FLOOD INSURANCE STUDY

LAFOURCHE PARISH, LOUISIANA

AND INCORPORATED AREAS

Community Name	Community Number
LAFOURCHE PARISH UNINCORPORATED AREAS	225202
GOLDEN MEADOW, TOWN OF	225196
LOCKPORT, TOWN OF	220254
RACELAND, CITY OF	220110
THIBODAUX, CITY OF	220111

PRELIMINARY
JULY 30, 2008

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
22057CV00A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) 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 (FIRM) 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:

Old Zone	New Zone
A1 through A30	AE
V1 through V30	VE
B	X
C	X

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

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FLOOD INSURANCE STUDY
LAFOURCHE PARISH, LOUISIANA 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 Lafourche Parish, including the Cities of Raceland and Thibodaux; the Towns of Golden Meadow and Lockport; and the unincorporated areas of Lafourche Parish (referred to collectively herein as Lafourche Parish), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

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

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.

The original hydrologic and hydraulic analyses for all revised flooding sources were prepared by the New Orleans District, U.S. Army Corps of Engineers (USACE-MVN), as a part of contract with the USACE-MVN under Interagency Agreement No. HSFE-06-05-X-0010 for Lafourche Parish, Louisiana. This work was completed in 2008.

1.3 Coordination

The initial Consultation Coordination Officer (CCO) meeting was held on December 8, 2004, and attended by representatives of FEMA, the communities, and the study contractors to explain the nature and purpose of Flood Insurance Studies and to identify the streams to be studied by detailed methods.

For this parishwide study, the final CCO meeting was held on _____, and attended by representatives of Federal Emergency Management Agency (FEMA), USACE-MVN, the contractor and the community. 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 Lafourche Parish, Louisiana including incorporated communities listed in Section 1.1.

The USACE-MVN has completed the new detailed study for portions of the Louisiana parishes of Ascension, Assumption, Lafourche, St. James, St. John the Baptist, St. Charles, Jefferson, Orleans, and Plaquemines. This entire study is called the Donaldsonville To The Gulf Feasibility Study (D2G). This specific Lafourche Parish study area was taken from this study.

Also the USACE-MVN has completed the detailed study for the West Bank of Bayou Lafourche to Parish Boundary also known as "Thibodaux to Larose (T2L)", and the "Larose to Golden Meadow (L2G)". In addition, East Bank of Bayou Lafourche to Parish Boundary, south to GIWW" is included in the detailed studies completed by the USACE-MVN.

Due to the flat land characteristics, the entire land was considered as potential runoff storage areas. The flooding sources studied by detailed methods are shown in Table 1, "Scope of Study." 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 2007.

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.

Coastal flooding from the Gulf of Mexico affecting Lake Salvador, Lake des Allemands and the adjacent land areas was also studied by detailed methods.

TABLE 1 SCOPE OF STUDY

New Detailed Study Streams and Lakes

Donaldsonville To The Gulf - WEST	**Donaldsonville To The Gulf - EAST**
Bayou Boeuf	Bayou Vacherie
Bowie Canal	Company Canal
Company Canal	Des Allemands
Grand Bayou	Godchaux Canal
Halpin Canal	Tisamond Foret Canal
Sam Foret Canal	Lake Salvador
Theirot Canal	
Lake des Allemands	

TABLE 1 SCOPE OF STUDY (continued)

New Detailed Study Streams and Lakes

Larose To Golden Meadow	**Thibodaux To Larose**
East Bank Borrow Canal	Bayou Cutoff
Golden Meadow	Bayou Folse
PS8	Hollywood Canal
West Bank Borrow Canal	McMahon Canal–Bayou du Mar

2.2 Community Description

Lafourche Parish is located in southeastern Louisiana, approximately 30 miles southwest of the City of New Orleans. The Parish is roughly centered about Bayou Lafourche and extends from Thibodaux at its northwest limit to the Gulf of Mexico in the southwest.

The Parish covers approximately 1,472.2 square miles, of which 1,084.7 square miles is land and 387.5 square miles is water. The population in the year 2000 was reported to be 89,974 by the U.S. Bureau of the Census (Reference 1). The normal annual precipitation averages 54 – 58 inches (Reference 2). The climate of the area is subtropical and is strongly influenced by the Gulf of Mexico. Extremes of temperature are seldom experienced and the average temperatures range from an average high of 82.7 degrees Fahrenheit in July to an average low of 52.6 degrees in January (Reference 3).

The economy of the area consists largely of sugar cane production and various marine industries, including fishing, petroleum production services, and boat construction and repair. Major highways in the Parish consist of US Highway 90 which traverses roughly an east-west course, and Louisiana State Highway 1 which parallels Bayou Lafourche. Various other state highways traverse portions of the Parish above Larose, as does a branch of the Southern Pacific Railroad.

Many navigable waterways traverse Lafourche Parish in the form of bayous and canals. Although there are no rivers, Bayou Lafourche is a former path of the Mississippi River, abandoned in ancient times.

Natural ground in the area varies from 16 feet North American Vertical Datum (NAVD) on the alluvial bank of Bayou Lafourche at Thibodaux, to minus 3 feet NAVD in the lower portions of several pumped areas.

Vegetation varies from urban and agricultural varieties along the alluvial banks and protected areas to heavily wooded swamp and open marsh classes covering the largest portions of land area within the Parish. Soil conditions in Lafourche Parish are sedimentary types ranging from consolidated clays on the higher alluvial banks, to clays and silts in various degrees of liquefactions in open marsh areas.

2.3 Principal Flood Problems

Low-lying areas of Lafourche Parish are subject to periodic flooding from a variety of sources. Flooding stages result from: intense rainfall in the general areas, abnormally high tides in the Gulf of Mexico, hurricanes or lesser tropical disturbances, and combinations of these various events. For example, areas in the vicinity of the Town of Lockport experiences stages of 4.35 feet NGVD in April 1973, an event having a recurrence interval of 25 years and which resulted from a combination of high gulf tides and heavy rains.

In the northern half of Lafourche Parish, the predominant flooding source is that of rainfall runoff. Pumping facilities within projected areas are inadequate for handling runoff from severe storms. The problem is further aggravated by subsidence which usually occurs in pumped areas which were formerly wetlands.

Areas in the southern half of the Parish (generally in latitudes southward of Lockport) also experience flooding from runoff ponding as described above. However, the greatest flood threat to southern Lafourche Parish is that of hurricane surge inundation. As hurricanes approach coastal Louisiana from the Gulf of Mexico, large volumes of water are propelled inland over the low elevation marshlands and into the many bayous and canals in southern Louisiana. Spoil bank levees flanking pumped drainage areas along Bayou Lafourche provide protection from lesser hurricanes having recurrence intervals of 10 years or less, but are over topped by more severe storms, producing severe flooding in these areas. Bayou Lafourche itself is forced out of its banks in these southern areas during hurricane conditions.

The most recent hurricanes affecting Lafourche Parish were Hurricanes Katrina and Rita, which occurred August 29 and September 24, 2005, respectively.

Prior to the Hurricanes of Katrina and Rita (2005), several hurricanes have been recorded in these areas, the worst being the storm of September 1915 (unnamed). This storm produced stages of 8.0 feet at Leeville, 5.3 feet NGVD at Golden Meadow, 4.5 feet at Cutoff, and 2.8 feet at Lockport (Reference 4). Hurricanes of more recent history have been Flossy (1956), Hilda (1964), Carmen (1974) and Babe (1977) producing stages of 3.3, 4.7, 4.6, and 4.2 feet (recurrence intervals of 4, 13, 12, and 8 years), respectively, at Golden Meadow (References 5 through 8). Other noticeable hurricanes such as, Camille (1969) and Andrew (1992) can be listed. Storms of greater intensity will produce more severe flooding conditions.

2.4 Flood Protection Measures

The Lafourche Parish Police Jury operates and maintains more than 100 pumps at over 40 locations in developed and developing areas within the Parish. These drainage areas are for the most part bounded by low-elevation levees, generally constructed of spoil from canals used for conveyance to the pumps. These measures provide relief from flooding due to low intensity rain storms and high stages which sometimes accrue in swamp or marsh areas outside the protected areas.

Over the past years, channel improvements were made to Bayou Folse, which drains eastern Thibodaux and much of the area on the west bank of Bayou Lafourche down to the vicinity of the Town of Lockport. Also, improvements were made to the levees protecting the developing area at the bottom of the Bayou Folse Watershed near Lake Fields (Reference 9).

None of the levees in the parish provide protection from the 1-percent-annual-chance flood event.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail, standard hydrologic and hydraulic study methods were used to determine the flood hazard data. Flood events of a magnitude which are 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 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 Hydrologic Analyses

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

For those areas limited to flooding from ponding of rainfall runoff or backwater flooding, hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals in areas studied in detail.

Topographic information for Lafourche Parish and vicinity was collected to determine drainage areas and storage characteristics. Rainfall depth, frequency, and duration data were obtained from National Weather Service information (Reference 10) for hypothetical storms of 10-, 2-, 1-, and 0.2-percent chance recurrence intervals, and time distributions were developed for each hypothetical storm.

Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS) version 3.1.0 (Reference 11) was utilized for the hydrologic analyses. The HEC-HMS models prepared by the USACE-MVN, the Donaldsonville To The Gulf Feasibility Study, Thibodaux To Larose, and Larose To Golden Meadow, include open channels as well as ponding areas within Lafourche Parish. From the study, runoff hydrographs generated by HEC-HMS were then routed through the hydraulic

models including open channels and storage areas for channel and storage routings to establish the peak stages.

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 2, "Summary of Discharges."

It should be noted that the Donaldsonville To The Gulf, Thibodaux To Larose, and Larose To Golden Meadow models were performed using unsteady-state condition. Therefore, the peak discharges listed in Table 2 resulted from the hydraulic analysis including channel and floodplain routings.

TABLE 2 -SUMMARY OF DISCHARGES

Flooding Source and Location	Drainage Area (sq.mi)	Peak Discharges (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
Donaldsonville To The Gulf-WEST					
Bayou Boeuf					
At mouth (Lake des Allemands) *	-	368**	343**	310**	322
Bowie Canal					
At confluence with Bayou Boeuf *	-	6	16**	25**	31**
Company Canal					
2,000 ft upstream from confluence with Grand Bayou *	-	269	335	370	405
Grand Bayou					
At confluence with Bayou Boeuf *	-	143**	117**	123**	282
Halpin Canal					
At confluence with Bayou Boeuf *	-	65**	60**	54**	15**
Sam Foret Canal					
At mouth (Lake Boeuf) *	-	25**	23**	21**	5
Theirot Canal					
At mouth (Lake Boeuf) *	-	9	9	9	10
Donaldsonville To The Gulf-EAST					
Bayou Vacherie					
At mouth (Lake Salvador) *	-	83	93	94	92

* Peak discharge rates at mouth are influenced by the stages of Lake des Allemands and Lake Salvador.
- : Drainage area is not available
All peak discharges listed are the results from unsteady HEC-RAS modeling at the time when the maximum stage occurs, those identified as ** indicate a flow direction reversal.

TABLE 2 – SUMMARY OF DISCHARGES (continued)

Flooding Source and Location	Drainage Area (sq.mi)	Peak Discharges (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
Donaldsonville To The Gulf-EAST					
Company Canal					
At confluence with Des Allemands *	-	22	23	23	83
Des Allemands					
Below Lake des Allemands *	-	184	172	189	281
At confluence with Lake Salvador *	-	1,514	1,852	1,969	7,307
Tisamond Foret Canal					
At confluence with Forty Arpent Canal *	-	220**	220**	217**	153**
Forty Arpent Canal					
At confluence with Company Canal	-	371	366	366	453
Thibodaux To Larose					
Bayou Cutoff					
Upstream of Hollywood Canal	-	3,075	4,310	4,839	6,217
Downstream of Hollywood Canal	-	1,739	2,549	2,929	3,949
Upstream of Bayou Folse	-	1,318	1,544	1,700	1,784
Bayou Folse					
Downstream of Bayou Cutoff	-	1,328	1,554	1,710	1,794
Downstream of McMahon Canal	-	395	471	512	714
At mouth (Lake Fields)	-	842	918	960	1,156
Hollywood Canal					
Downstream of Bayou Cutoff	-	1,337	1,761	1,911	2,268
App. 2,600 ft upstream from Lake Long	-	1,306	1,930	2,236	3,008
McMahon Canal-Bayou du Mar					
Below Bayou Cutoff	-	745	826	871	1,108
At mouth of Bayou du Mar (Lake Fields)	-	811	893	936	1,150

* Peak discharge rates at mouth are influenced by the stages of Lake des Allemands and Lake Salvador.
- : Drainage area is not available
All peak discharges listed are the results from unsteady HEC-RAS modeling at the time when the maximum stage occurs, those identified as ** indicate a flow direction reversal.

TABLE 2 – SUMMARY OF DISCHARGES (continued)

Flooding Source and Location	Drainage Area (sq.mi)	Peak Discharges (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
Larose To Golden Meadow					
East Bank Borrow Canal					
Downstream Study Limit (at Larose)	-	498	600	501	502
E. 36th Street	-	241	256	259	261
Golden Meadow					
Dursette Lane Ext.	-	268	302	323	380
Texas Road Ext.	-	340	398	393	451
PS8					
At Pump Station 8	-	138	138	138	138
West Bank Borrow Canal					
Near W. 11th Street (at Larose)	-	1,786	1,306	1,463	1,901
W. 107th Street (at PS2)	-	366	435	462	479
At Pump Station 1 at Oakridge Road	-	512	512	512	512

Peak discharges are the results from unsteady HEC-RAS modeling when maximum stages occur.
- : Drainage area is not available

3.2 Hydraulic Analyses

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

For streams, as well as storage areas, included in the Donaldsonville To The Gulf Feasibility Study (D2G WEST and EAST), Thibodaux To Larose (T2L), and Larose To Golden Meadow (L2G), water surface elevations for the 10-, 2-, 1-, and 0.2-percent-annual-chance floods were computed using the U.S. Army Corps of Engineers' HEC-RAS version 3.1.3 (Reference 12). It was modeled using unsteady-state condition simulation.

Due to the flat terrain characteristics, no significant water surface elevation changes exist in long distance of open channels. Also the flood stages in the channel are influenced by the stages of adjacent storage areas. The initial stages of the major lakes are listed in Table 3.

TABLE 3 – SUMMARY OF STORAGE AREA ELEVATIONS

Major Lakes and Storage Areas	Initial Stage (FT. NAVD)
Lake des Allemands	0.0
Lake Cataouatche	0.0
Lake Salvador	0.0

Roughness coefficients were estimated based on field inspection of stream channels and floodplain areas. The following Table 4 shows the Manning's "n" ranges for the streams studied by detailed methods in this study:

TABLE 4 - SUMMARY OF ROUGHNESS COEFFICIENTS

Stream	Channel "n"	Overbank "n"
All channels in Donaldsonville To The Gulf - WEST	0.035	0.045
All channels in Donaldsonville To The Gulf - EAST	0.045	0.045
All channels in Thibodaux To Larose	0.035	0.05
All channels in Larose To Golden Meadow	0.04	0.05

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations on the FIRM are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Since the flood elevations resulting from the Larose to Golden Meadow Riverine Analysis Model were lower than the elevations resulting from the Coastal Analyses for the area, the Riverine model elevations were not used for this flood insurance study mapping purposes.

3.3 Coastal Analyses

The hydraulic characteristics of flooding from possible sources were 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 in the FIS report.

3.3.1 Storm Surge Analysis and Modeling

For areas subject to tidal inundation, the 10-, 2-, 1-, and 0.2-percent-annual-chance stillwater elevations and delineations were taken directly from a detailed storm surge study documented in the Technical Study Data Notebook (TSDN) for this new Louisiana coastal flood hazard study.

The Advanced Circulation model for Coastal Ocean Hydrodynamics (ADCIRC) developed by the USACE-MVN, was applied to predict the stillwater elevations or storm surge levels for coastal Louisiana. 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 the areas of interest including shorelines, open coasts and inland bays. It solves the three dimensional equations of motion, including tidal potential, Coriolis acceleration, and nonlinear 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.

Nearshore waves are required to calculate wave runup and overtopping on structures, and the wave momentum (radiation stress) contribution to elevated water levels (wave setup). The numerical model STWAVE was used to generate and transform waves to the shore. STWAVE is a finite-difference model that calculates wave spectra on a rectangular grid. The model outputs zero-moment wave height, 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 surge field. The surge significantly alters the wave transformation and generation for the hurricane simulations in shallow areas flooded.

The STWAVE model was applied on several grids for the Southern Louisiana area. The input for each grid includes the bathymetry (interpolated from the ADCIRC domain), surge fields (interpolated from ADCIRC surge fields), and wind (interpolated from the ADCIRC wind fields, which apply land effects to the wind fields input to the surge model). The wind applied in the STWAVE is spatially and temporally variable for all domains. The STWAVE model was run at 30-mintue intervals.

An existing ADCIRC grid mesh developed by the USACE-MVN was refined along the shoreline of Louisiana and surrounding areas using bathymetric and topographic data from various sources. Bathymetric data consisted of ETOPO5 and Digital Nautical chart databases in the offshore regions. In the nearshore areas, bathymetric data came from regional bathymetric surveys conducted by the USACE-MVN. The topographic portion of the ADCIRC mesh was populated with topographic light detection and ranging (LiDAR) from several sources. In addition, subgrid sized features such as roads and levees were captured in the grid and modeled as weirs. Further details about the terrain data and how it was processed can be found in the TSDN.

The completed ADCIRC grid mesh forming the finite element model has over 2,200,000 grid nodes. The National Oceanic and Atmospheric Administration (NOAA) high definition vector shoreline was used to define the change between water and land elements. The grid includes other features, such as islands, roads, bridges, open water, bays, and rivers. Field reconnaissance detailed the significant drainage and road features, and documentation of coastal structures in the form of seawalls, bulkheads, and harbors. The National Land Cover Dataset was used to define Manning's n values for bottom roughness coefficients input at each node to the mesh. A directional surface wind roughness value was also applied. Further

details about the ADCIRC mesh creation and grid development process can be found in the TSDN.

Predicted tidal cycles were used to calibrate the ADCIRC model and refine the grid. Tidal boundary conditions were obtained from a total of 40 NOAA tide gauges. Seven tidal constituents were used (K1, O1, Q1, M2, S2, N2, and K2). The simulated water-surface elevation time series was compared to measured tides from tide gauge stations for over a 30-day period. Model validation, which tests its ability to reproduce historical events, was performed against Hurricanes Katrina (2005), Rita (2005), and Andrew (1993). Simulated water levels for each event were compared to observed water levels from NOAA tidal gauges, as well as available high water marks. Further details about the model calibration and validation can be found in the TSDN.

Production runs were carried out with STWAVE and ADCIRC on a set of hypothetical storm tracks and storm parameters in order to obtain the maximum water levels for input to the statistical analysis. The hypothetical (synthetic) population of storms was divided into two groups, one for hurricanes of Saffir-Simpson scale Category 3 and 4 strength or "greater storms" and another set for hurricanes of Category 2 strength or "lesser storms." A total of 304 individual storms with different tracks and various combinations of the storm parameters were chosen for the production runs of synthetic hurricane simulations. Each storm was run for at least 3 days of simulation and did not include tidal forcing. Wind and pressure fields obtained from the Planetary Boundary Layer model and wave radiation stress from the STWAVE model were input into the ADCIRC model for each production storm. All stillwater results for this study include the effects of wave setup. The maximum water-surface elevation was output at every wetted ADCIRC grid point in a specific storm. This resulted in more than 1,000,000 locations where statistical methods were applied to obtain return periods of the stillwater elevation. A Triangular Irregular Network (TIN) was created to represent the stillwater surface based on the density of the output points from the ADCIRC. Further details about the production run process can be found in the TSDN.

3.3.2 Statistical Analysis

The Joint Probability Method (JPM) was used to develop the stillwater frequency curves for the 10-, 2-, 1-, and 0.2-percent-annual-chance stillwater elevations. The JPM approach 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. The JPM approach was modified for this coastal study based on updated statistical methods developed by FEMA and the USACE-MVN for Mississippi and Louisiana.

Due to the excessive number of simulations required for the traditional JPM method, the Joint Probability Method-Optimum Sampling (JPM-OS) was utilized to determine the stillwater elevations associated with tropical events. JPM-OS is a modification of the JPM method developed cooperatively by FEMA and the USACE-MVN for Mississippi and Louisiana coastal flood studies that were performed simultaneously, 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 Louisiana coast.

3.3.3 Stillwater Elevation

The results of the ADCIRC model, as described above, provided stillwater elevations, including wave setup effects that are statistically analyzed to produce probability curves. The JPM-OS is applied to obtain the return periods associated with tropical storm events. The approach involves assigning statistical weights to each of the simulated storms and generating the flood hazard curves using these statistical weights. The statistical weights are chosen so that the effective probability distributions associated with the selected greater and lesser storm populations reproduced the modeled statistical distributions derived from all historical storms.

Stillwater elevations for each Louisiana coastal parish, obtained using the ADCIRC and JPM-OS models, are provided for JPM and ADCIRC grid node locations for the 10-, 2-, 1-, or 0.2-percent-annual-chance return period stillwater elevations in the TSDN.

3.3.4 Wave Height Analysis

Areas of coastline subject to significant wave attack are referred to as coastal high hazard zones. The USACE-MVN has established the 3-foot breaking wave as the criterion for identifying the limit of coastal high hazard zones. The 3-foot wave has been established as the minimum size wave capable of causing major damage to conventional wood frame and brick veneer structures.

Figure 1 shows a profile for a typical transect and illustrates the effects of energy dissipation and regeneration of wave as it moves inland. 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 VE/AE boundary. 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.

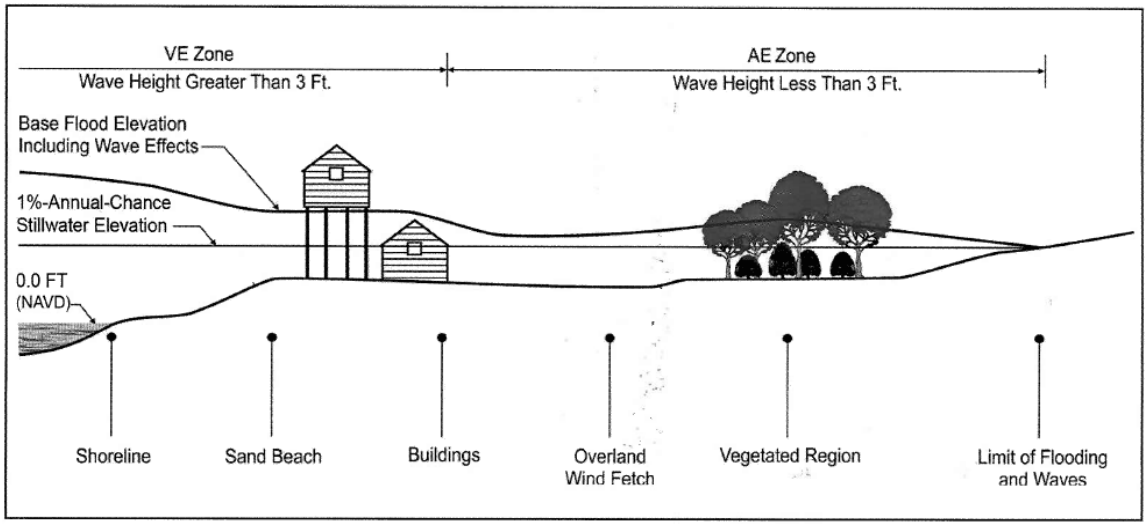

FIGURE 1 – TRANSECT SCHEMATIC

In Lafourche Parish, transects are running in the north-south directions, originating from the Gulf of Mexico shoreline and ending at the Mississippi River south levee. Some of those transects originate in (and are extended from) the Terrebonne and Jefferson Parishes. Wave Height Analysis for Flood Insurance Studies (WHAFIS, Reference 13) for those extended transects was performed and included in the parishes where the transects originated . The initial wave heights representing 1- and 0.2-percent-annual-chance flood events were determined based on depth-limited breaker heights, which is 78% of the stillwater depth under the corresponding surge conditions. Wave periods were extracted from STWAVE modeling results.

The wave transects for this study were developed considering the physical and cultural characteristics of the land so that they would closely represent physical conditions in their locality. Transects were spaced dense enough to represent the hydraulic conditions and to capture hydraulic changes. In areas having more uniform characteristics, transects were spaced at relatively larger intervals. Transects are also located in areas where unique flooding existed and in areas where computed wave heights varied significantly between adjacent transects. Transects are shown on the respective FIRM panels for the parish.

The topographic information applied to transect profiles was based on ADCIRC grid bathymetry and LiDAR data collected by the State of Louisiana and FEMA between 2003 and 2005 (Reference 14). The vertical datum for topographic/bathymetry data is the NAVD88.

The Louisiana Gap Analysis Program (GAP) Analysis, developed by the U.S. Geological Survey (USGS), served as the primary source for the spatial

distribution of vegetative cover. Aerial imagery and field reconnaissance were performed to verify the Louisiana GAP Analysis data. Aerial photos and images downloaded from http://atlas.lsu.edu/ were applied to verify features such as buildings, levees, forested vegetation, and marsh grass for input to the wave height models.

No storm-induced erosion analysis was performed. Primary frontal dune erosion was not applicable for this parish.

Wave height calculation used in this study follows the methodology described in Appendix D of the October 2006 FEMA Guidelines and Specifications for Flood Hazard Mapping Partners. WHAFIS 4.0 was applied to calculate overland wave height propagation and establish base flood elevations. In addition to the 1-percent-annual chance event, the 0.2 percent-annual-chance event was also modeled with WHAFIS 4.0. The 0.2-percent-annual-chance wave height results are not included on the FIRMs but are provided in wave transect profiles in the FIS.

Stillwater elevations are applied to each ground station along each transect and input to WHAFIS. The stillwater elevations were obtained from the ADCIRC storm surge study, using the stillwater TIN generated by the USACE-MVN. Wave setup was not calculated separately because wave setup was included in the base stillwater elevations from the storm surge analysis.

Levees and embankment structures not meeting the free board requirements of 44 CFR, 65.10 were removed in the WHAFIS wave height analysis. For the remaining levees, if there is high ground in front of those levees and the surge did not reach those levees, then no wave runup analysis is performed. Otherwise, the van der Meer method described in the 2003 version of the Coastal Engineering Manual (CEM) was used in calculating wave runup over sloped levees. Wave characteristics and stillwater elevations were obtained from the WHAFIS wave height analysis and USACE-MVN's storm surge analysis (without wave setup). The FIRM panel shows a BFE along the levee that includes wave runup.

Table 5. COASTAL DATA TABLE

Community Name	Transect	Description	Latitude & Longitude at Start of Transect		Starting Stillwater Elevations (FT. NAVD) Range of Stillwater Elevations (FT. NAVD)				Zone Designation and BFE (FT. NAVD)
					10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	
Lafourche	1	Begins at Gulf shoreline in Lafourche Parish, near western end of the Parish, traversing south to north to Mississippi River	29.3378	90.3486	5.9 Range Not Available	8.7 Range Not Available	10.4 4.5-11.6	13.4 7.0-18.8	AE 5-13 VE 8-16
Lafourche	2	Located to the east of transect 1, traversing south to north.	29.2485	90.3002	5.5	7.5	9.0 2.2-11.3	11.7 4.8-14.5	AE 2-11 VE 8-14
Lafourche	3	Located to the east of transect 2, traversing south to north.	29.0937	90.2039	6.3	9.1	11.3 5.8-11.9	14.0 7.7-15.1	AE 7-13 VE 8-17
Lafourche	4	Located to the east of transect 3, traversing south to north.	29.1167	90.1621	6.4	9.3	11.5 5.8-11.6	14.3 7.8-14.4	AE 7-14 VE 8-18

Note: All ranges are for the complete transects.

3.4 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD). With the completion of the North American Vertical Datum of 1988 (NAVD), 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 Lafourche Parish is -0.18 foot.

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

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

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

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

3.5 Land Subsidence

The prevalence of land subsidence in the study area complicates the determination of the expected depth of flooding at a property. This information should always be obtained by direct comparison of the current property elevation with the official base flood elevation at the property as shown on the FIRM.

Local officials should be aware of the subsidence problem and should require the use of the most up-to-date and accurate property elevation data in compensating for land subsidence; however, base flood elevations should not be adjusted, but rather obtained directly from the FIRM.

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 flood 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 and Coastal Data Table. 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 maps at scales of 1:6000, with a contour interval of 2 feet (Reference 14).

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 correspond to the boundaries of the areas of special flood hazards (Zones A, AE, and VE), and the 0.2-percent-annual-chance floodplain boundaries correspond to the boundaries 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.

Approximate 1-percent-annual-chance floodplain boundaries in some portions of the study areas were taken directly from the previous FIRM.

4.2 Floodway Analyses

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 2.

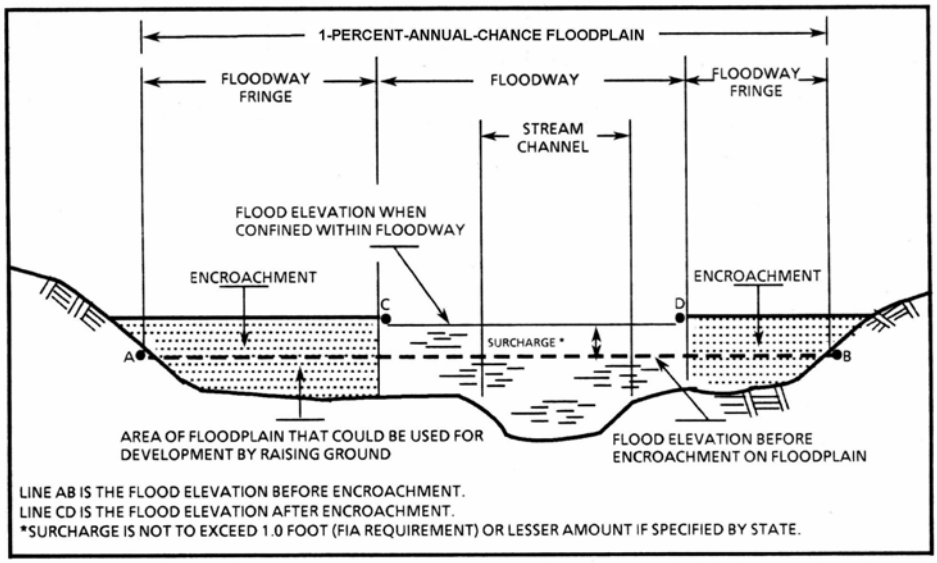

FIGURE 2 – FLOODWAY SCHEMATIC

No floodways were computed for Lafourche Parish since all the studied channels are defined by the berms between the storage areas.

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. The 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 Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations 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 Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals 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 base flood elevations 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 base flood elevations 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 parishwide FIRM presents flooding information for the entire geographic area of Lafourche Parish. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the Parish identified as flood-prone. Historical data relating to the maps prepared for each community are presented in Table 6, “Community Map History.”

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISION DATE(S)
Golden Meadow, Town of	November 20, 1970	July 1, 1974	July 11, 1975	None
Lockport, Town of	January 10, 1975	December 19, 1975	August 15, 1980	None
Raceland, City of	May 8, 1971 (Lafourche Parish)	January 10, 1978 October 1, 1983 (Lafourche Parish)	April 17, 1985 (Lafourche Parish)	None
Thibodaux, City of	February 12, 1974	None	February 7, 1978	December 15, 1989
Lafourche Parish, Unincorporated Areas	May 8, 1971	January 10, 1978 October 1, 1983	April 17, 1985	May 4, 1992

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

FIS and FIRMs for adjacent St. John the Baptist Parish, Jefferson Parish, St. Charles Parish, and Terrebonne Parish are being revised concurrently for parishwide studies.

This FIS report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purpose 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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13. Federal Emergency Management Agency, Users Manual for Wave Height Analysis, Revised February 1981.

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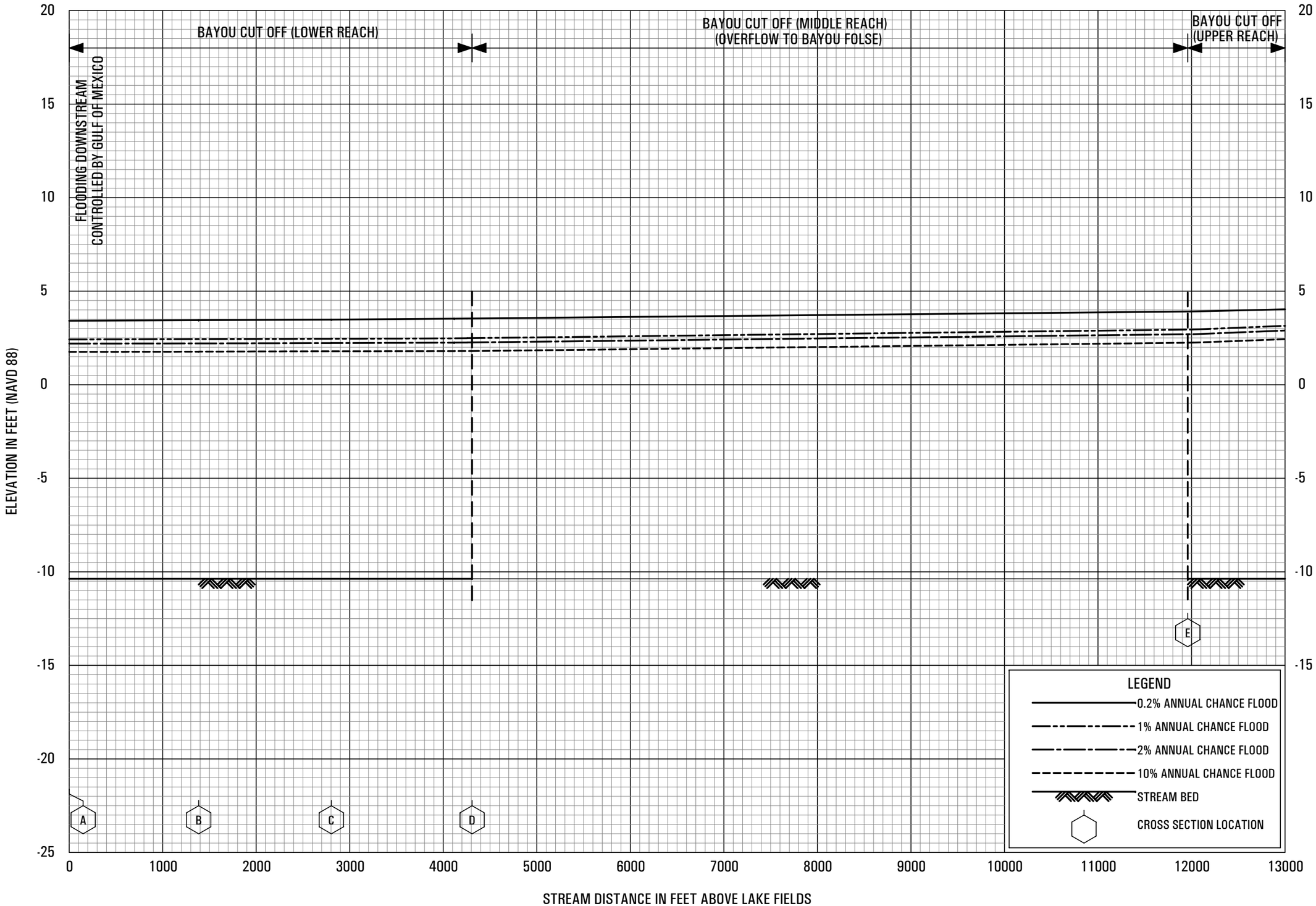

FLOOD PROFILES

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FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

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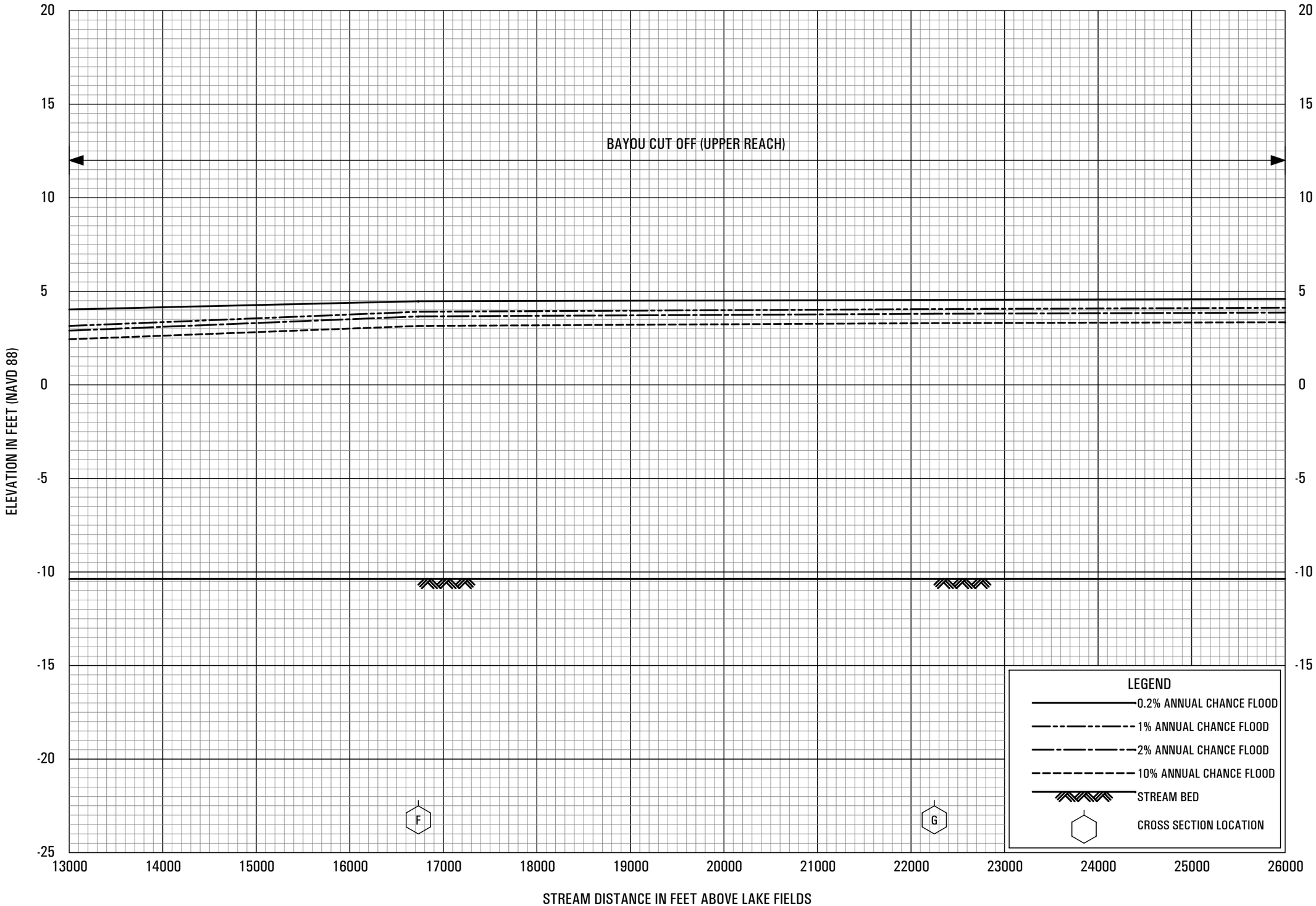

FLOOD PROFILES

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FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

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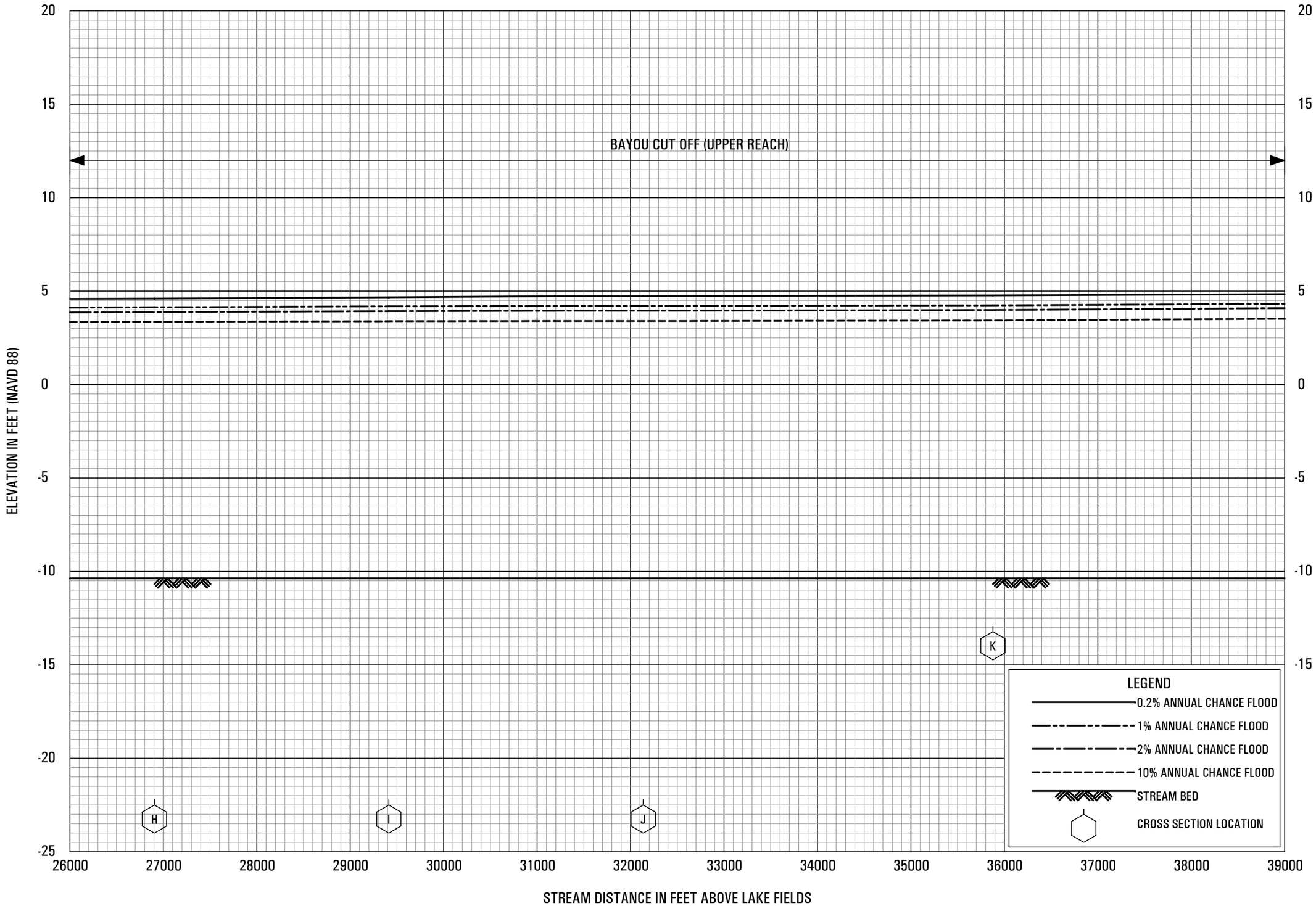

FLOOD PROFILES

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FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

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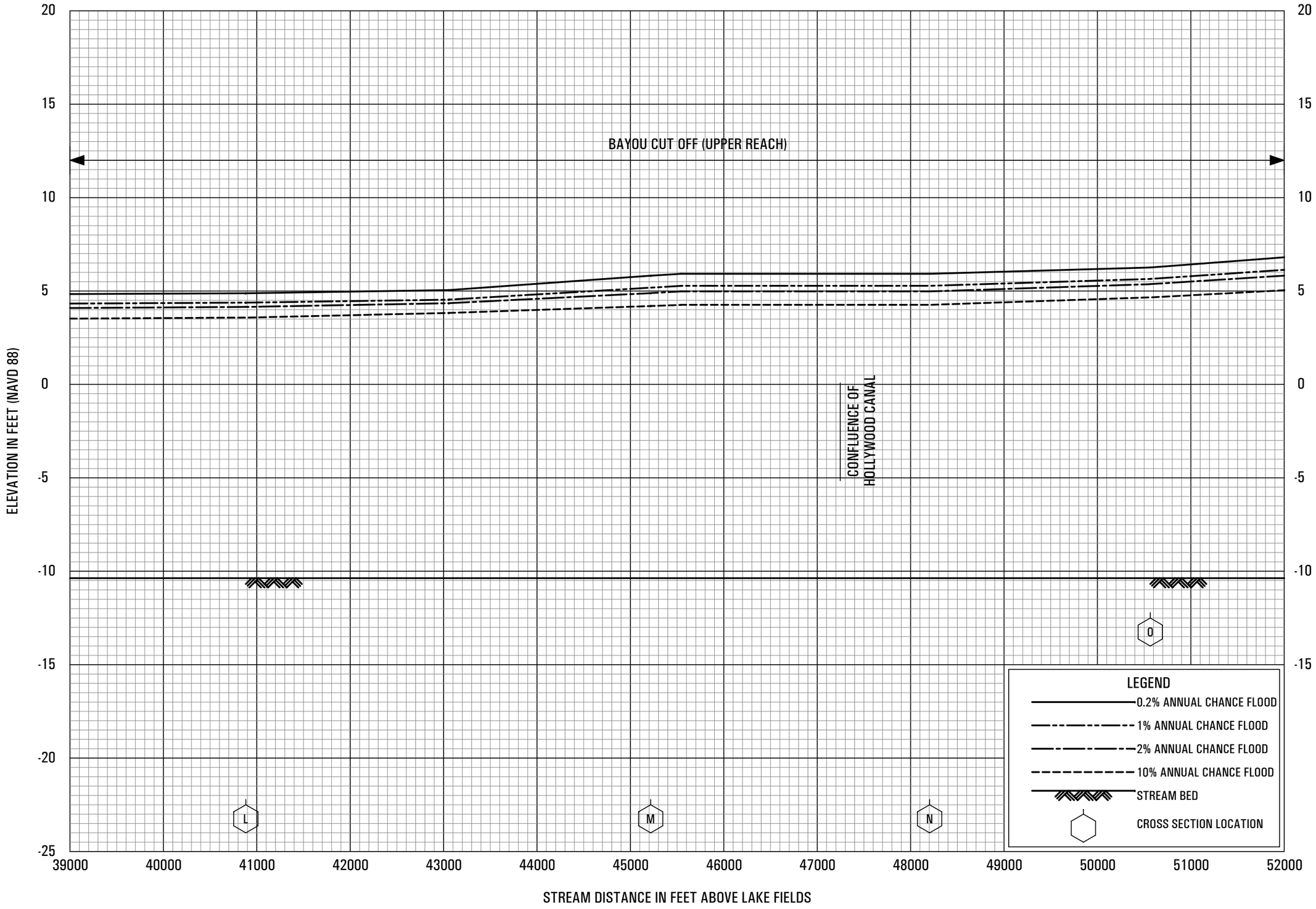

FLOOD PROFILES

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FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

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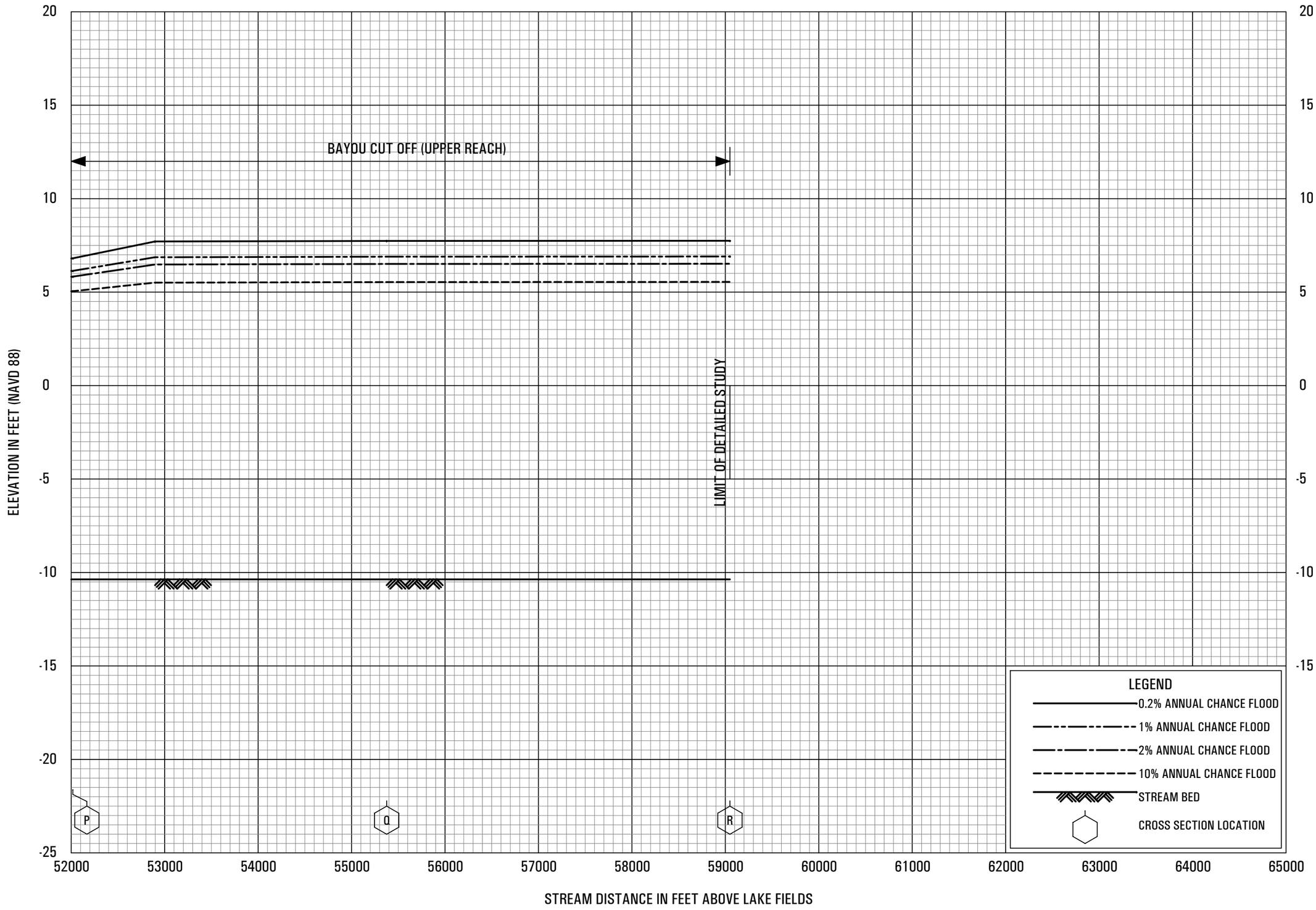

FLOOD PROFILES

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FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

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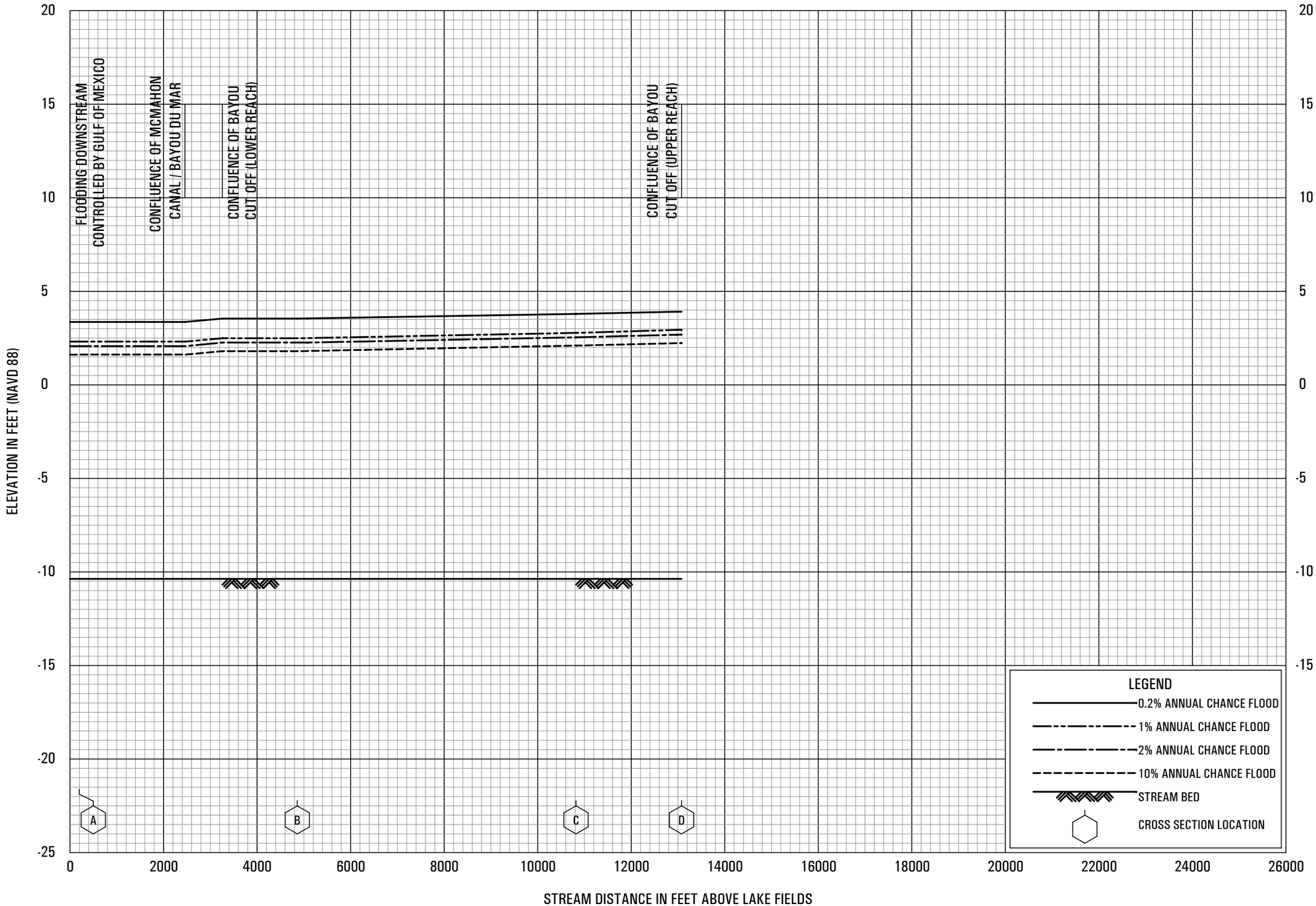

