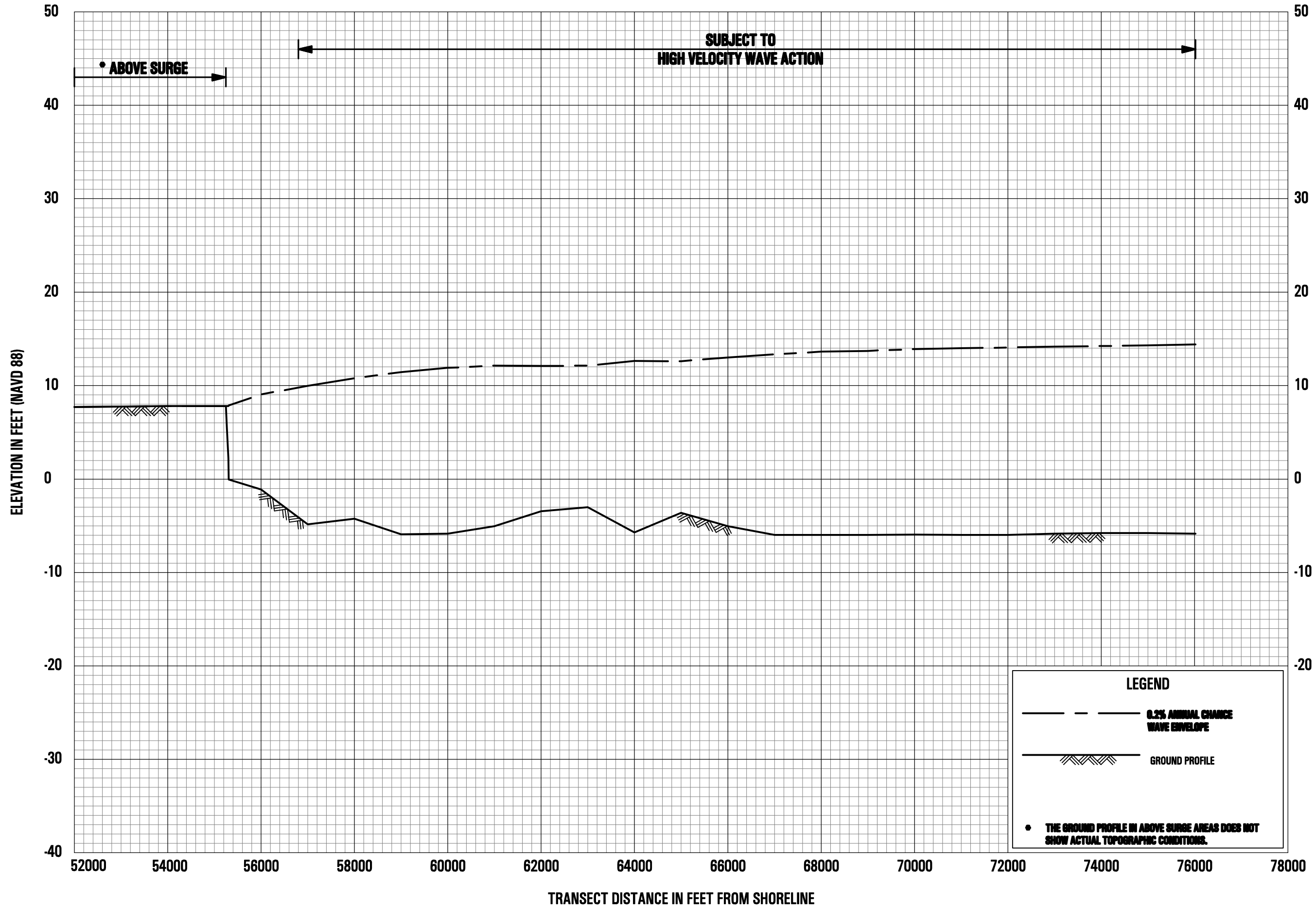


0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 15

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

45T



0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 15

**FEDERAL EMERGENCY MANAGEMENT AGENCY
ARANSAS COUNTY, TX
AND INCORPORATED AREAS**

46T