FLOOD PROFILES

BAYOU FOLSE

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

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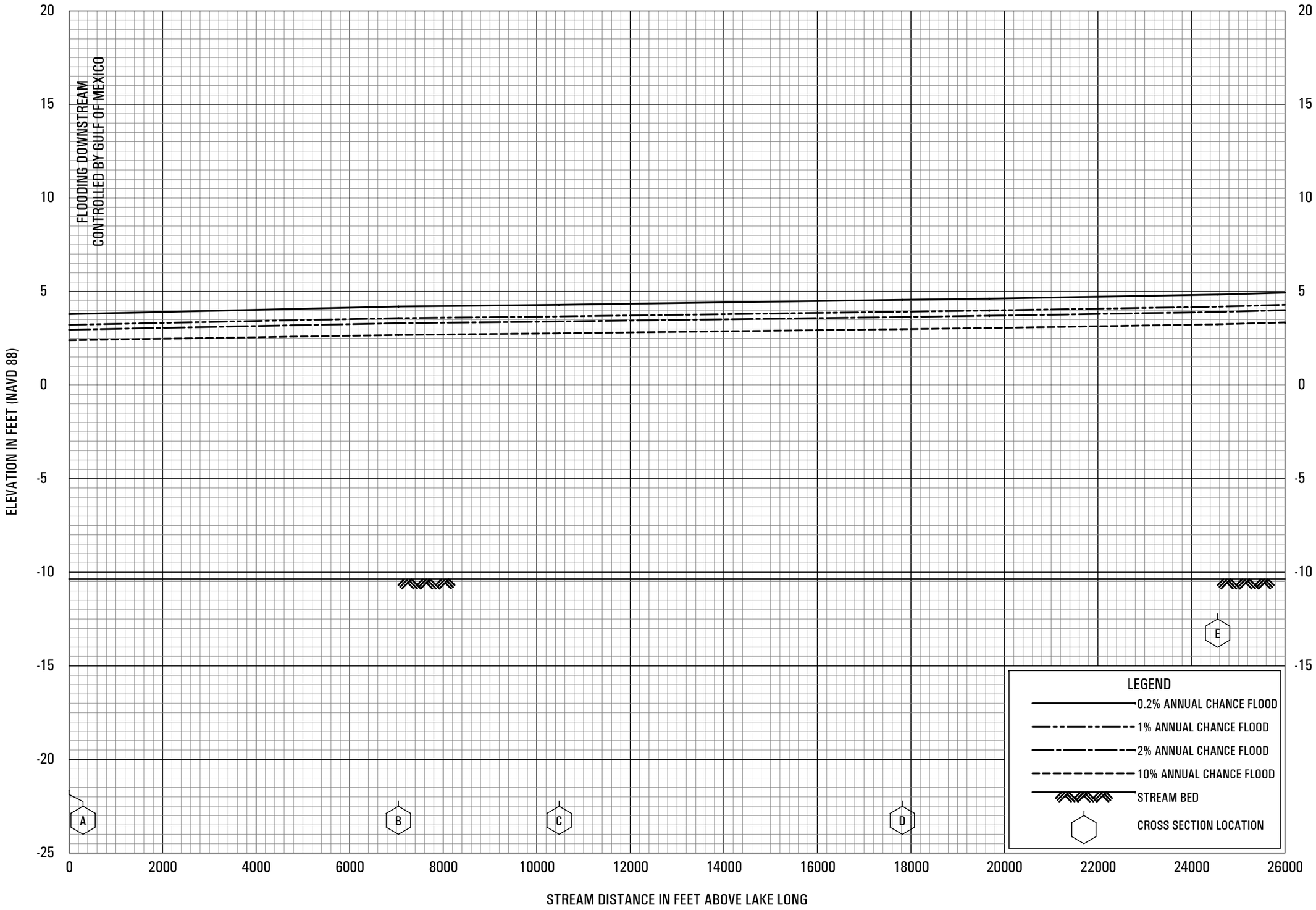

FLOOD PROFILES

HOLLYWOOD CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

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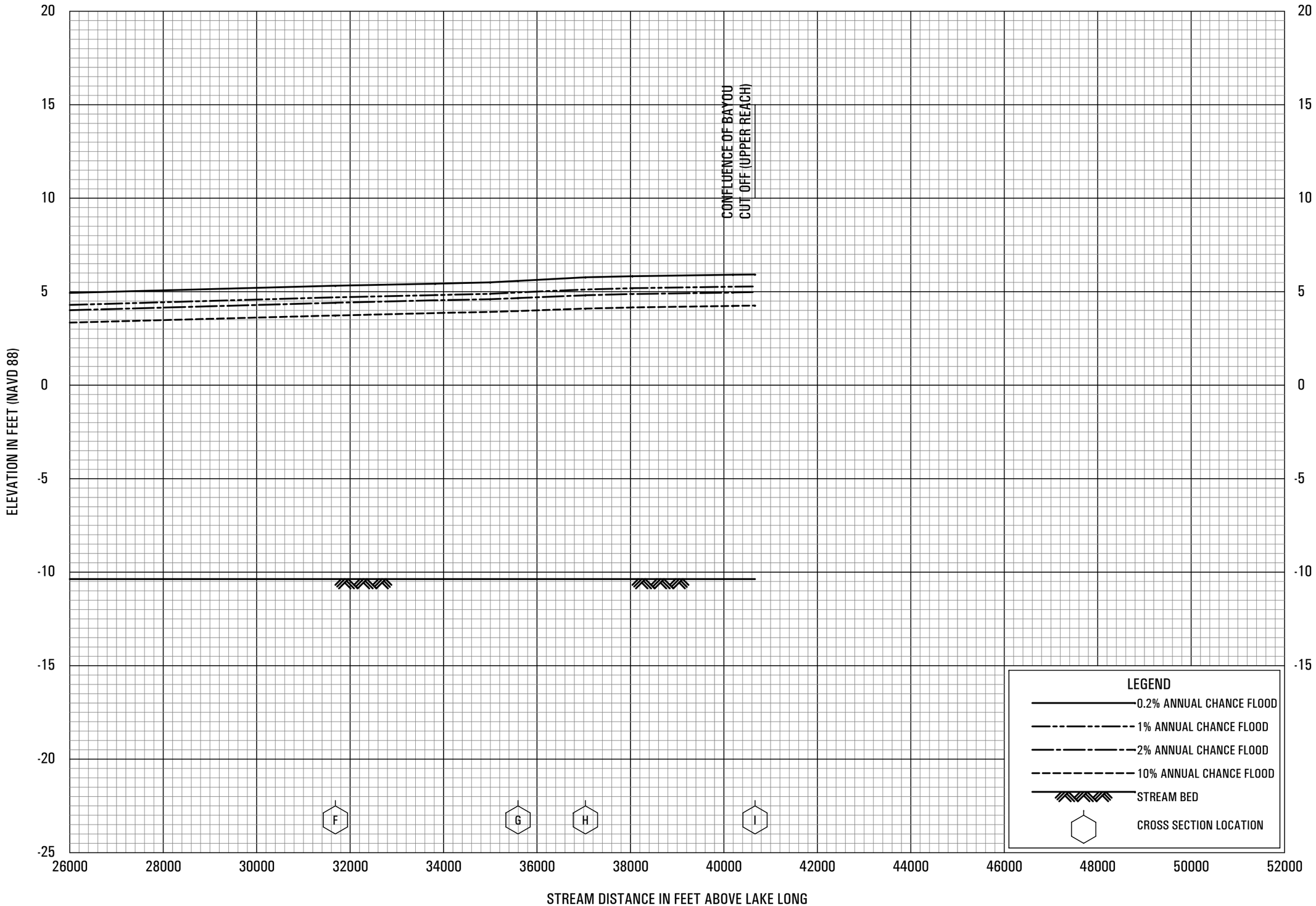

FLOOD PROFILES

HOLLYWOOD CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

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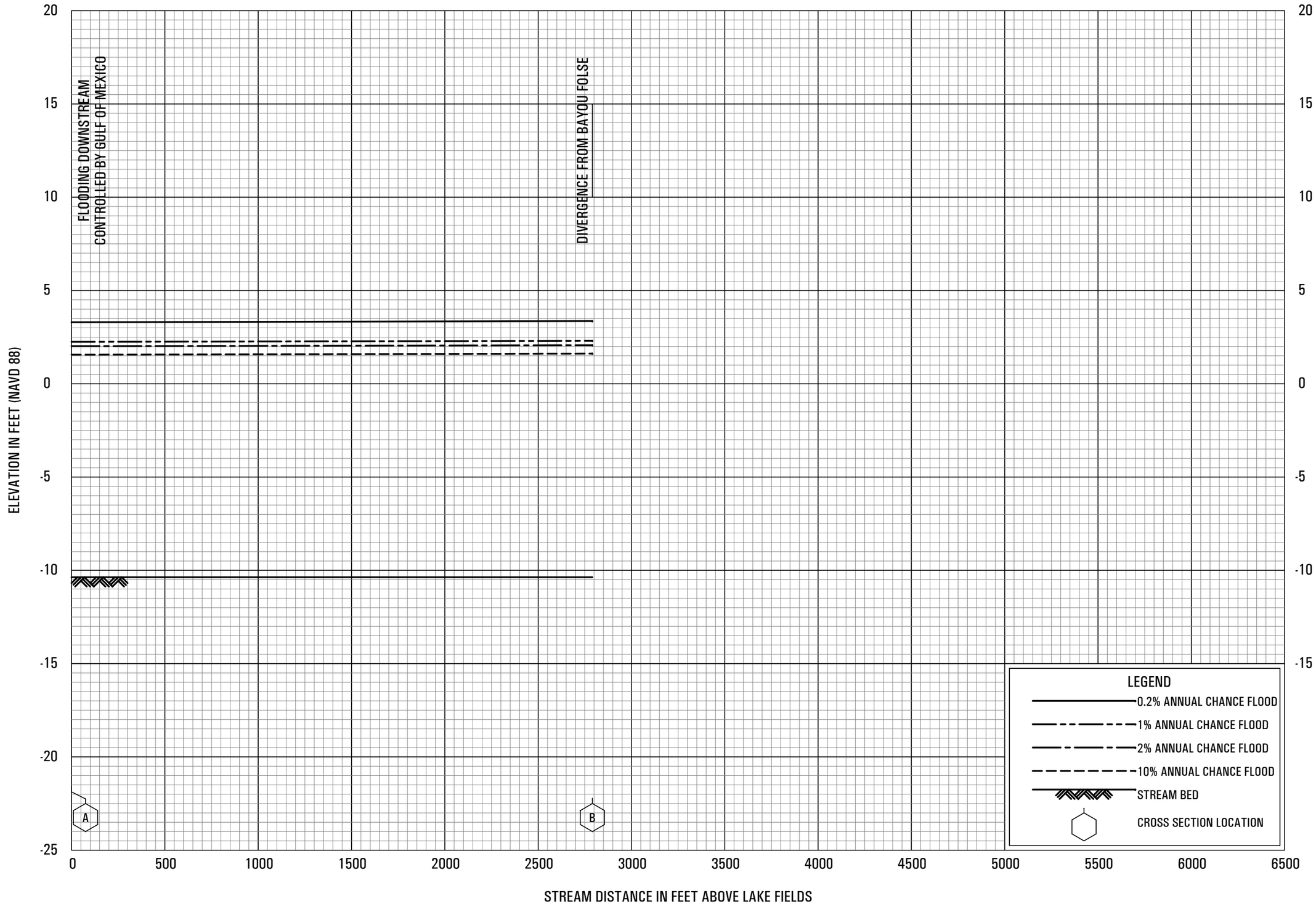

FLOOD PROFILES

MCMAHON CANAL / BAYOU DU MAR

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

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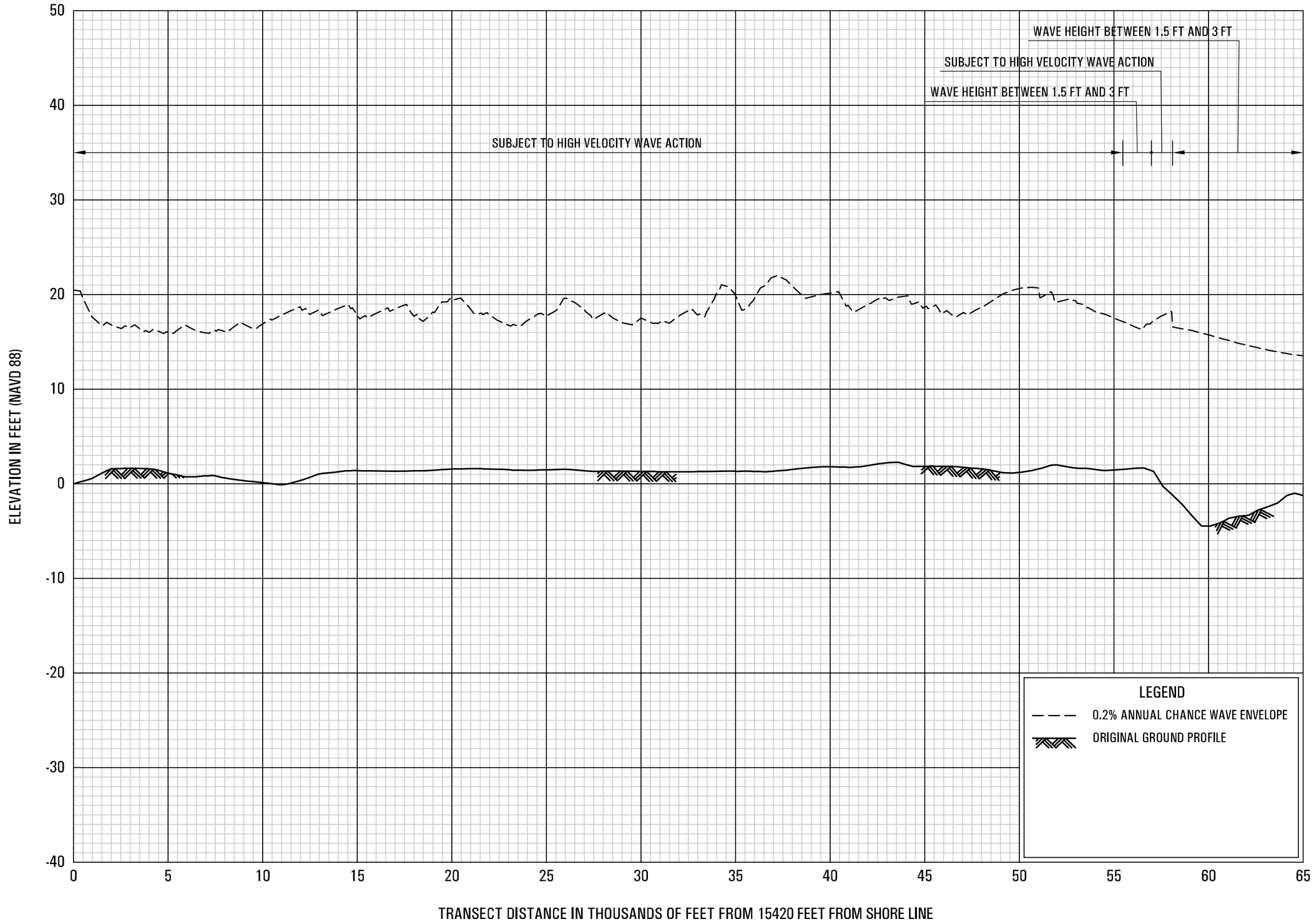

0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

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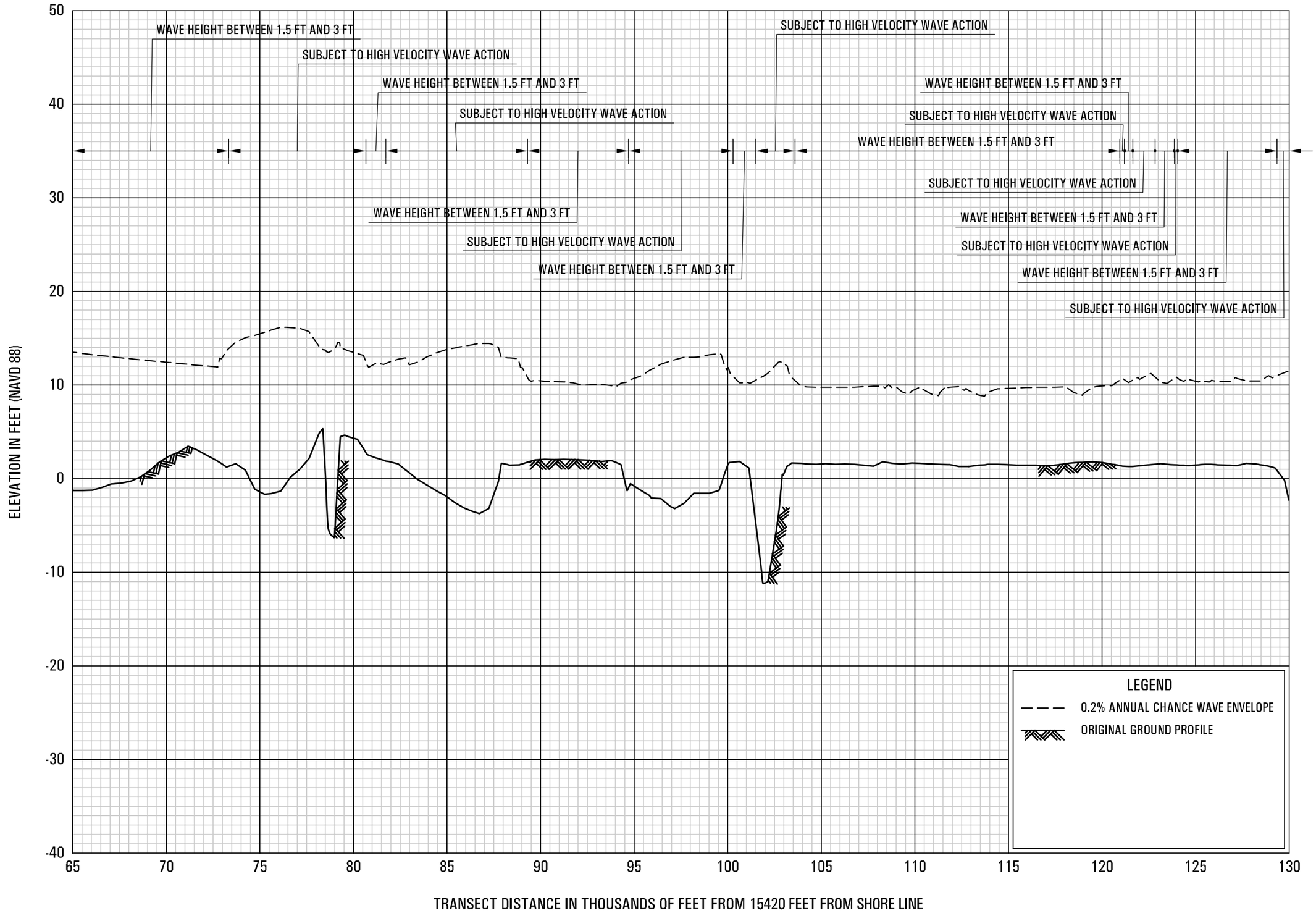

0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

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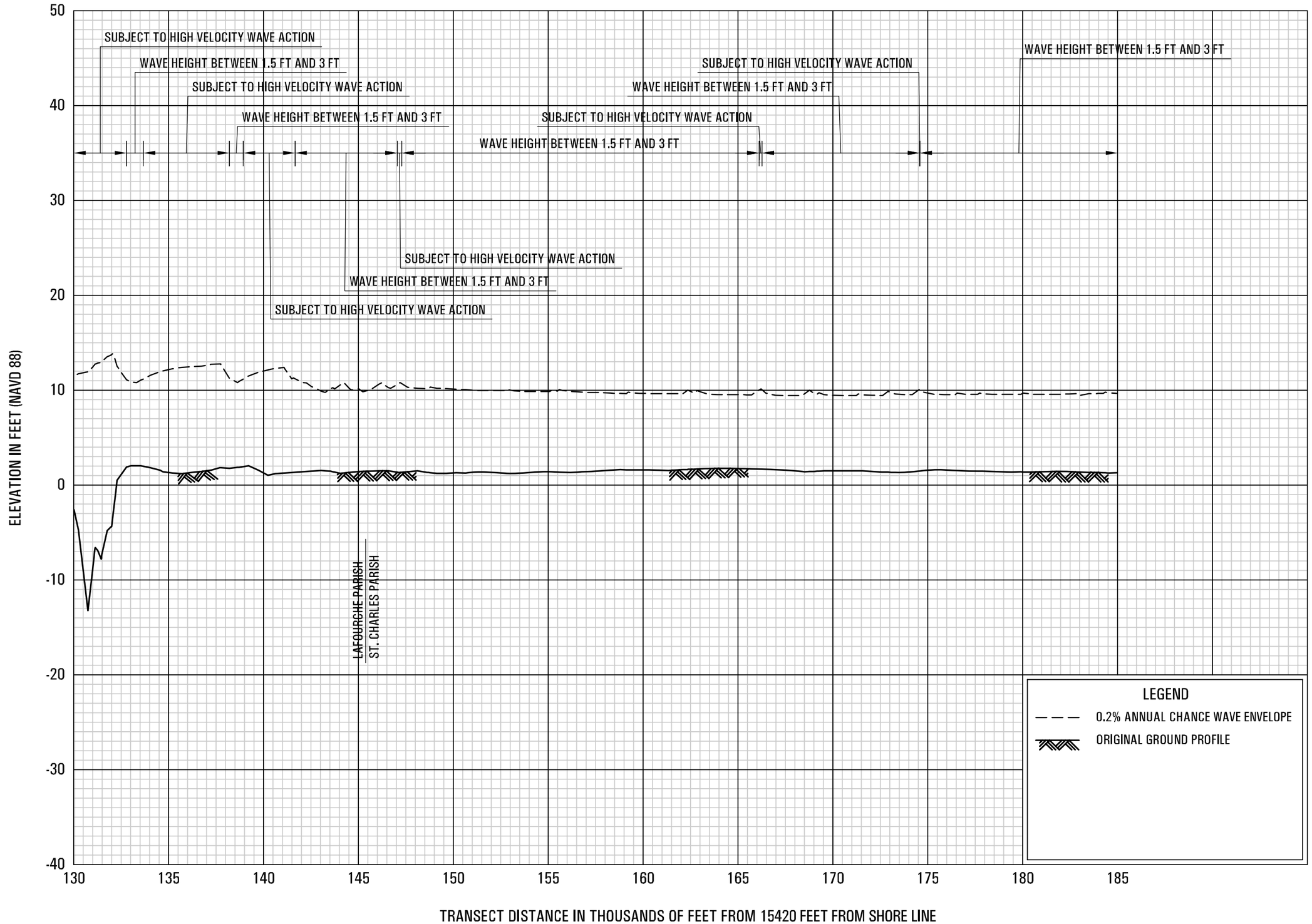

0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

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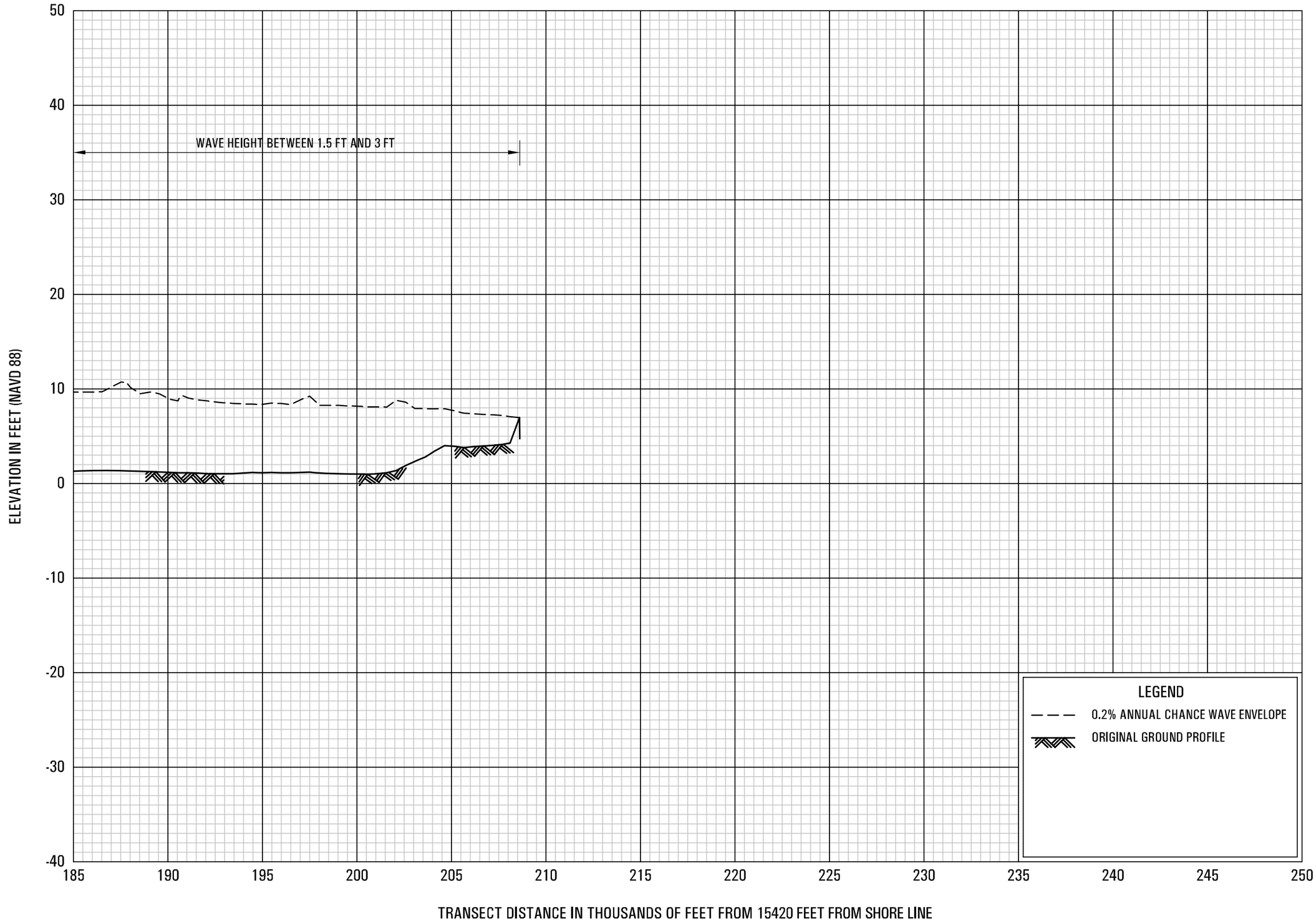

0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

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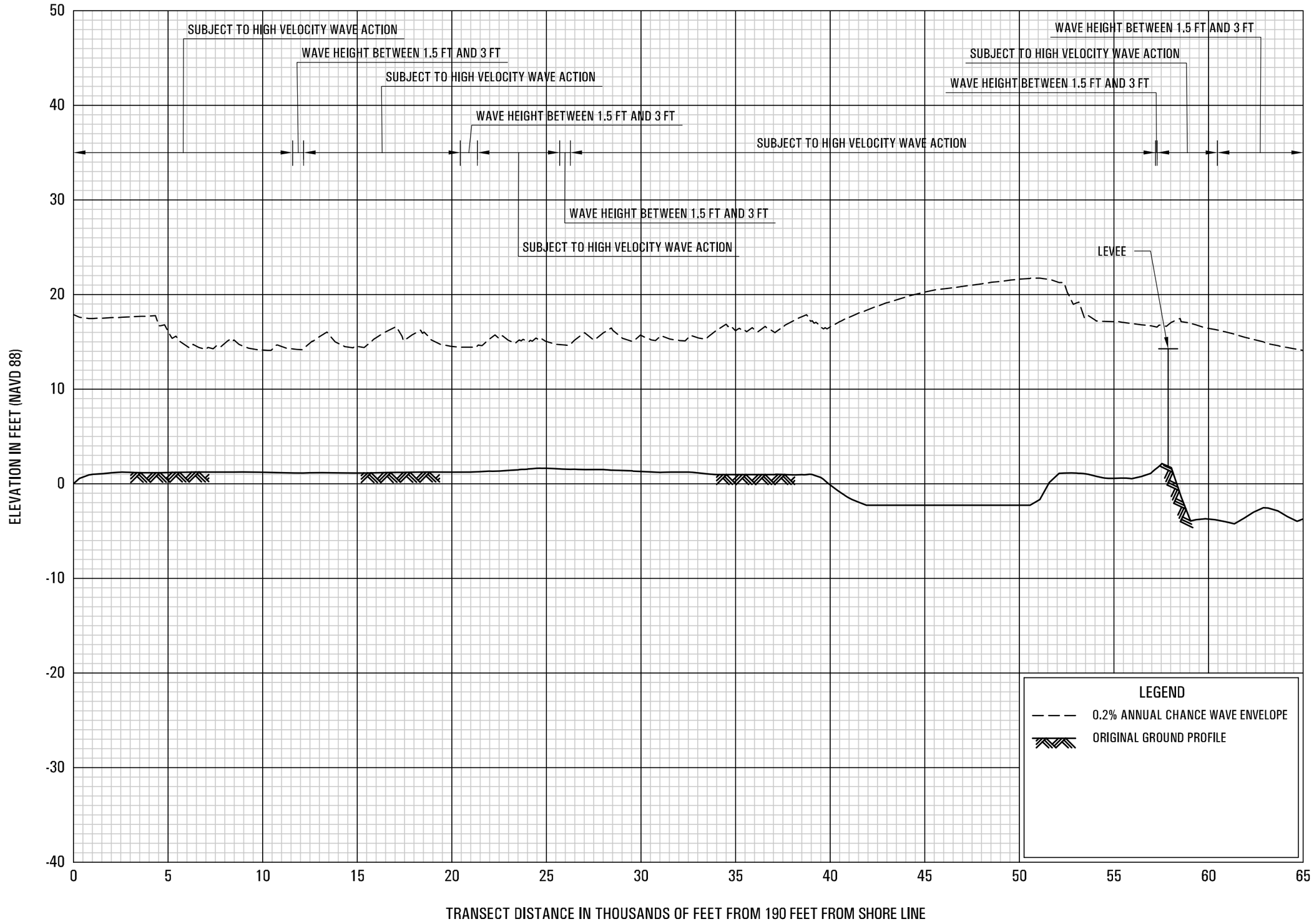

0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

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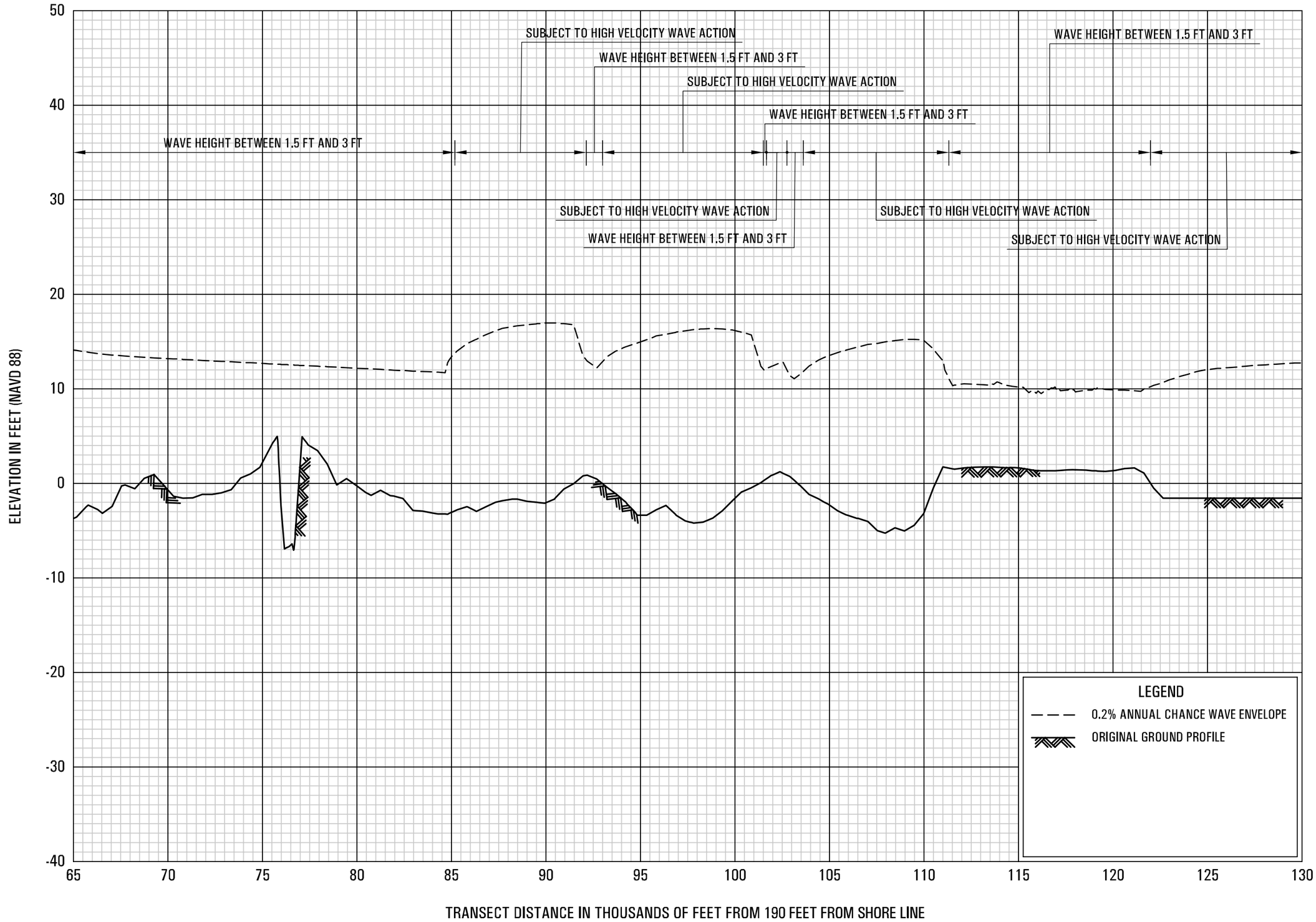

0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

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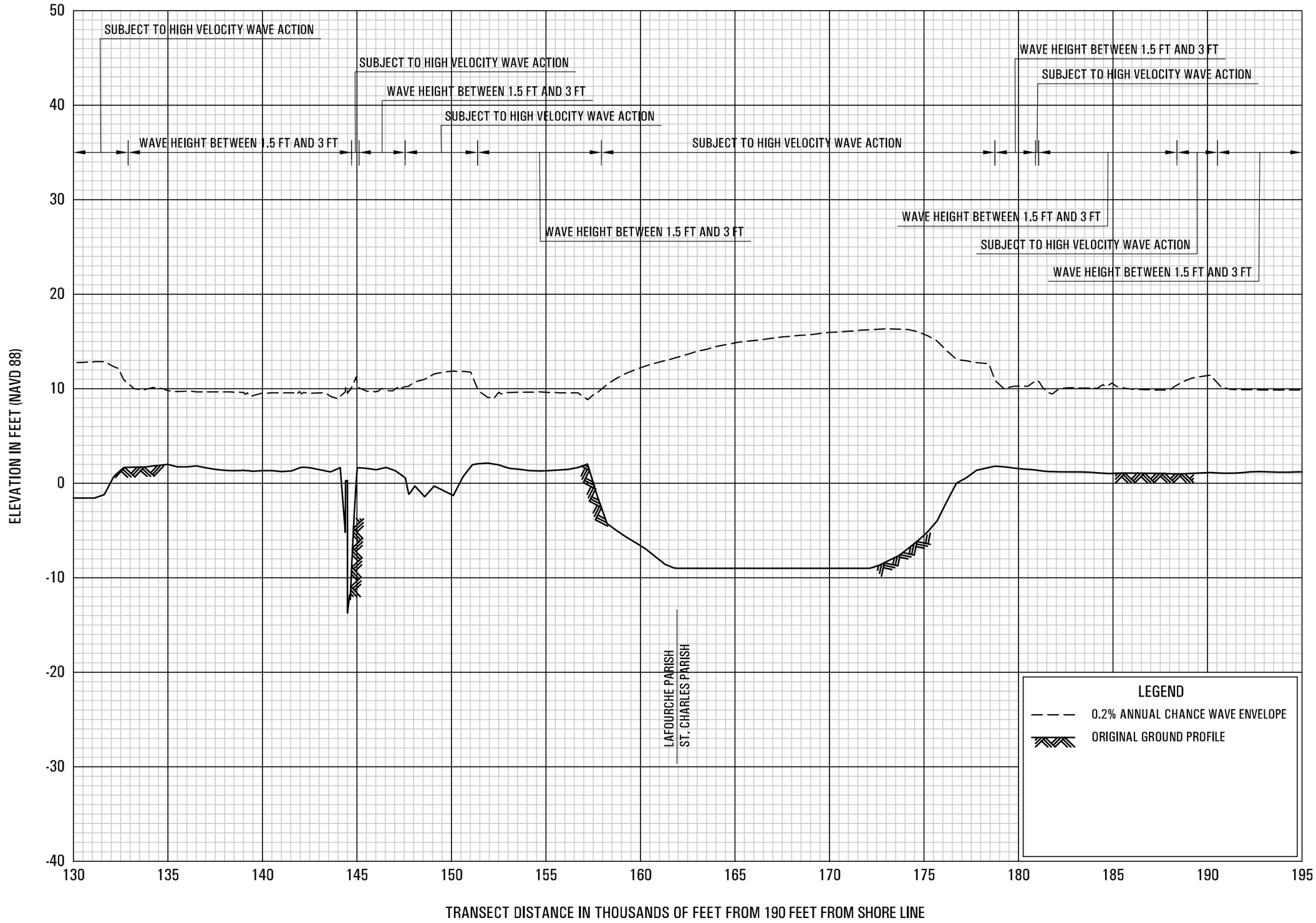


0.2% ANNUAL CHANCE WAVE ENVELOPE

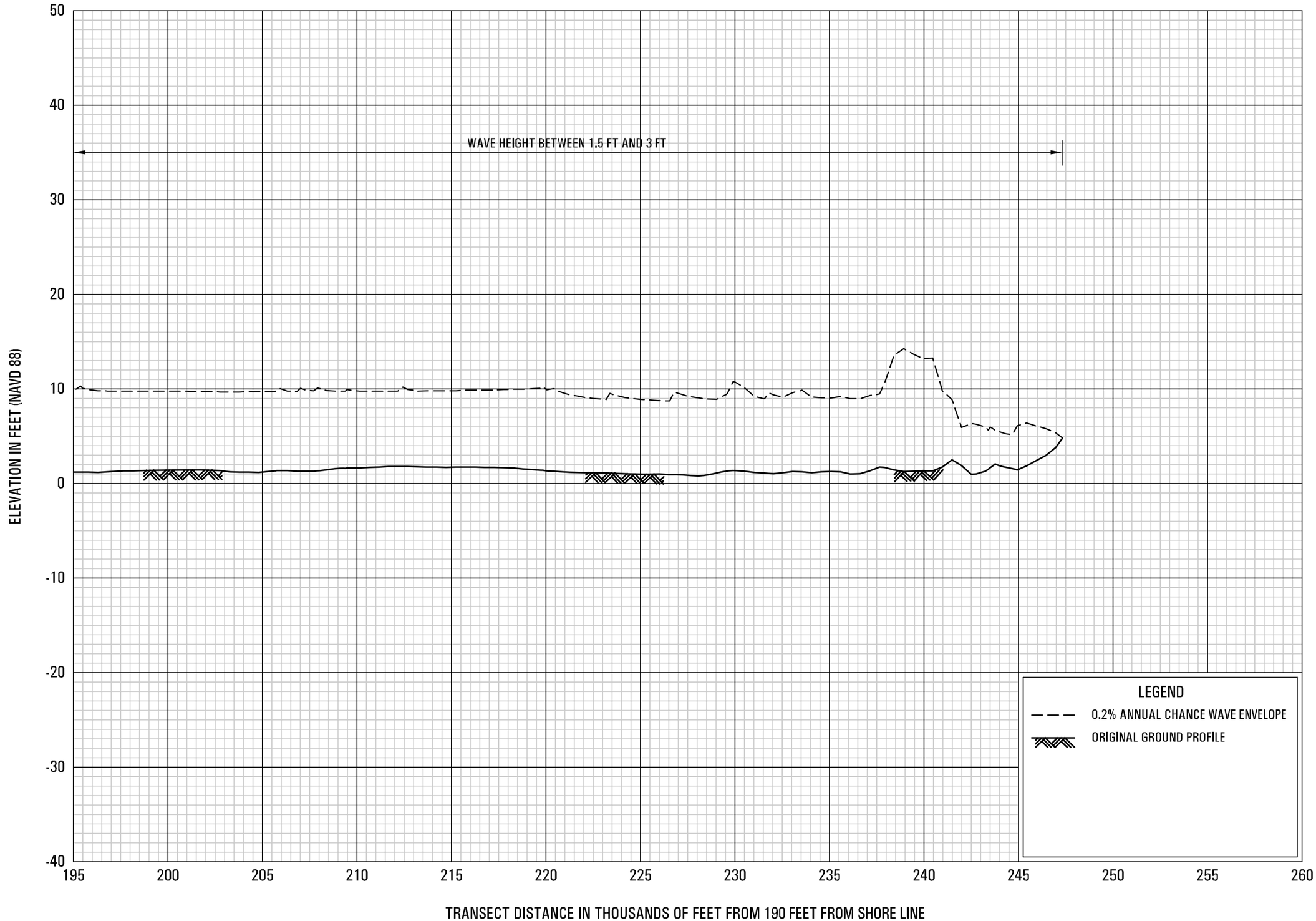
TRANSECT 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

07P



0.2% ANNUAL CHANCE WAVE ENVELOPE

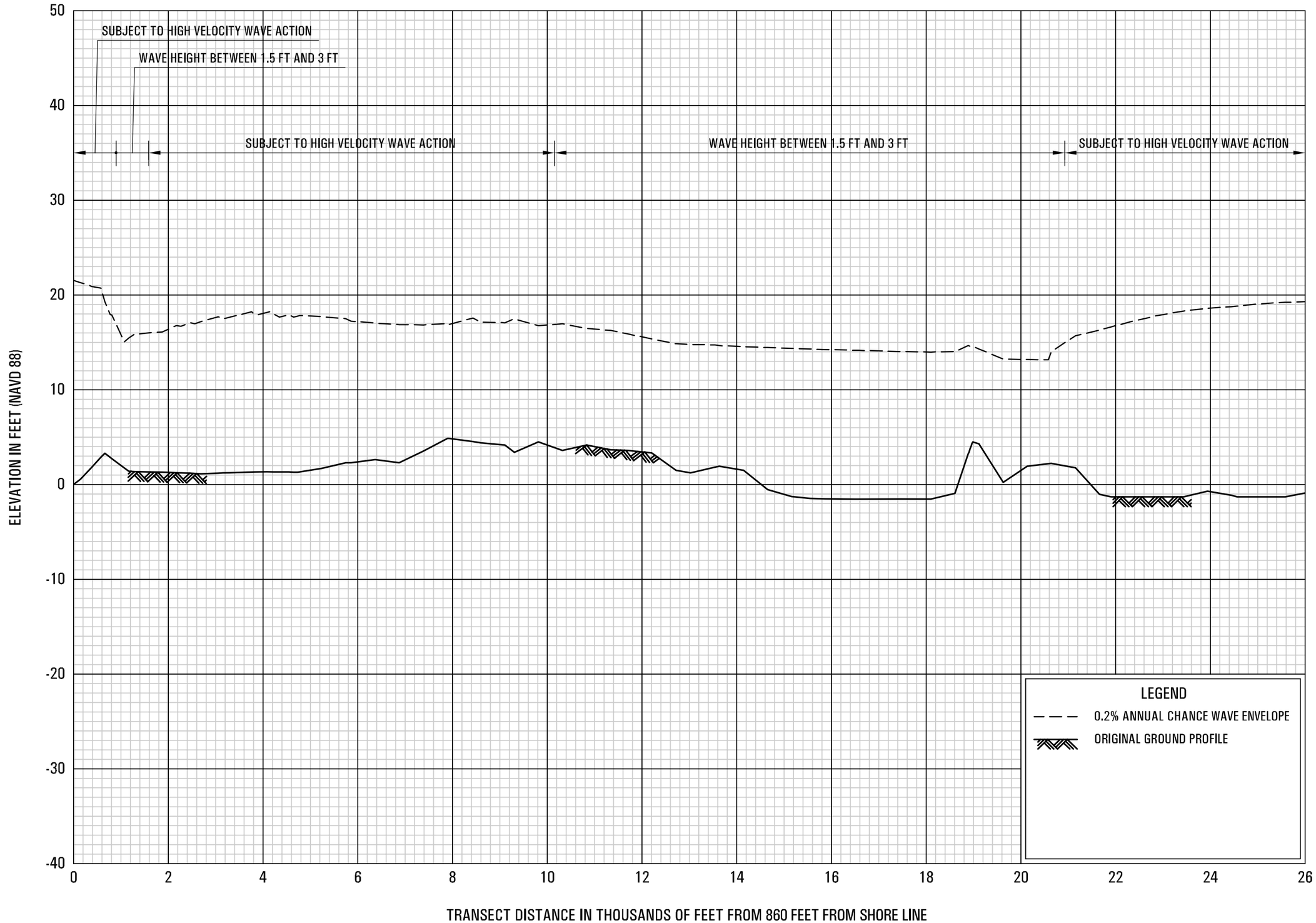
TRANSECT 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

08P



0.2% ANNUAL CHANCE WAVE ENVELOPE

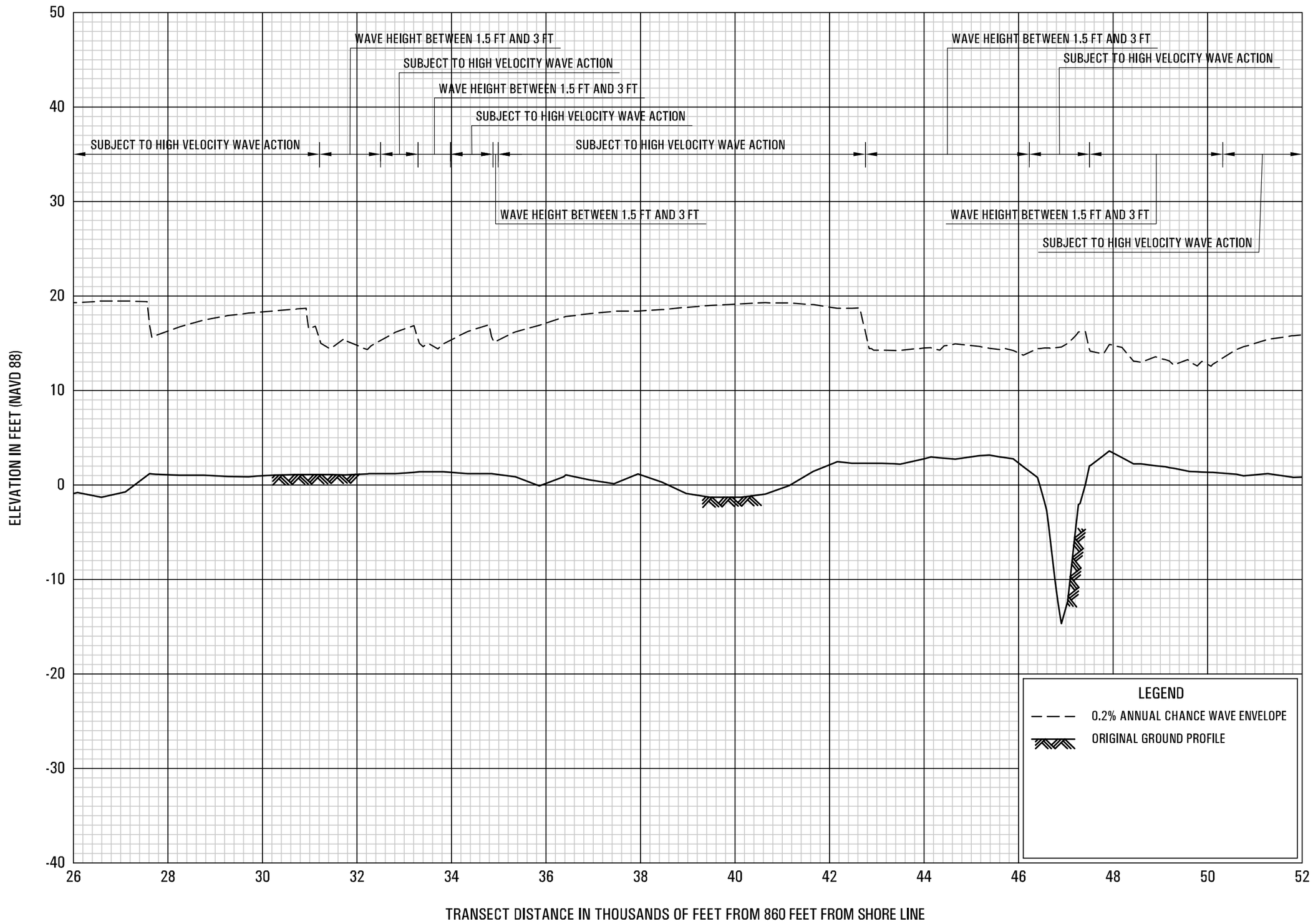
TRANSECT 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

09P



0.2% ANNUAL CHANCE WAVE ENVELOPE

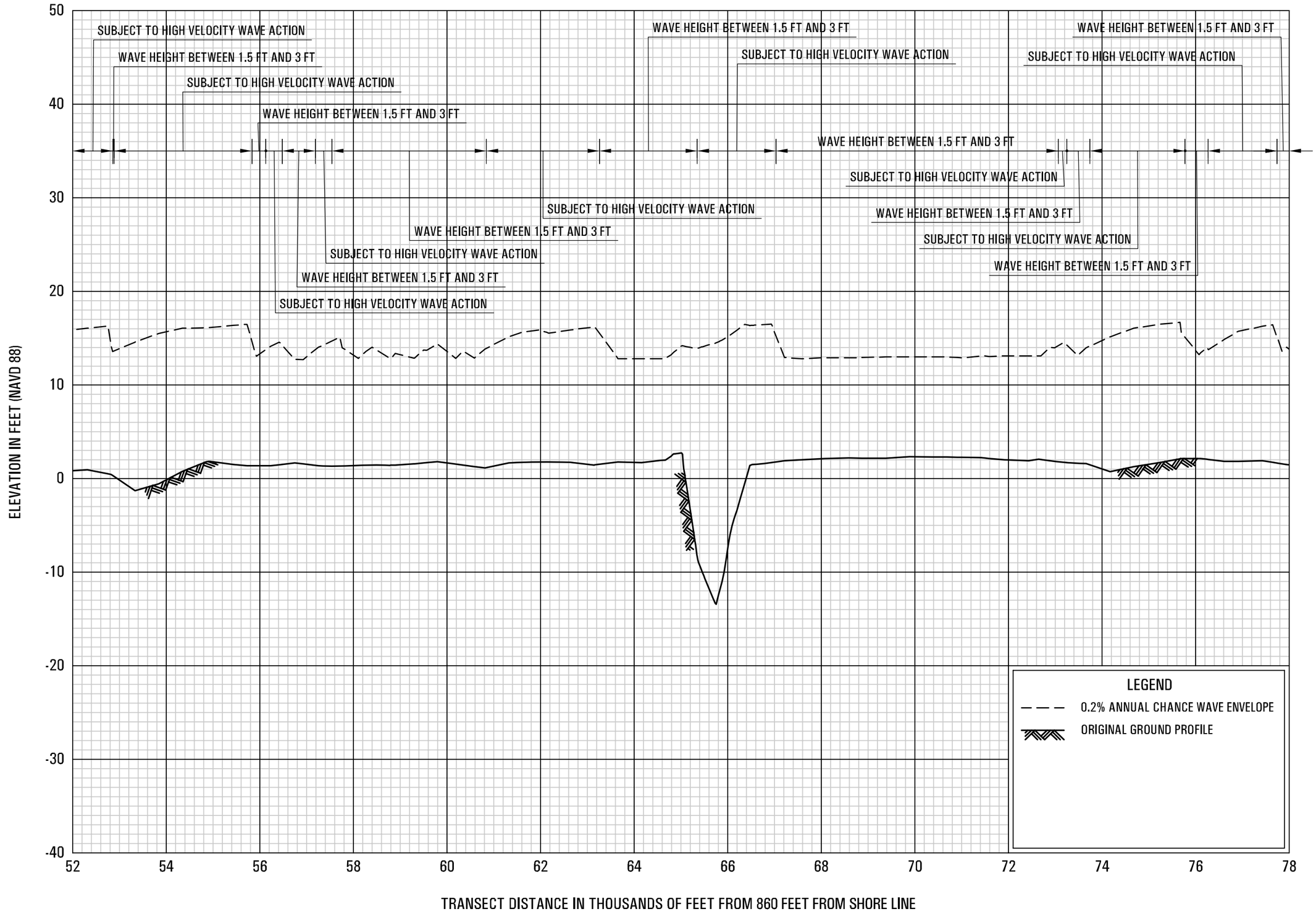
TRANSECT 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

10P



0.2% ANNUAL CHANCE WAVE ENVELOPE

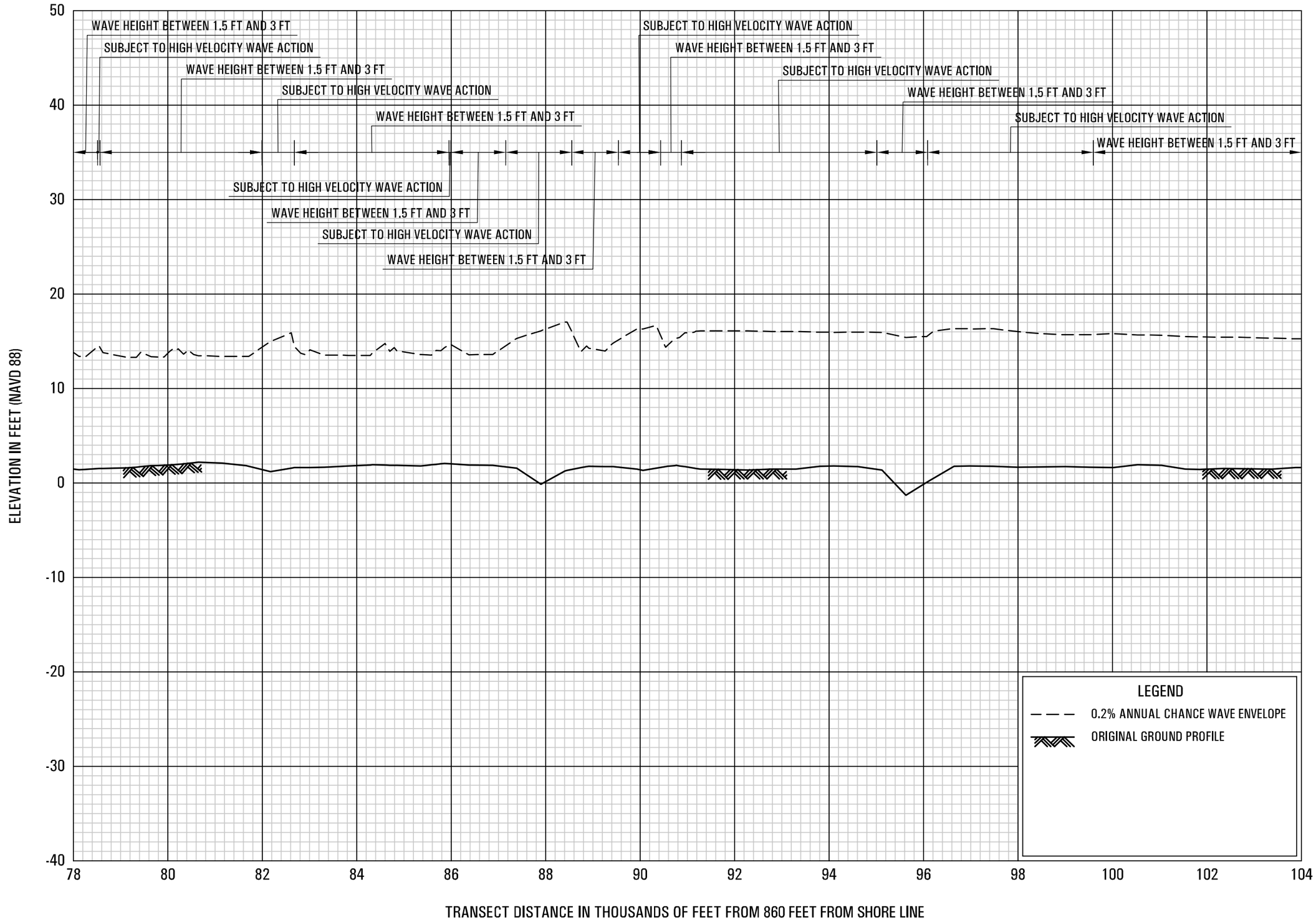
TRANSECT 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

11P



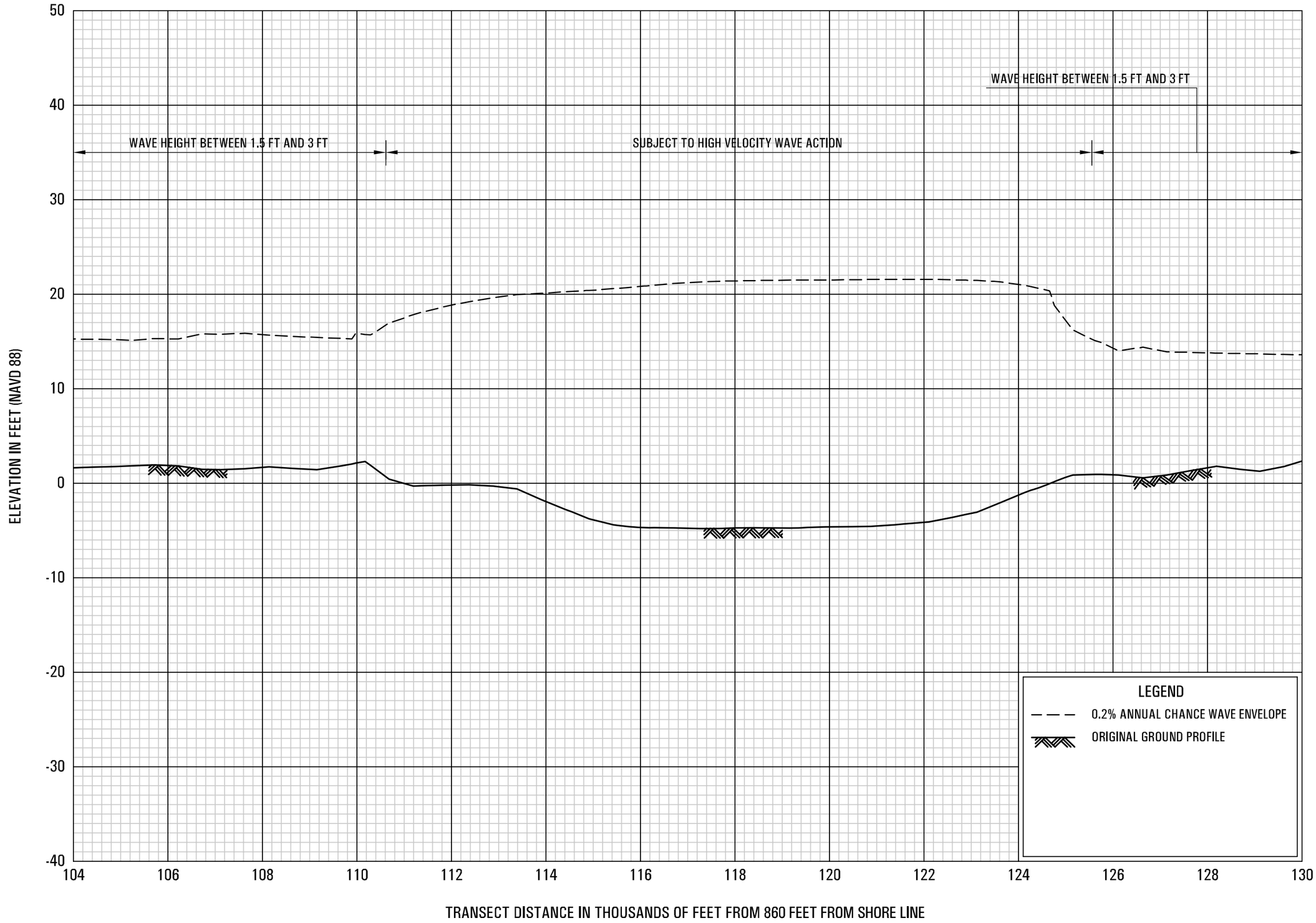
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



0.2% ANNUAL CHANCE WAVE ENVELOPE

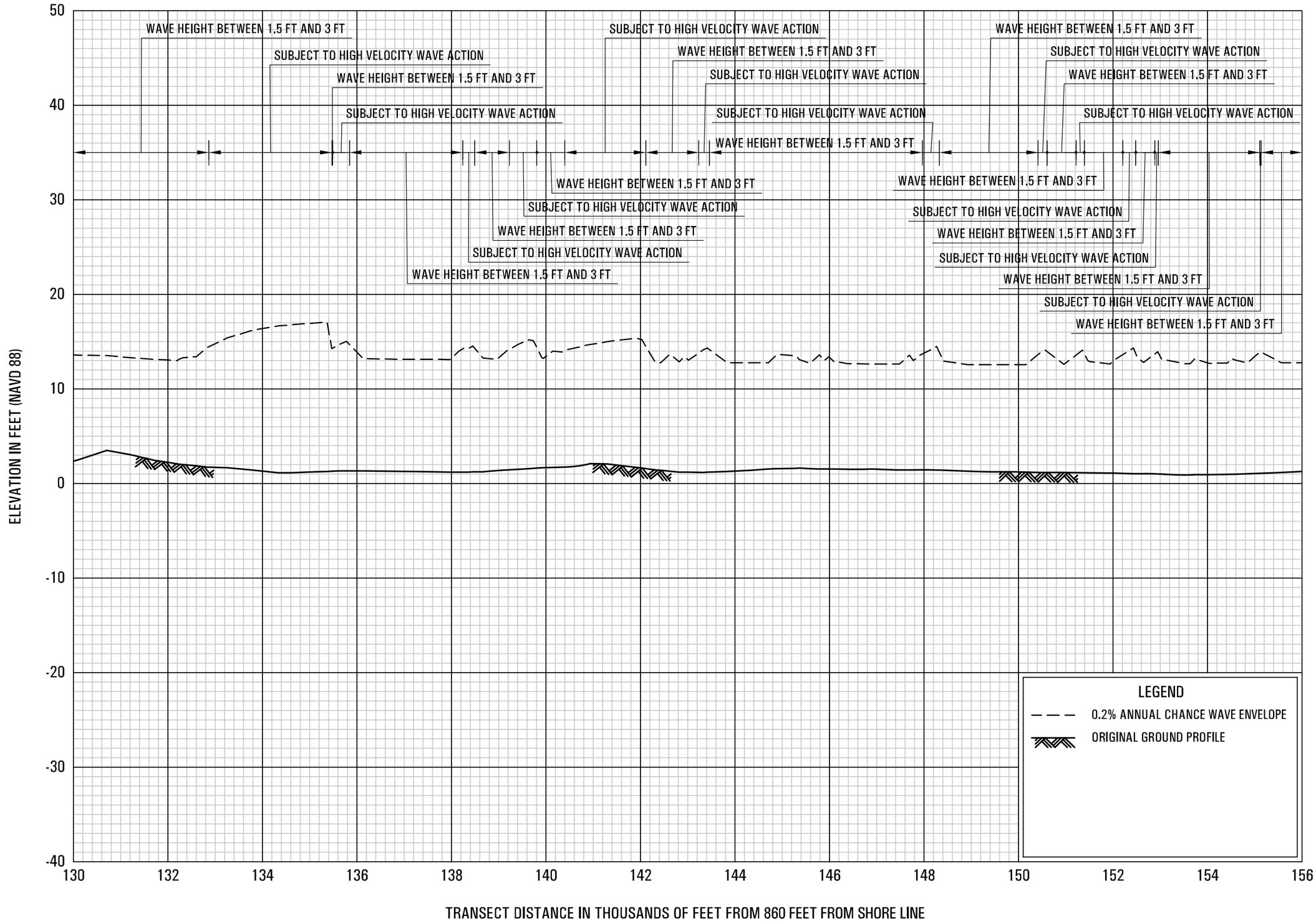
TRANSECT 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

13P



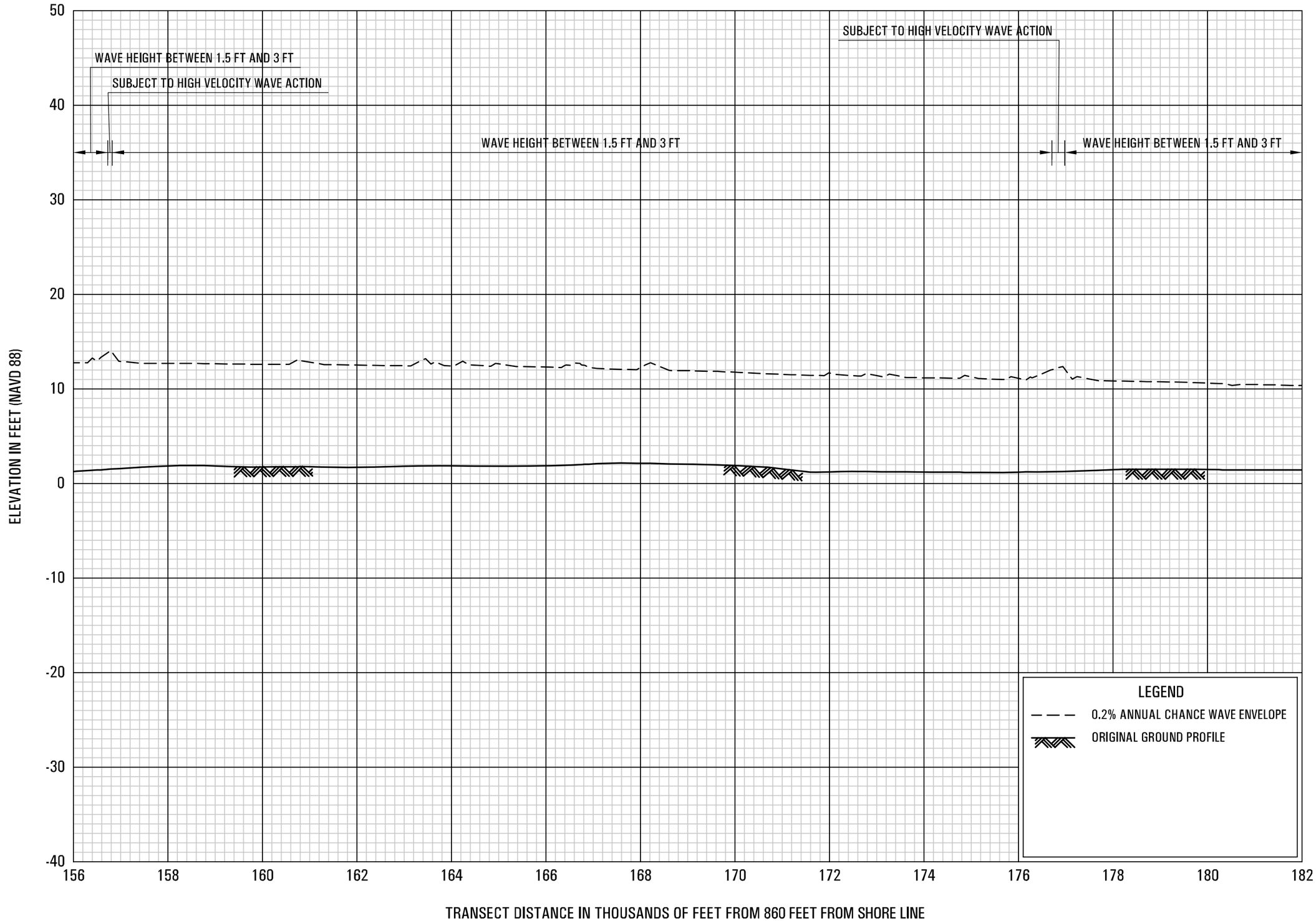
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



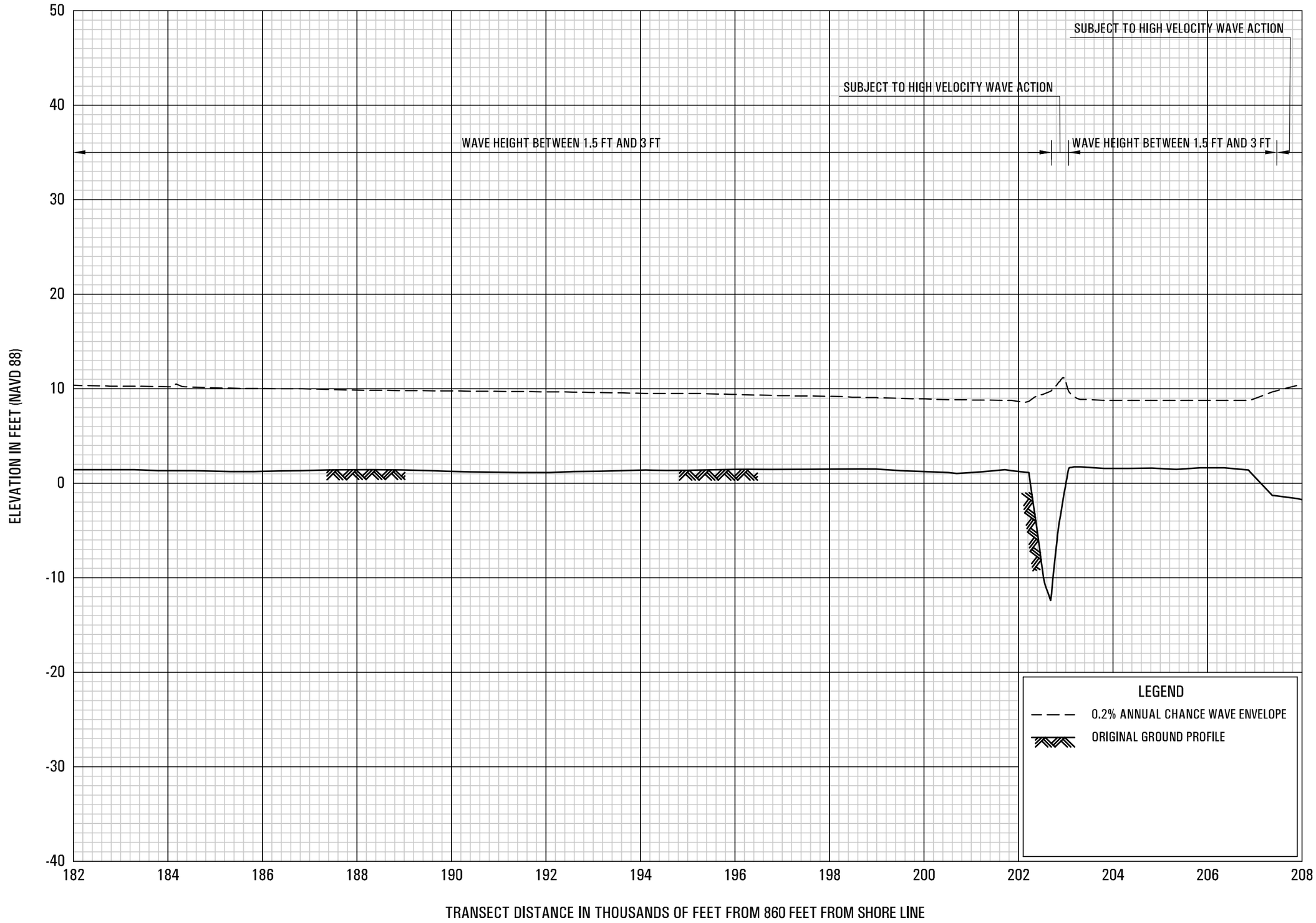
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



0.2% ANNUAL CHANCE WAVE ENVELOPE

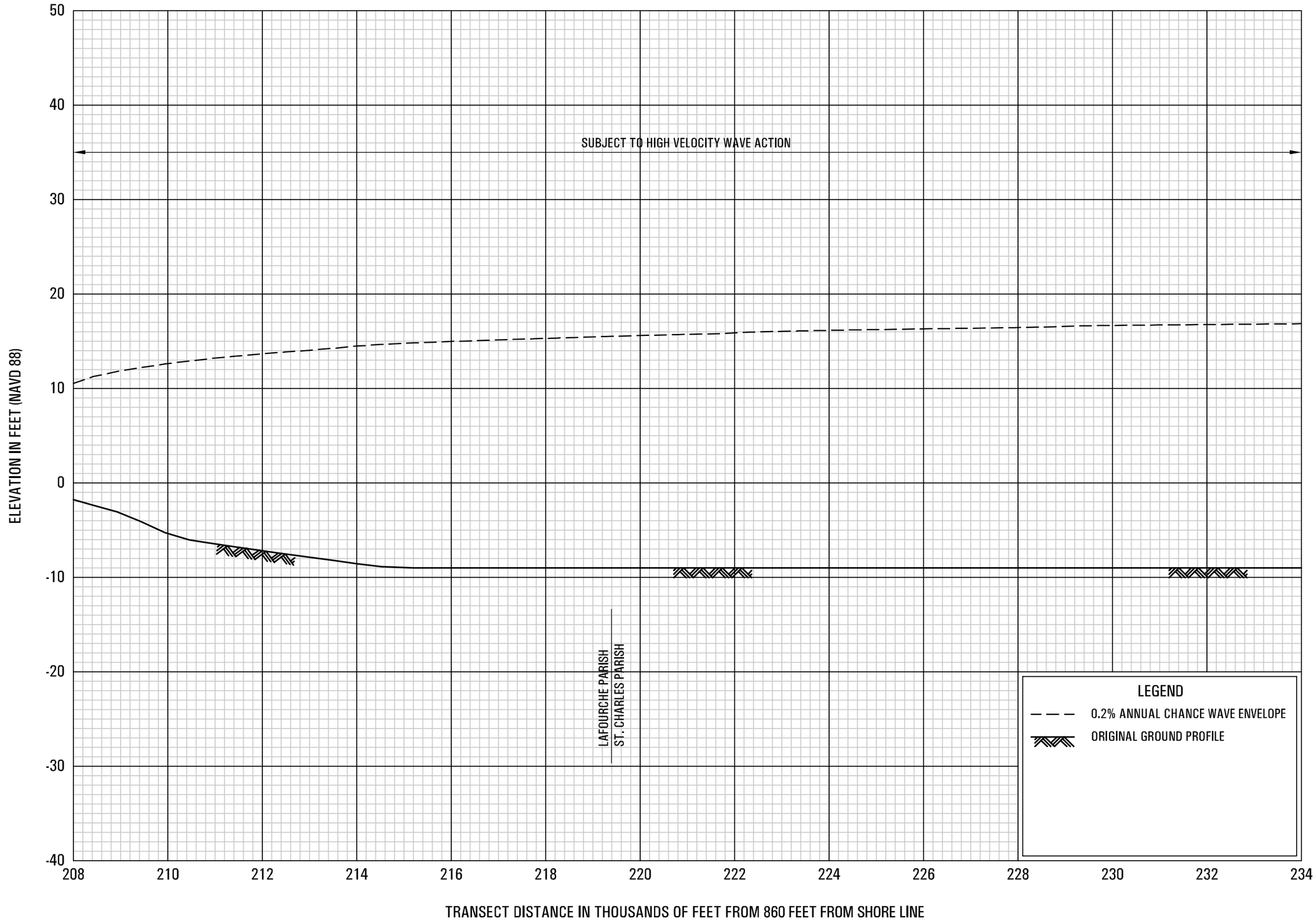
TRANSECT 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

16P



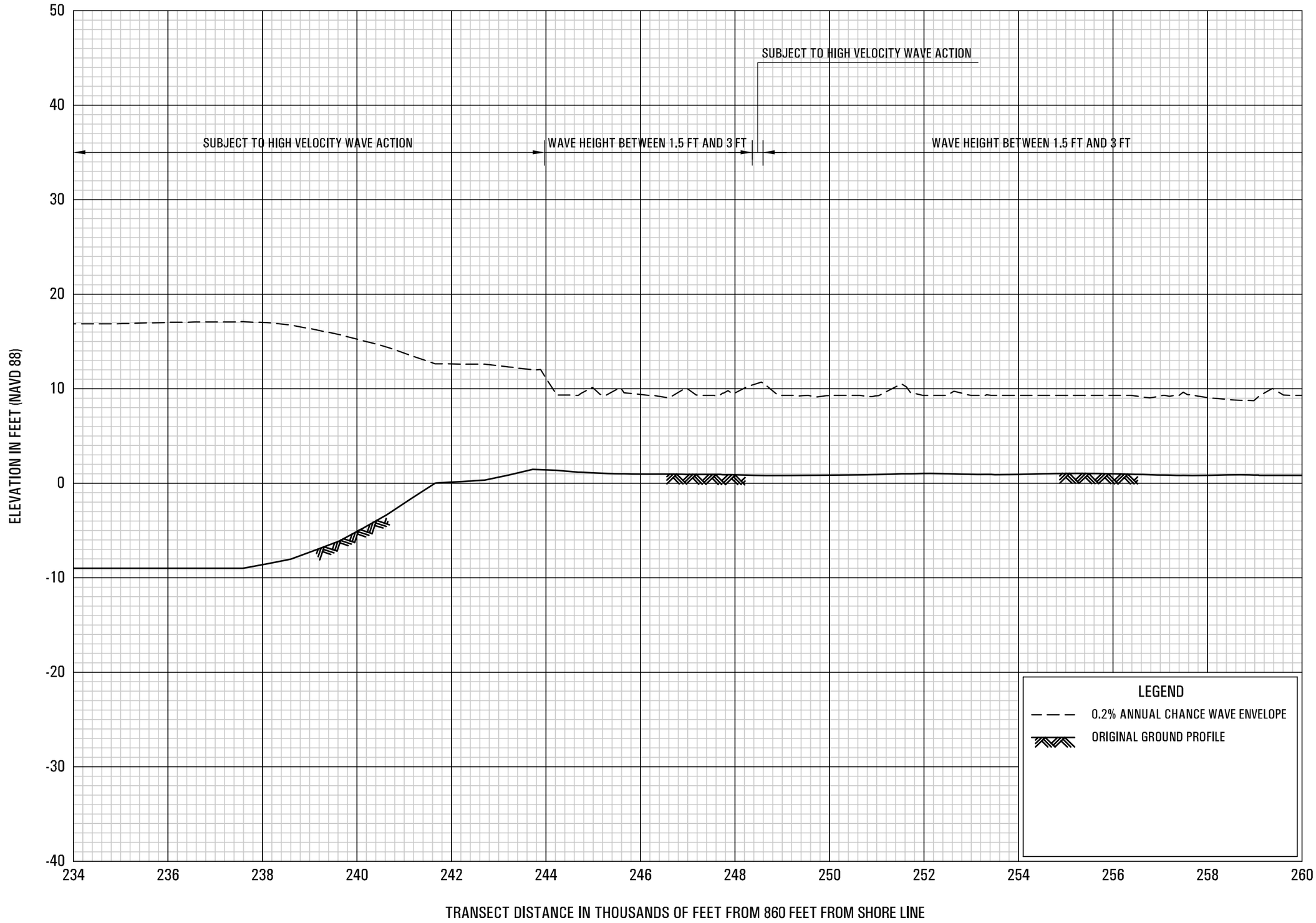
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



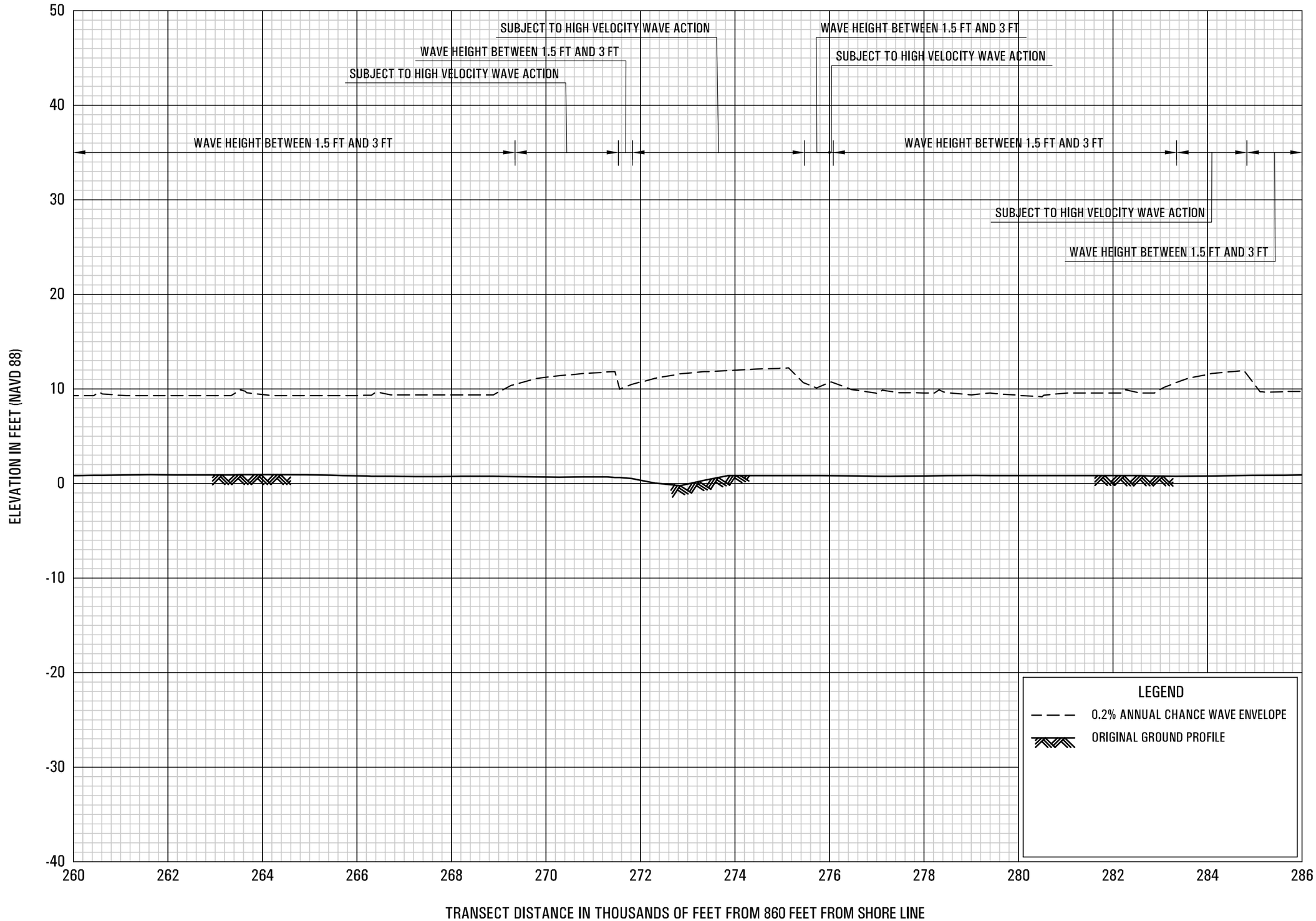
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



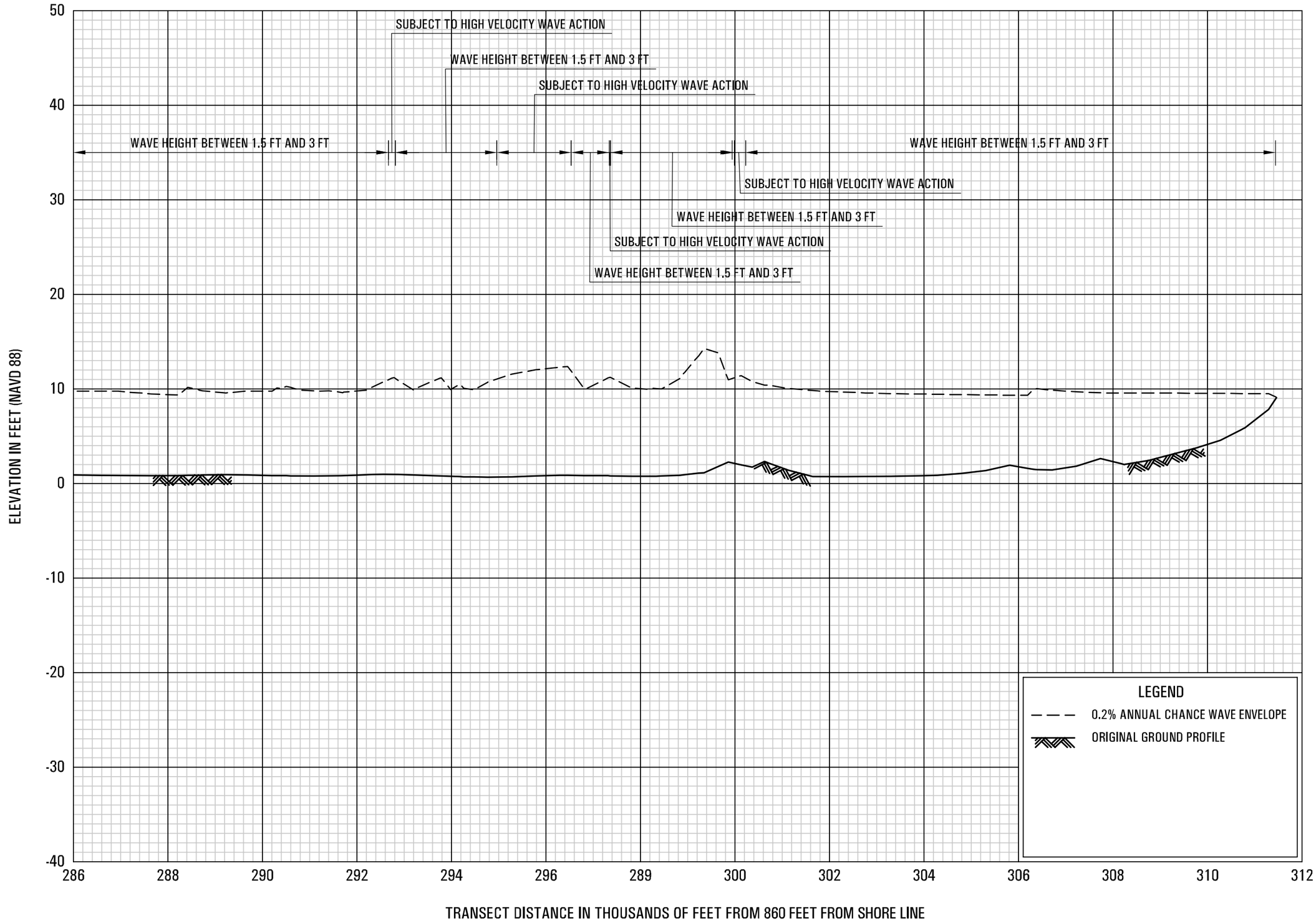
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



0.2% ANNUAL CHANCE WAVE ENVELOPE

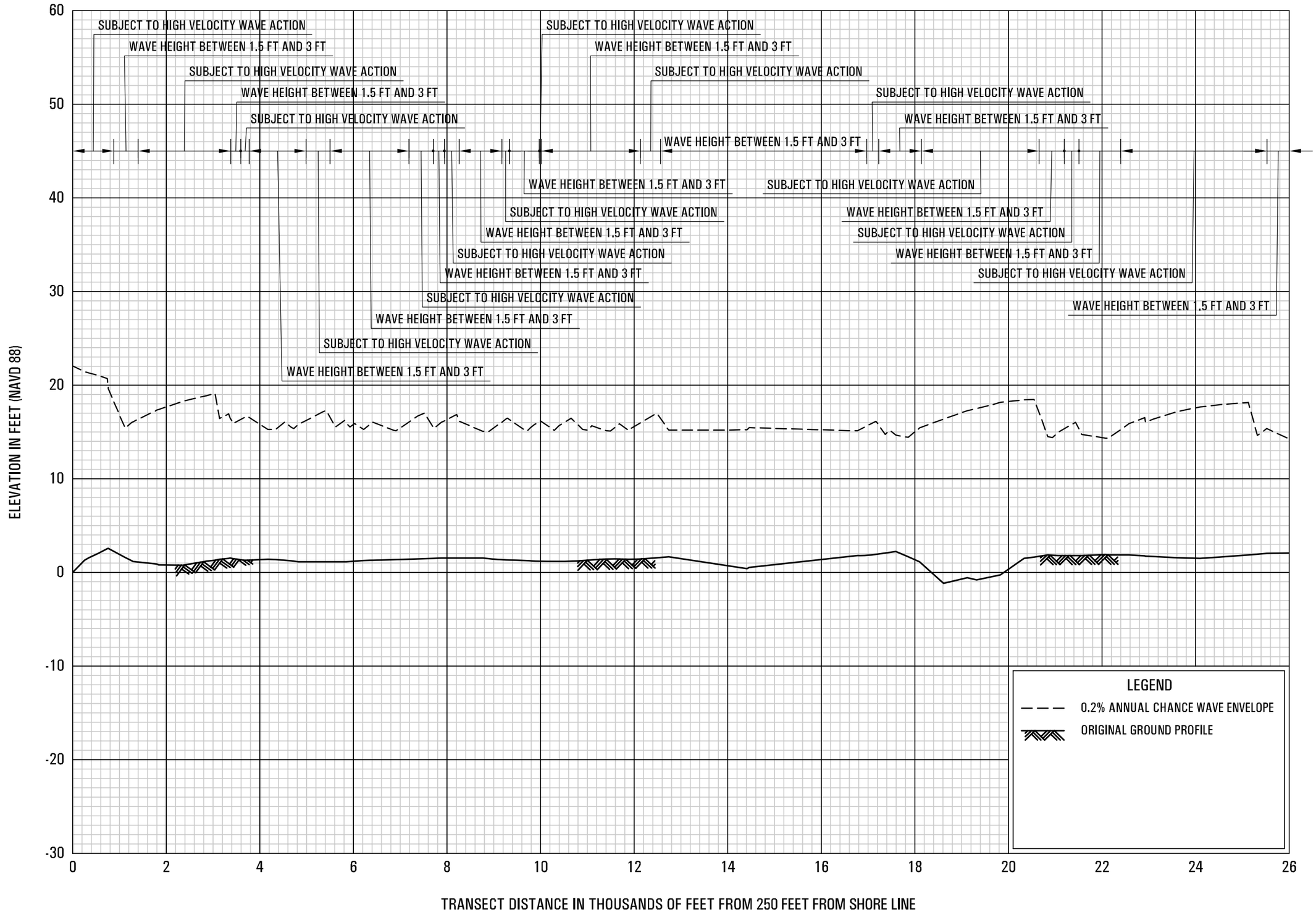
TRANSECT 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

20P



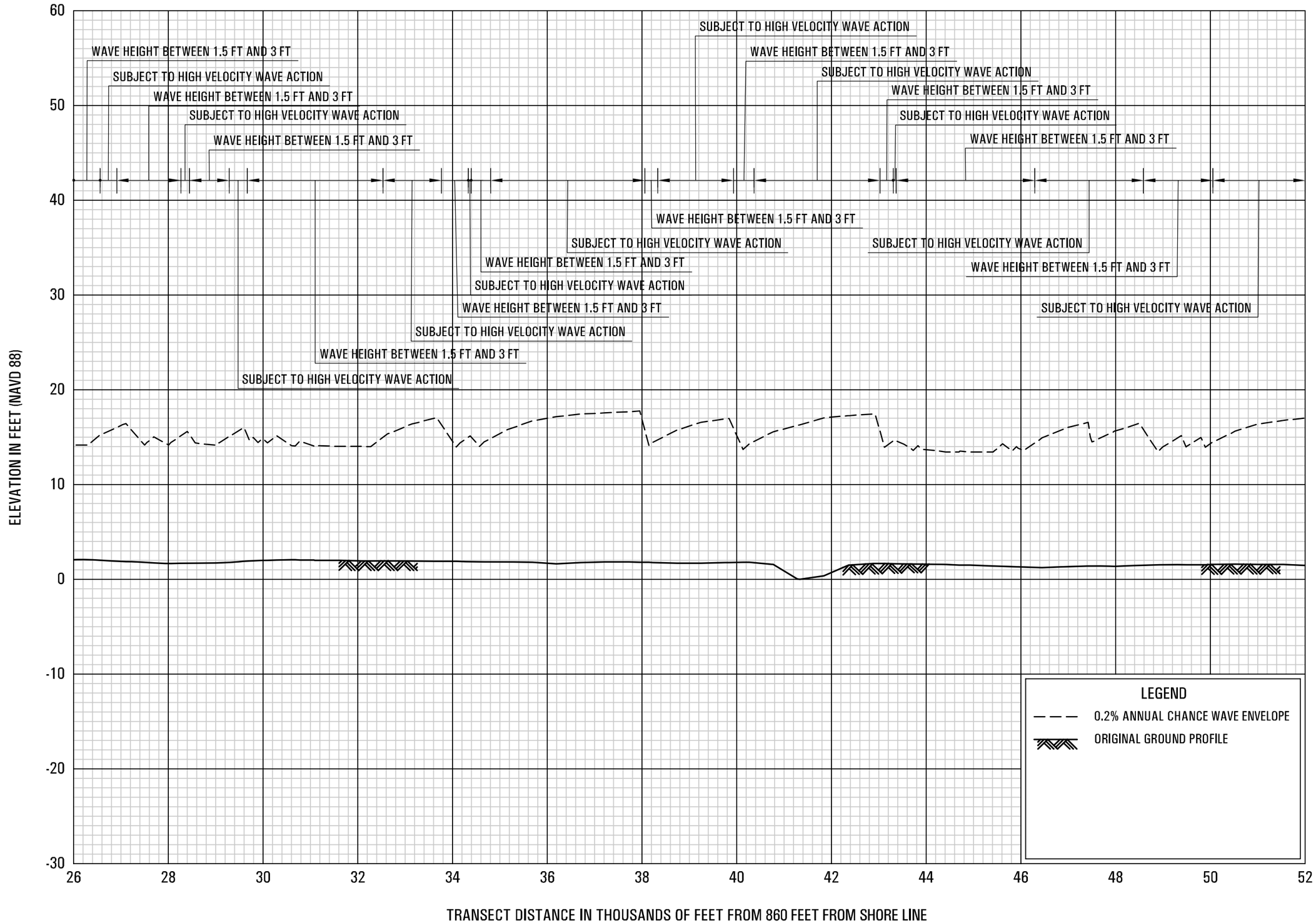
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



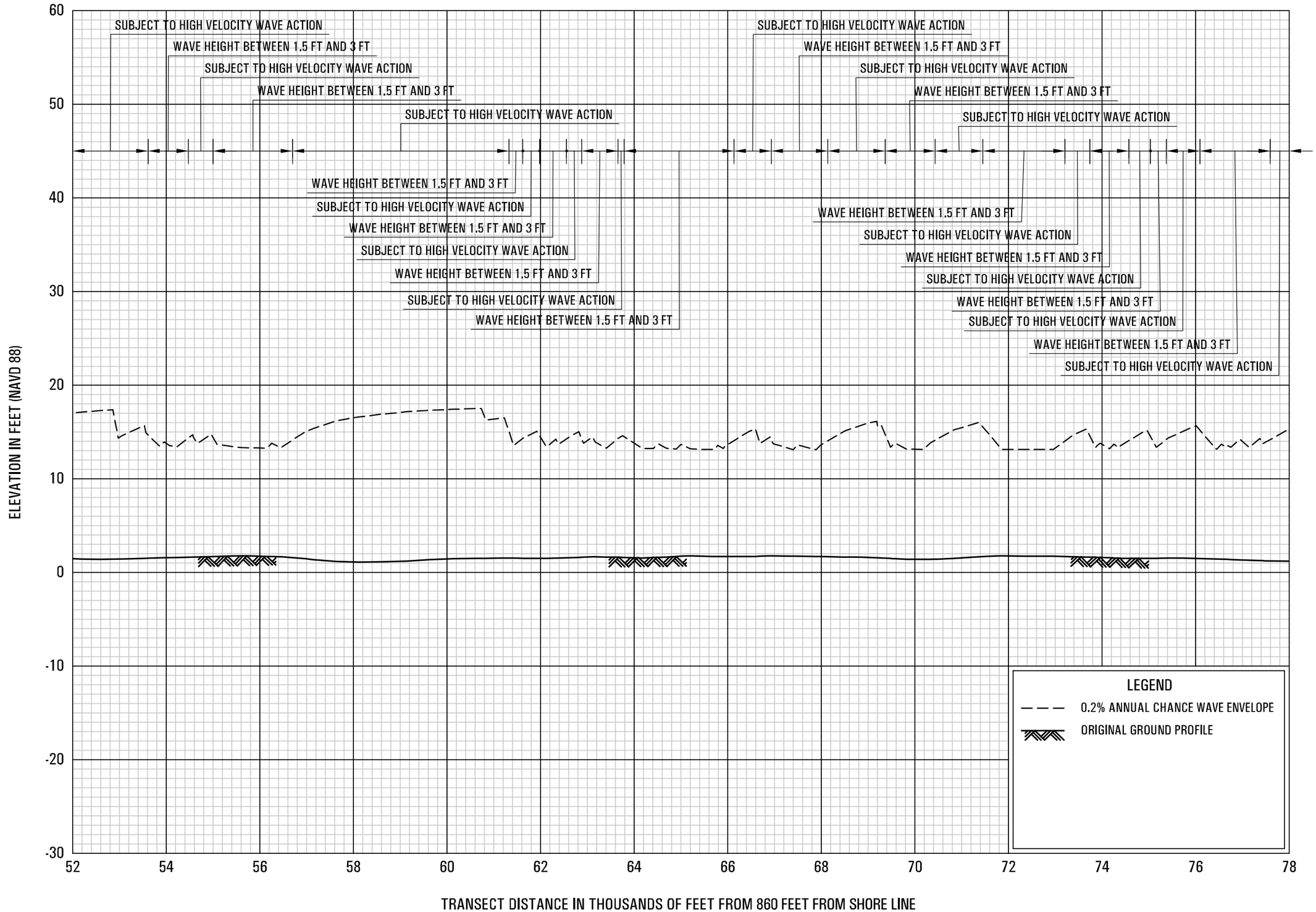
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



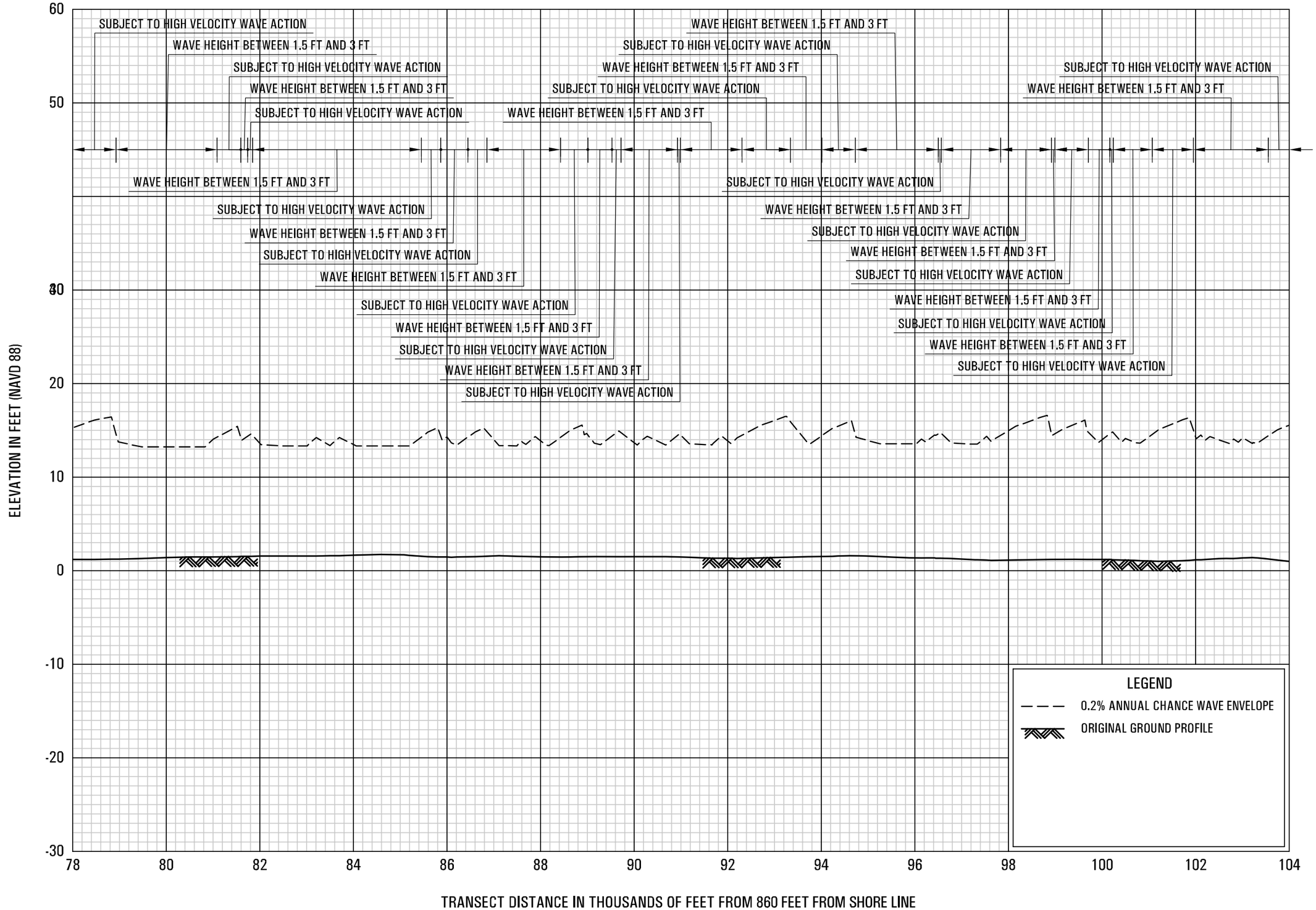
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



0.2% ANNUAL CHANCE WAVE ENVELOPE

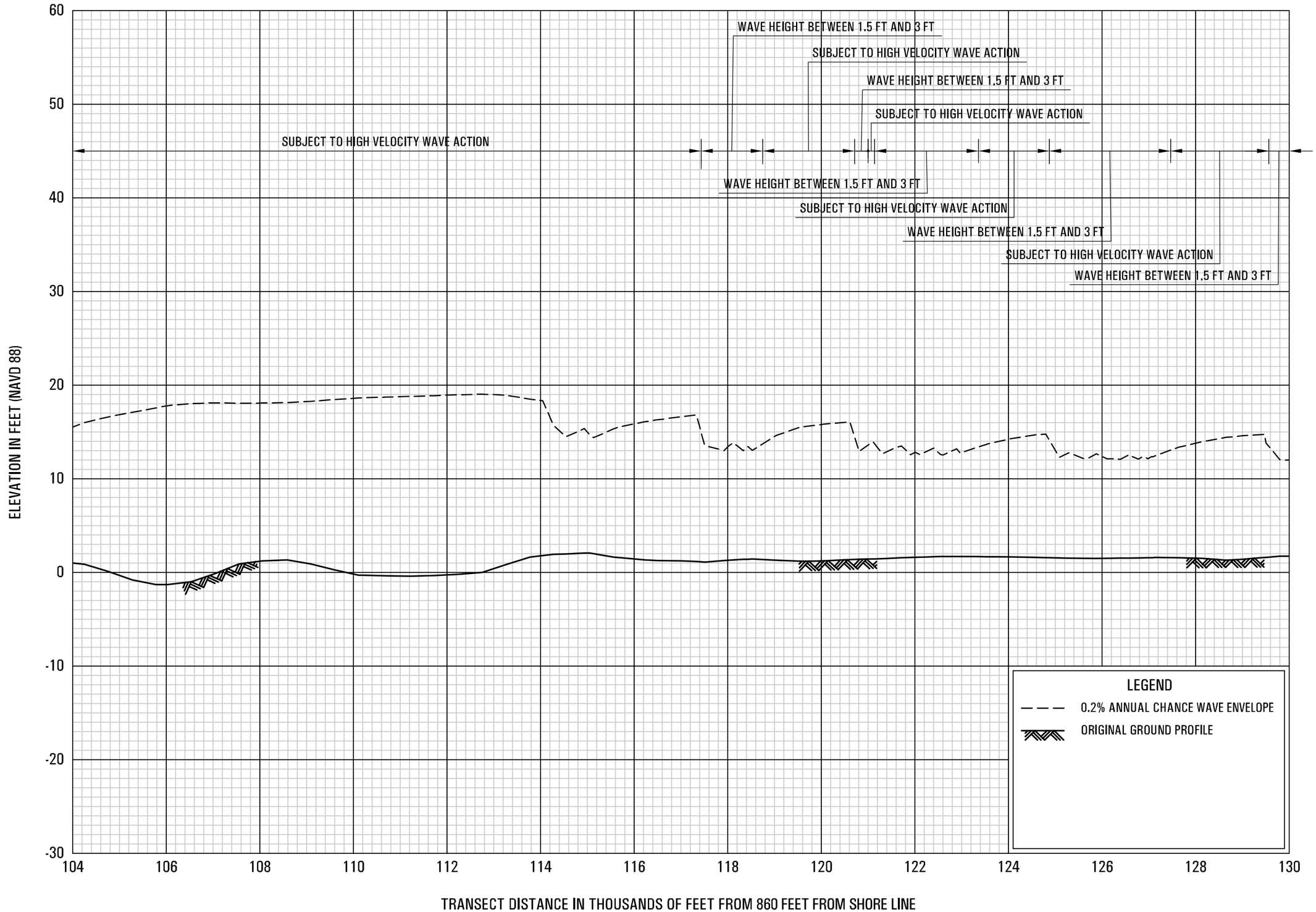
TRANSECT 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

24P



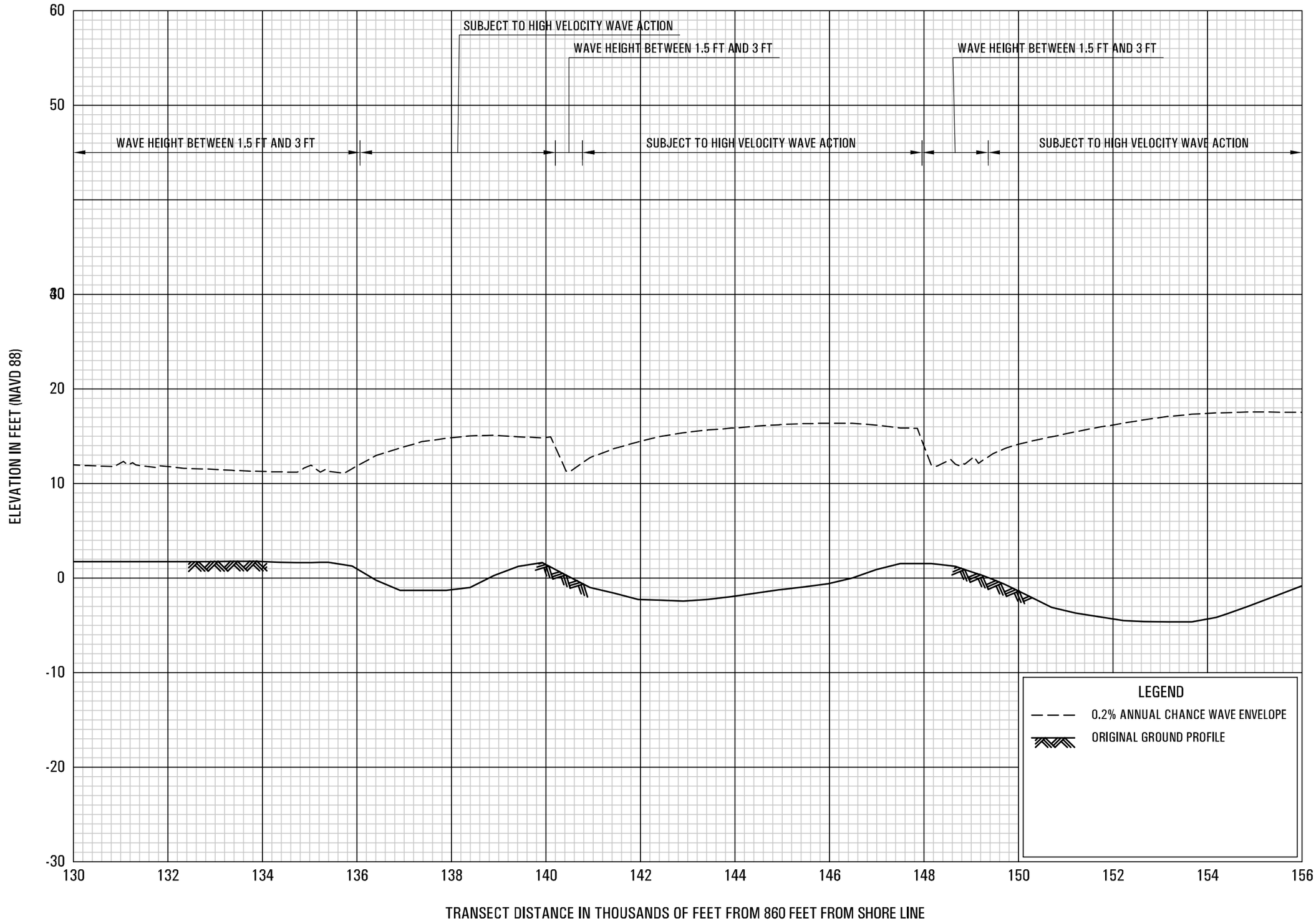
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



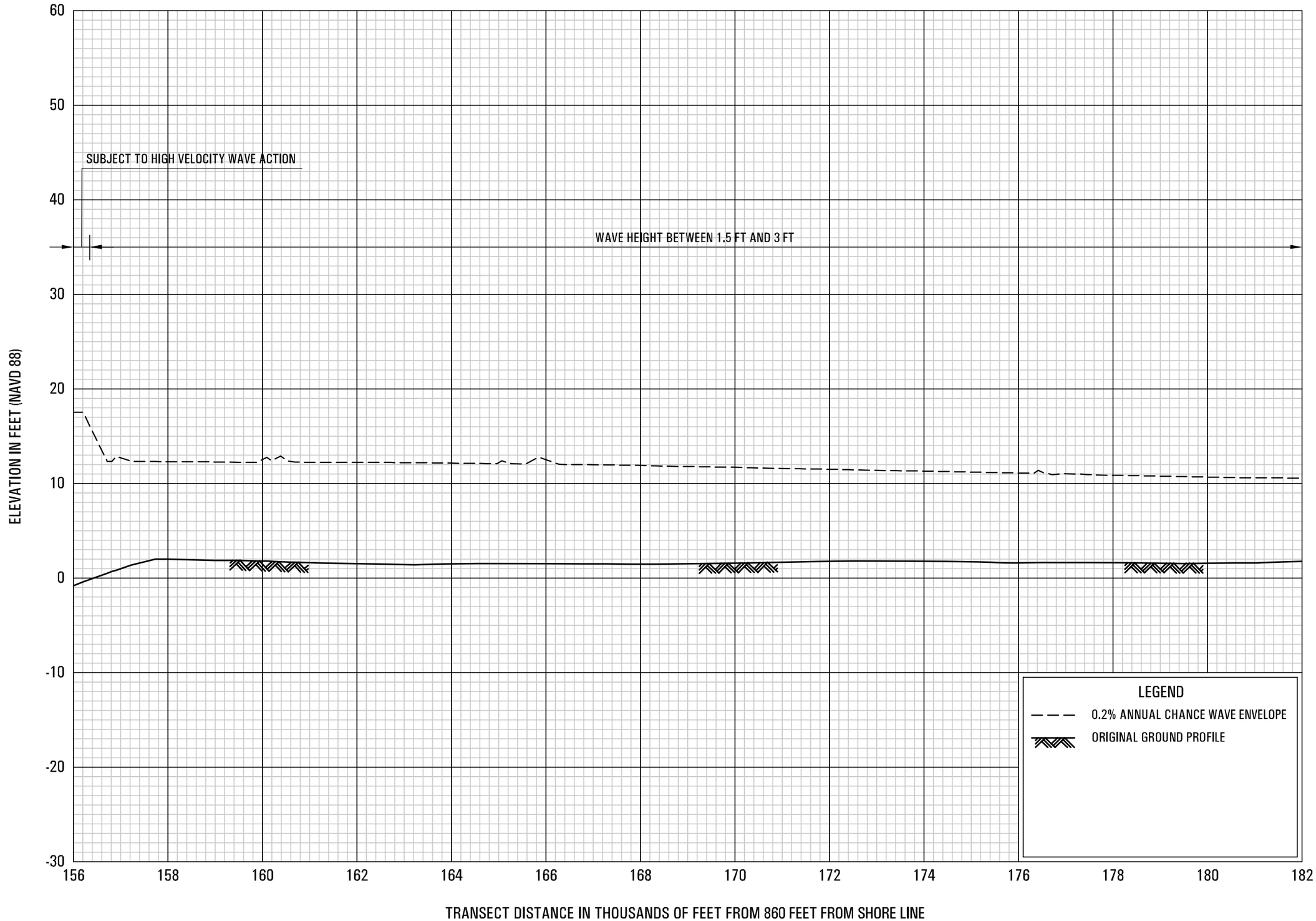
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



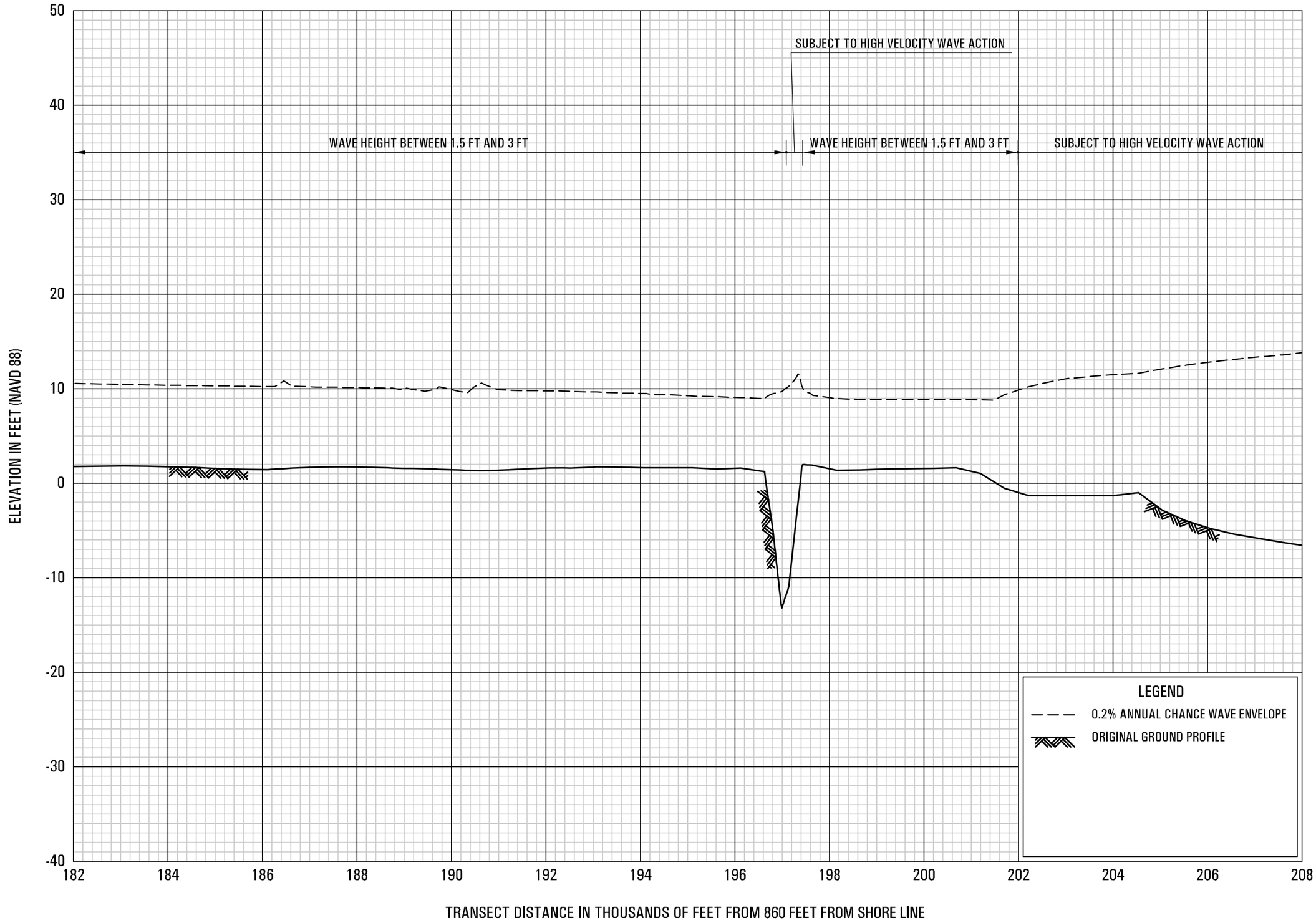
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



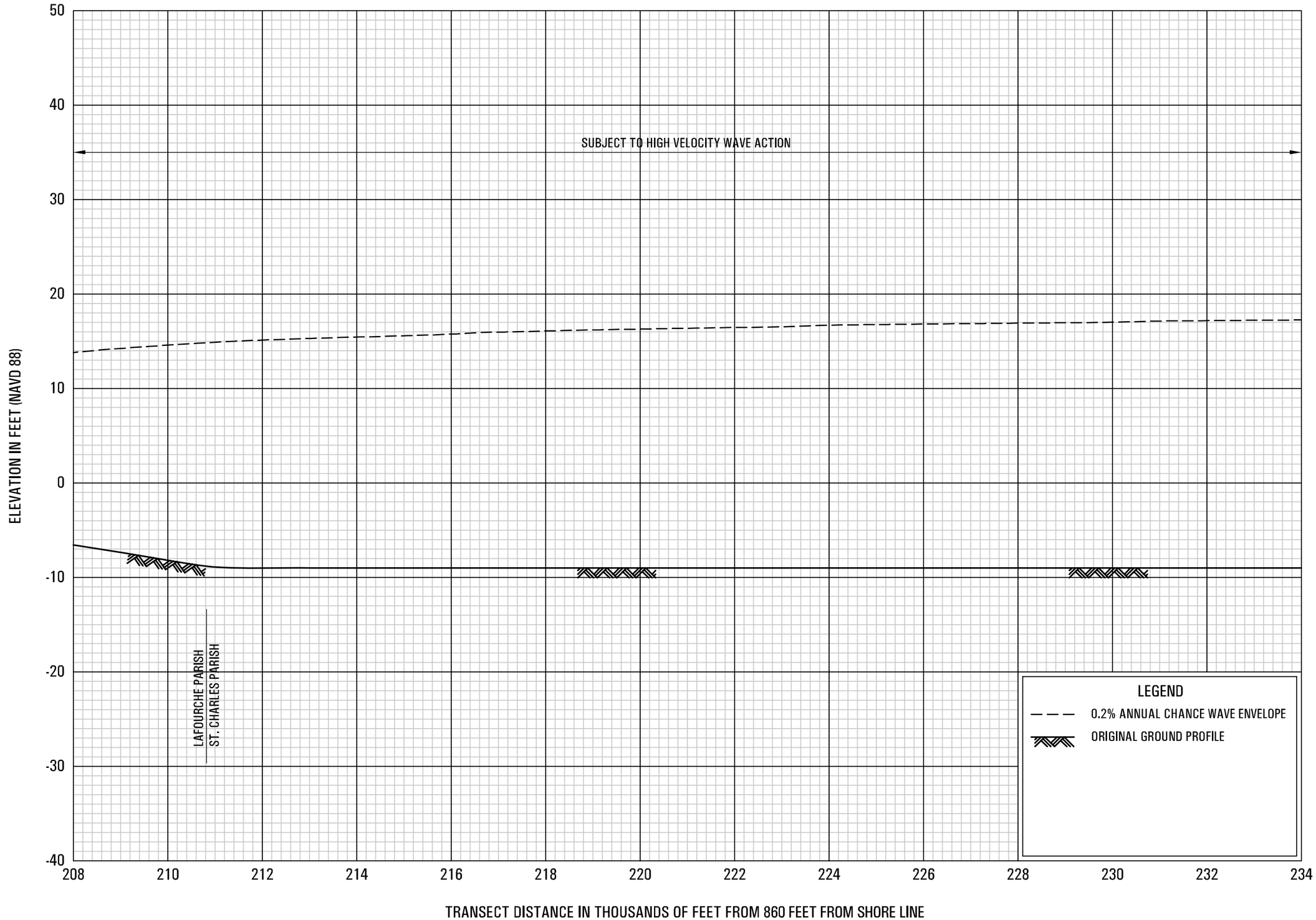
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



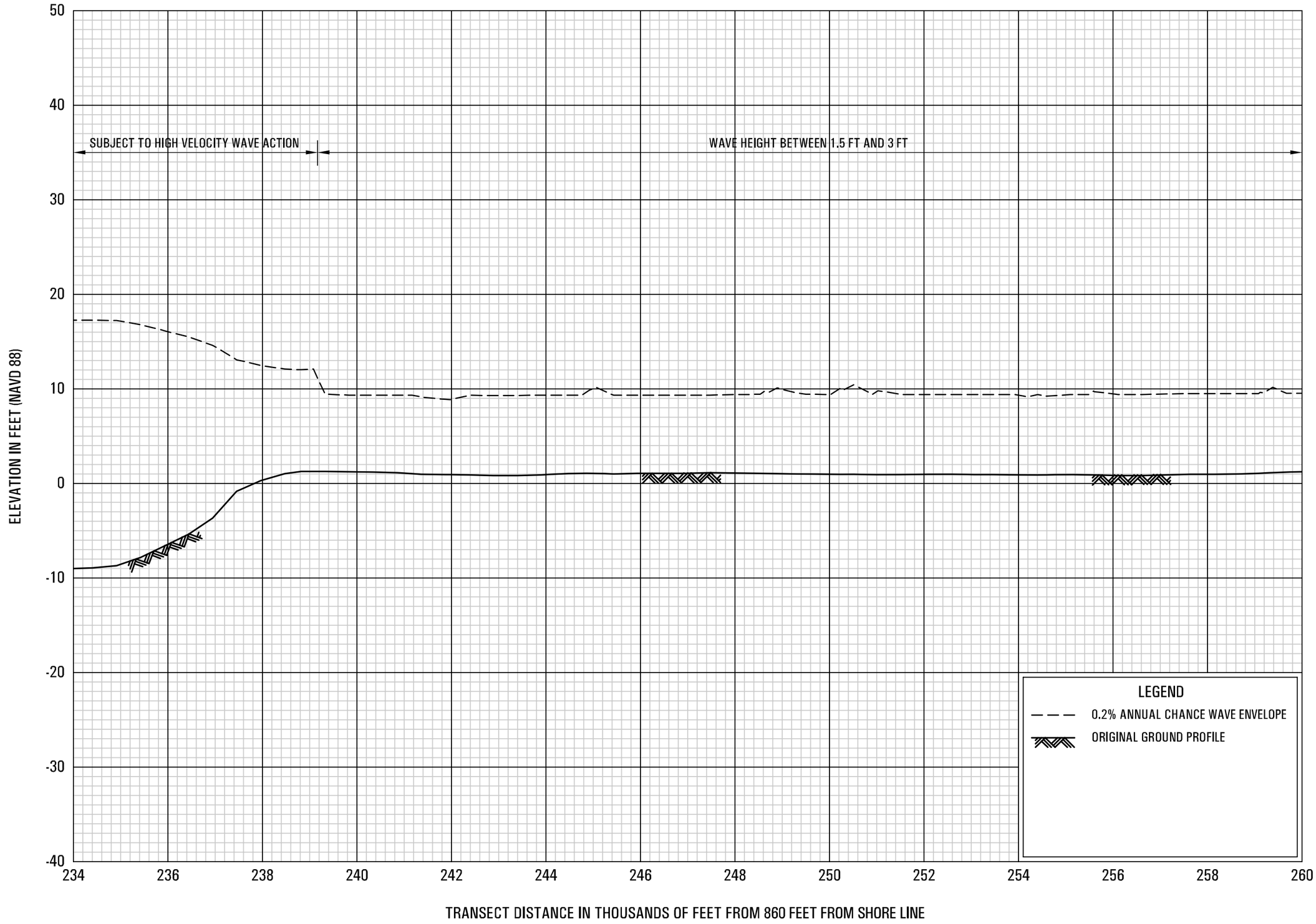
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



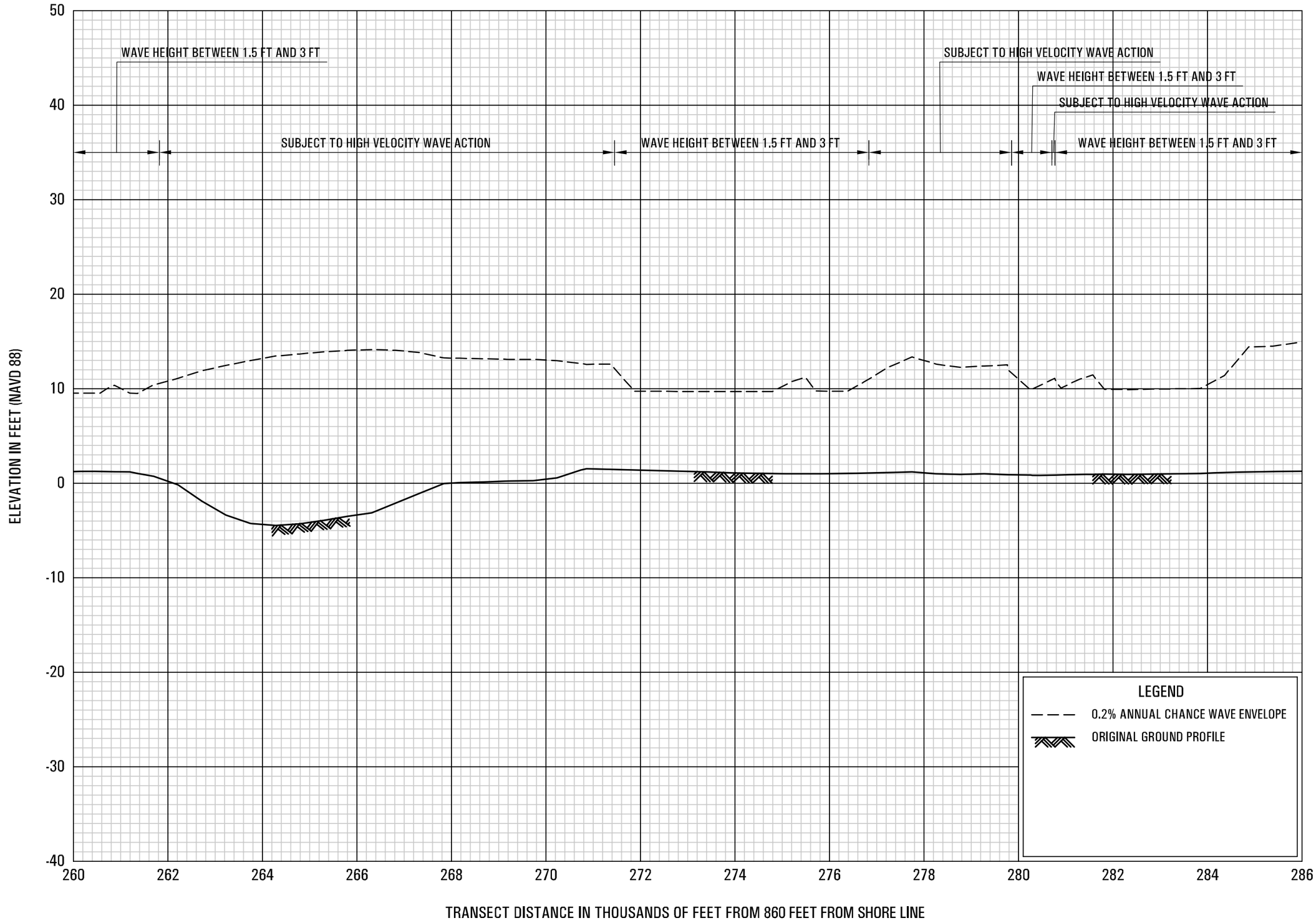
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



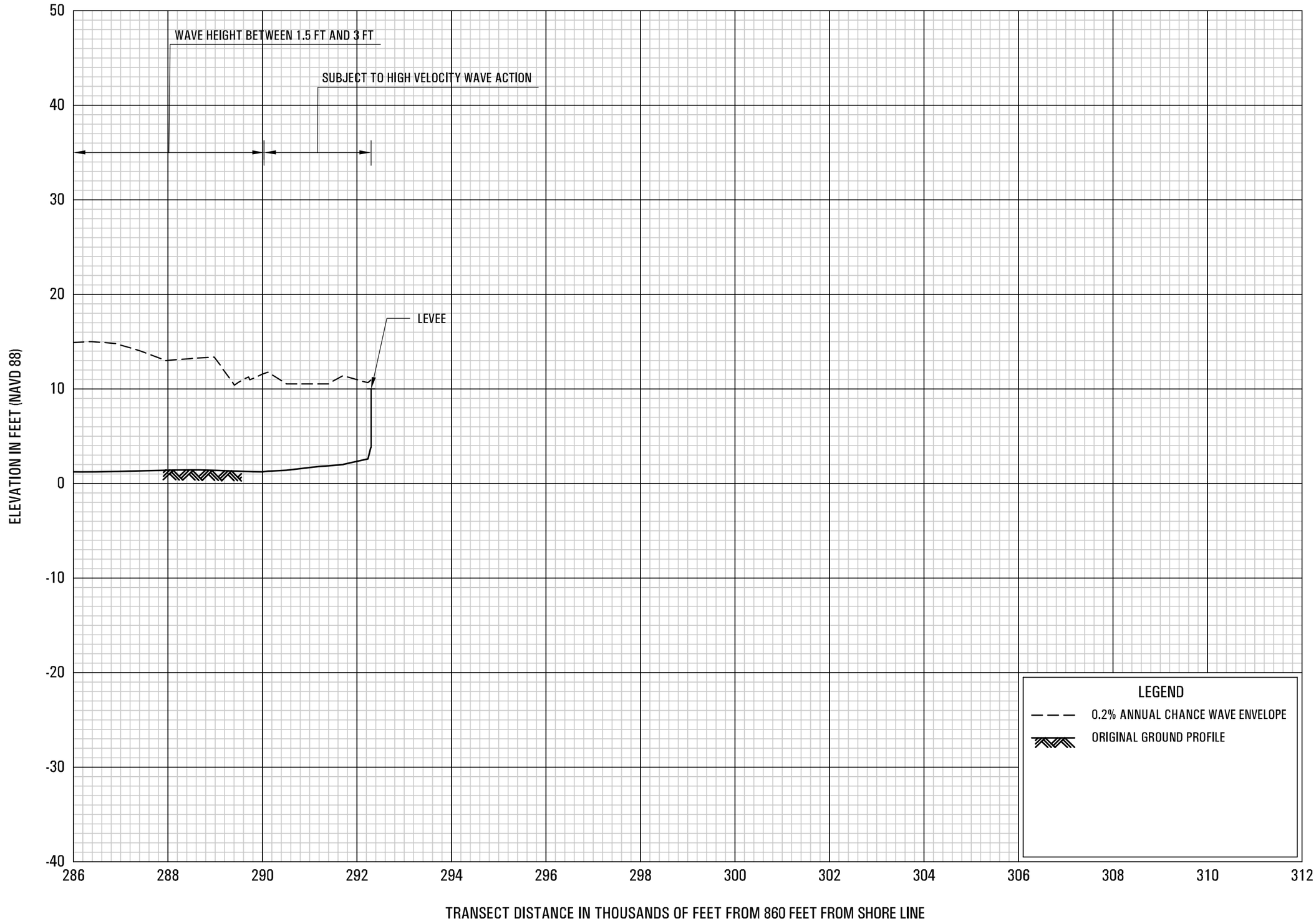
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



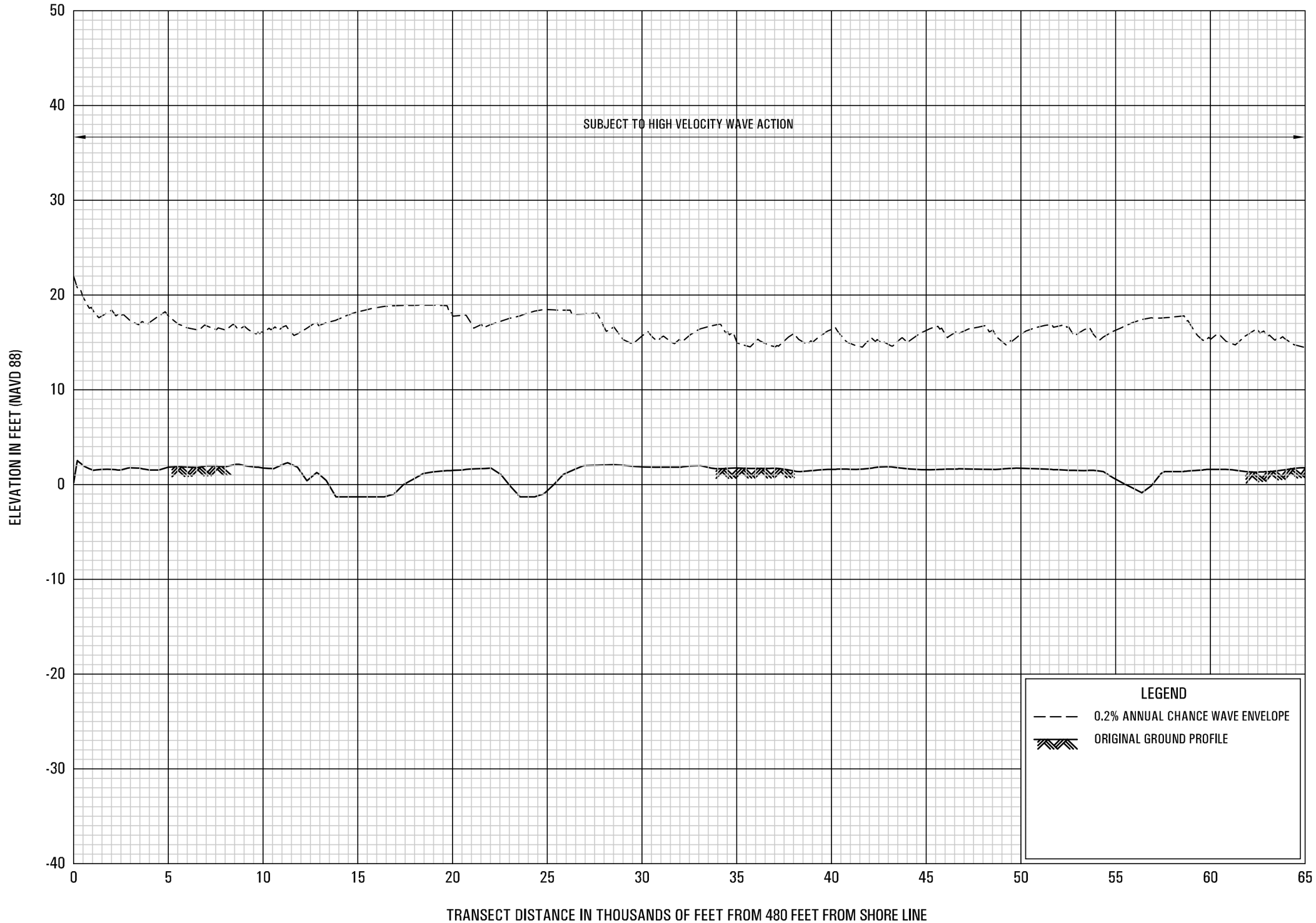
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



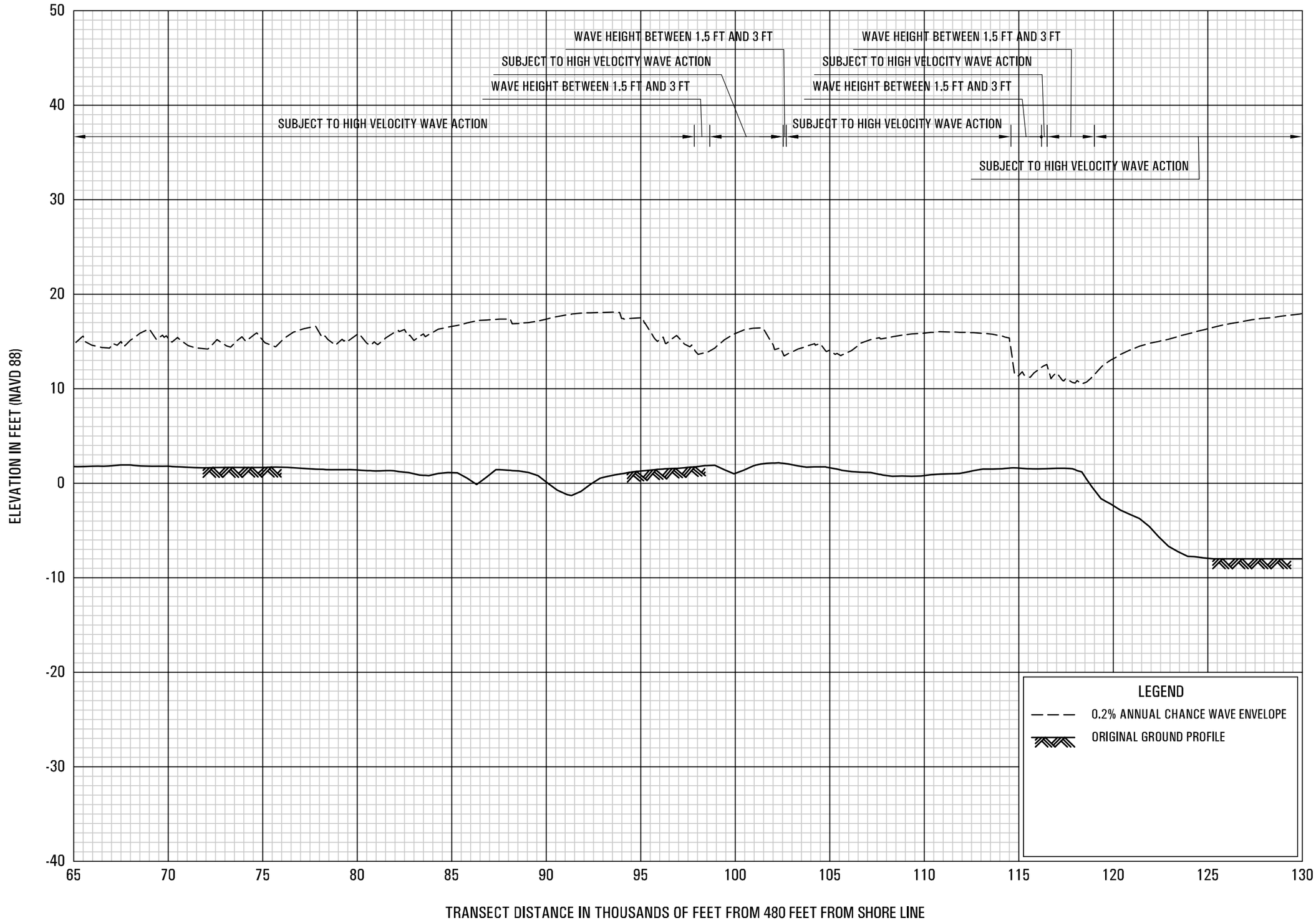
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



0.2% ANNUAL CHANCE WAVE ENVELOPE

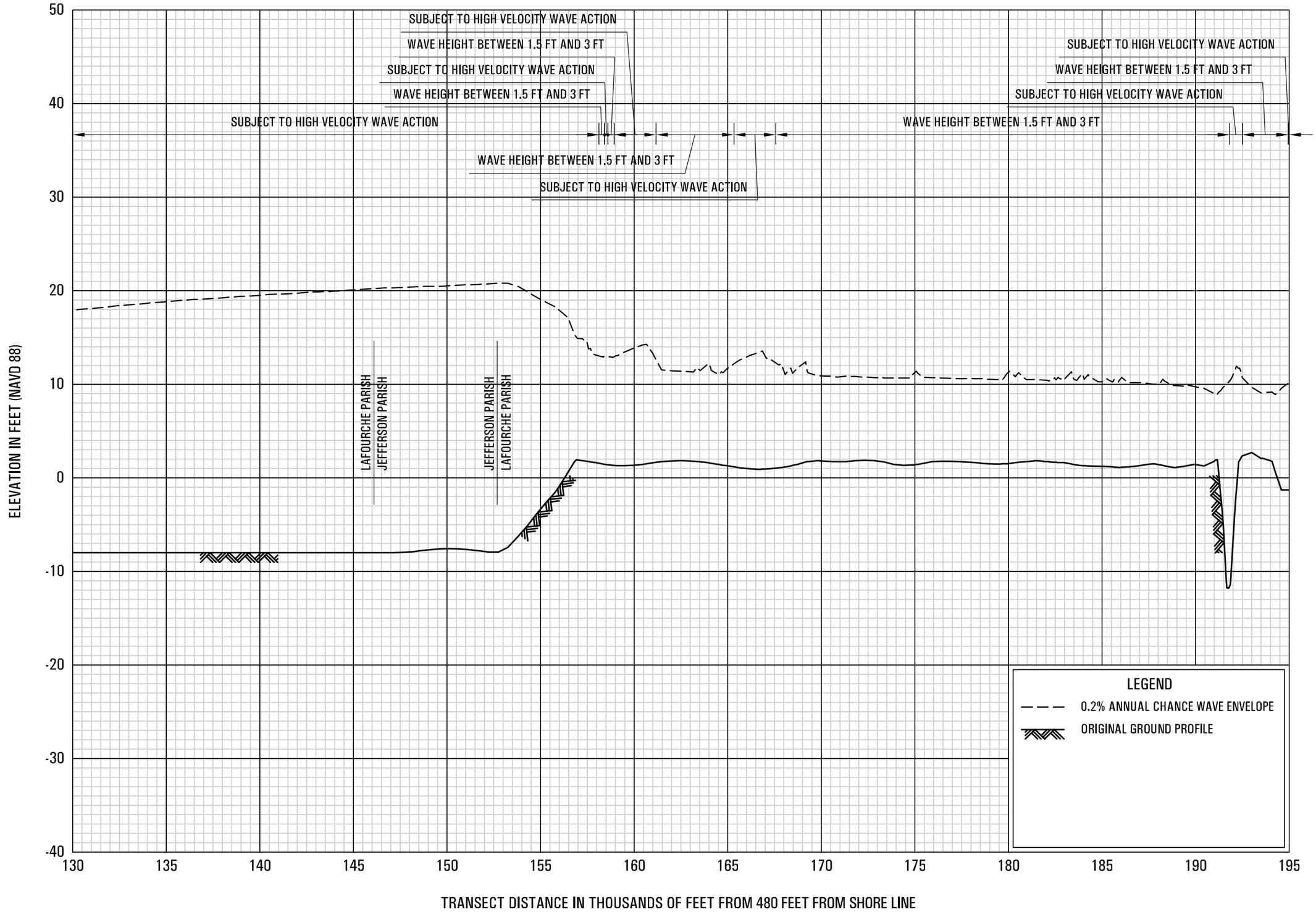
TRANSECT 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

34P



0.2% ANNUAL CHANCE WAVE ENVELOPE

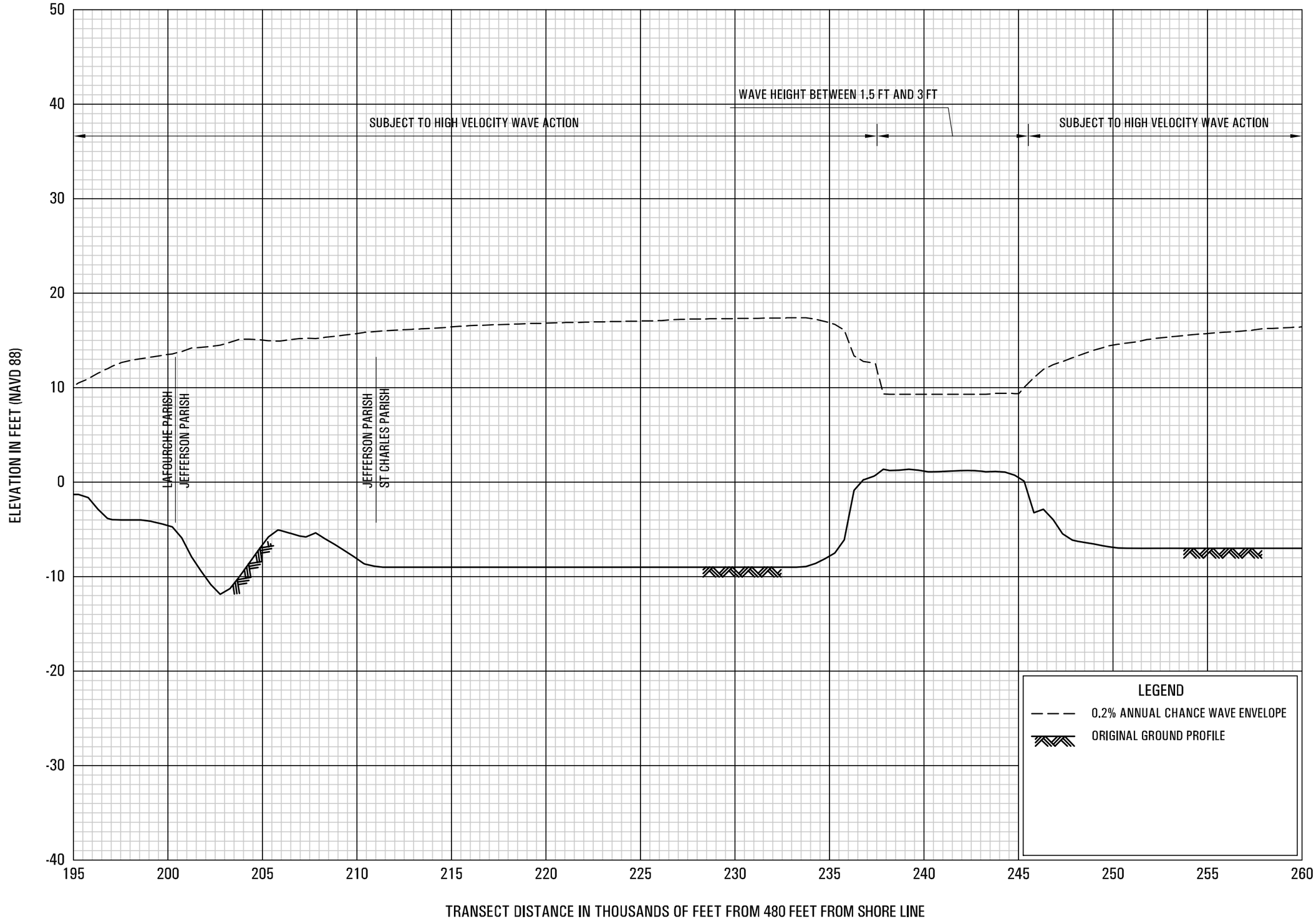
TRANSECT 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

35P



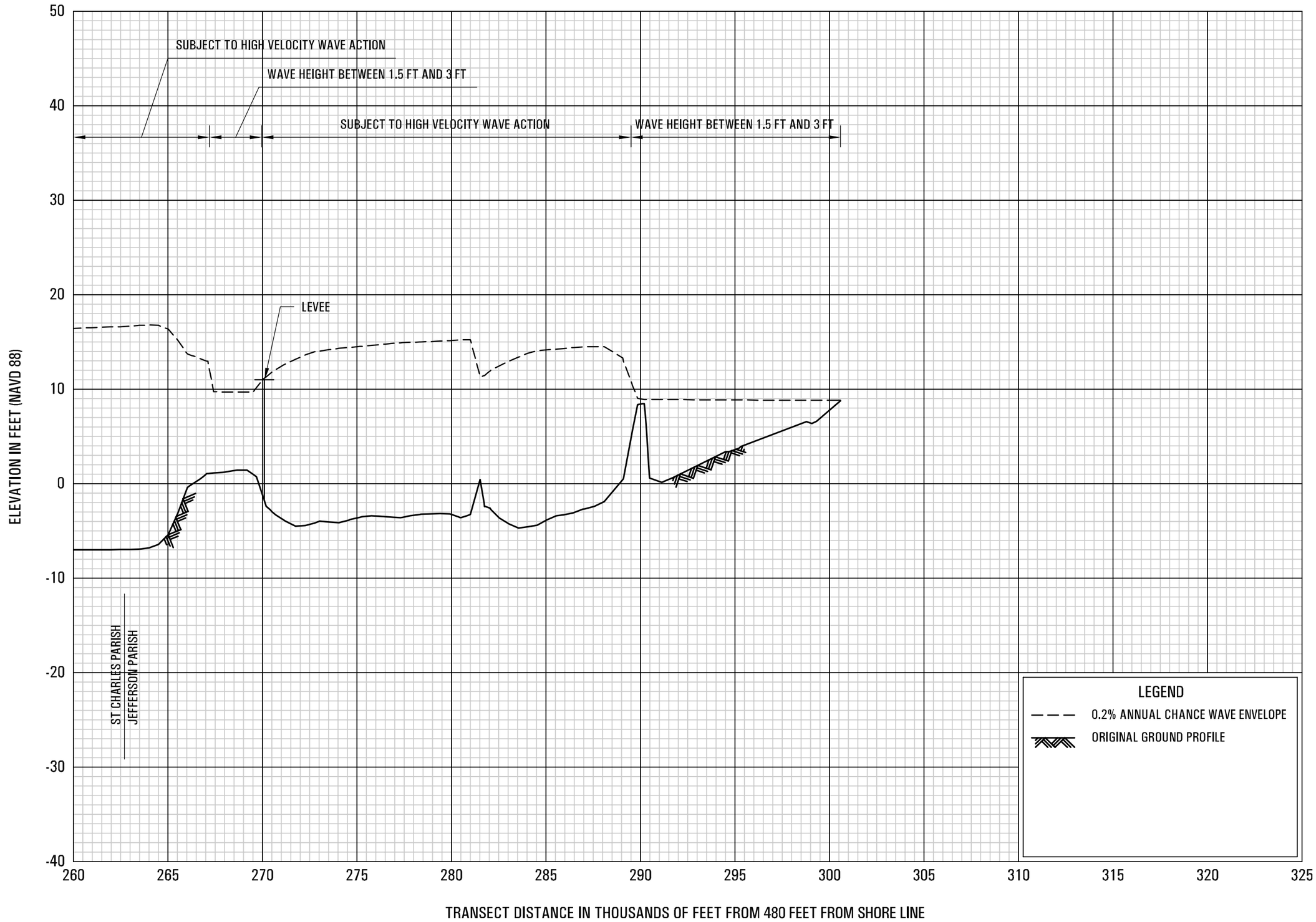
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



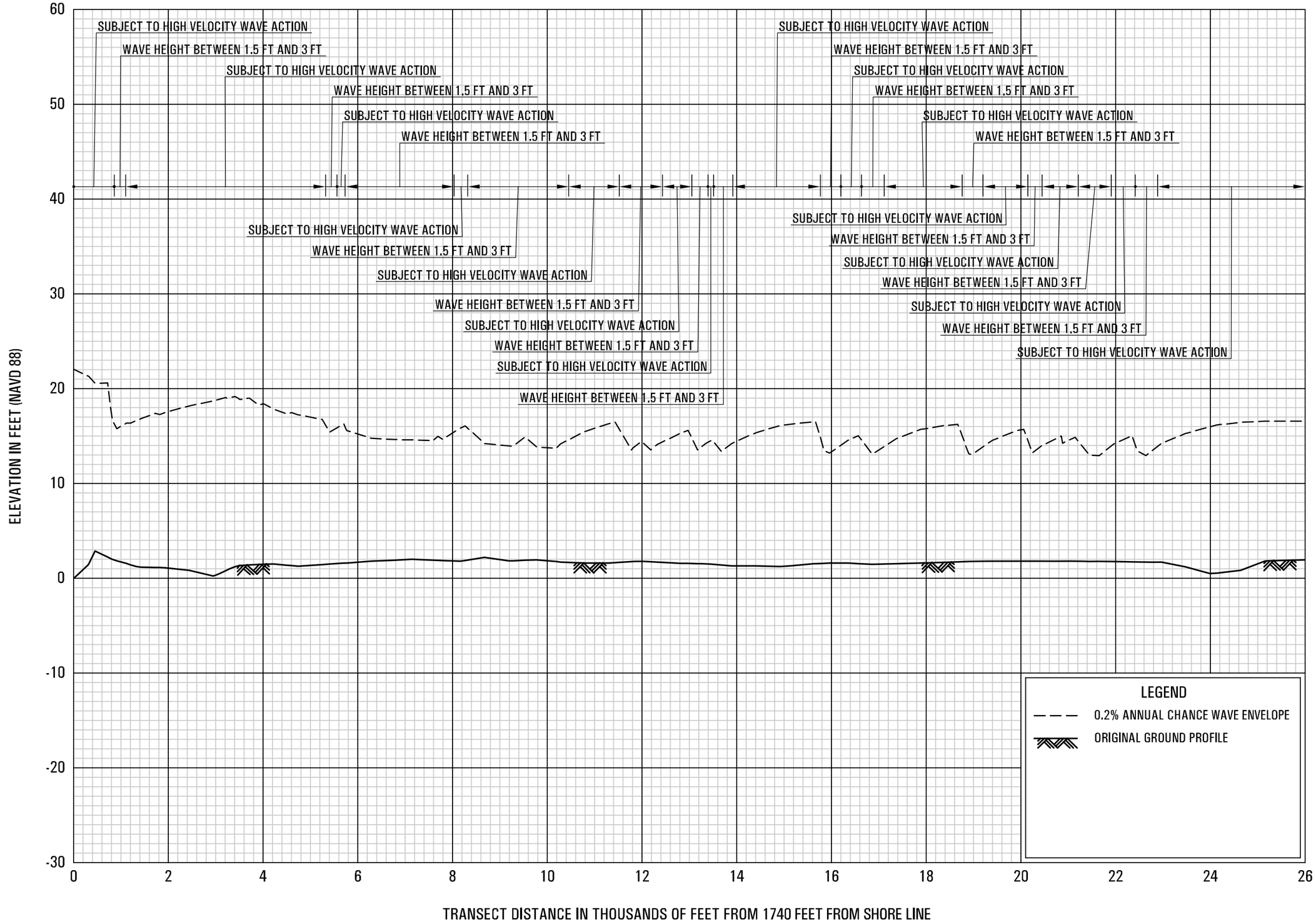
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



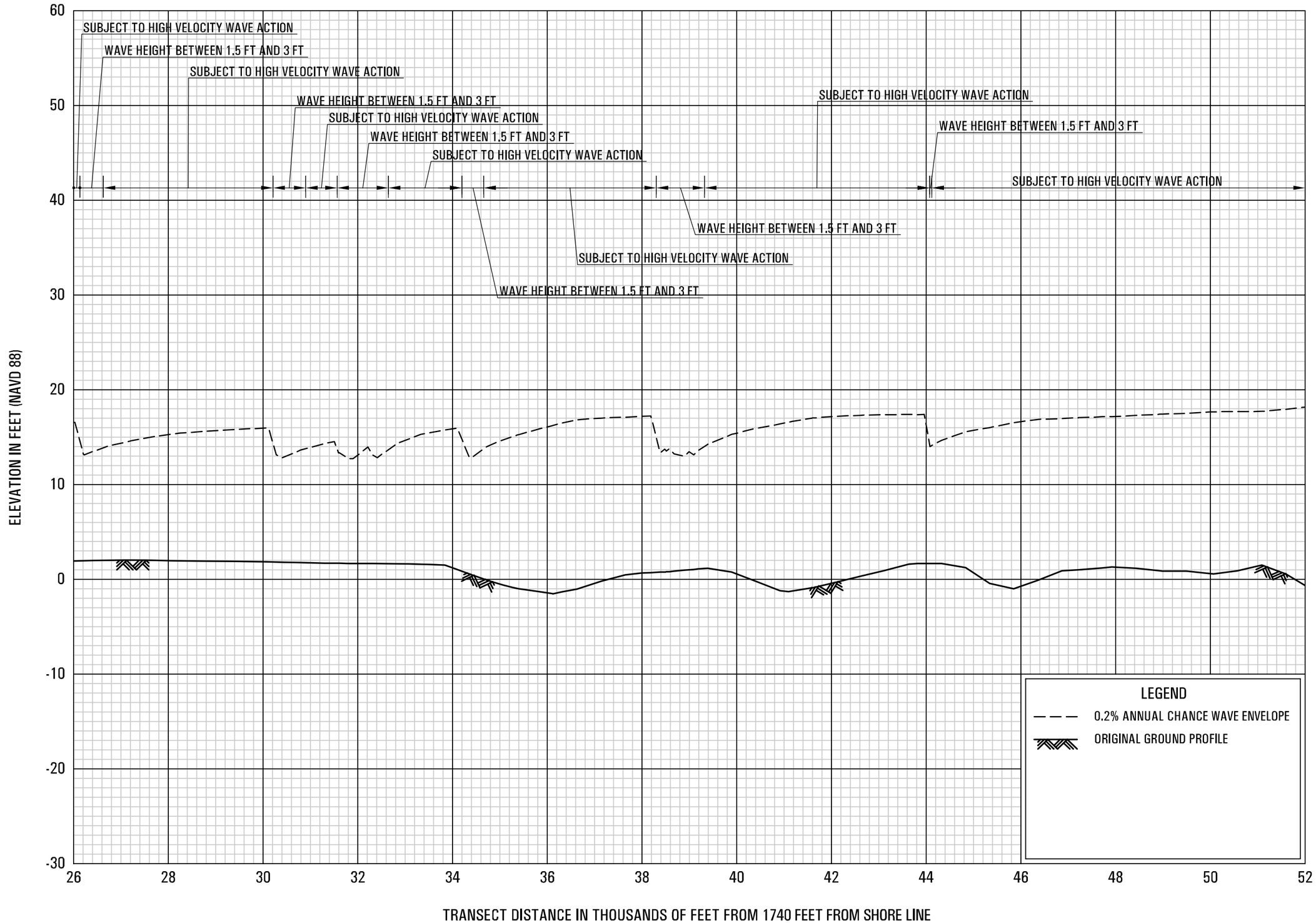
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



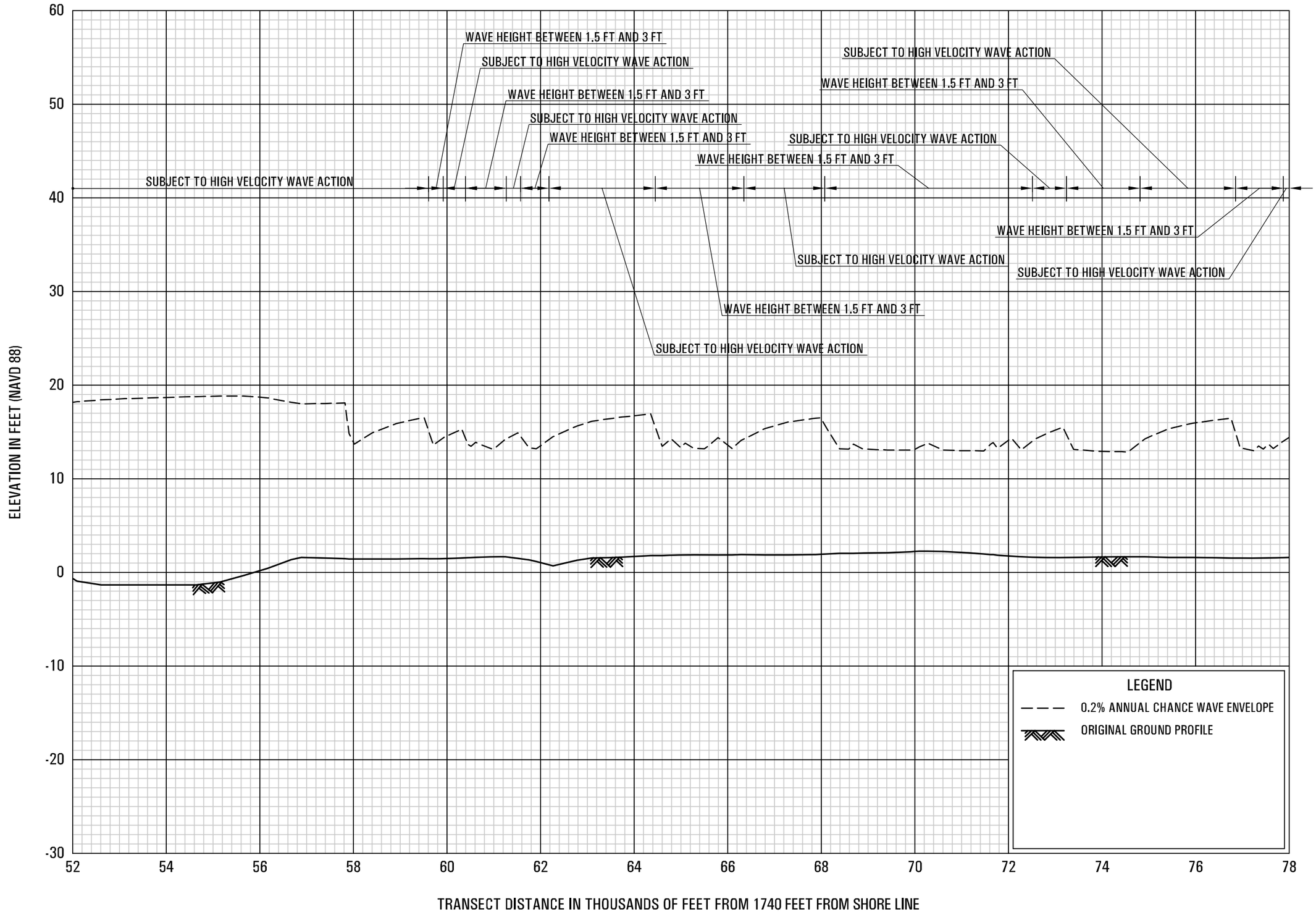
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



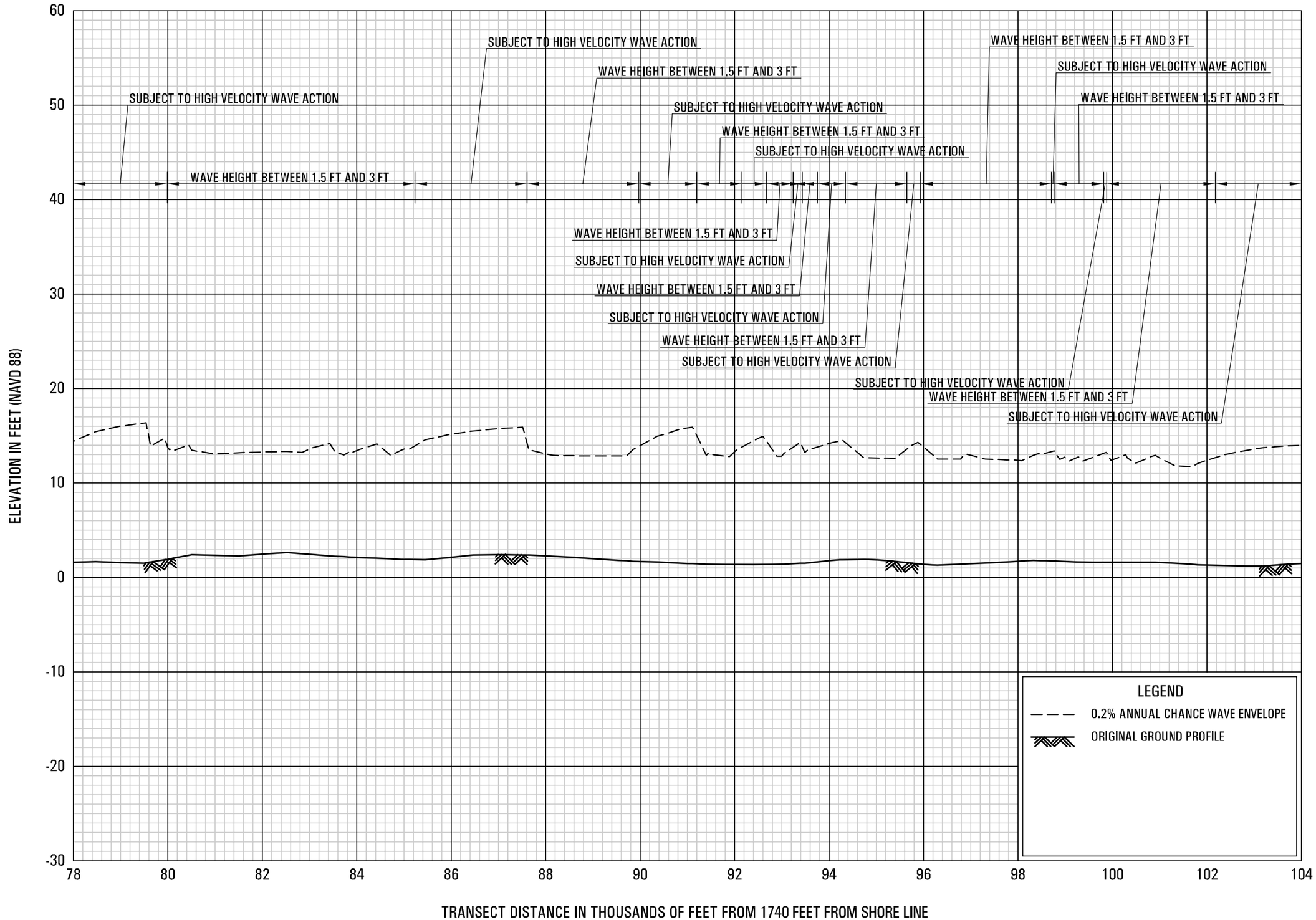
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



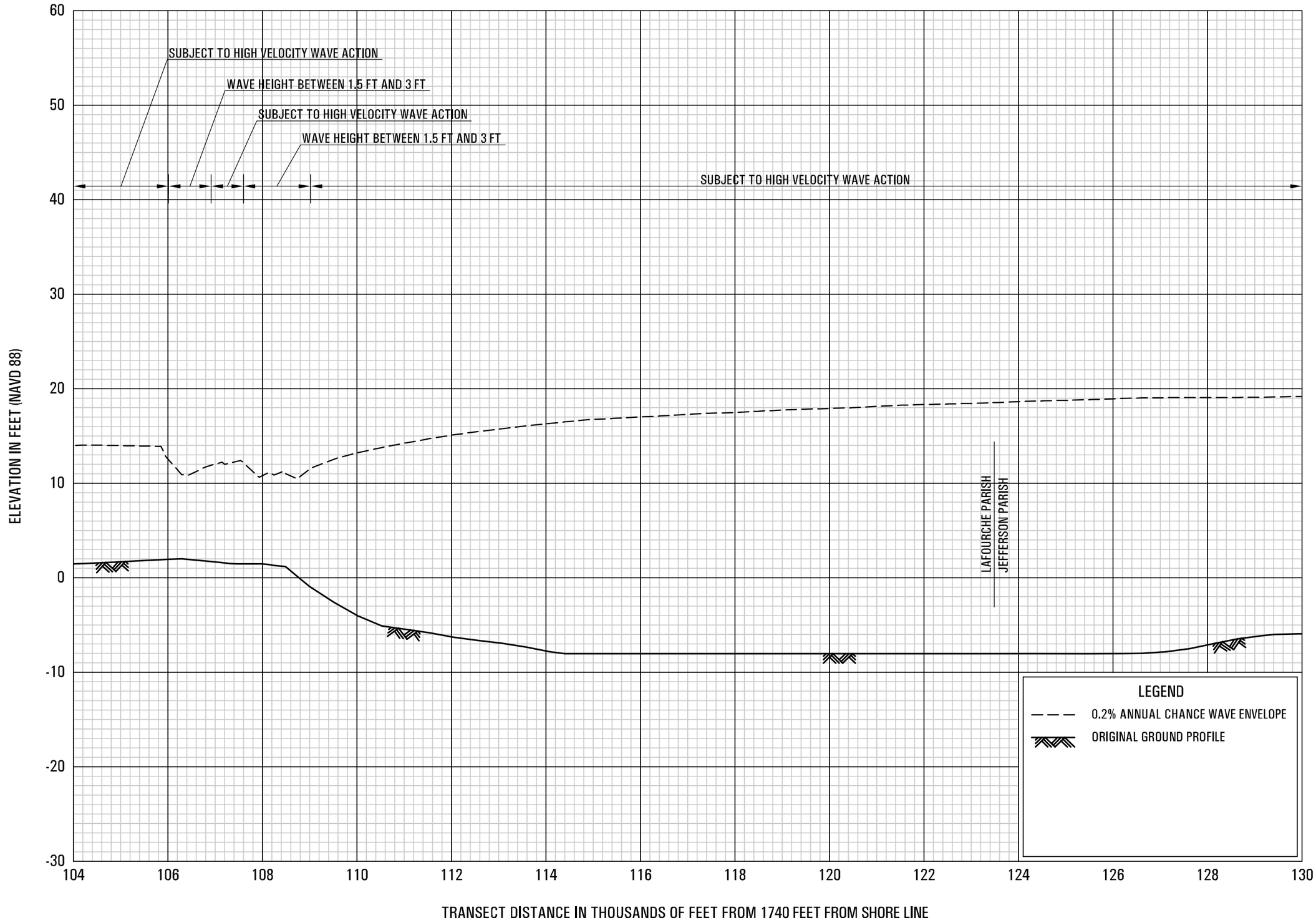
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



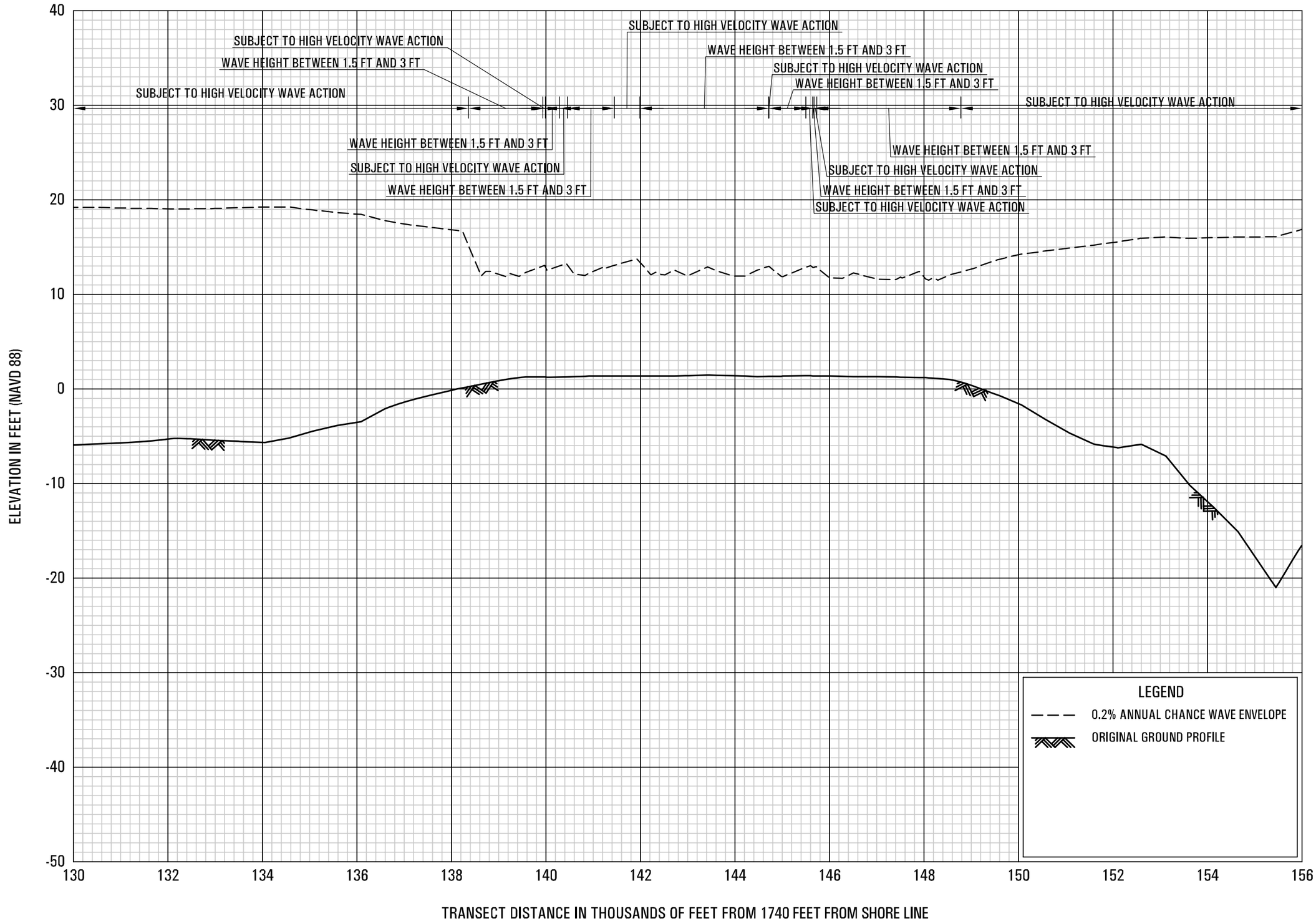
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



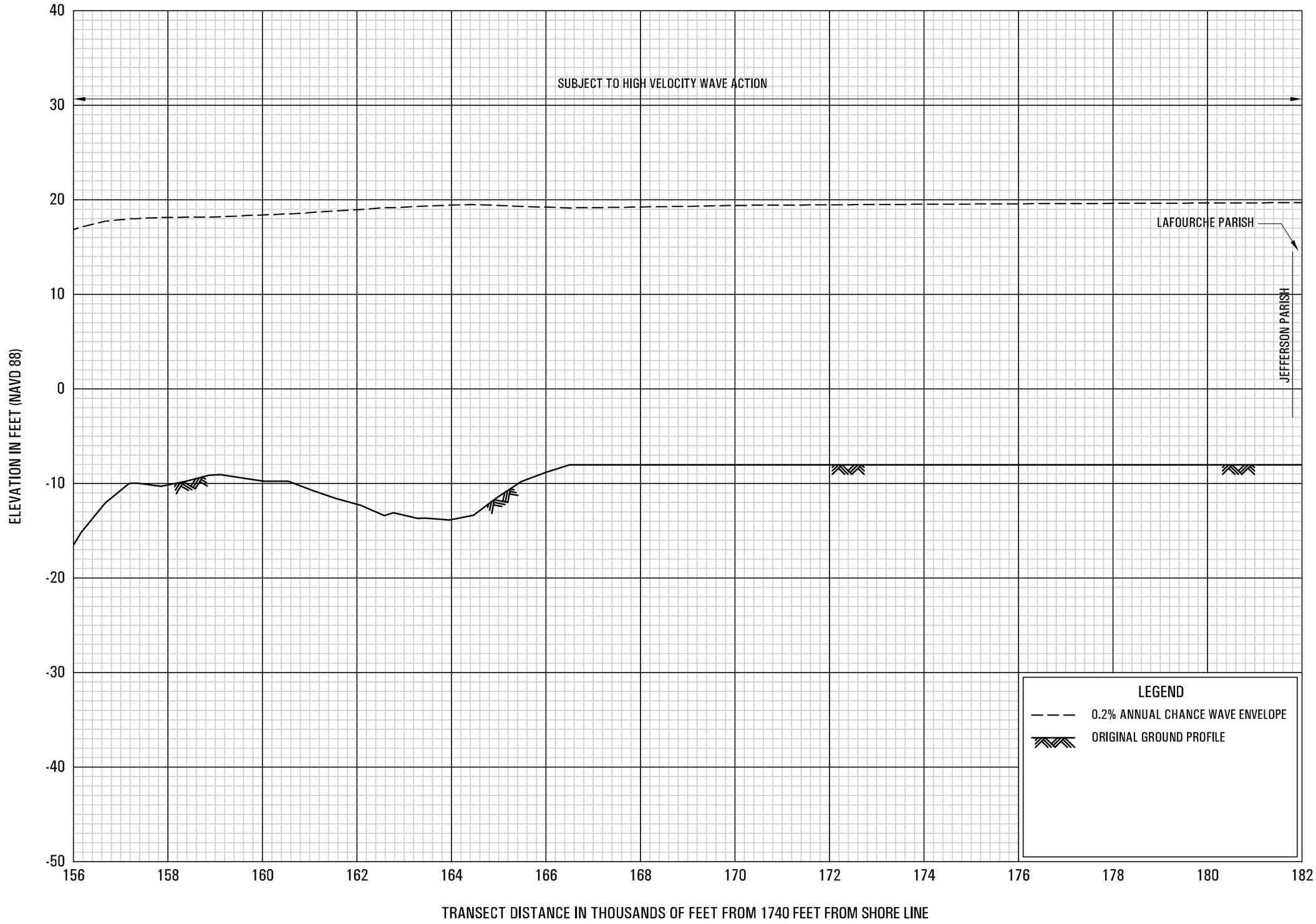
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



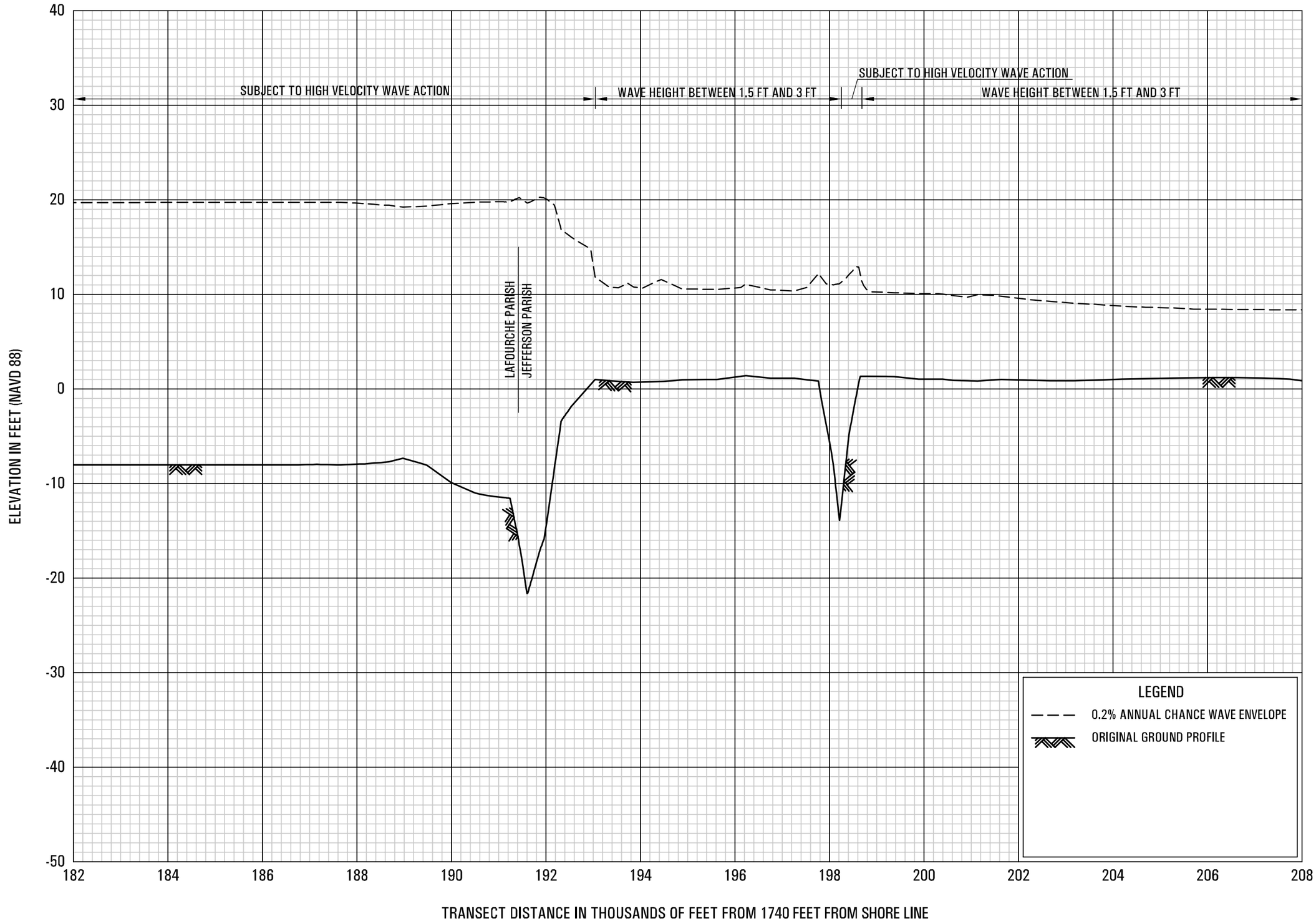
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



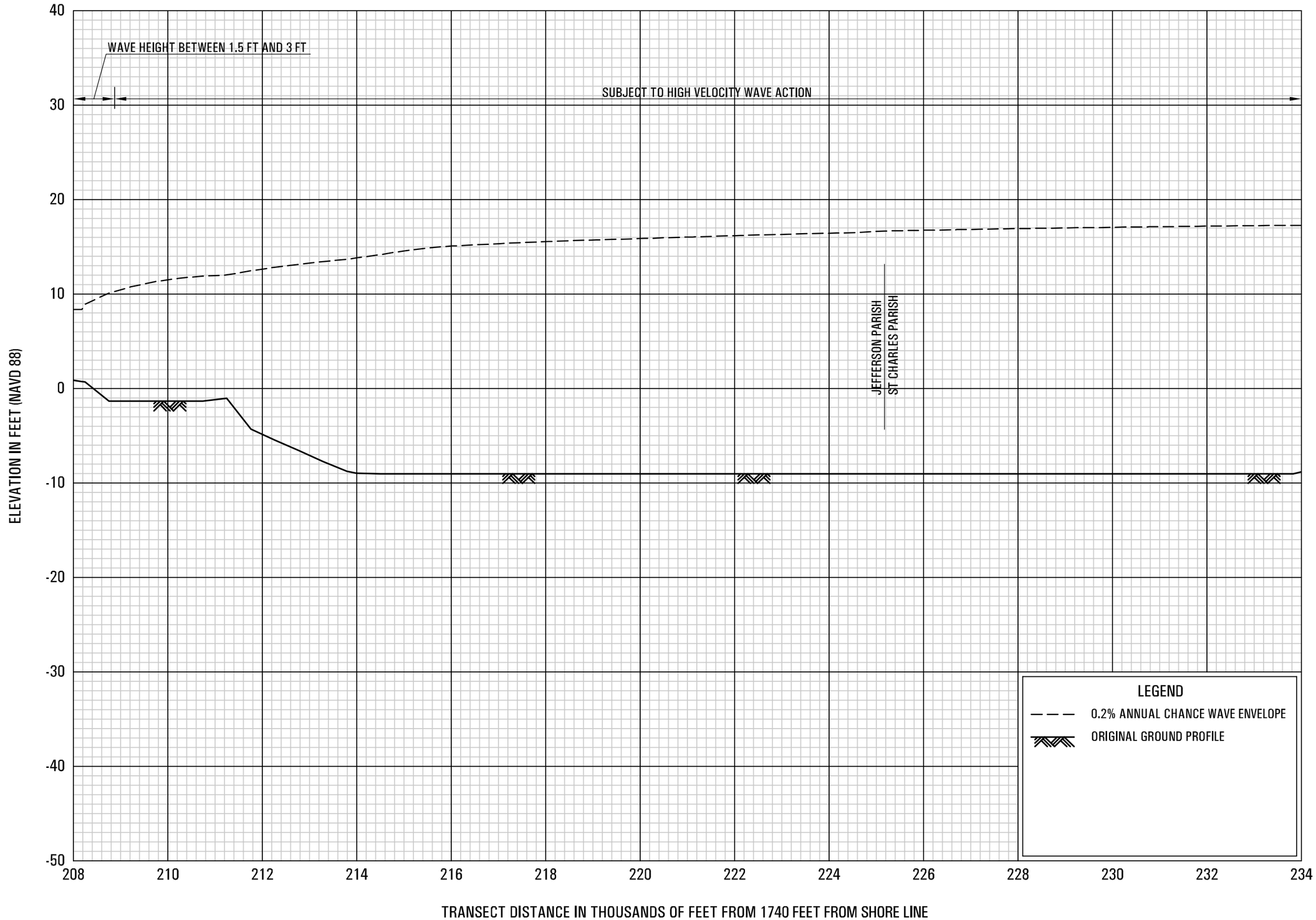
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



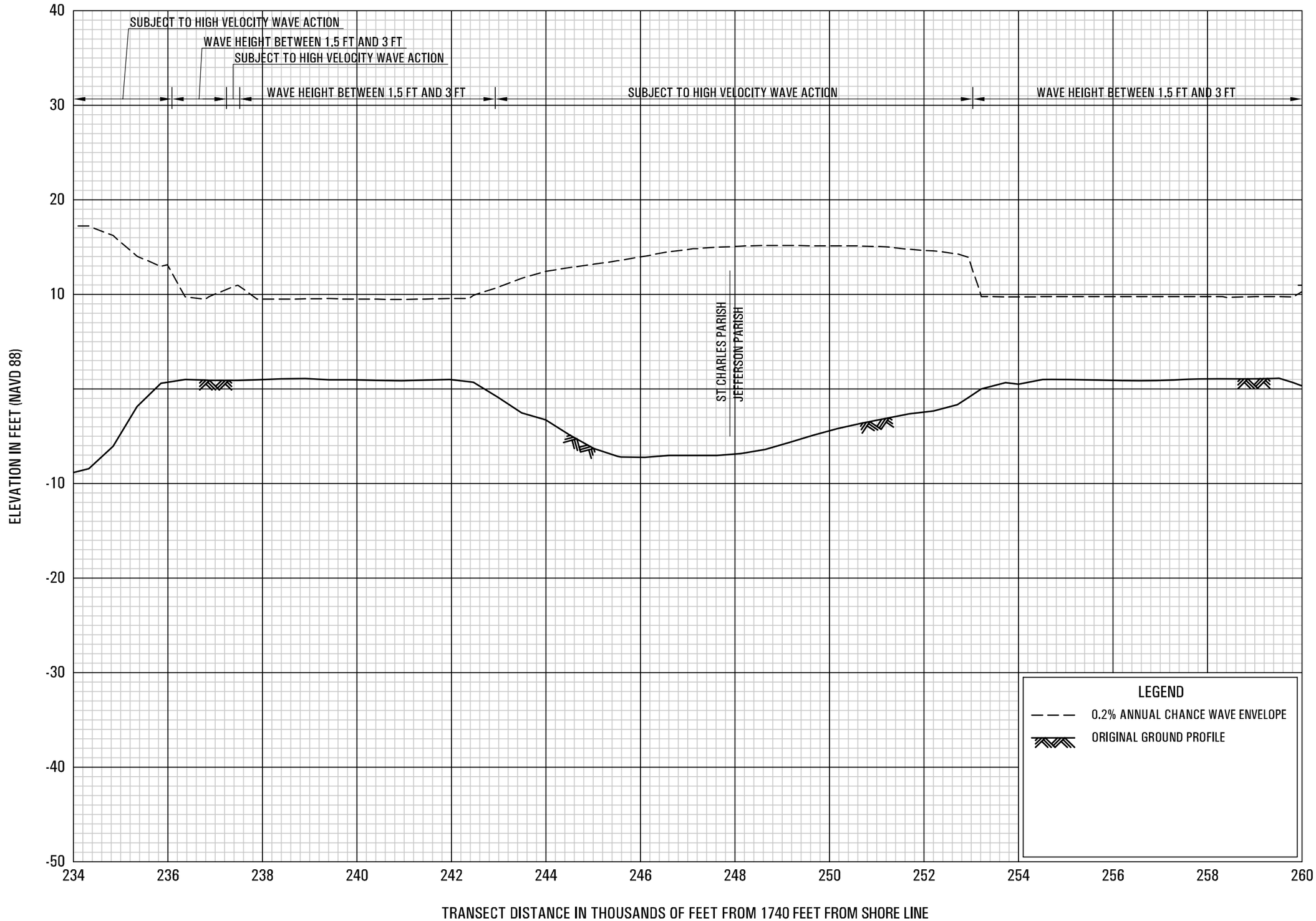
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



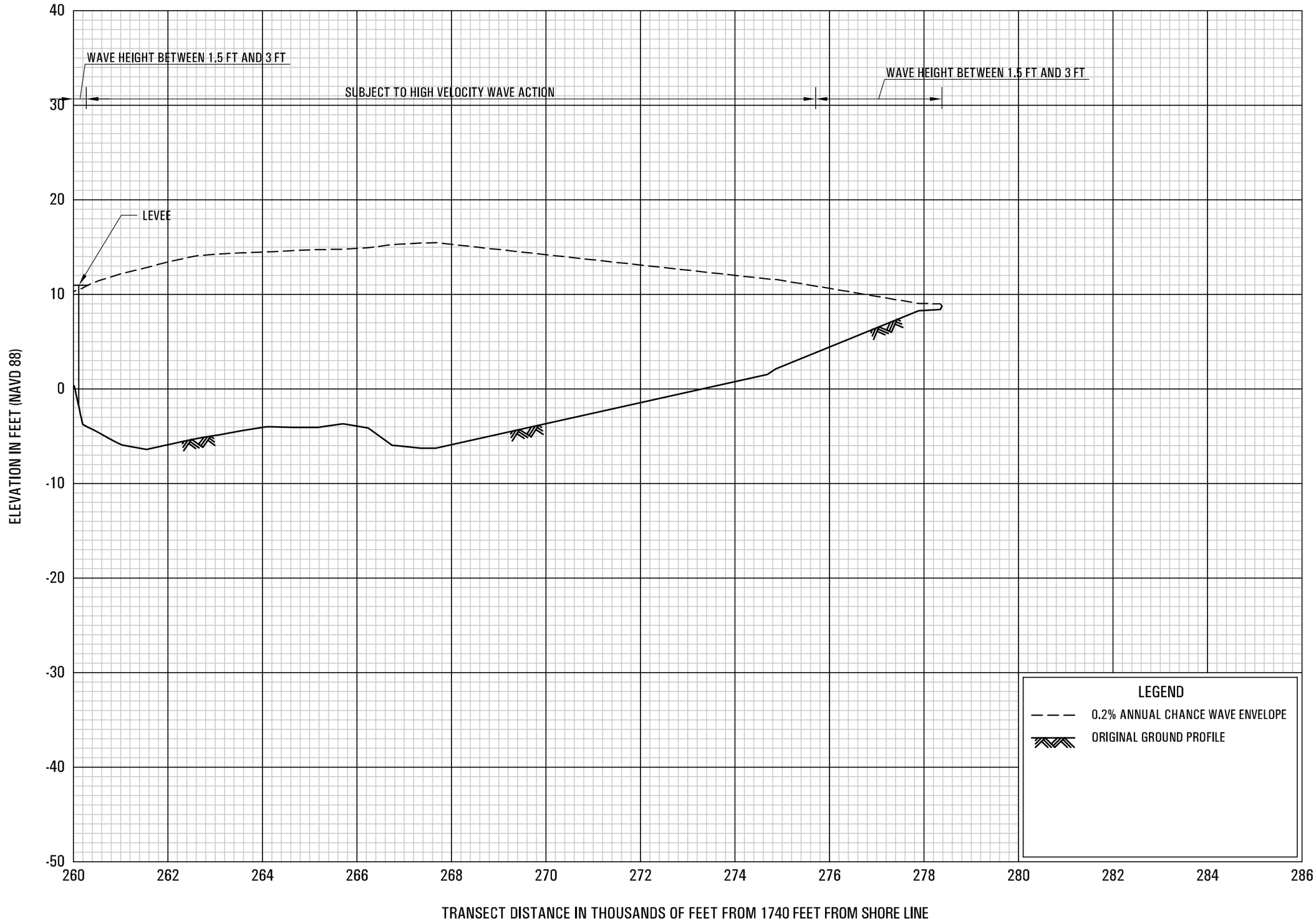
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



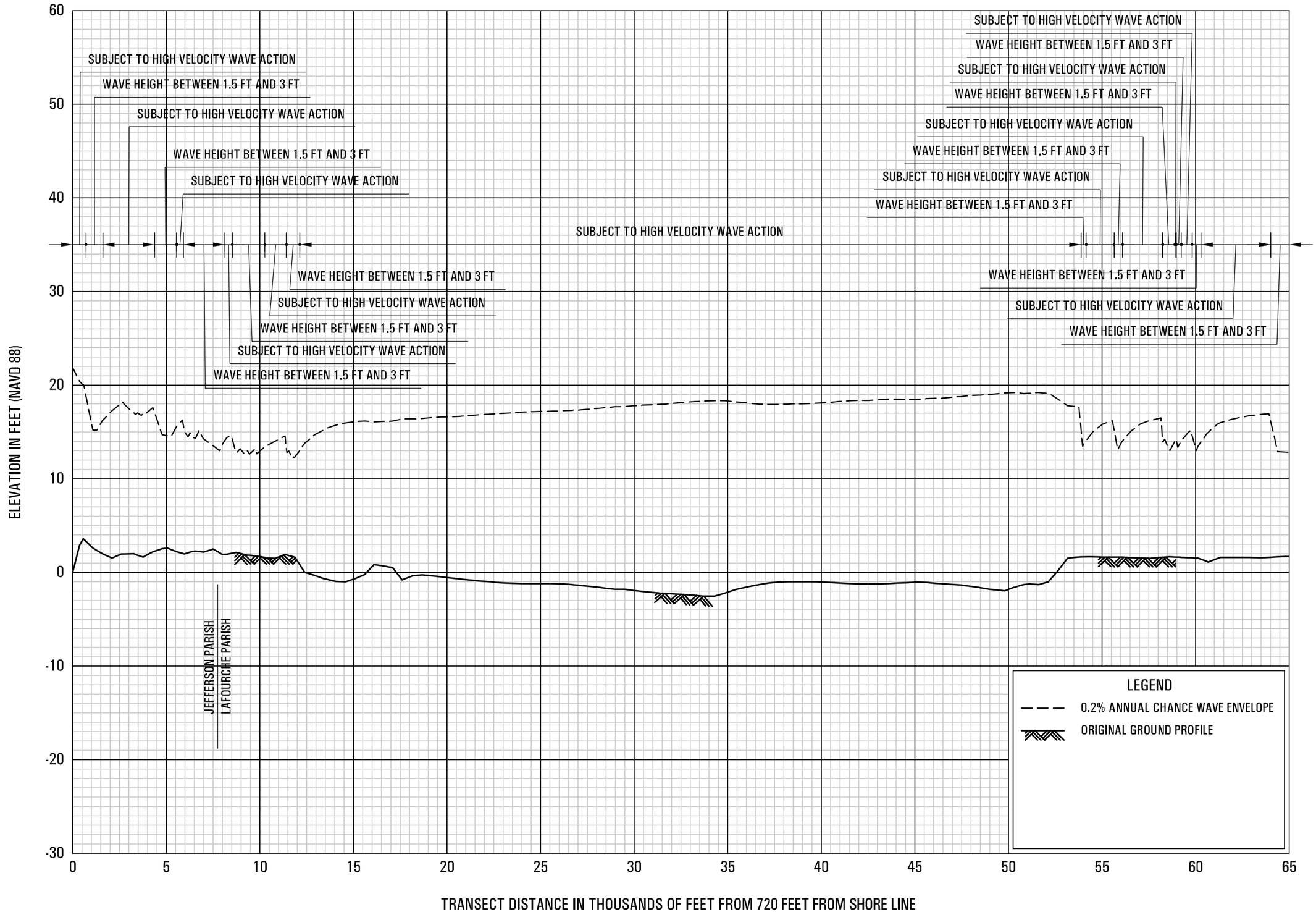
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



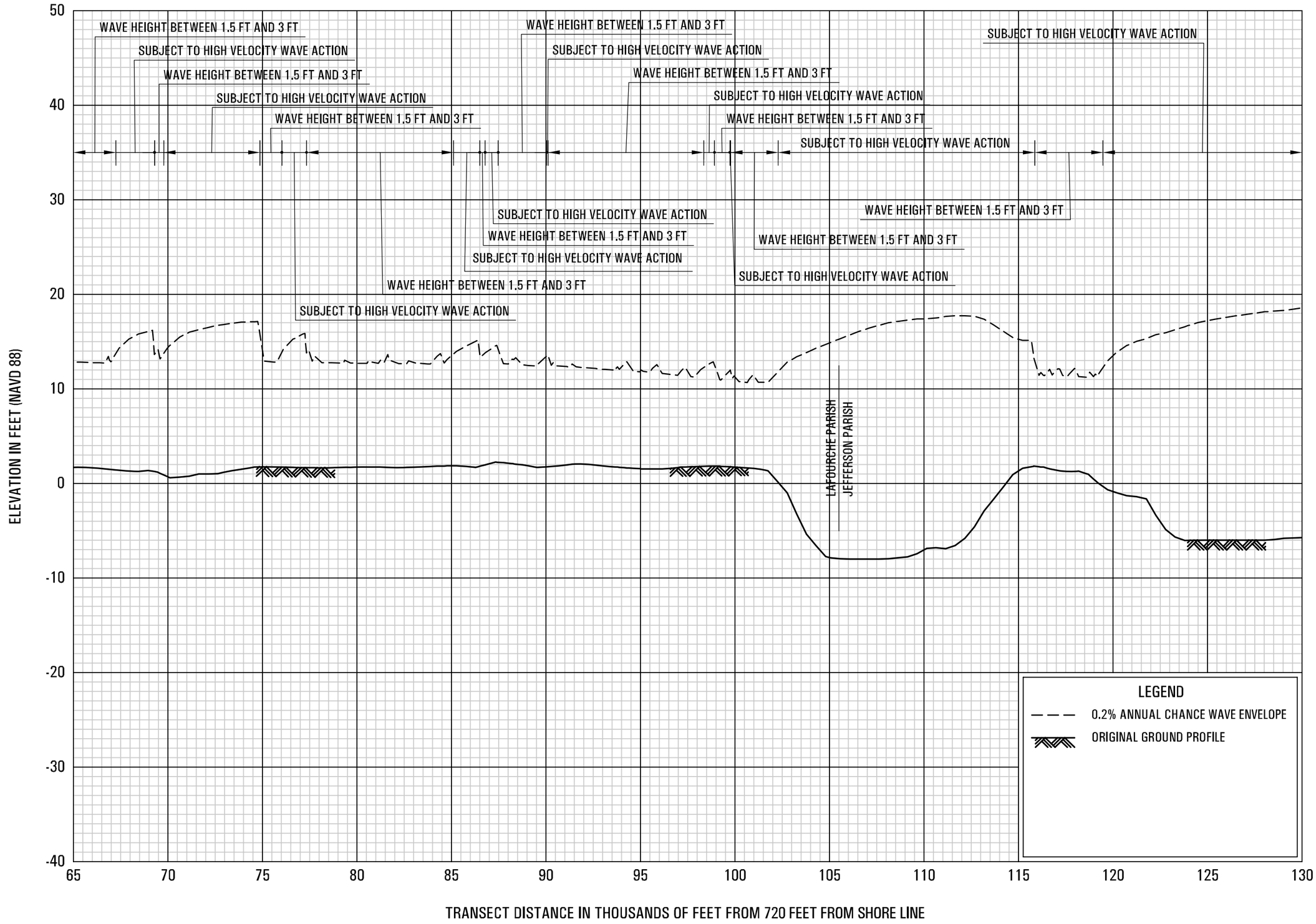
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



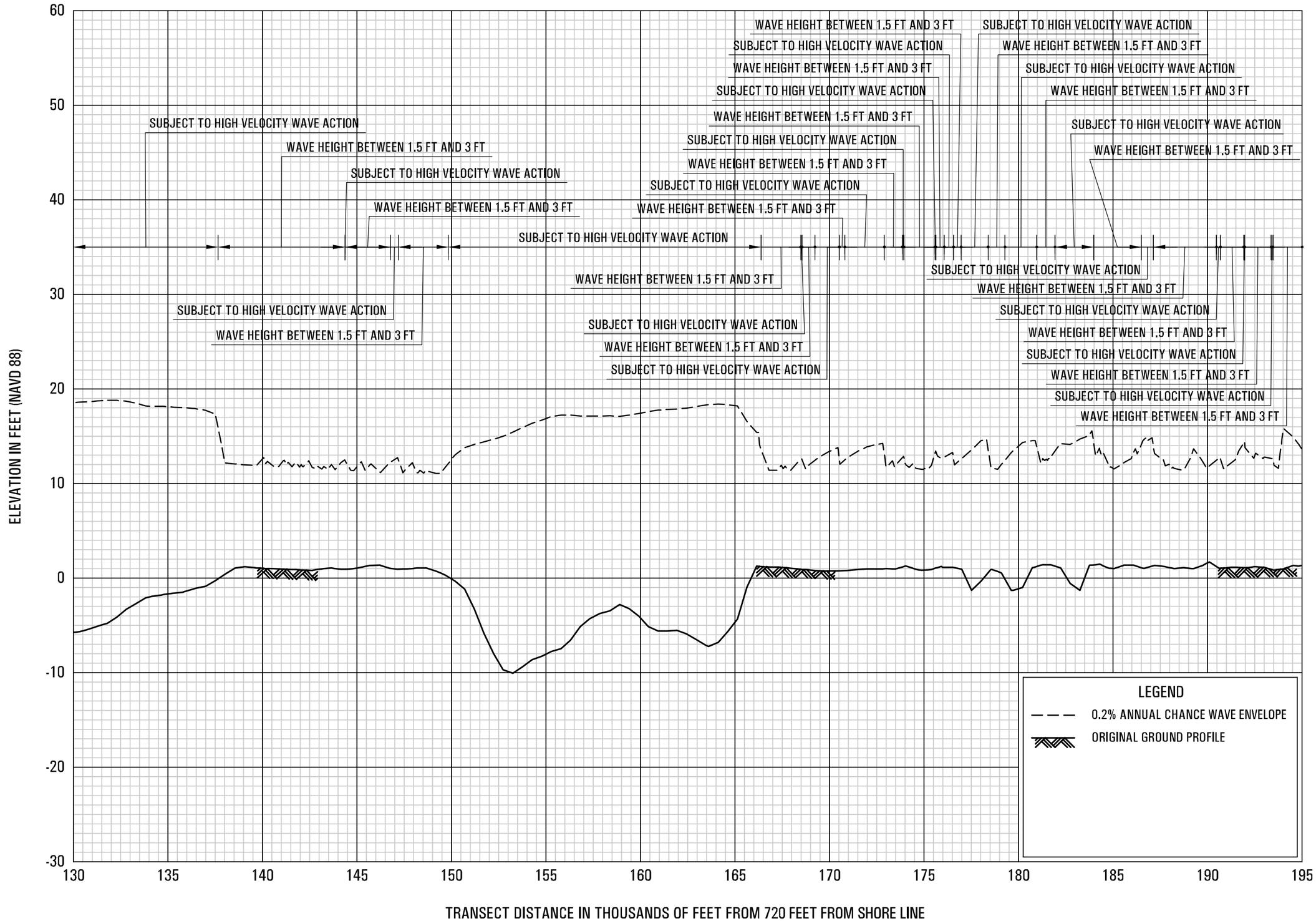
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



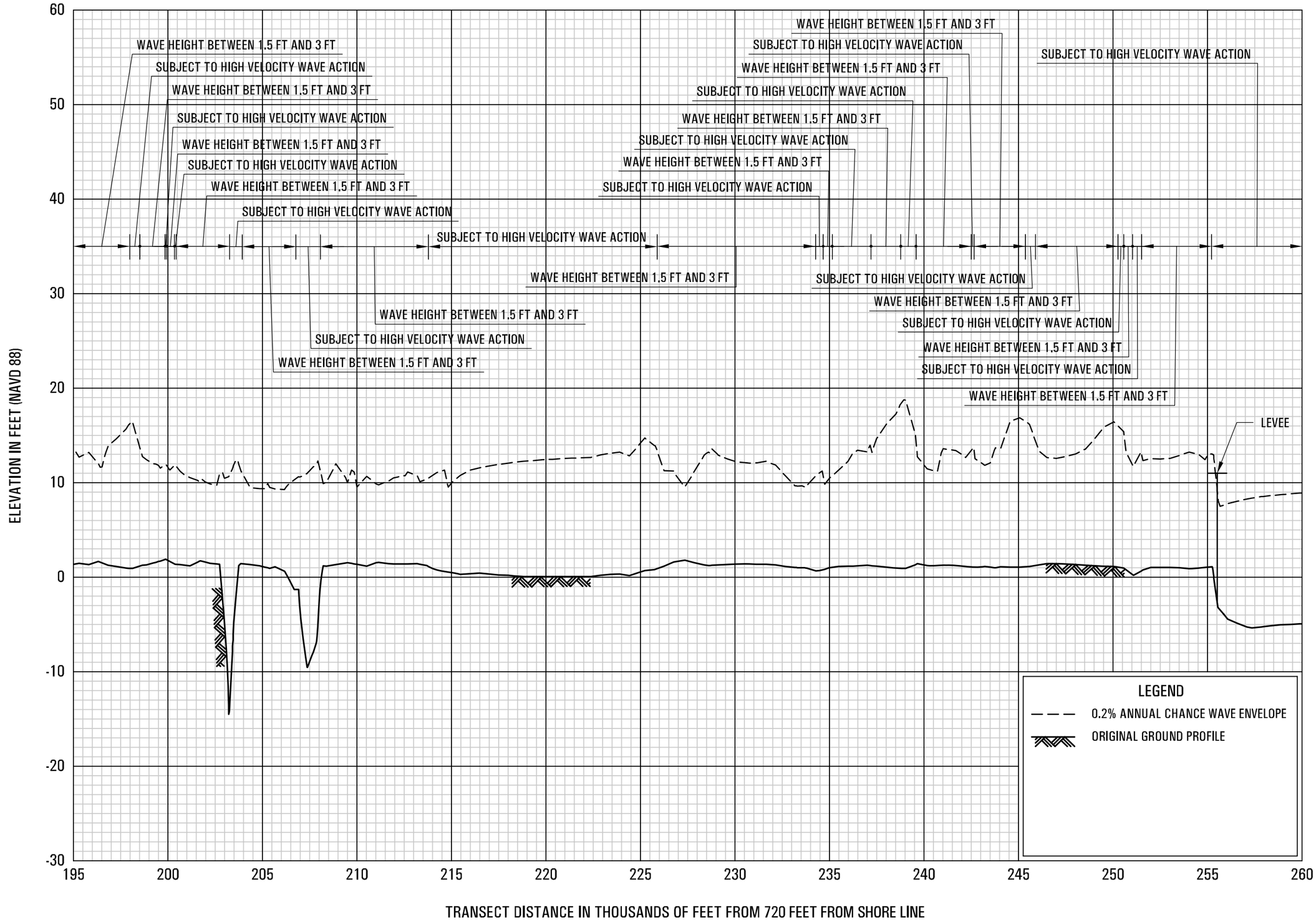
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



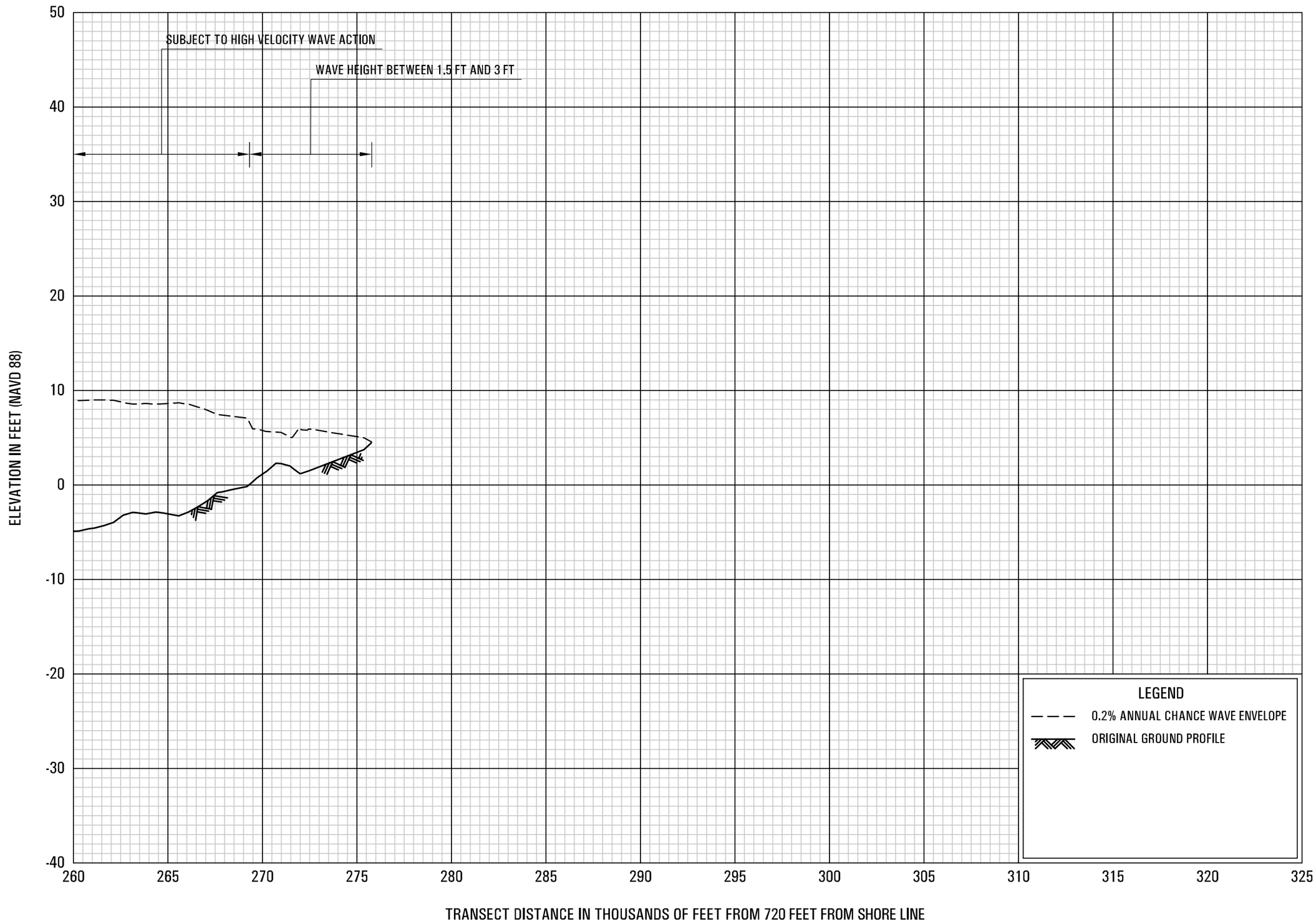
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



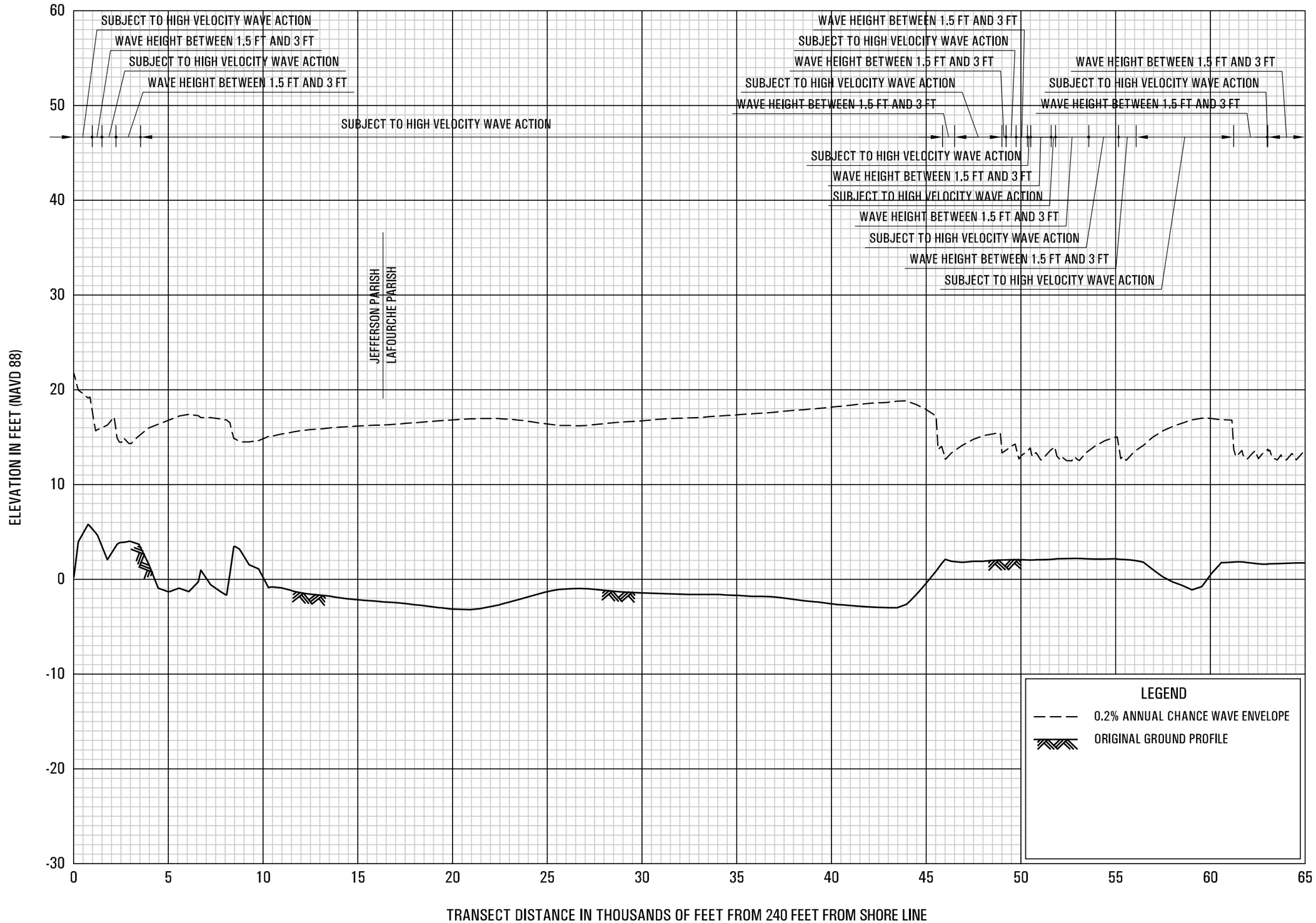
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



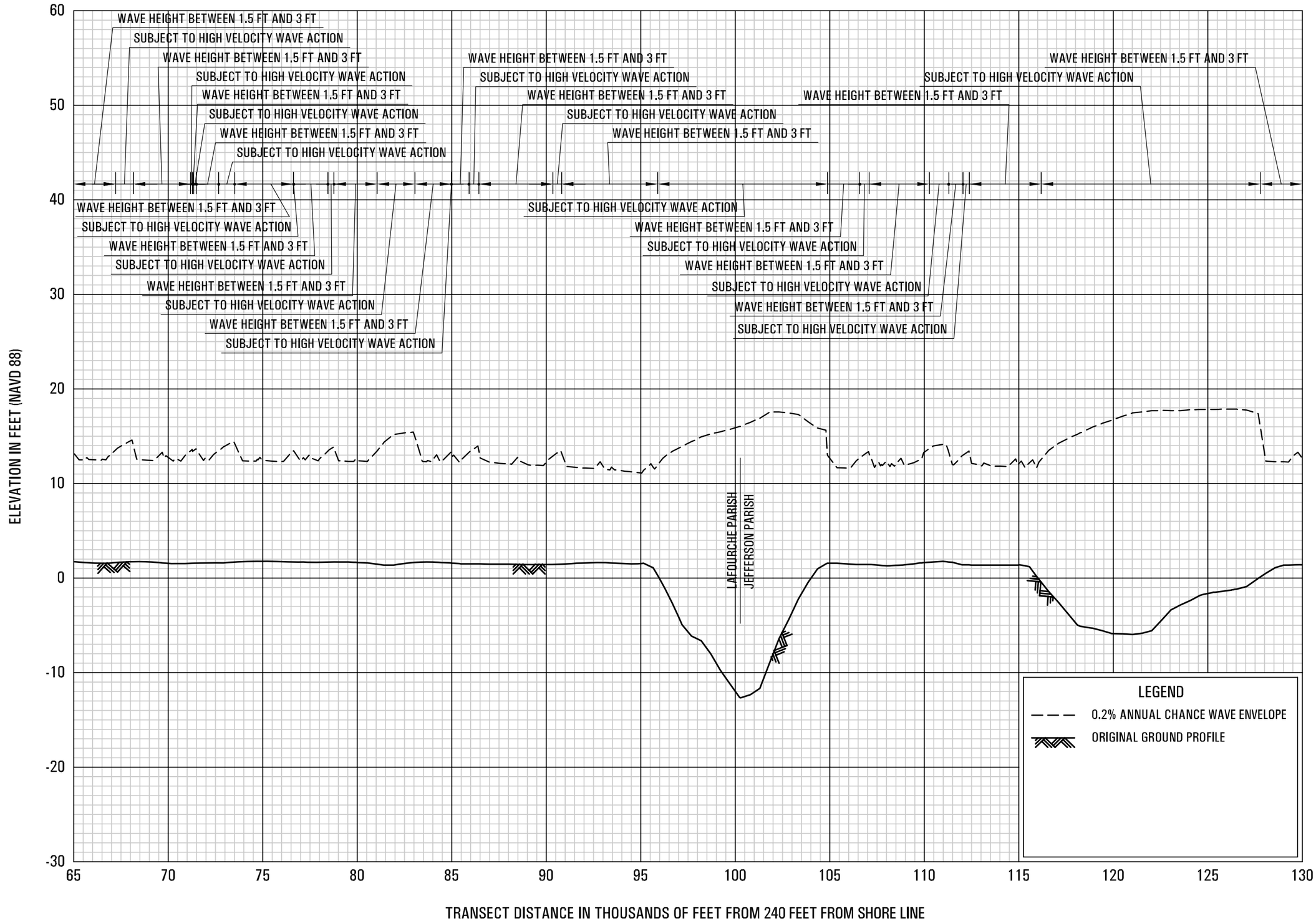
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



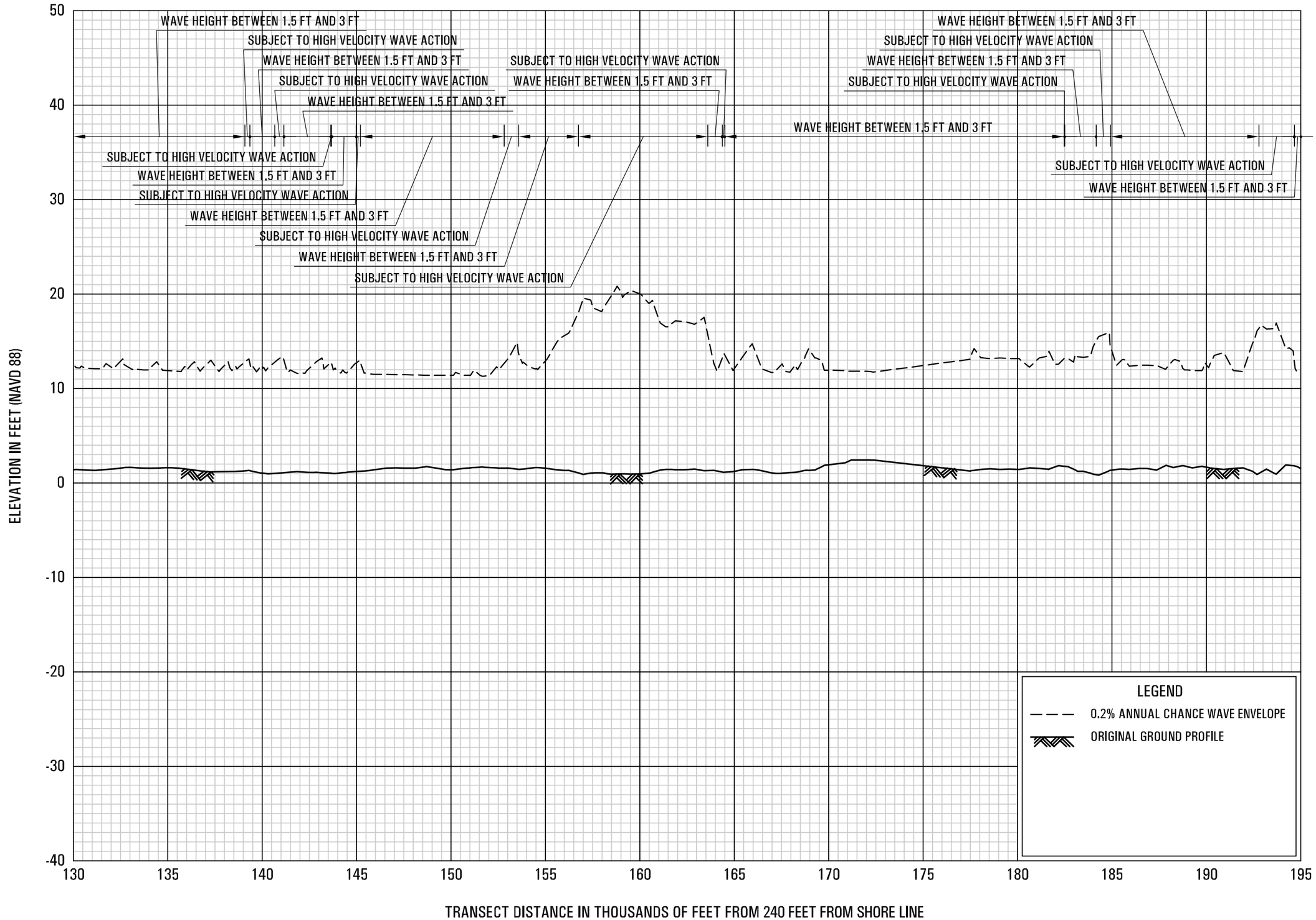
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



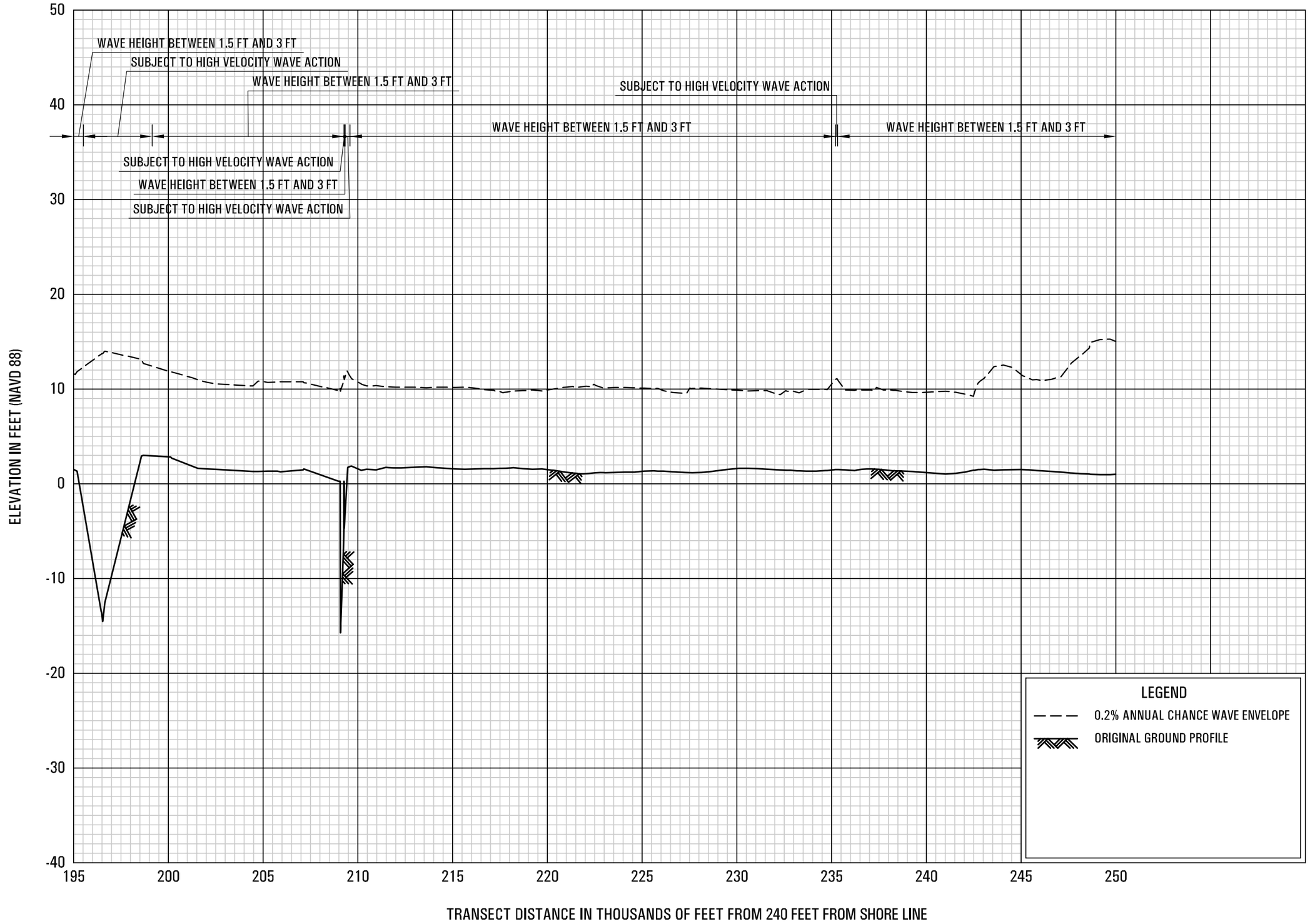
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



0.2% ANNUAL CHANCE WAVE ENVELOPE

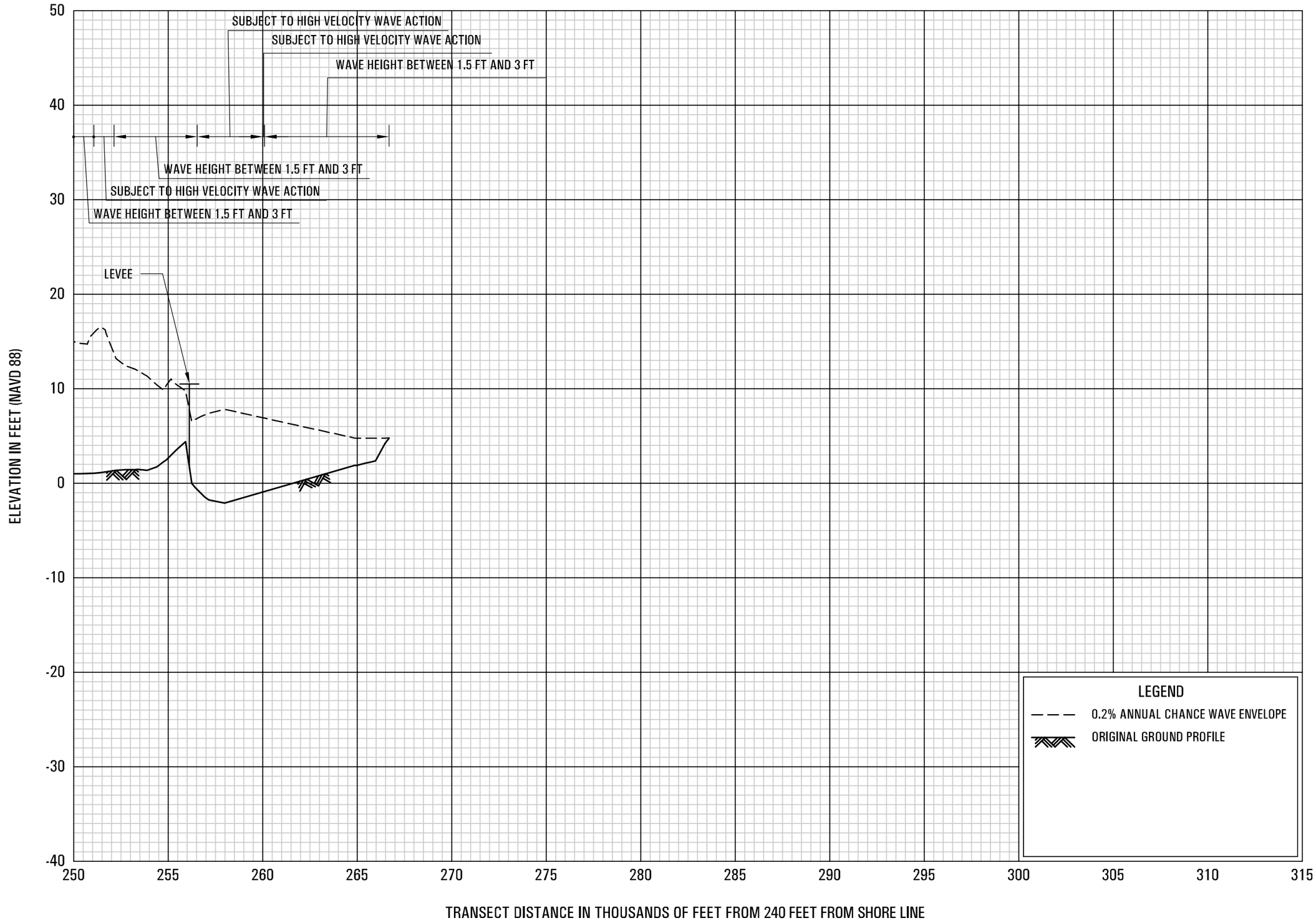
TRANSECT 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

57P



0.2% ANNUAL CHANCE WAVE ENVELOPE

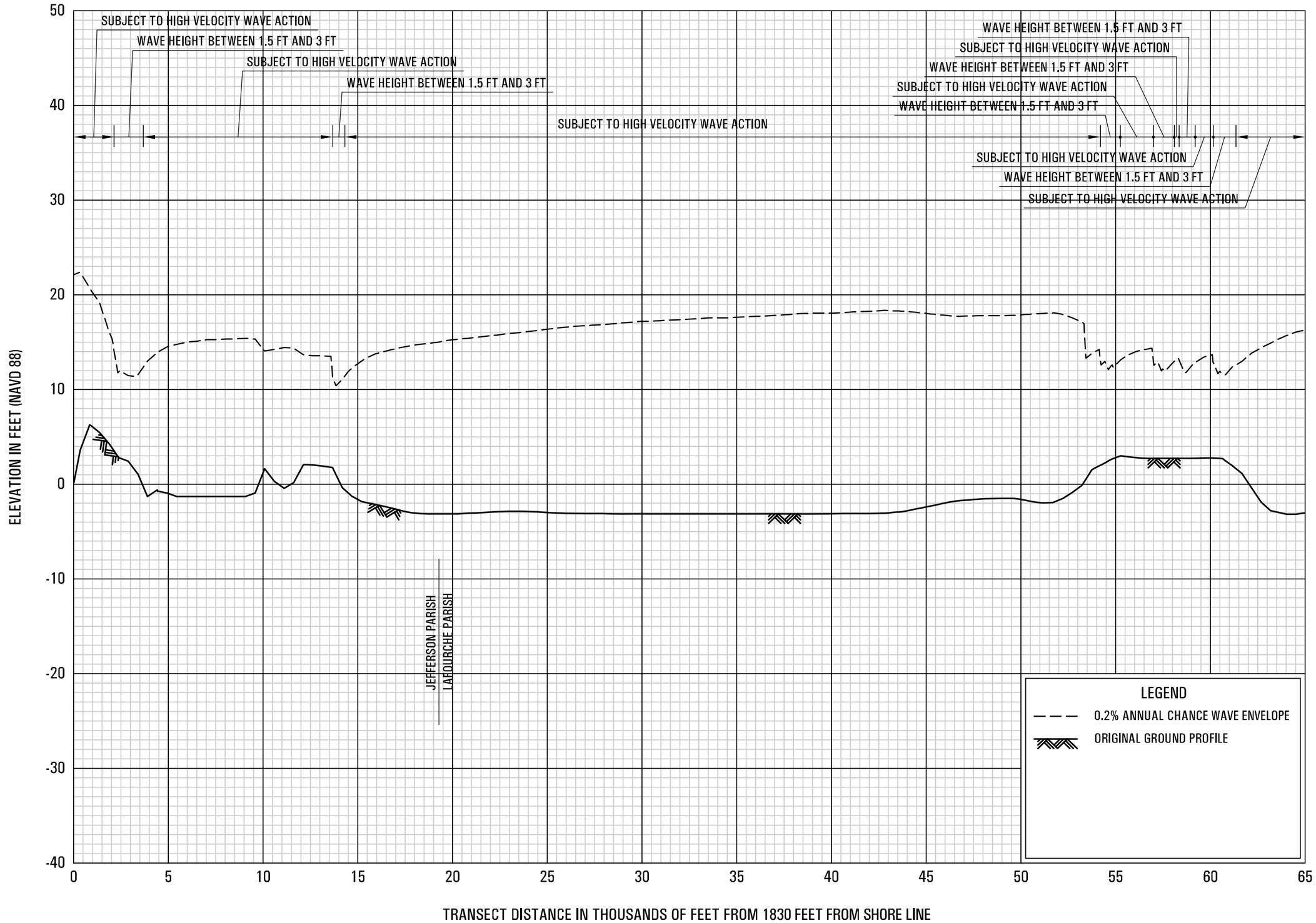
TRANSECT 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

58P



0.2% ANNUAL CHANCE WAVE ENVELOPE

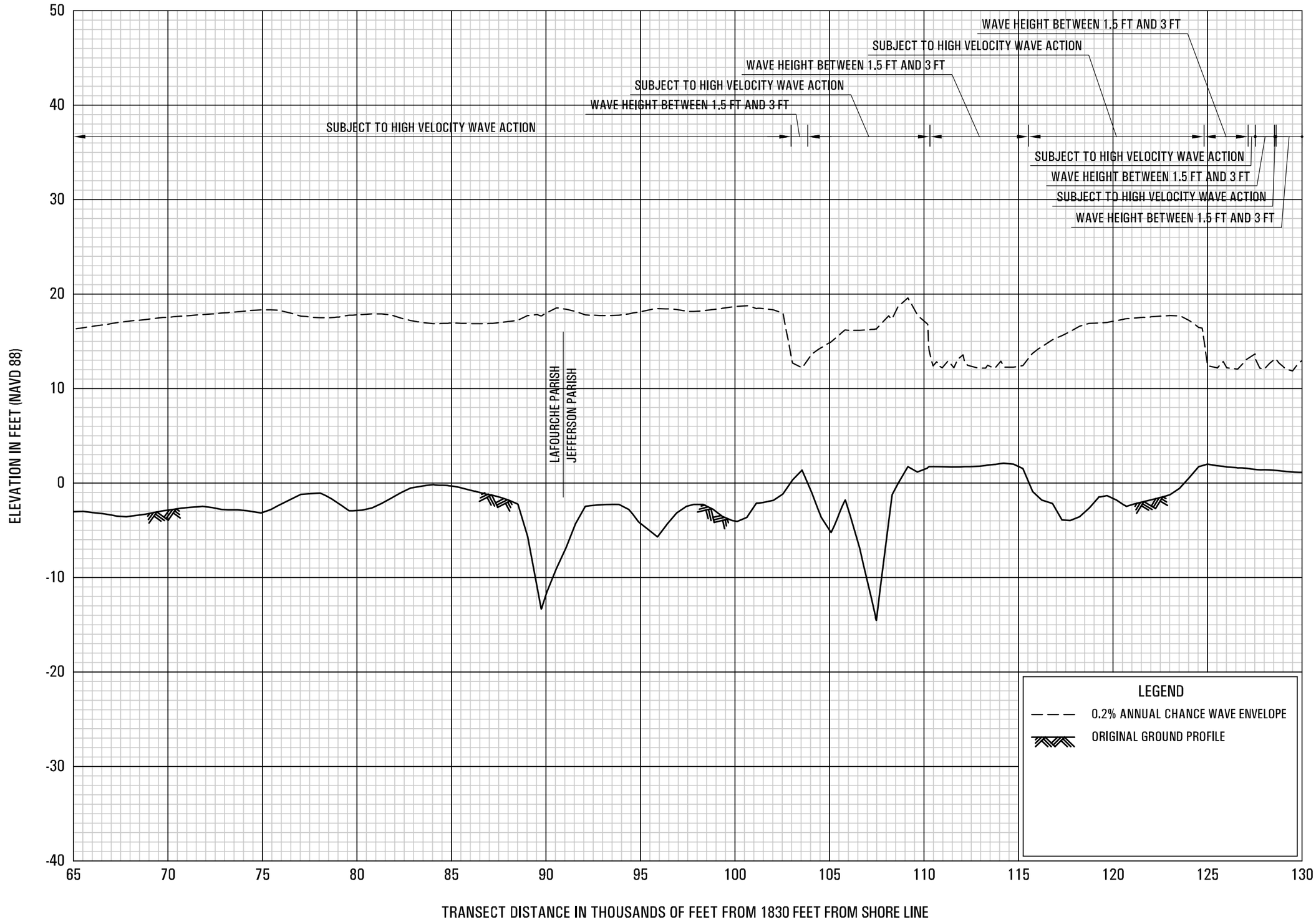
TRANSECT 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

59P



0.2% ANNUAL CHANCE WAVE ENVELOPE

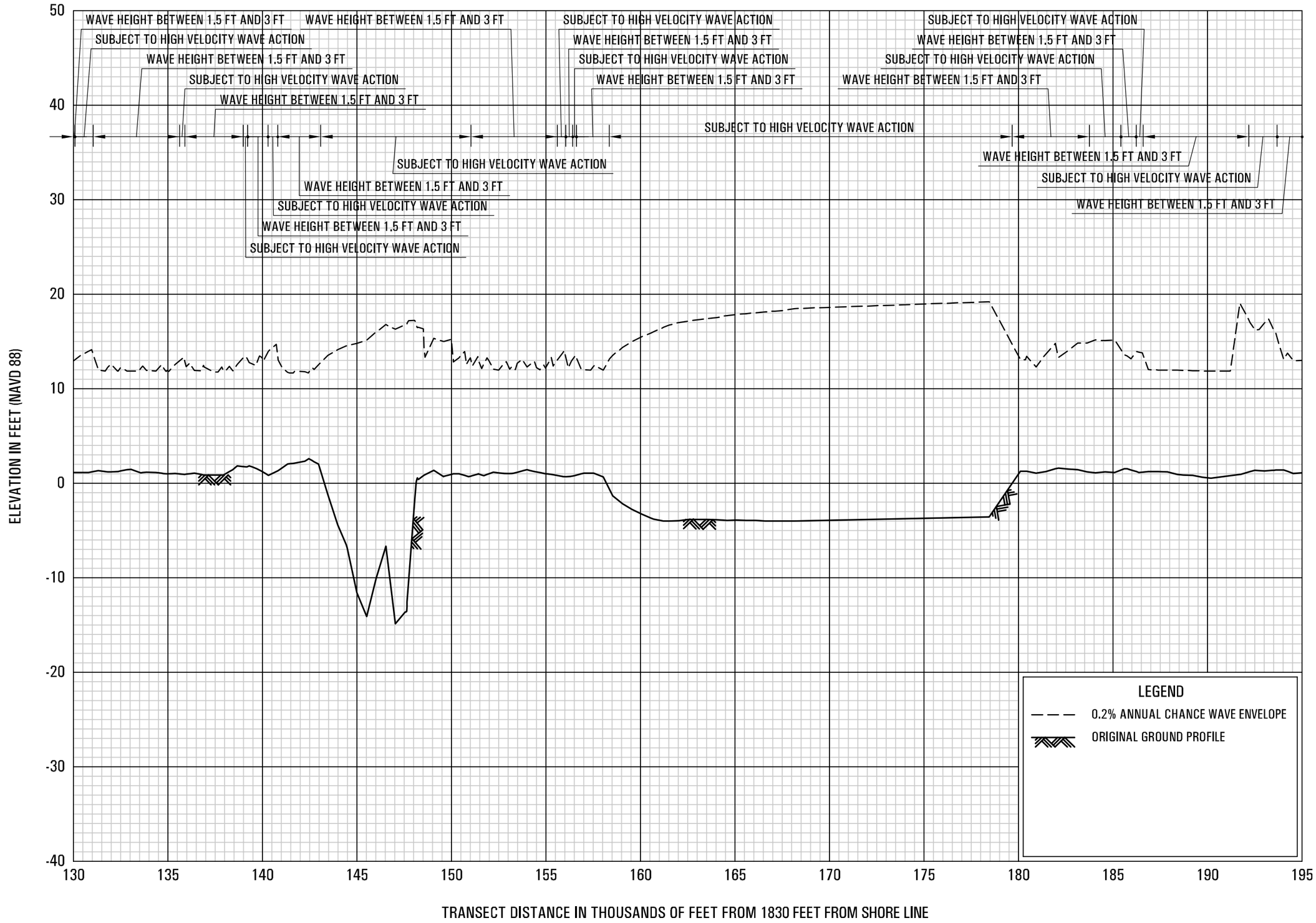
TRANSECT 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

60P



0.2% ANNUAL CHANCE WAVE ENVELOPE

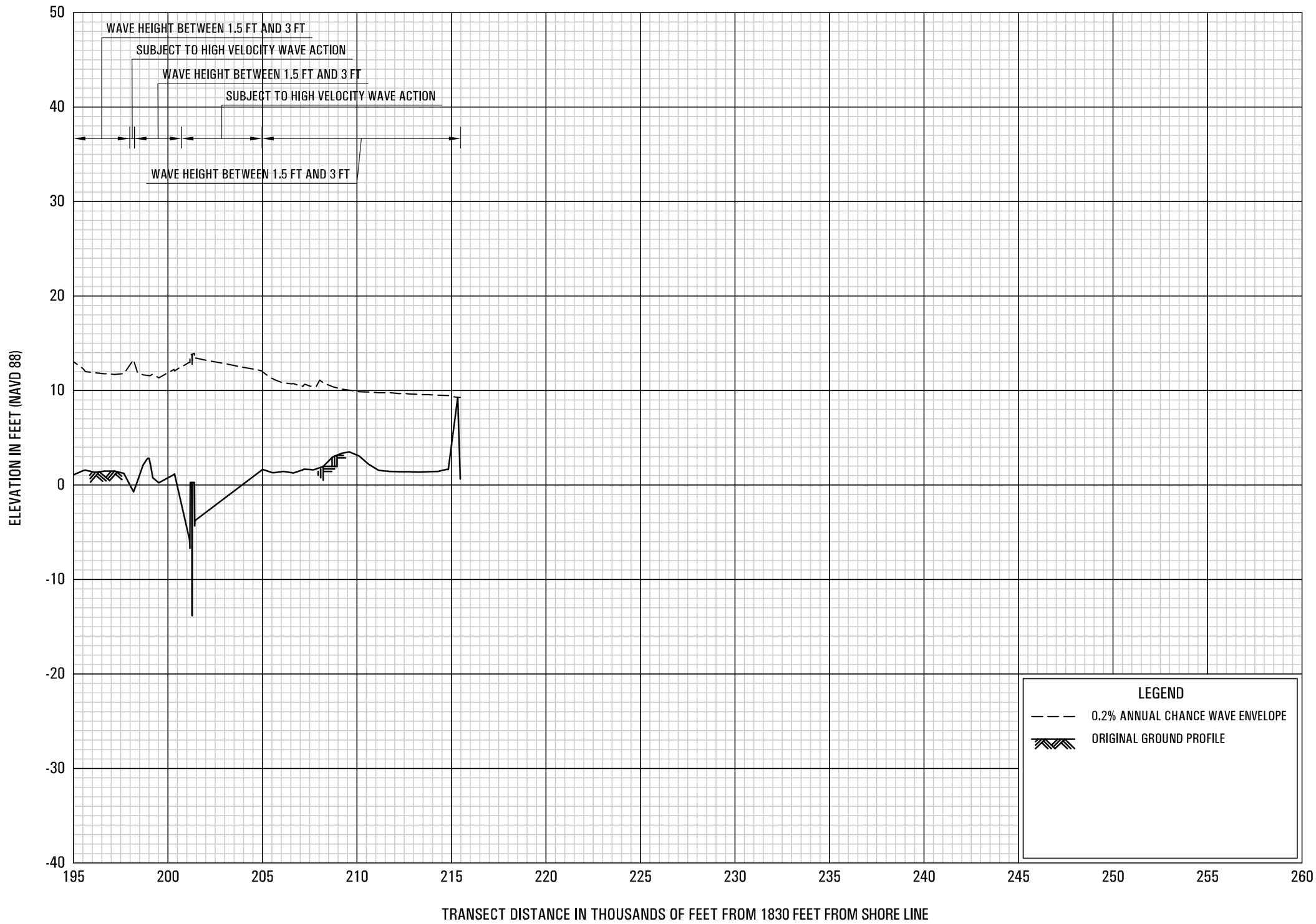
TRANSECT 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

61P



0.2% ANNUAL CHANCE WAVE ENVELOPE

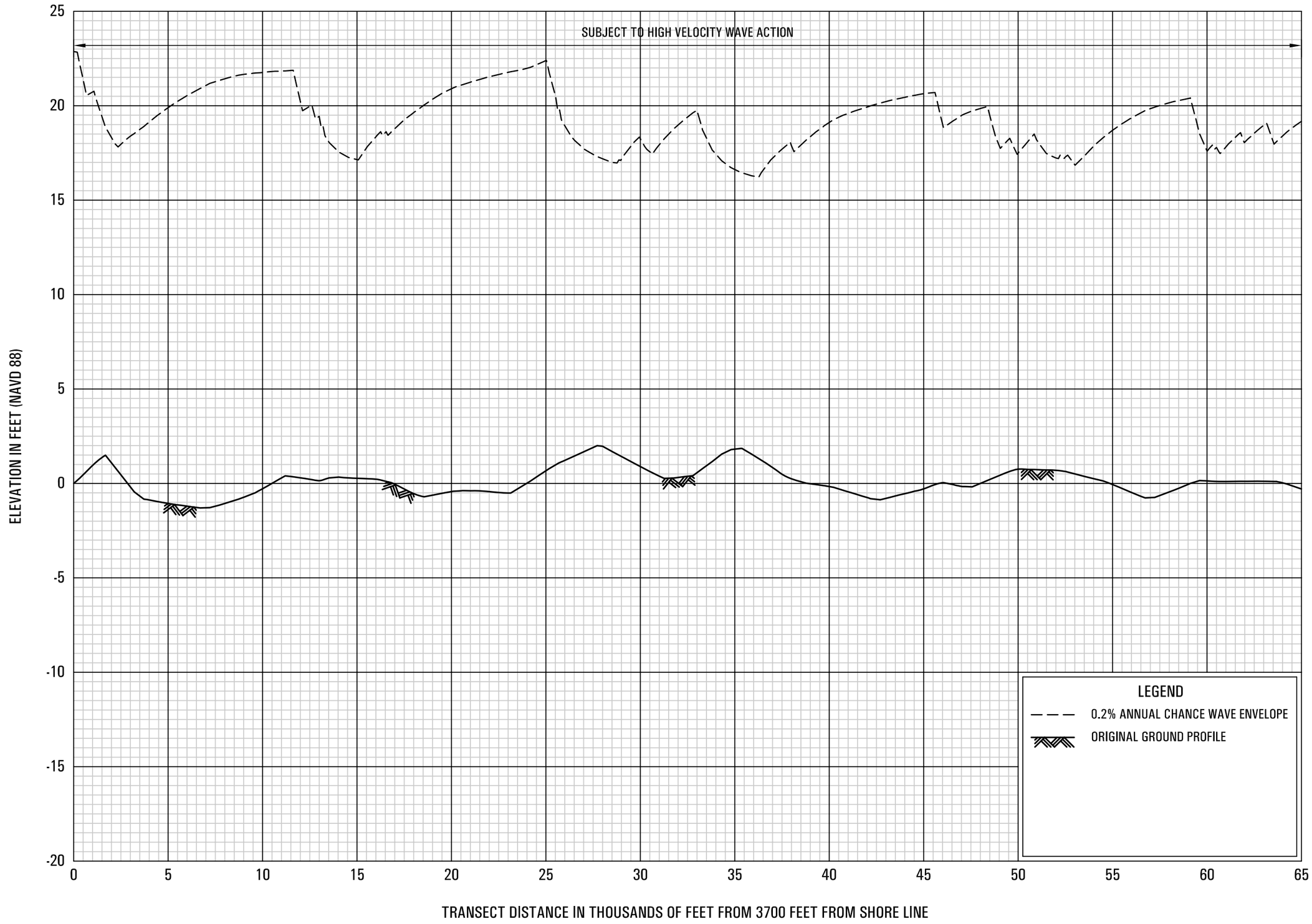
TRANSECT 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

62P



0.2% ANNUAL CHANCE WAVE ENVELOPE

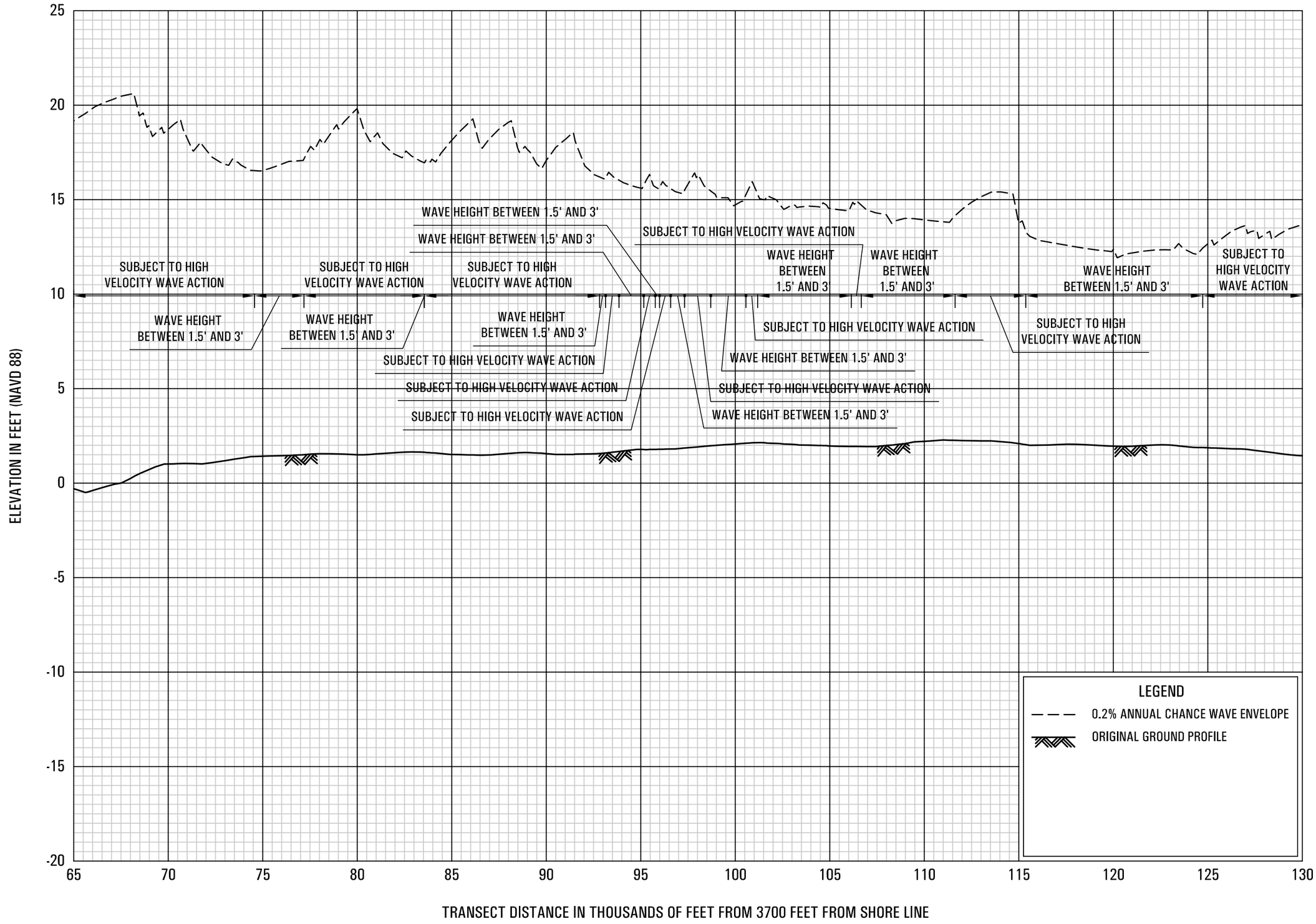
TRANSECT 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

63P



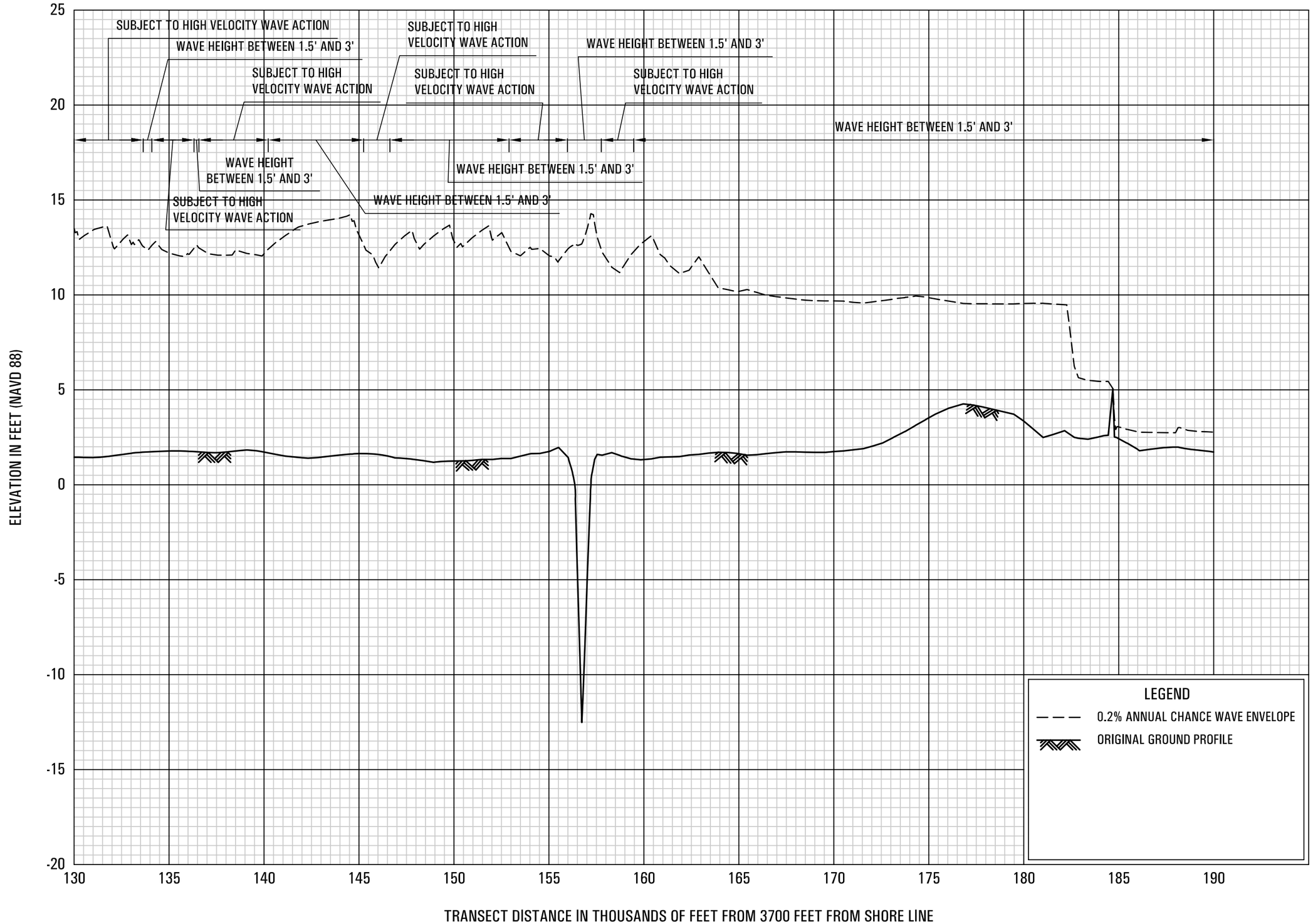
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



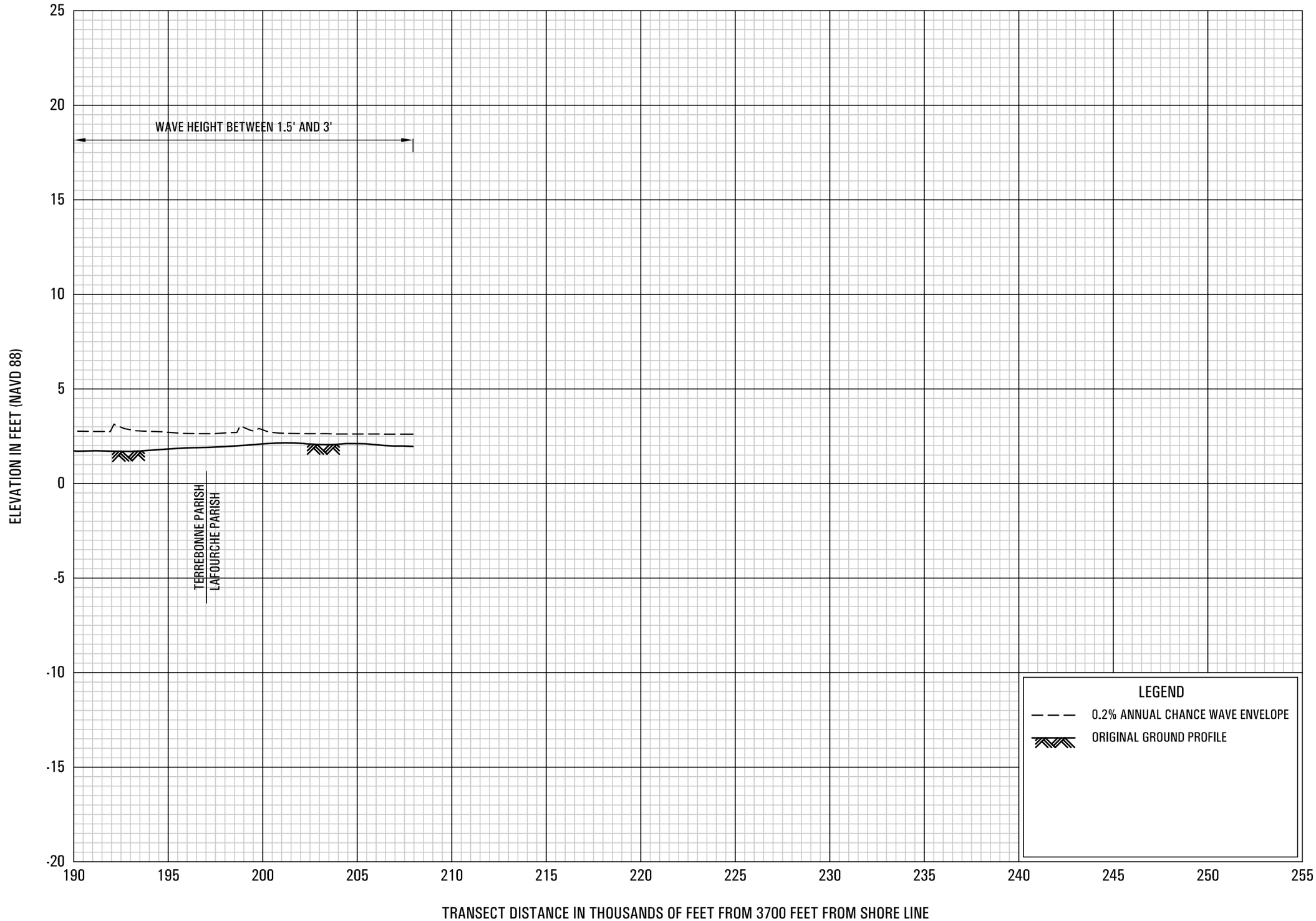
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



0.2% ANNUAL CHANCE WAVE ENVELOPE

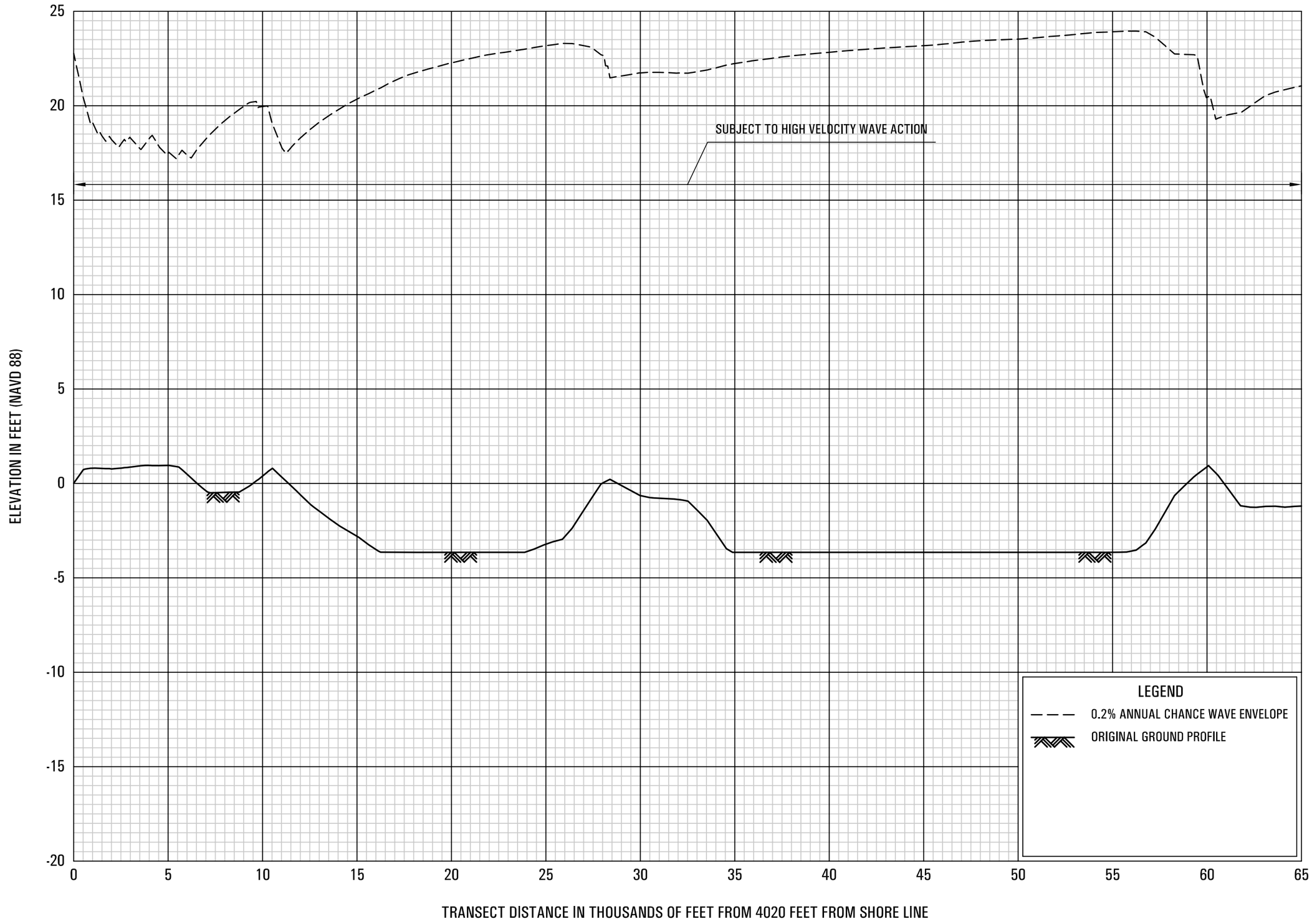
TRANSECT 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

66P



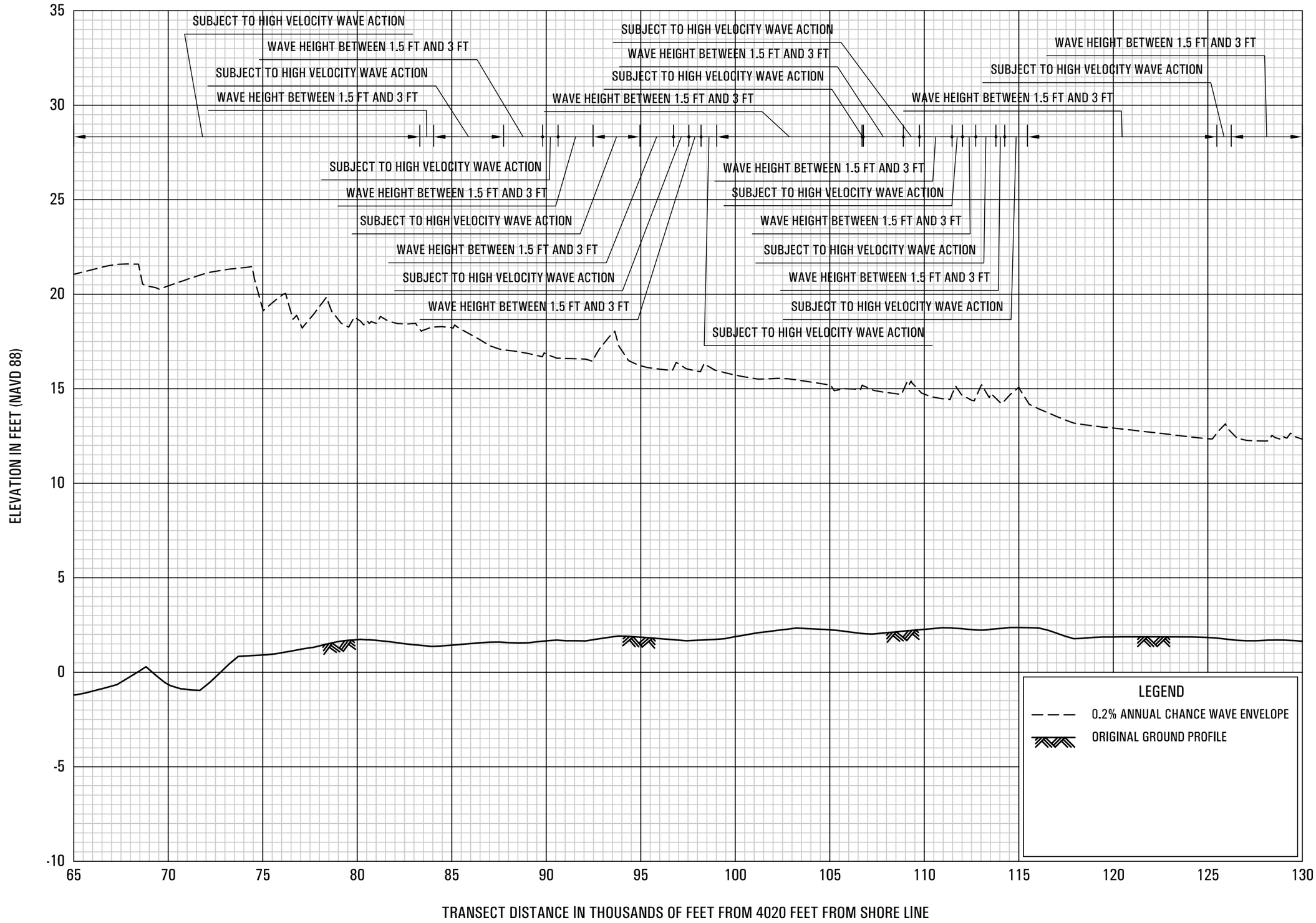
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 11

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



0.2% ANNUAL CHANCE WAVE ENVELOPE

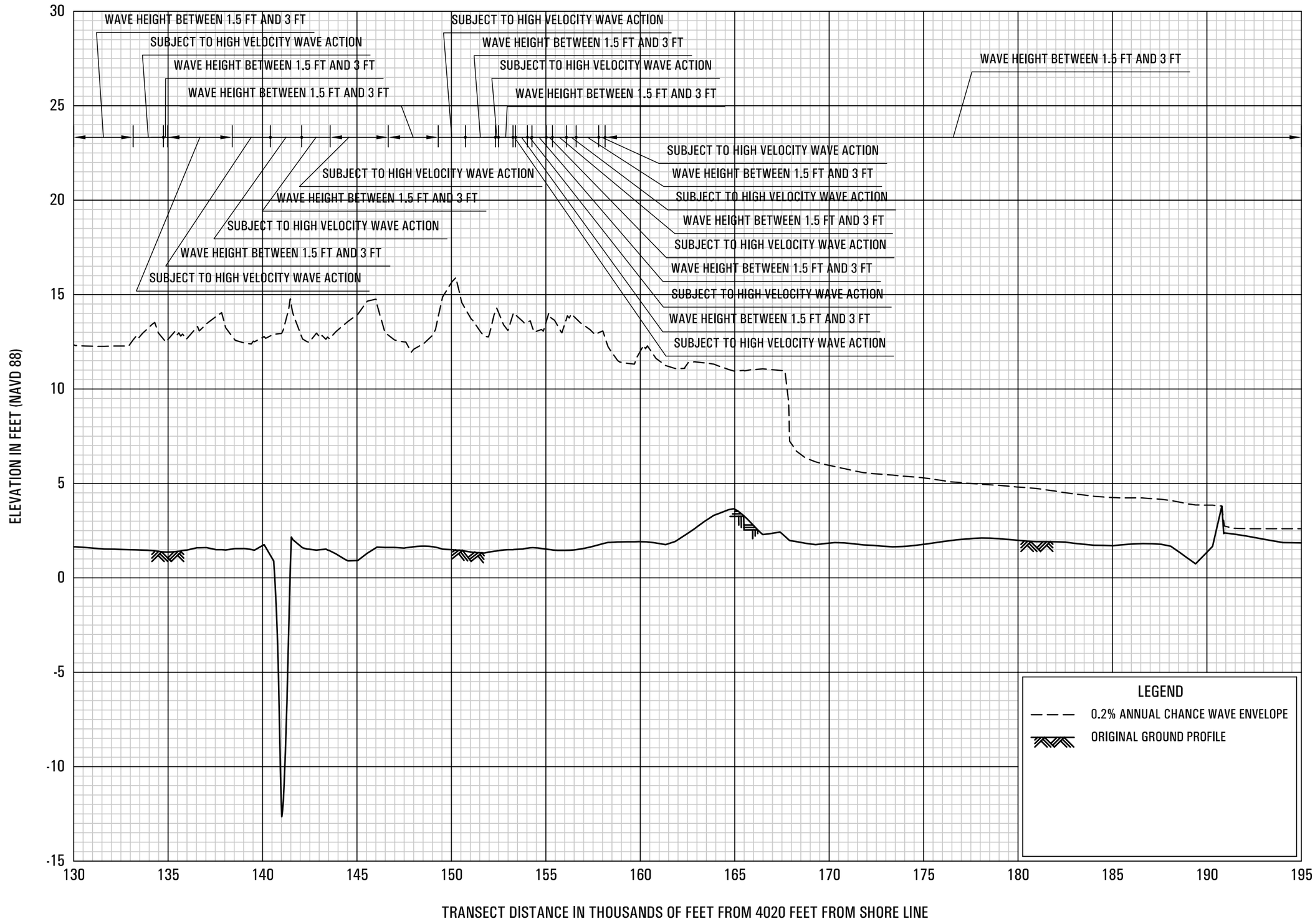
TRANSECT 11

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

68P



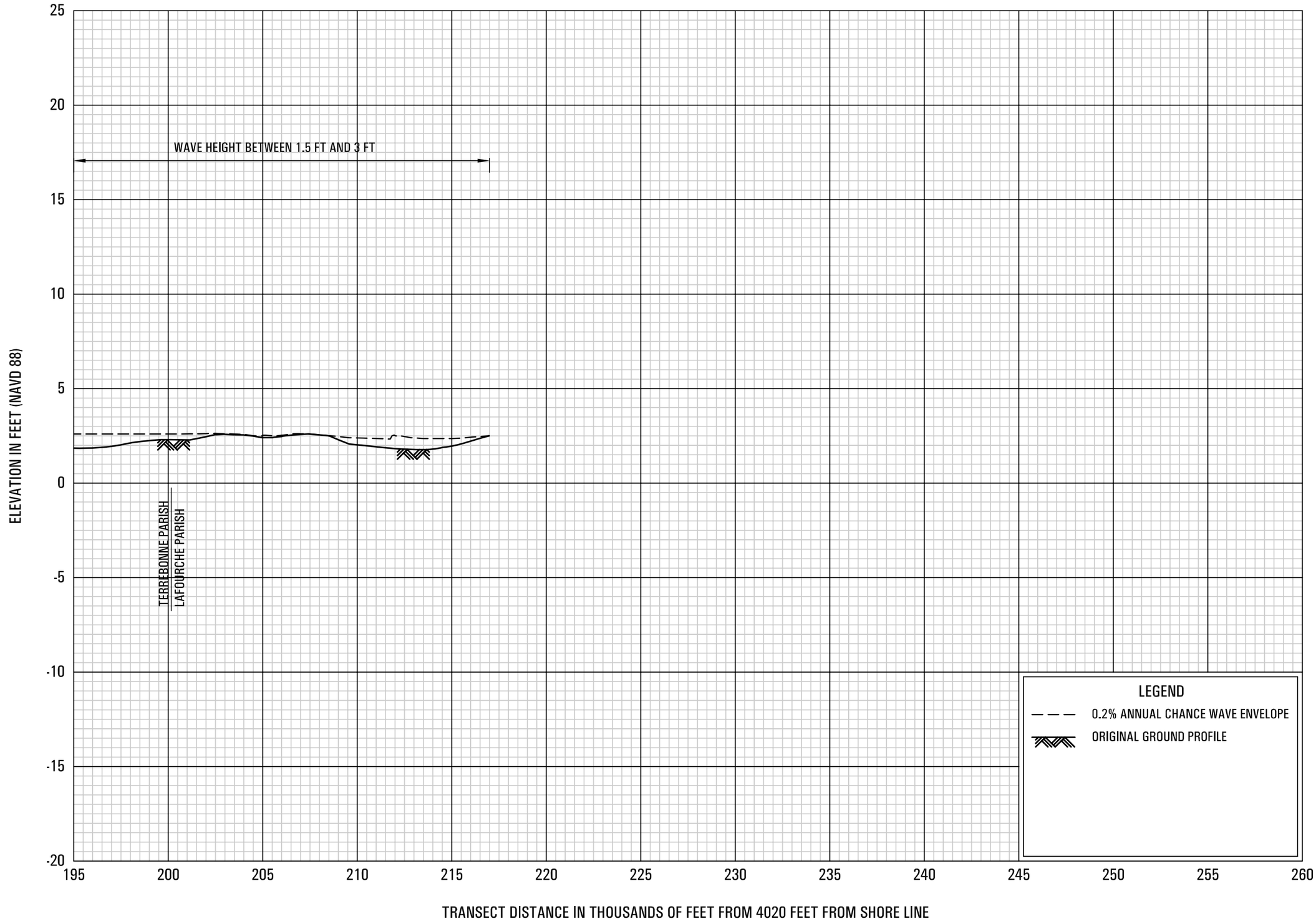
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 11

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



0.2% ANNUAL CHANCE WAVE ENVELOPE

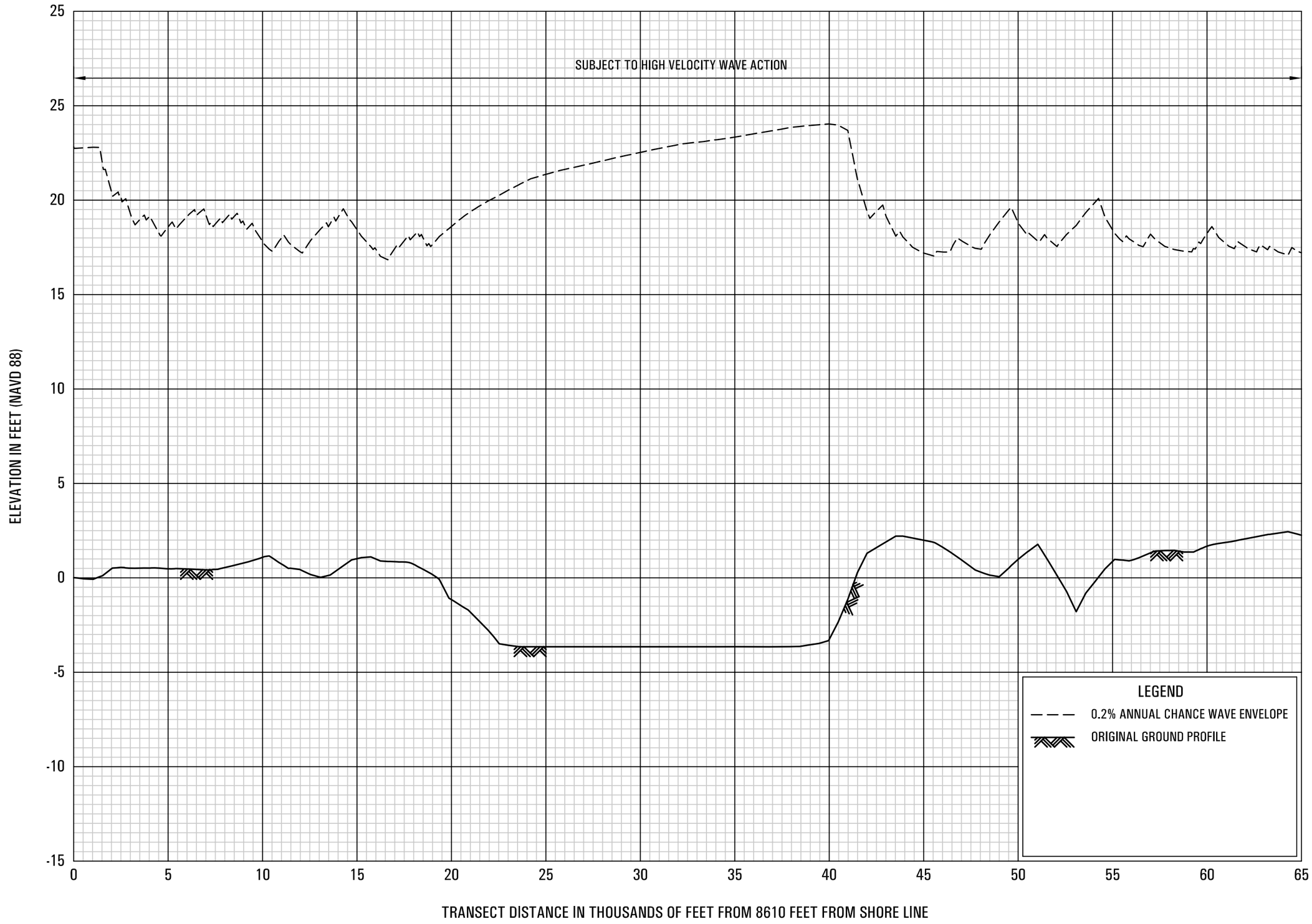
TRANSECT 11

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

70P



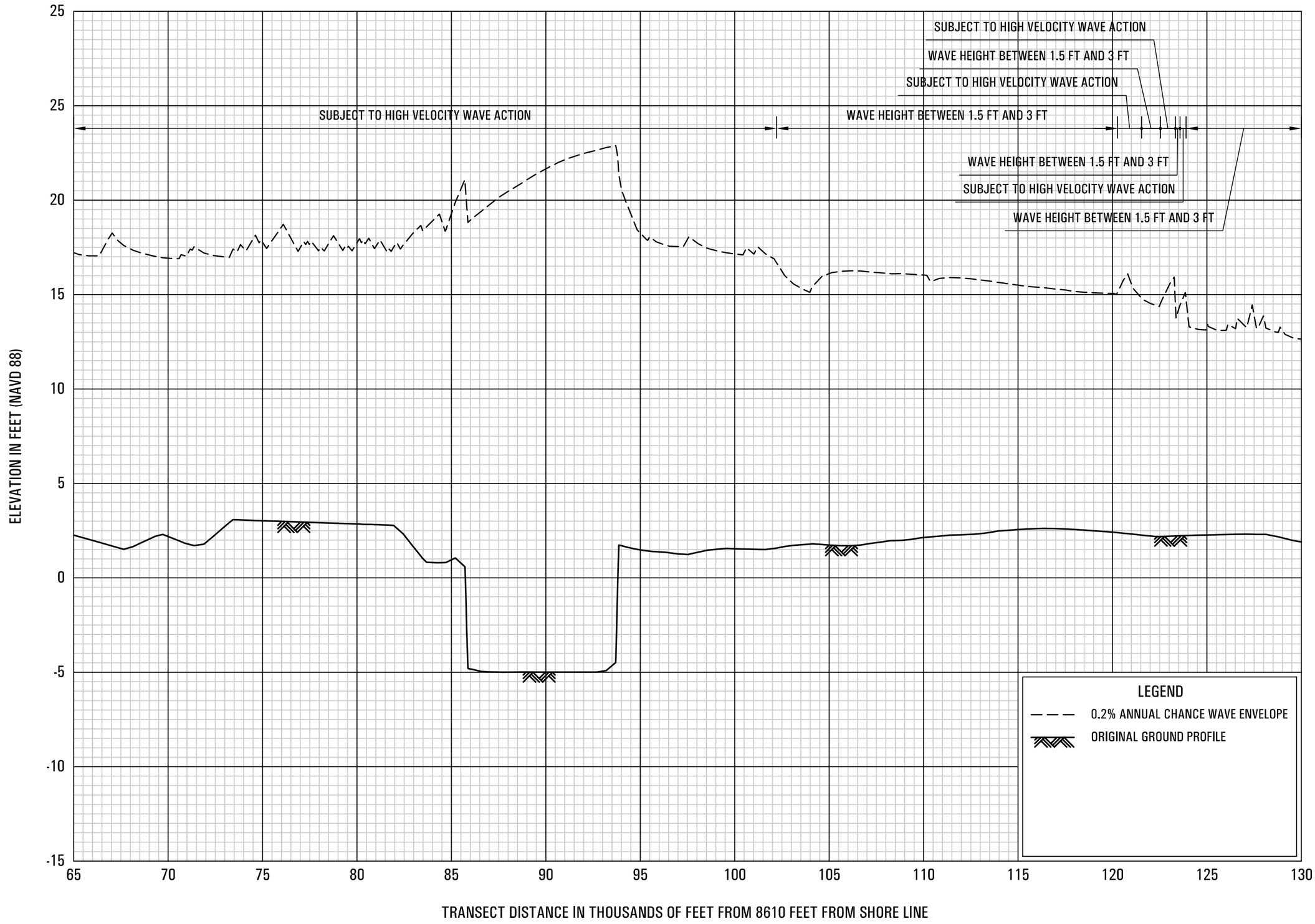
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



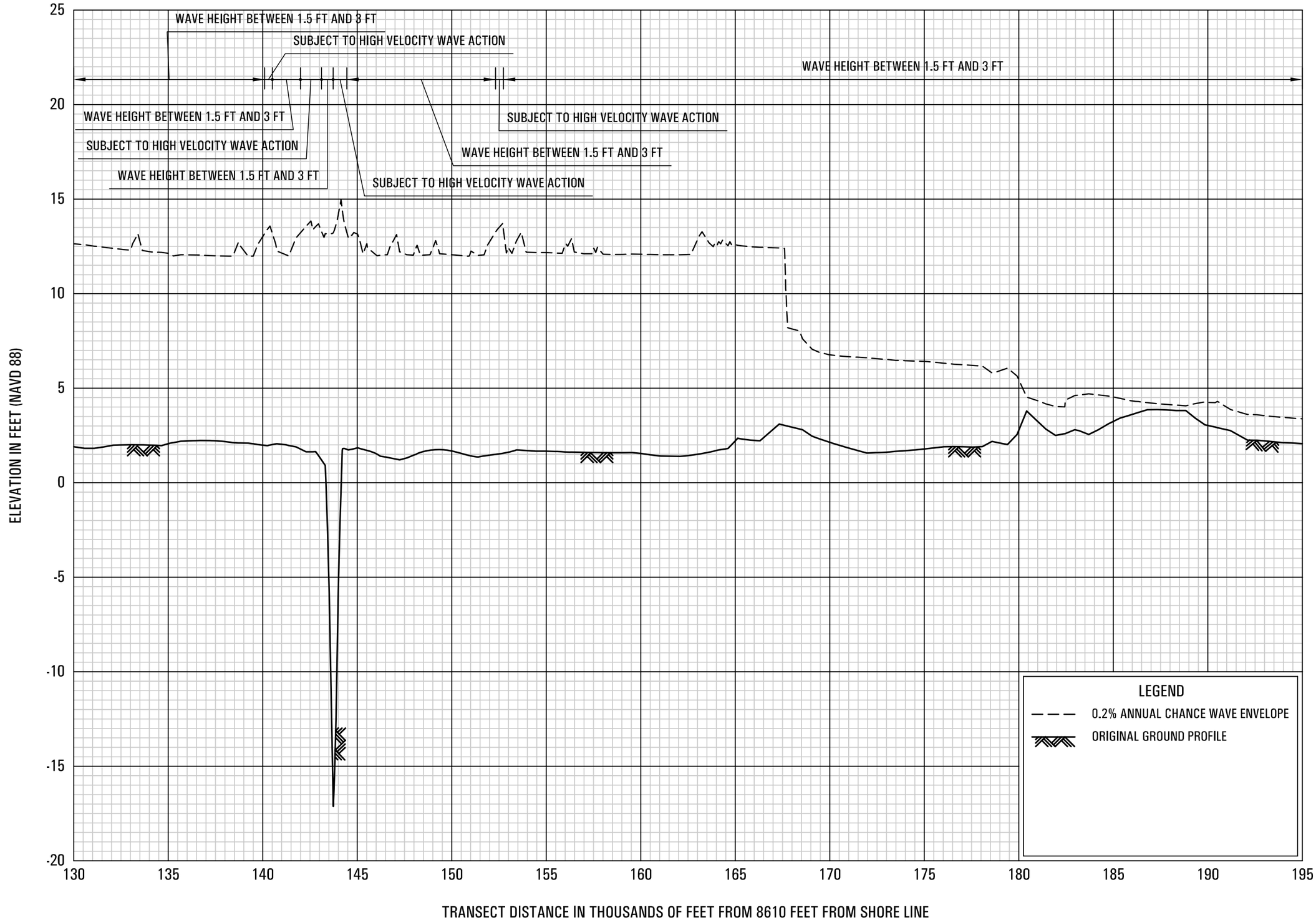
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



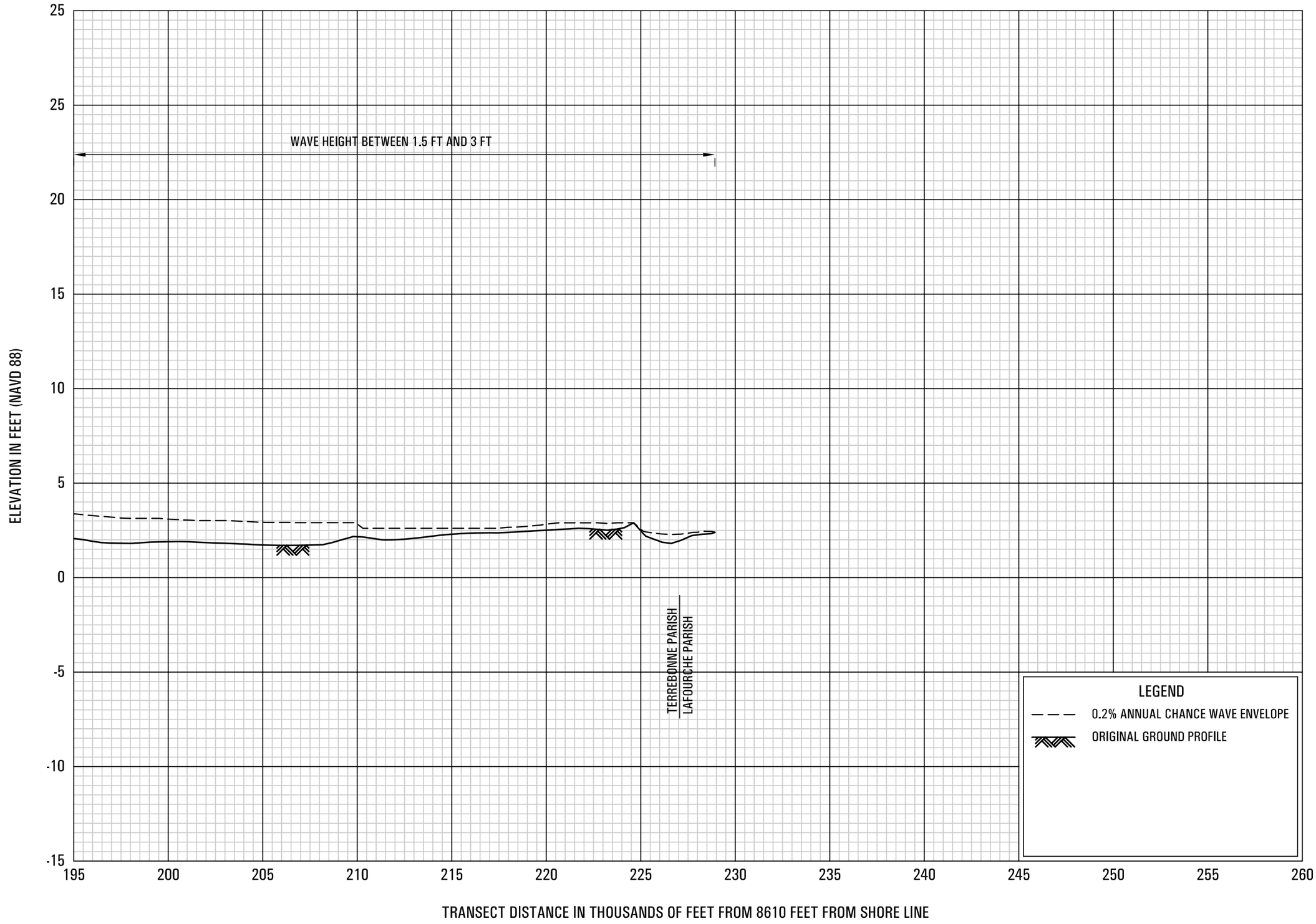
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



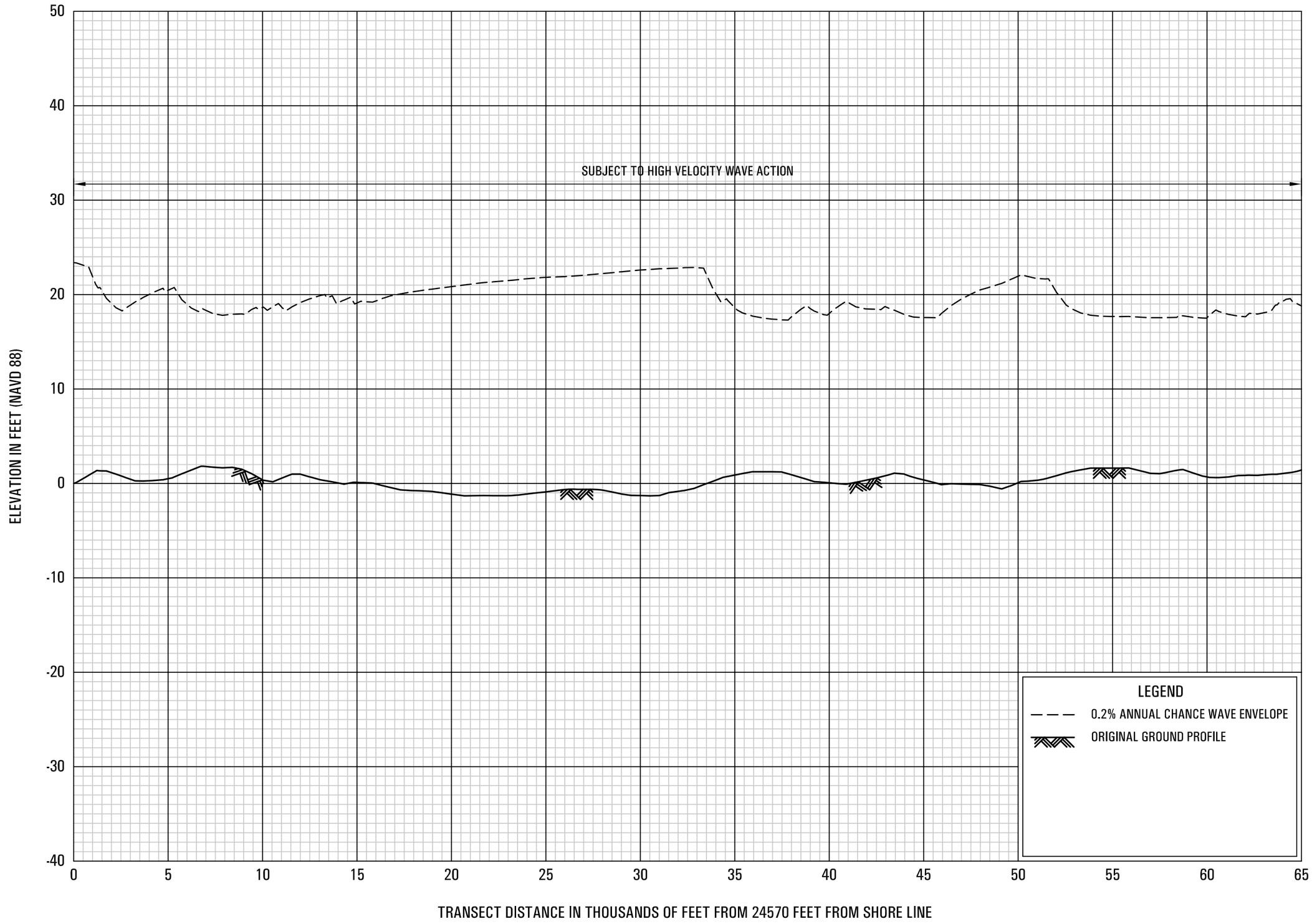
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



0.2% ANNUAL CHANCE WAVE ENVELOPE

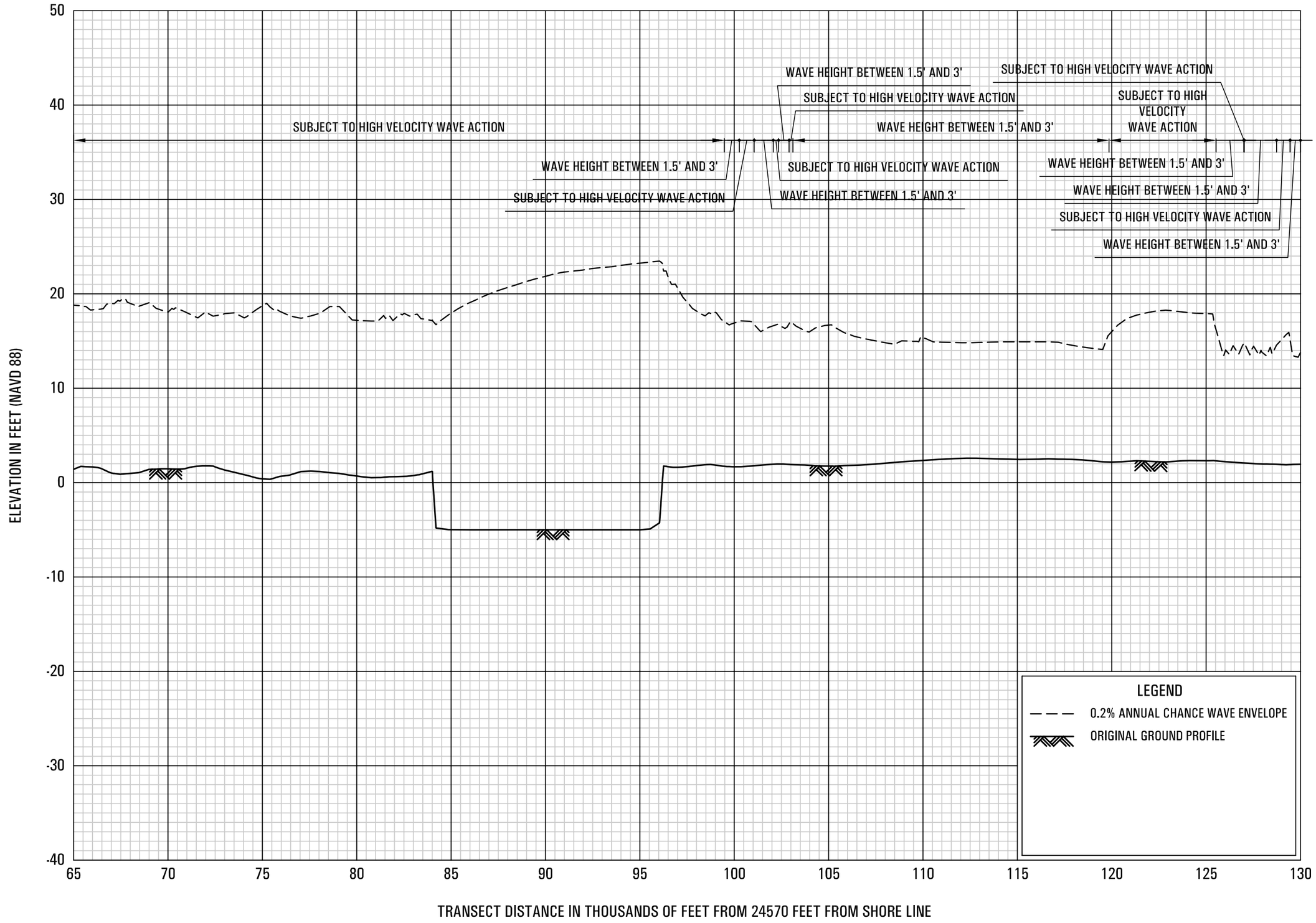
TRANSECT 13

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

75P



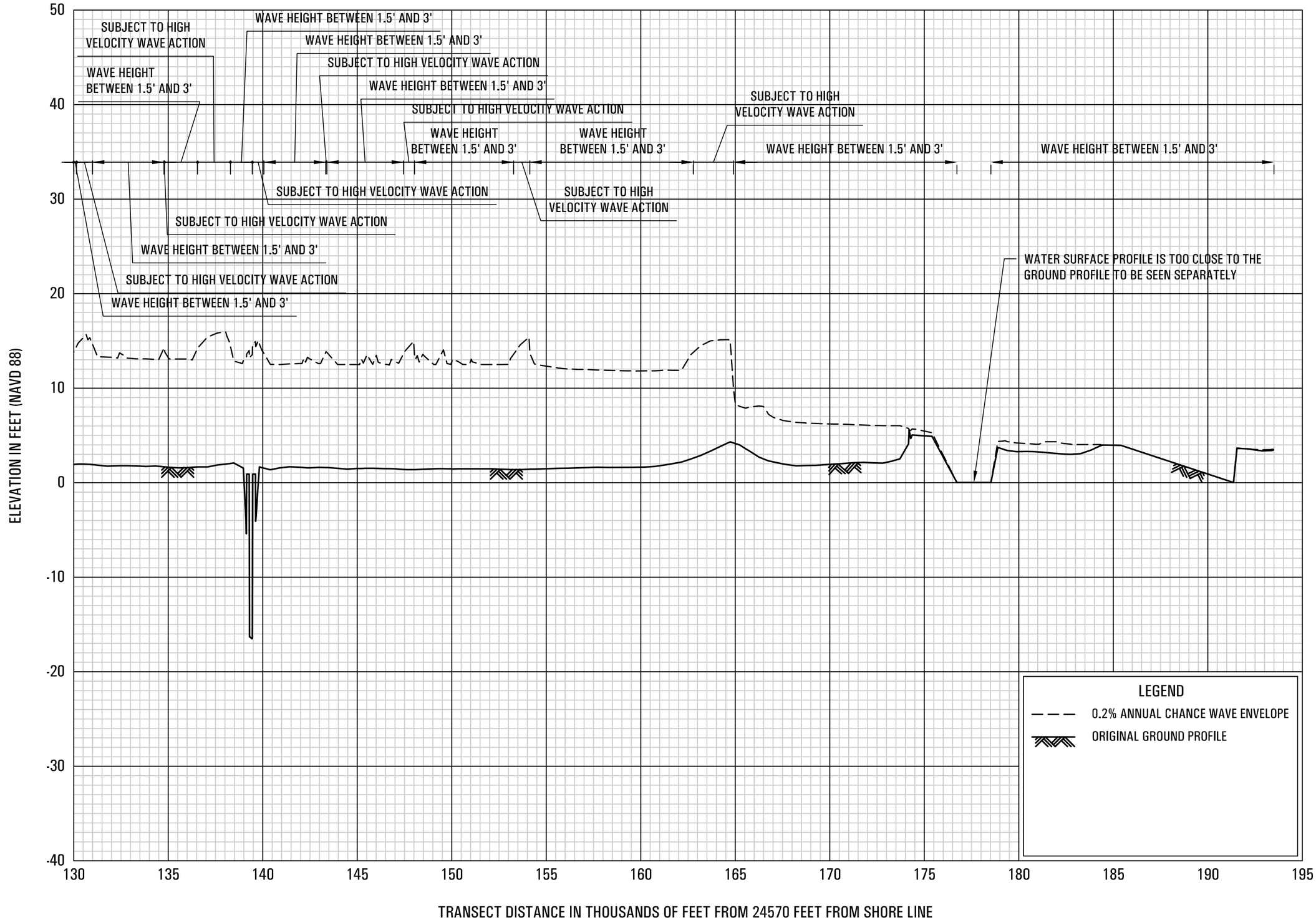
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 13

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



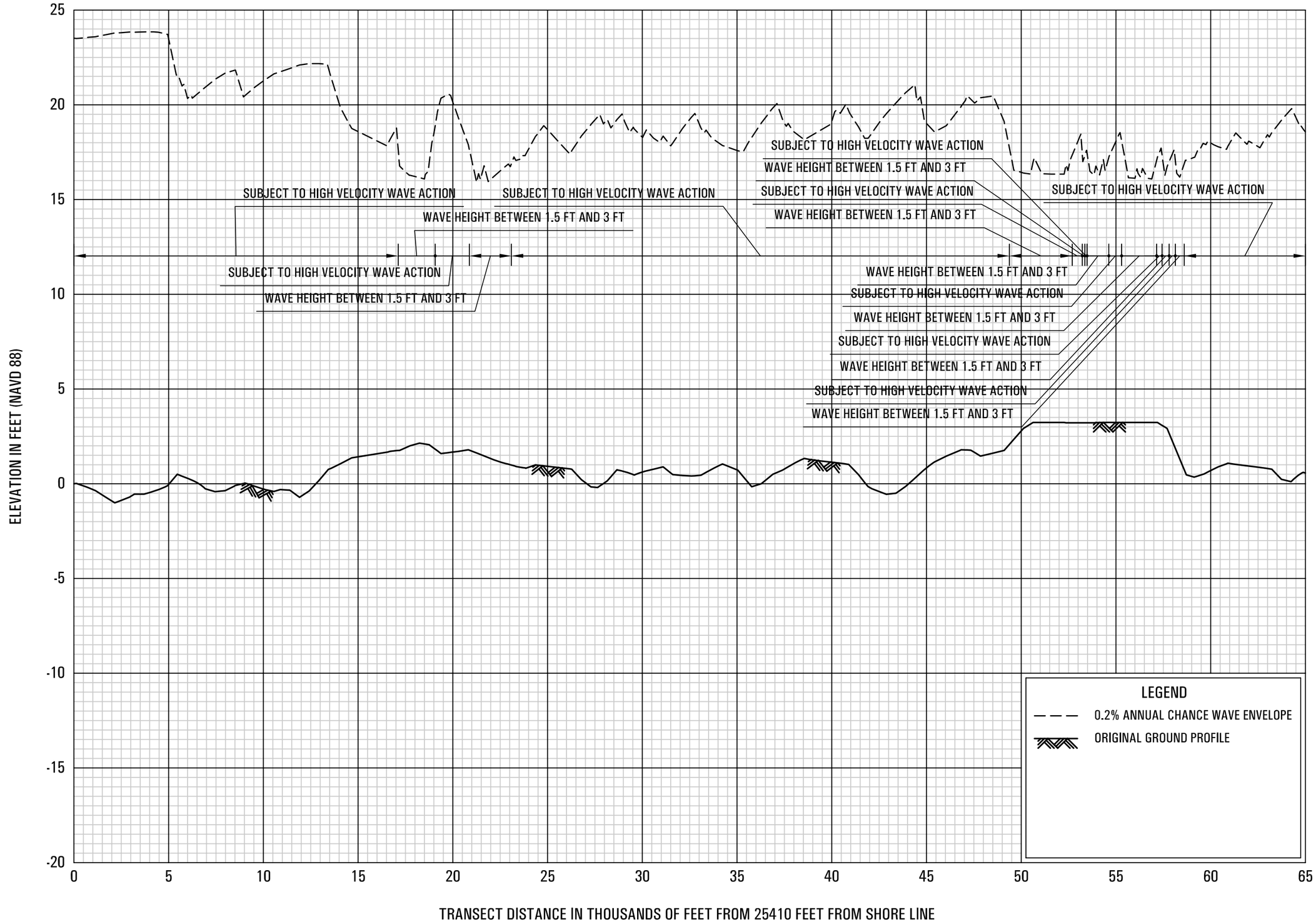
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 13

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



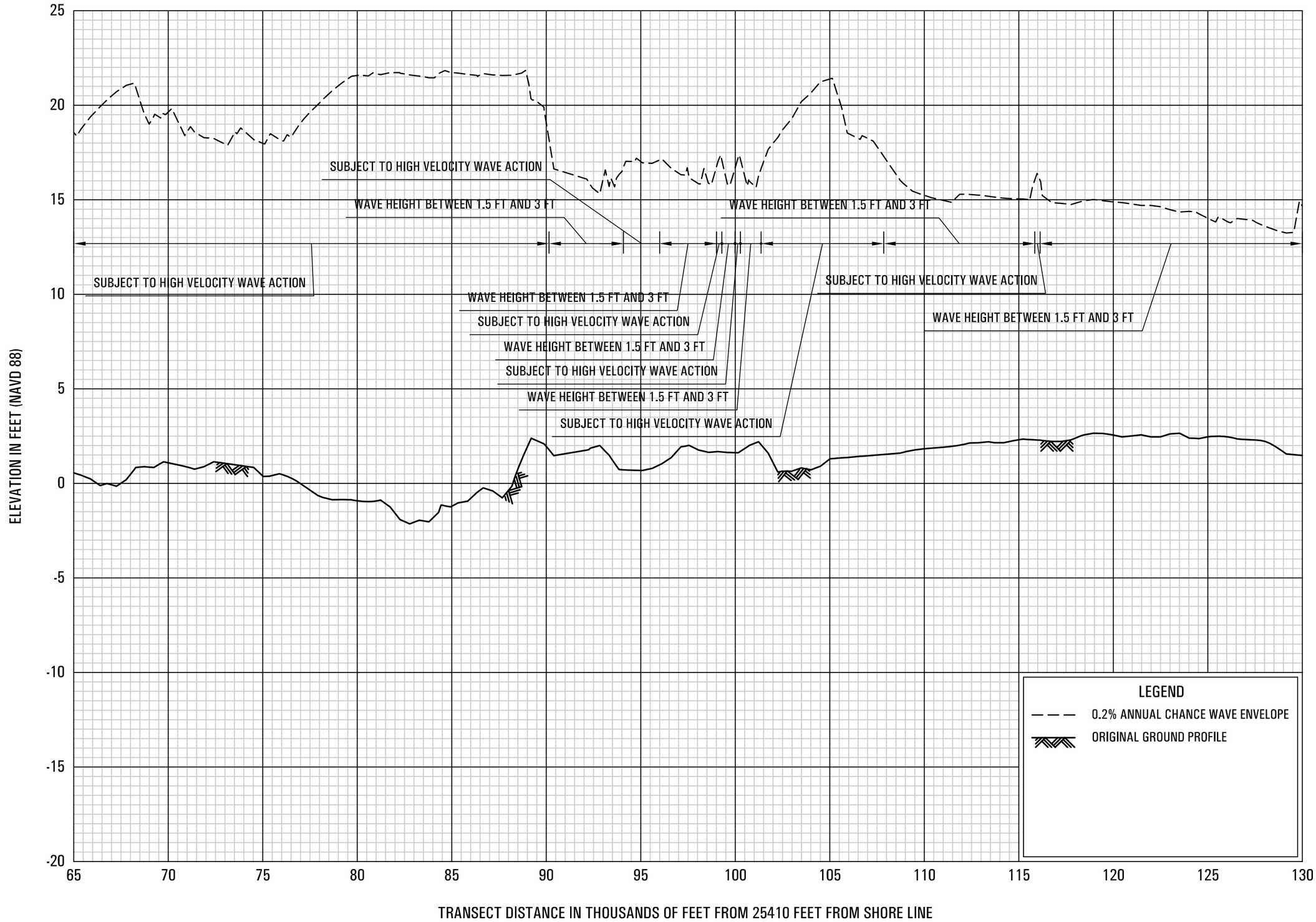
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



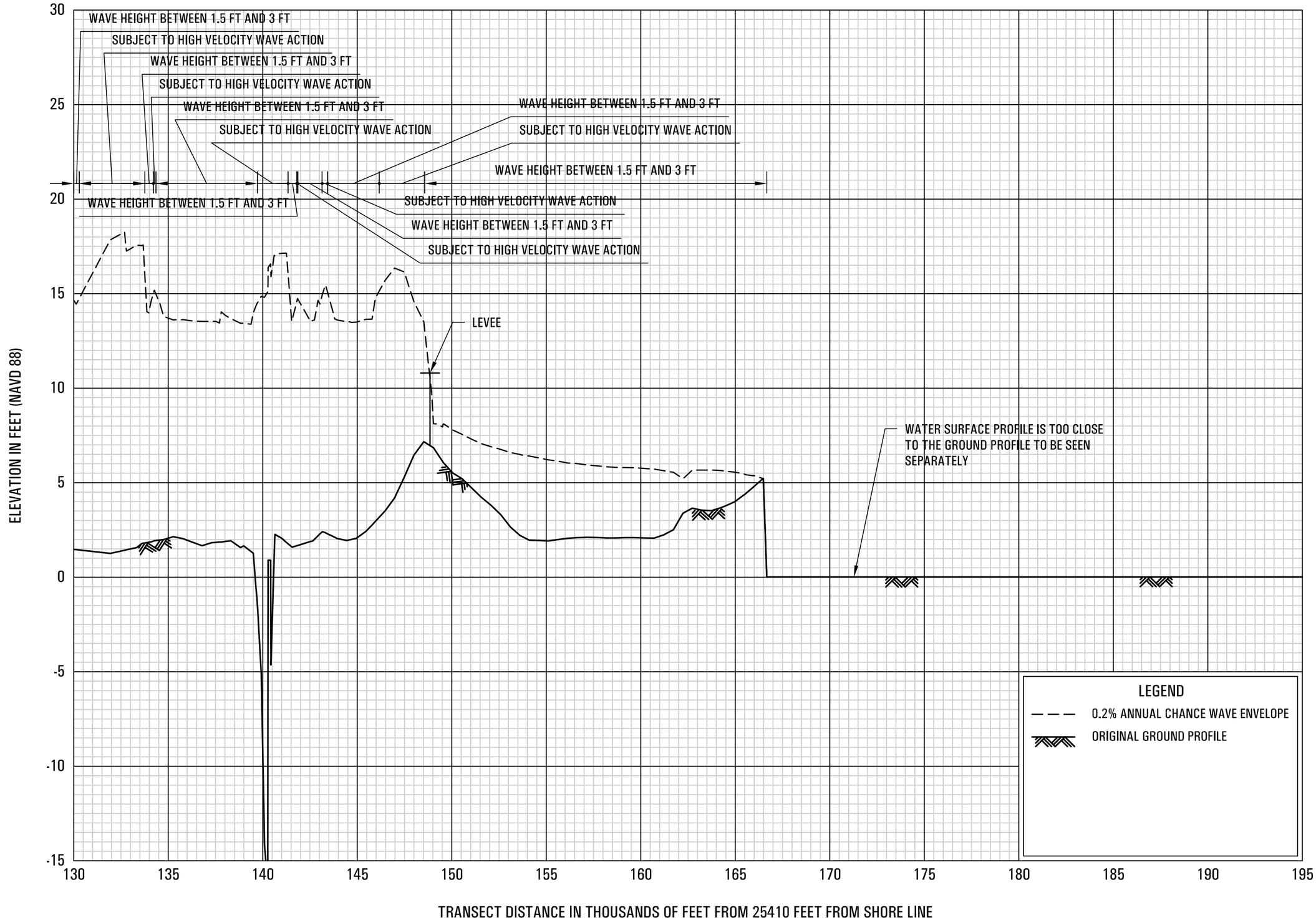
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



0.2% ANNUAL CHANCE WAVE ENVELOPE

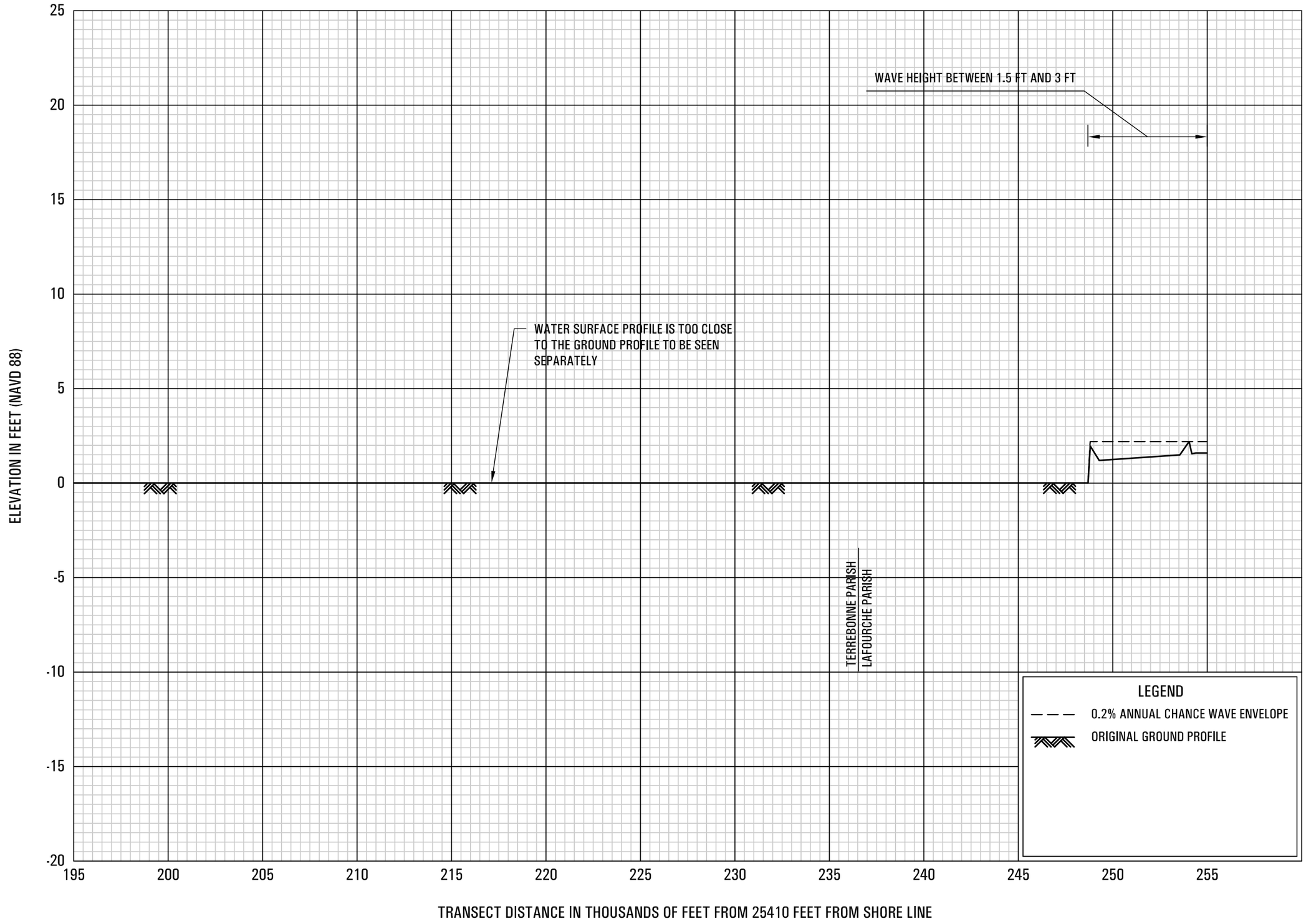
TRANSECT 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

80P



0.2% ANNUAL CHANCE WAVE ENVELOPE

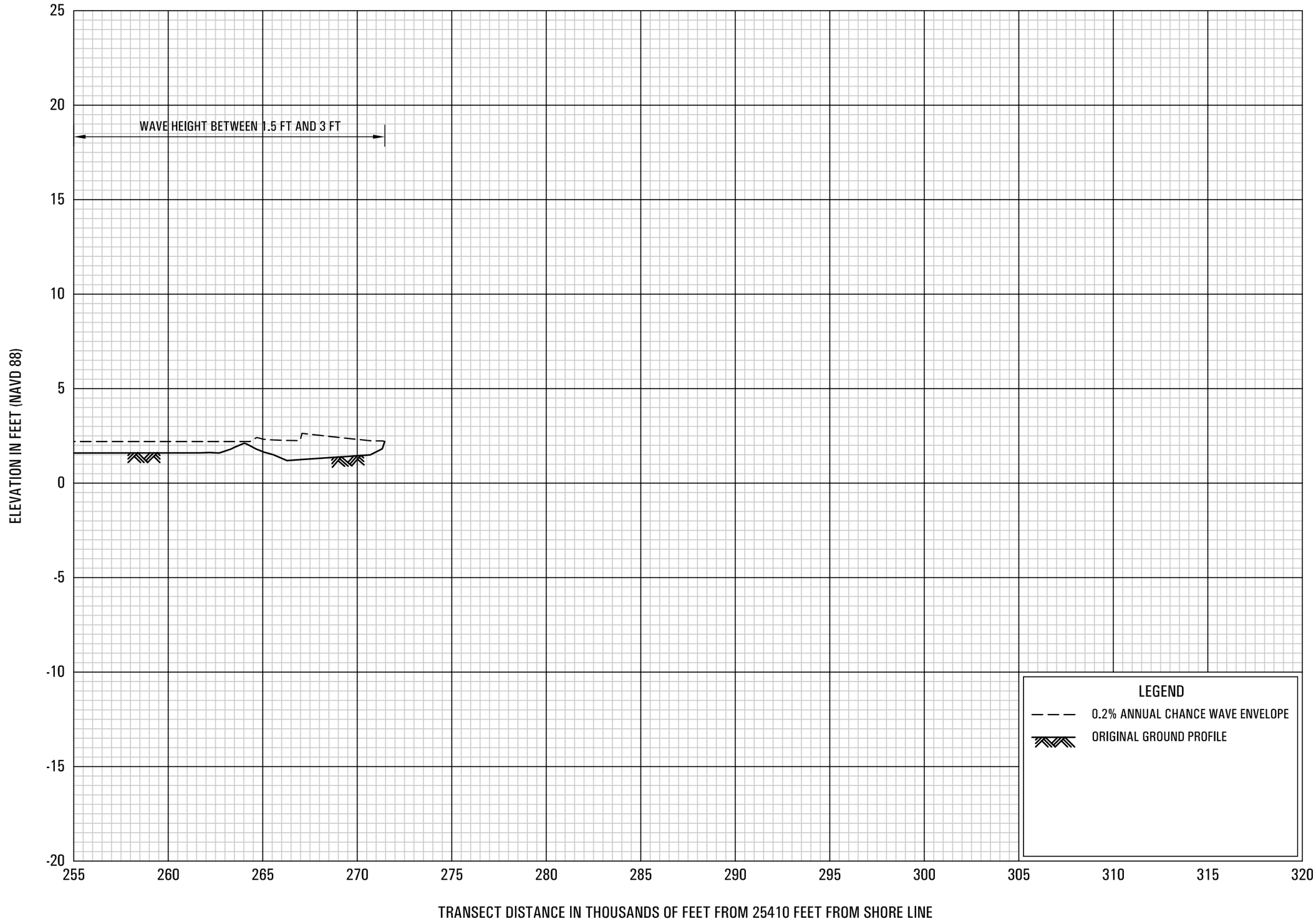
TRANSECT 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

81P



0.2% ANNUAL CHANCE WAVE ENVELOPE

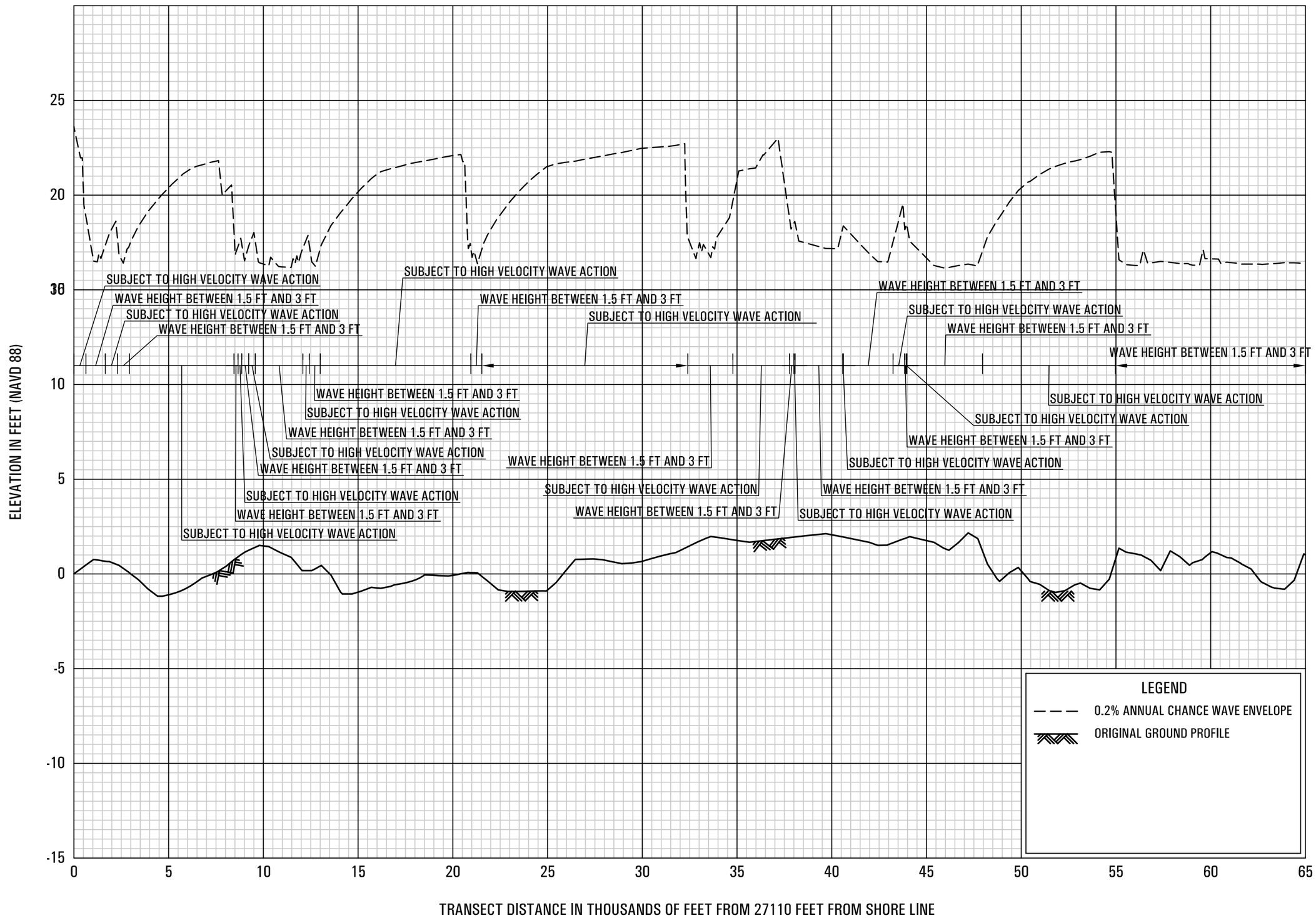
TRANSECT 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

82P



0.2% ANNUAL CHANCE WAVE ENVELOPE

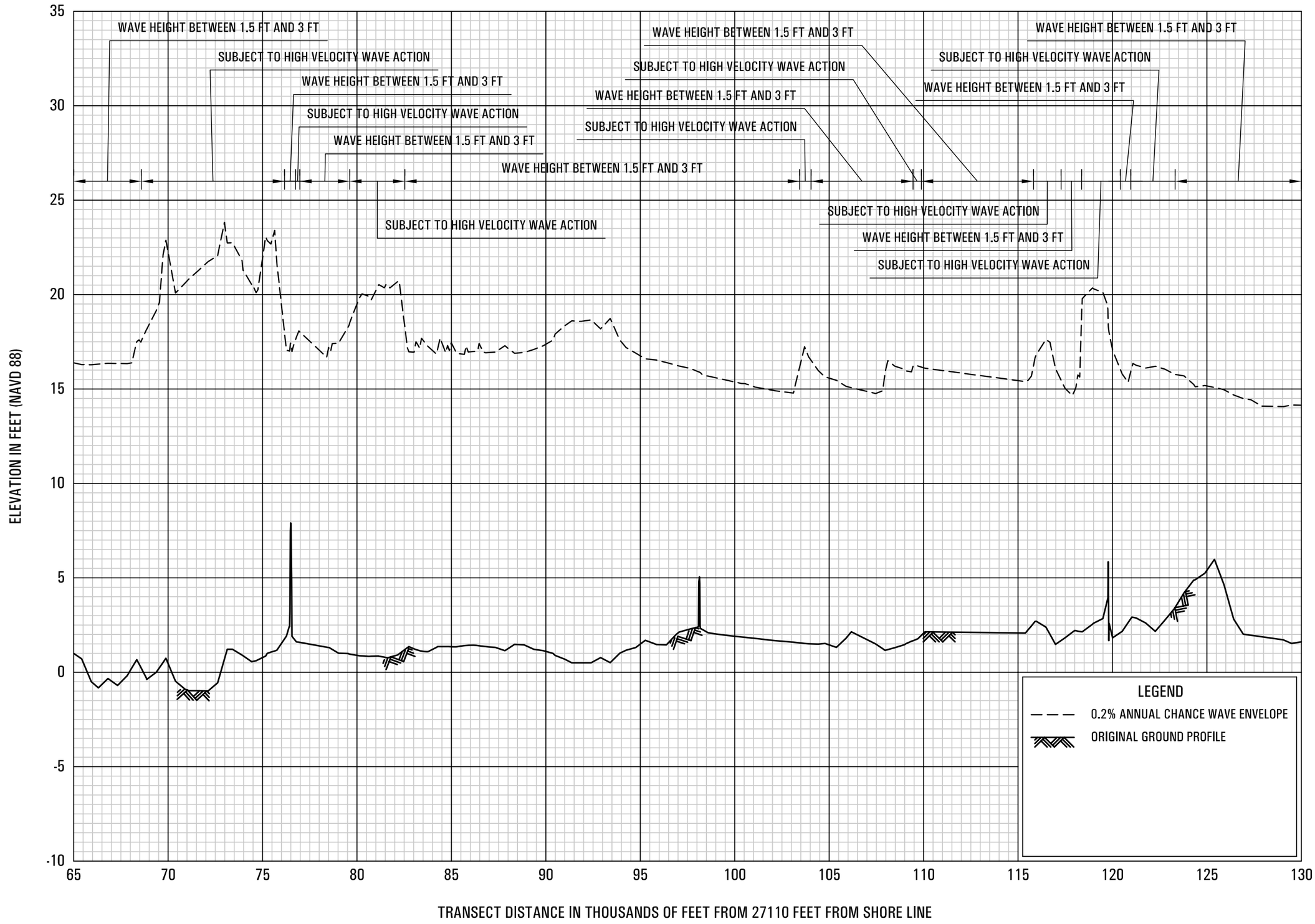
TRANSECT 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

83P



0.2% ANNUAL CHANCE WAVE ENVELOPE

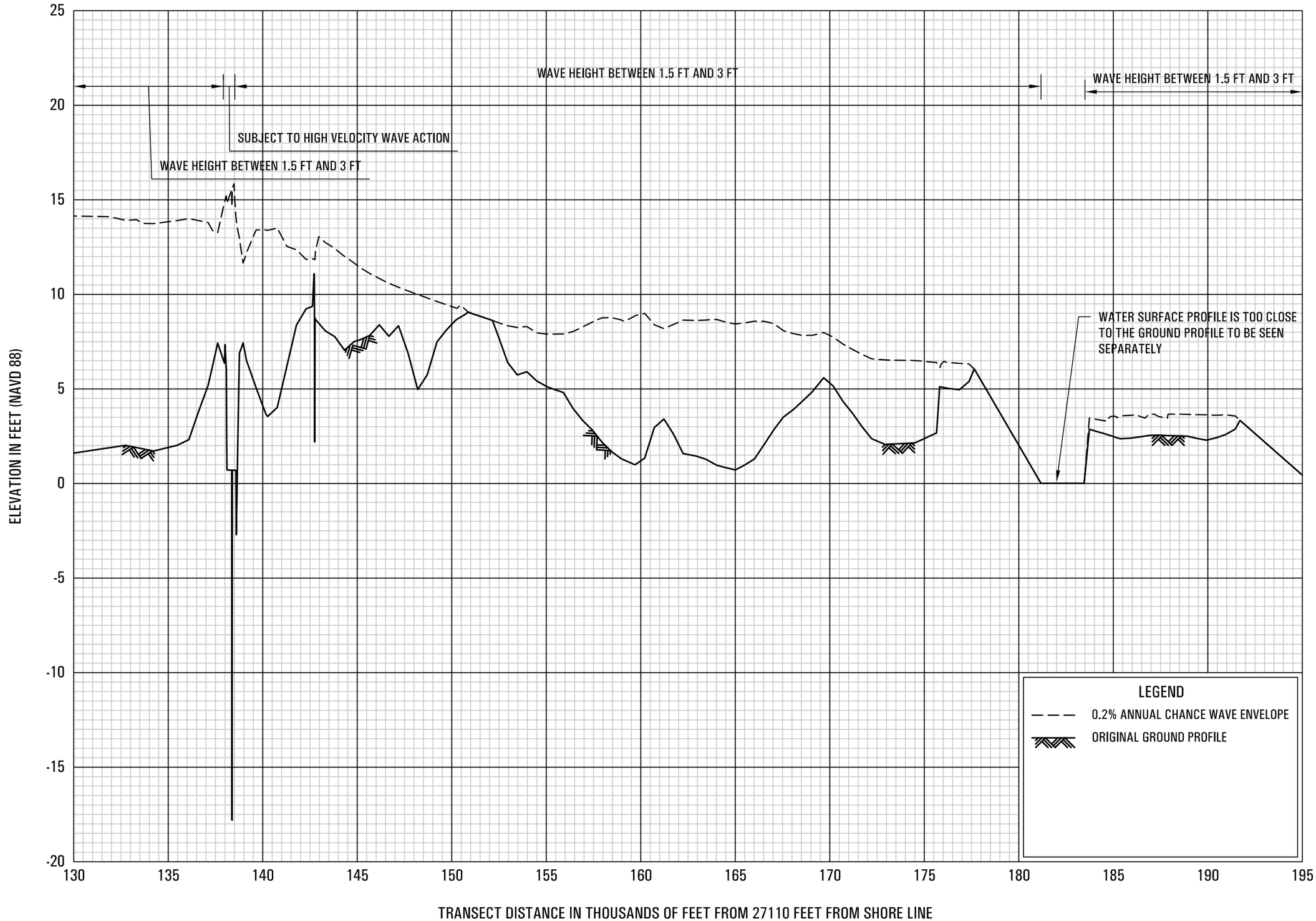
TRANSECT 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

84P



0.2% ANNUAL CHANCE WAVE ENVELOPE

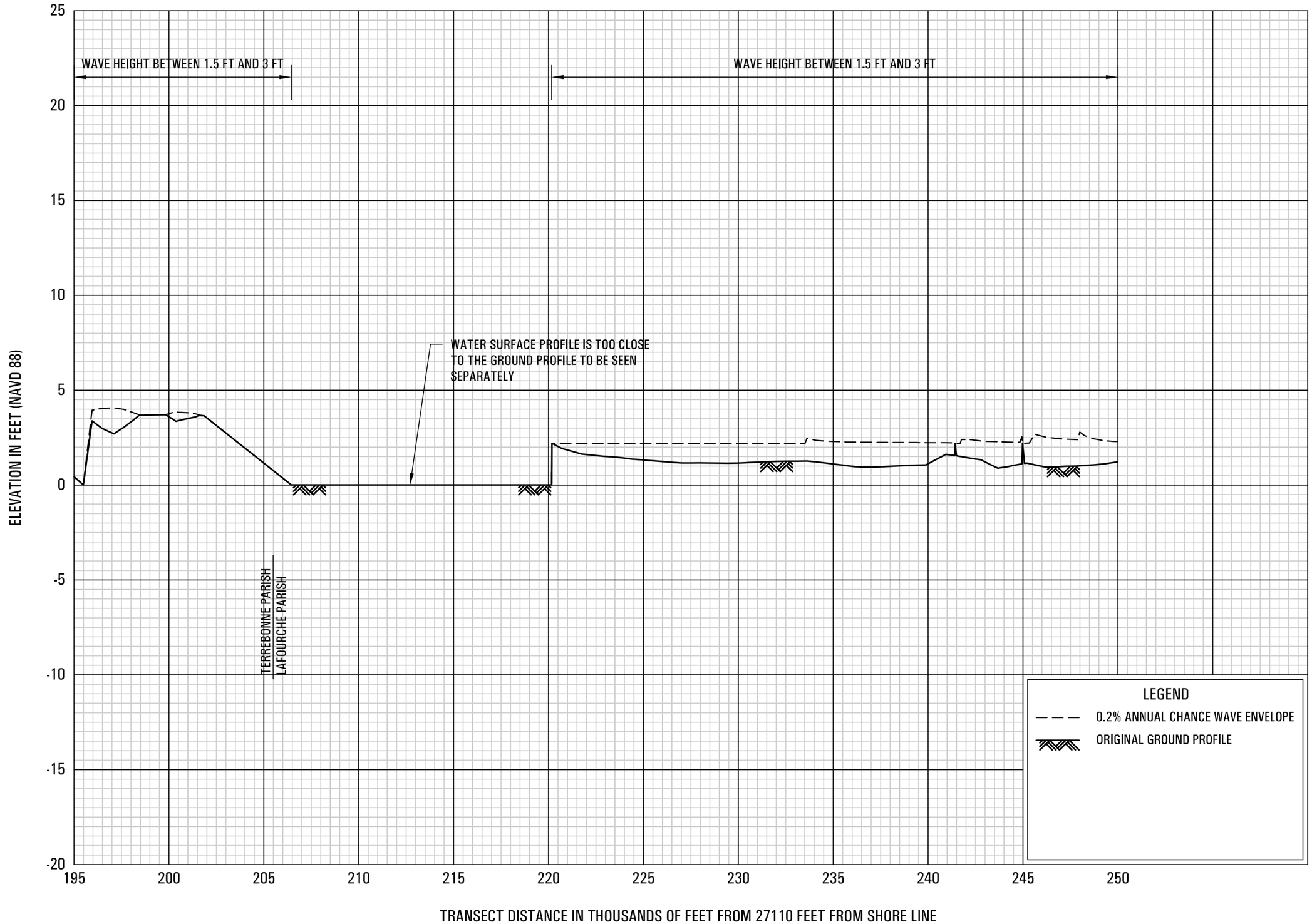
TRANSECT 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

85P



0.2% ANNUAL CHANCE WAVE ENVELOPE

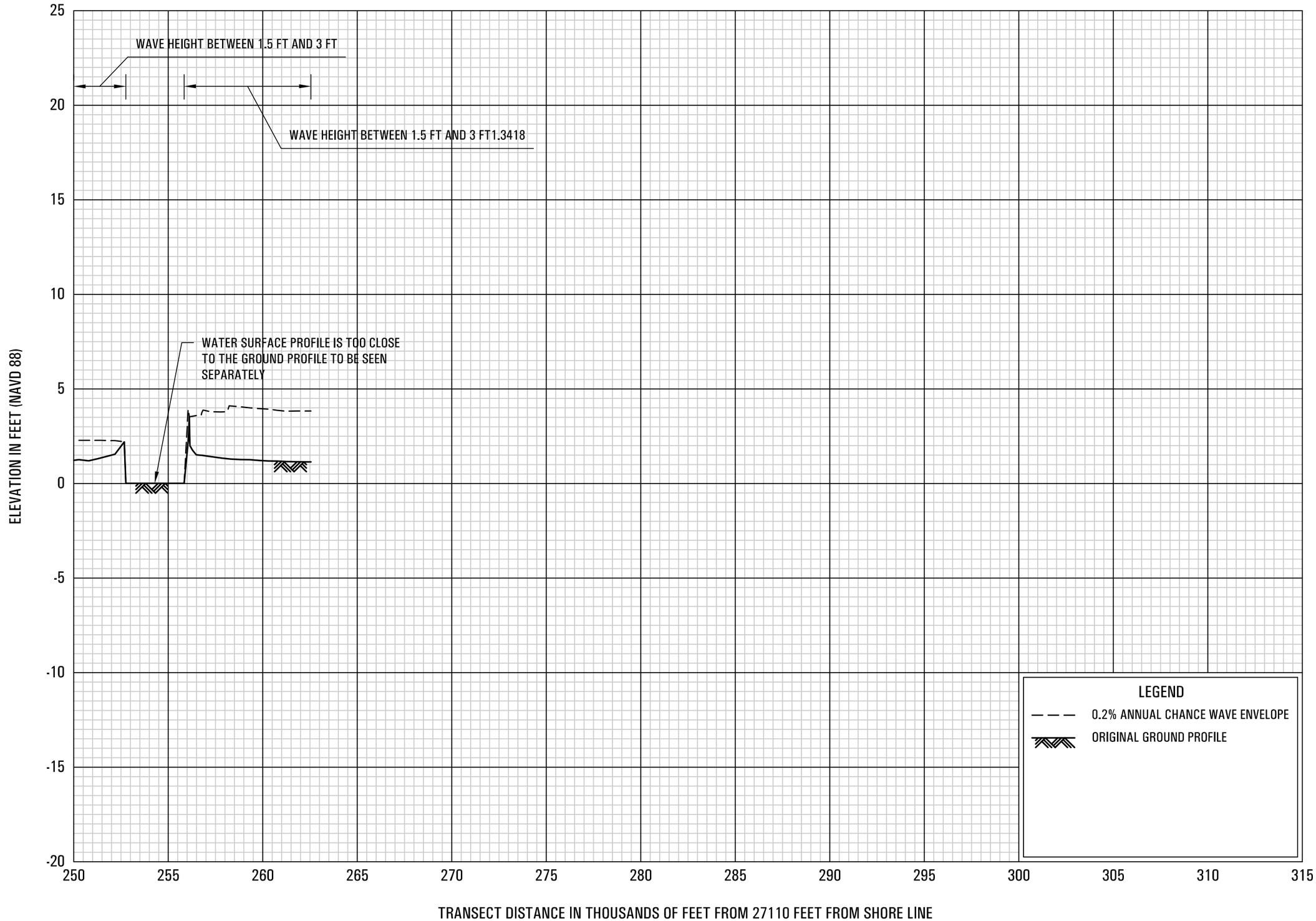
TRANSECT 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

86P



0.2% ANNUAL CHANCE WAVE ENVELOPE

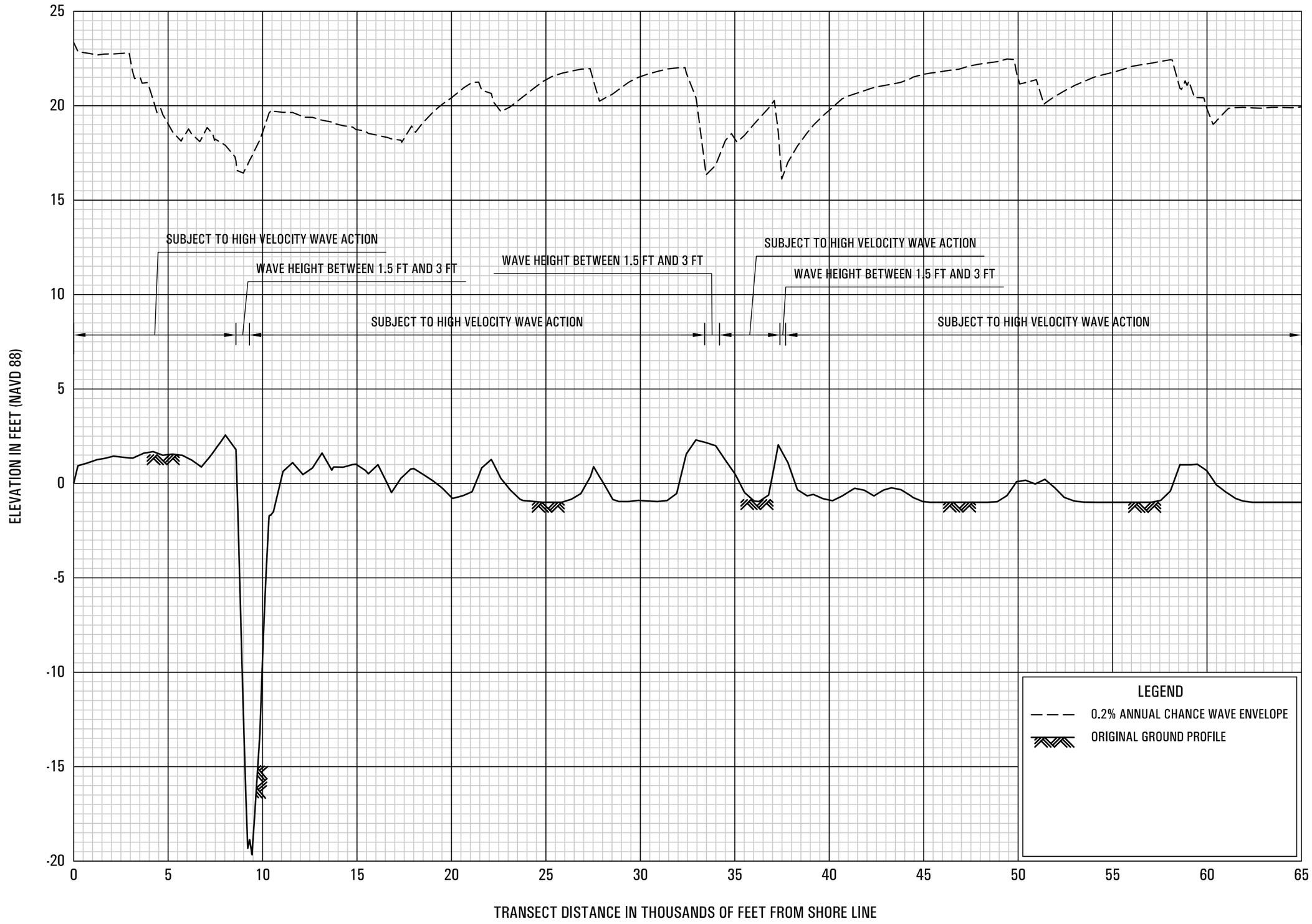
TRANSECT 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

87P



0.2% ANNUAL CHANCE WAVE ENVELOPE

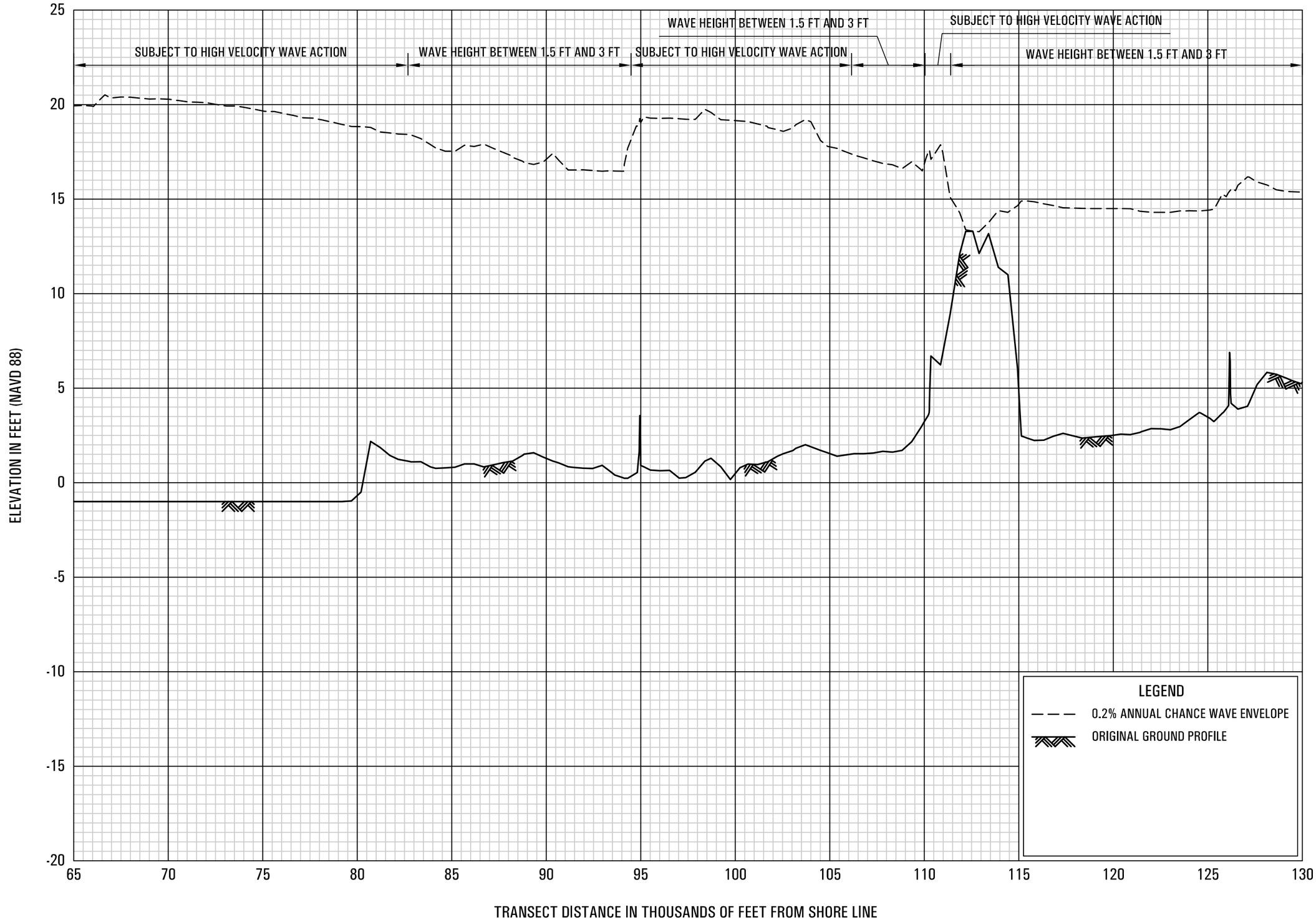
TRANSECT 16

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

88P



0.2% ANNUAL CHANCE WAVE ENVELOPE

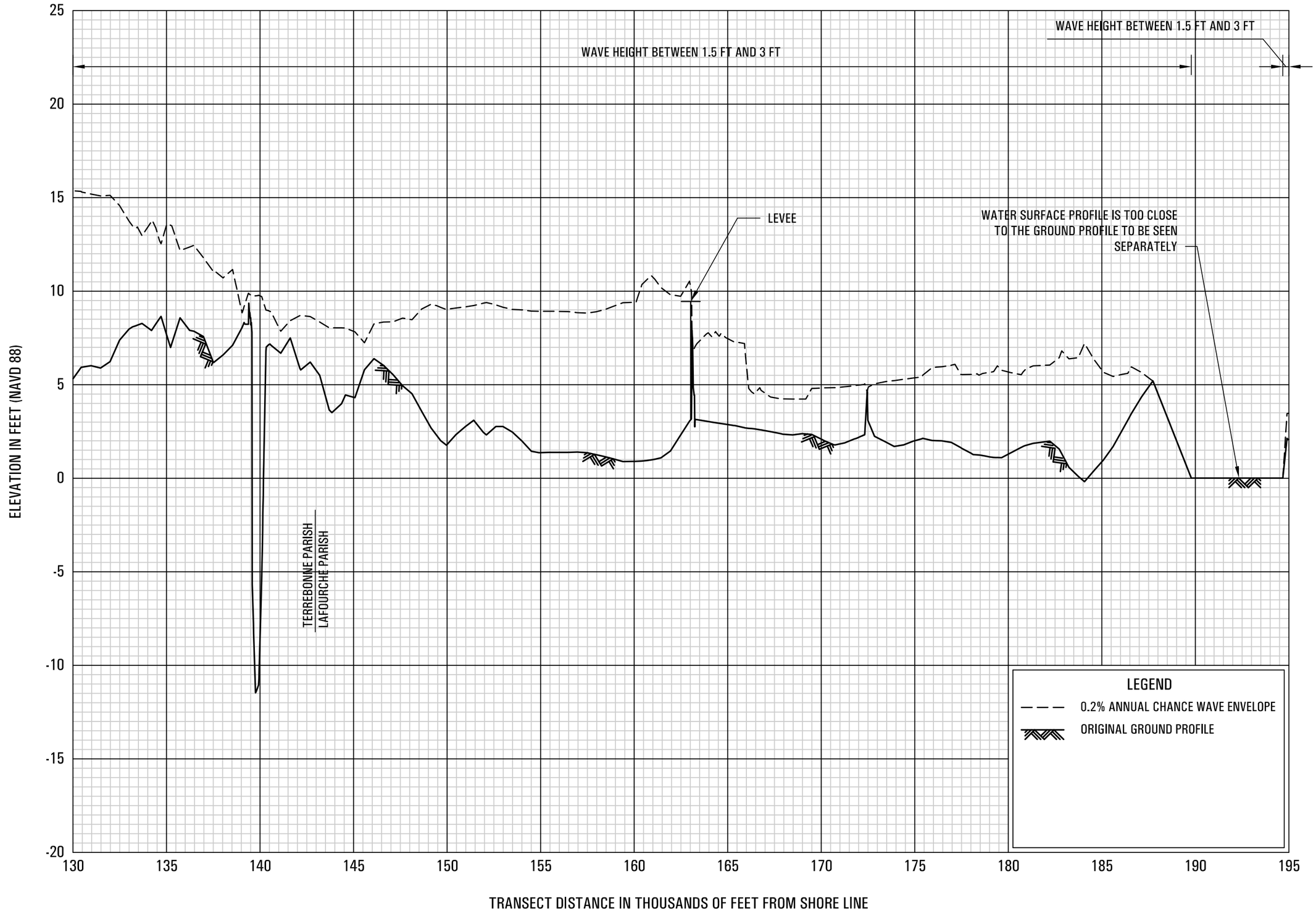
TRANSECT 16

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

89P



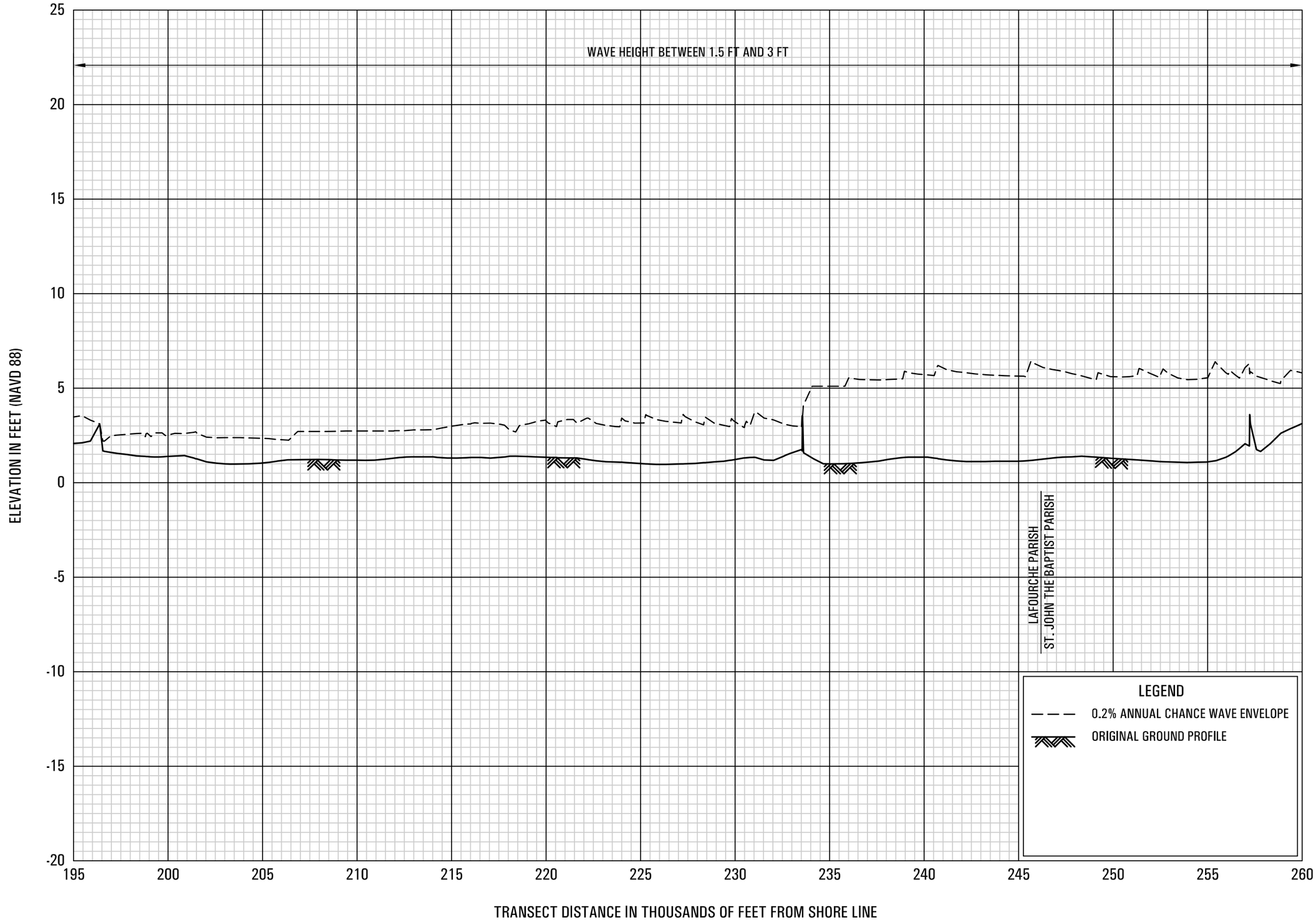
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 16

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



0.2% ANNUAL CHANCE WAVE ENVELOPE

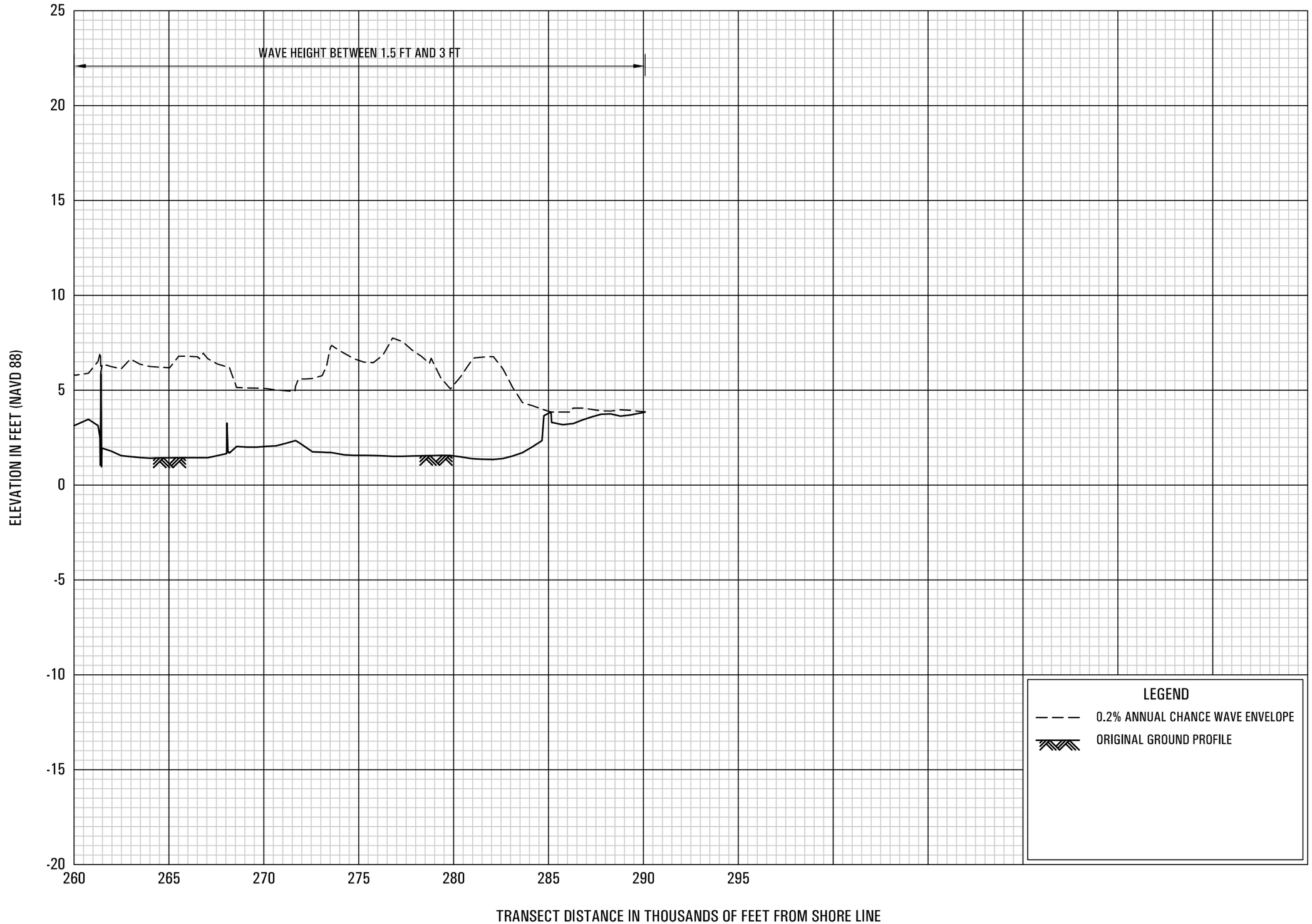
TRANSECT 16

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

91P



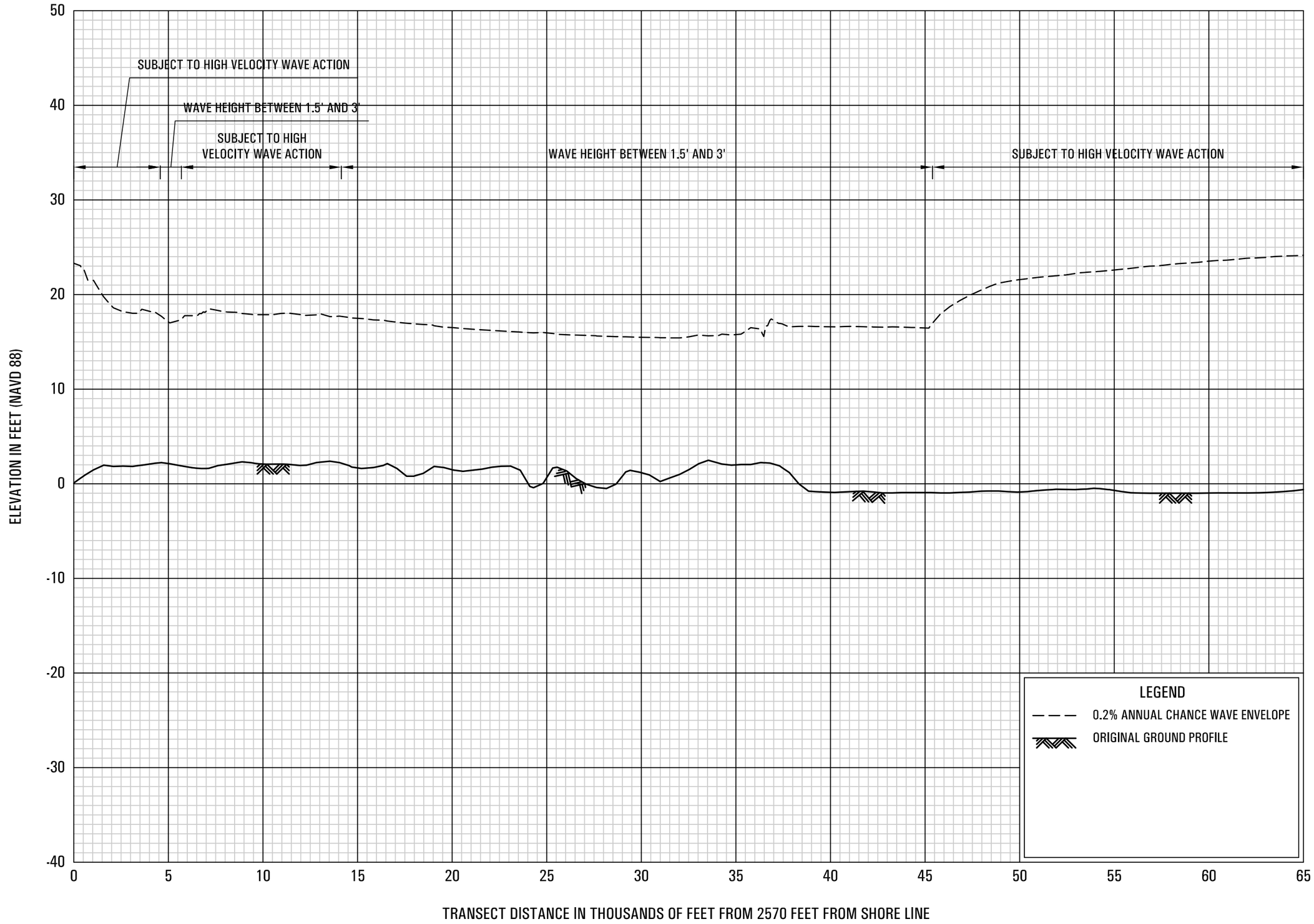
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 16

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



0.2% ANNUAL CHANCE WAVE ENVELOPE

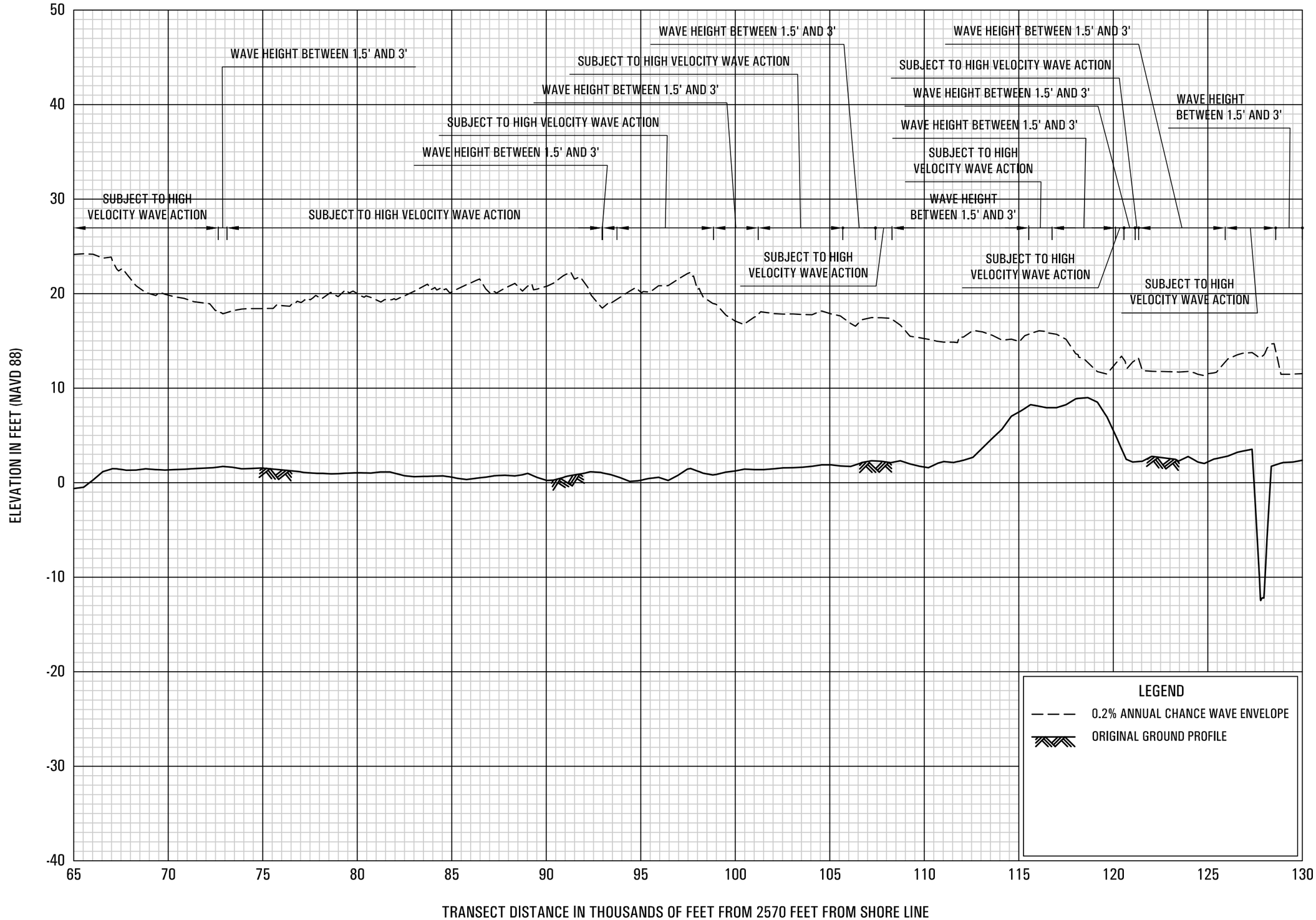
TRANSECT 17

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

93P



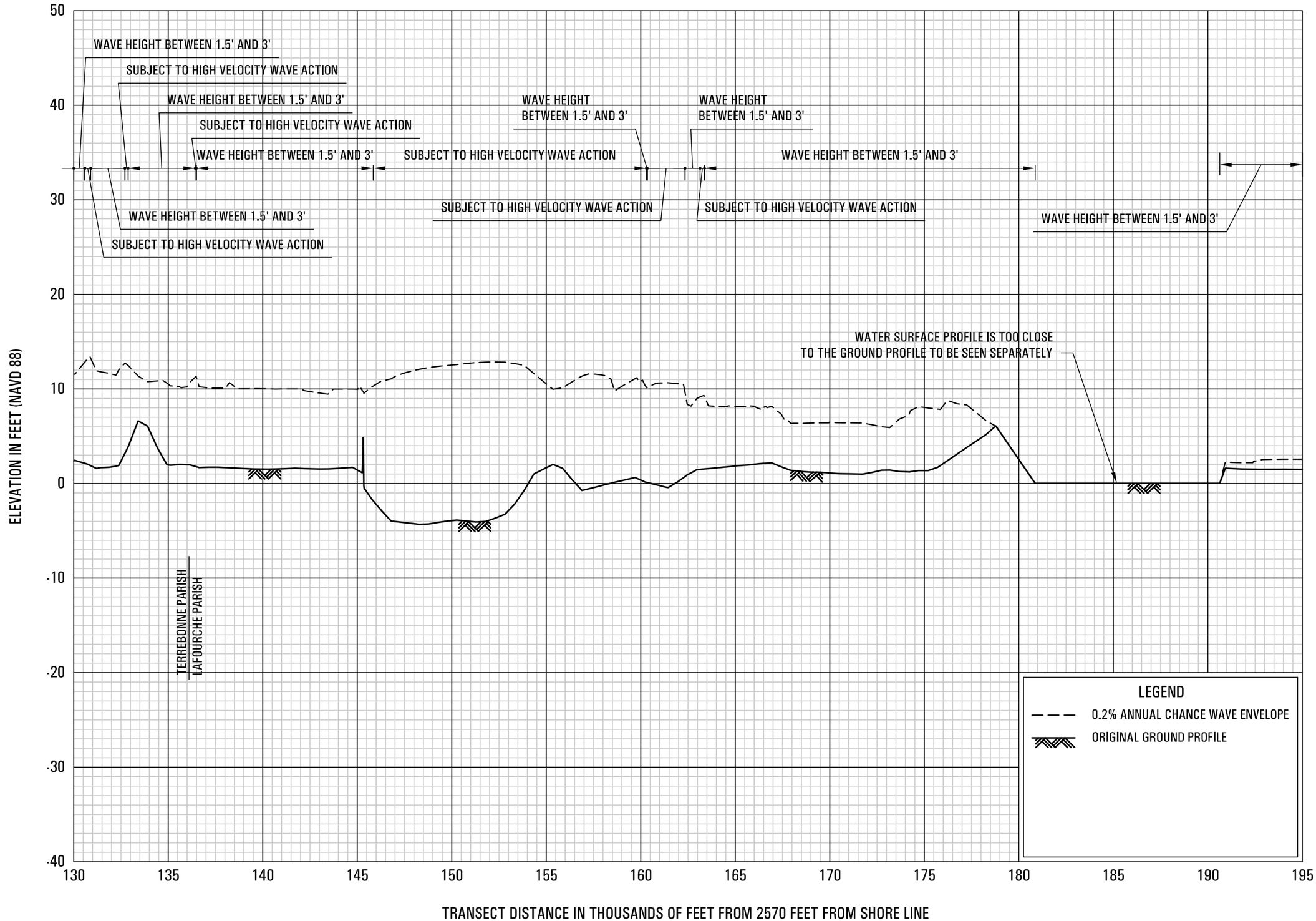
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 17

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



0.2% ANNUAL CHANCE WAVE ENVELOPE

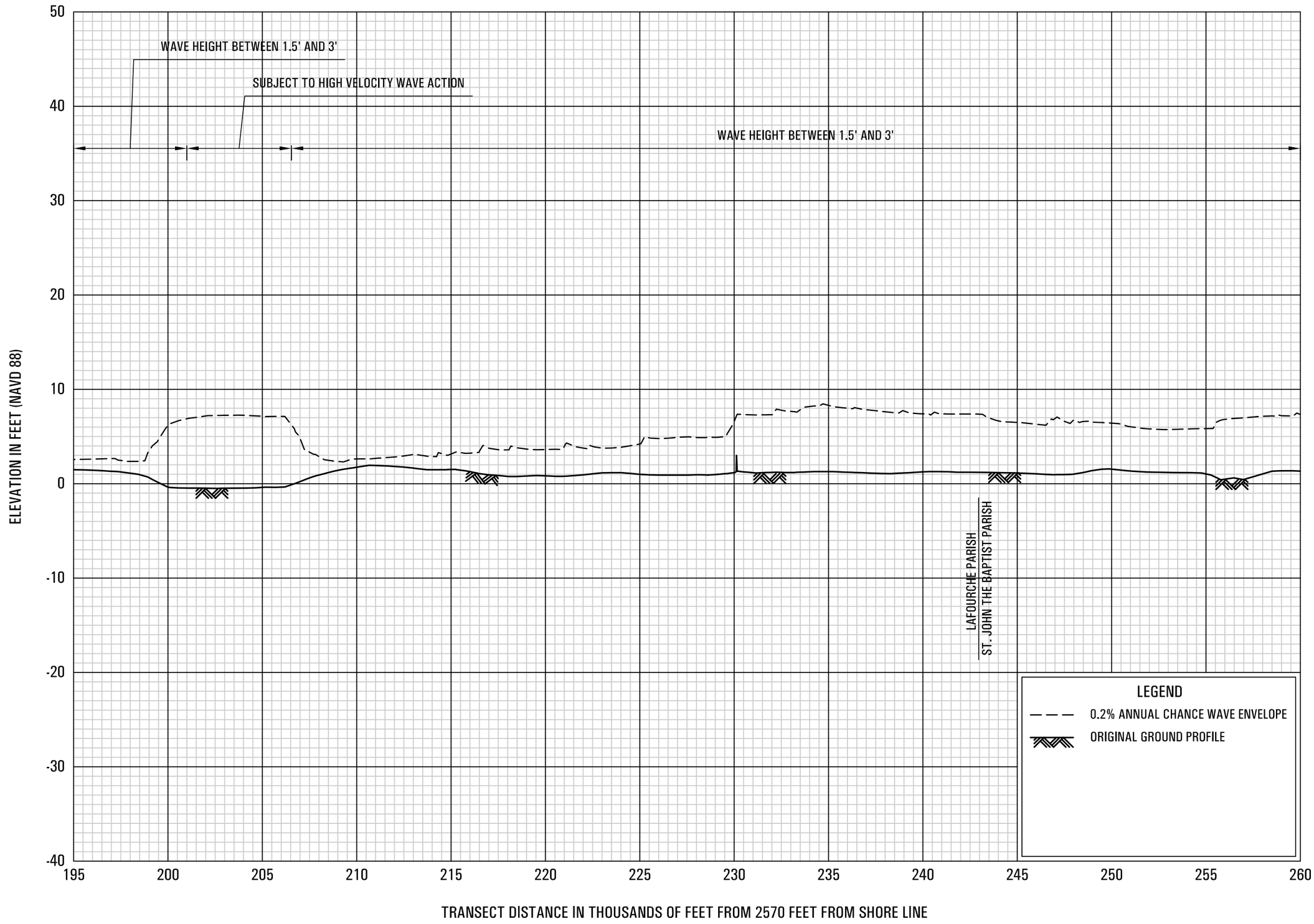
TRANSECT 17

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

95P



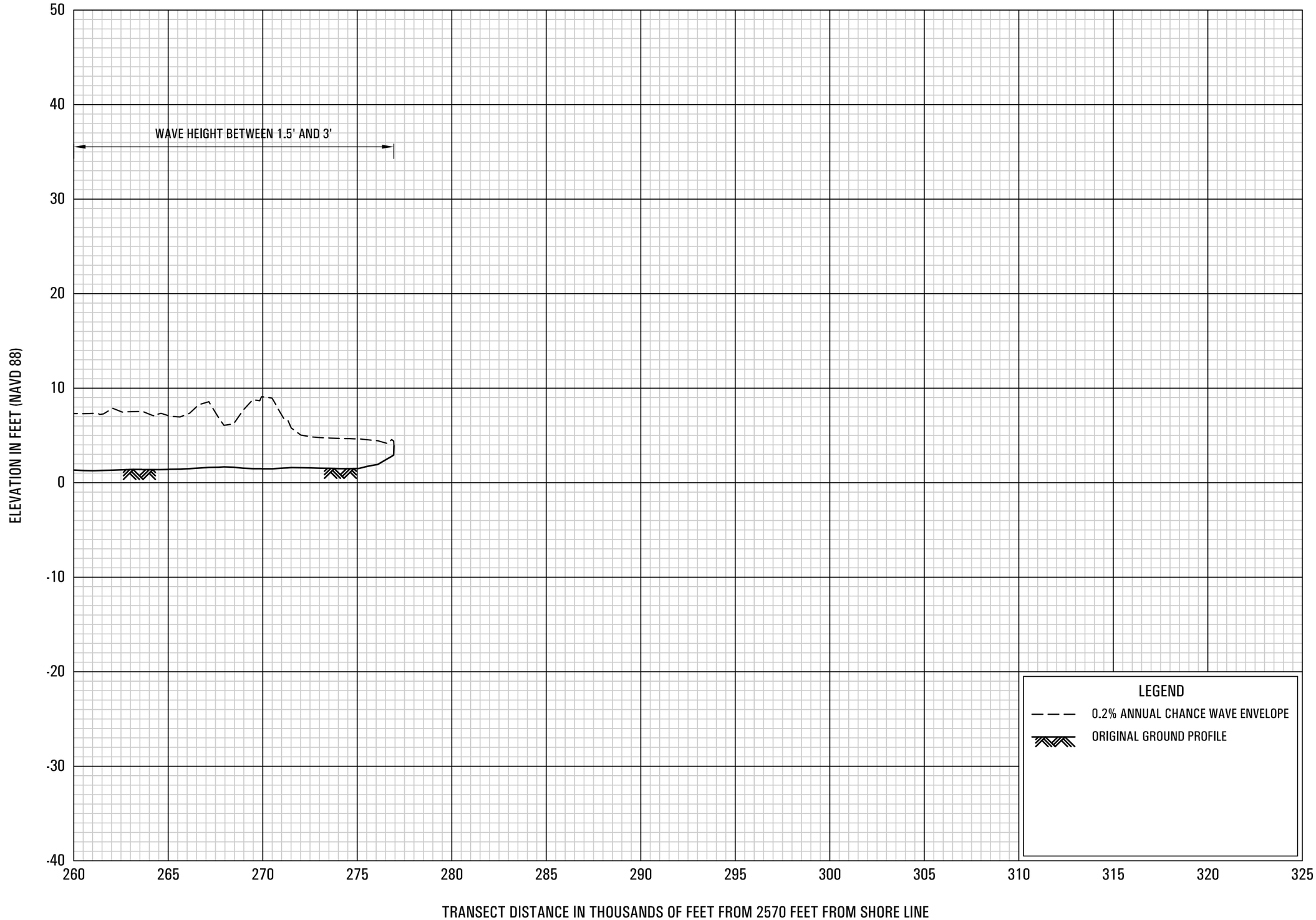
0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 17

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS



0.2% ANNUAL CHANCE WAVE ENVELOPE

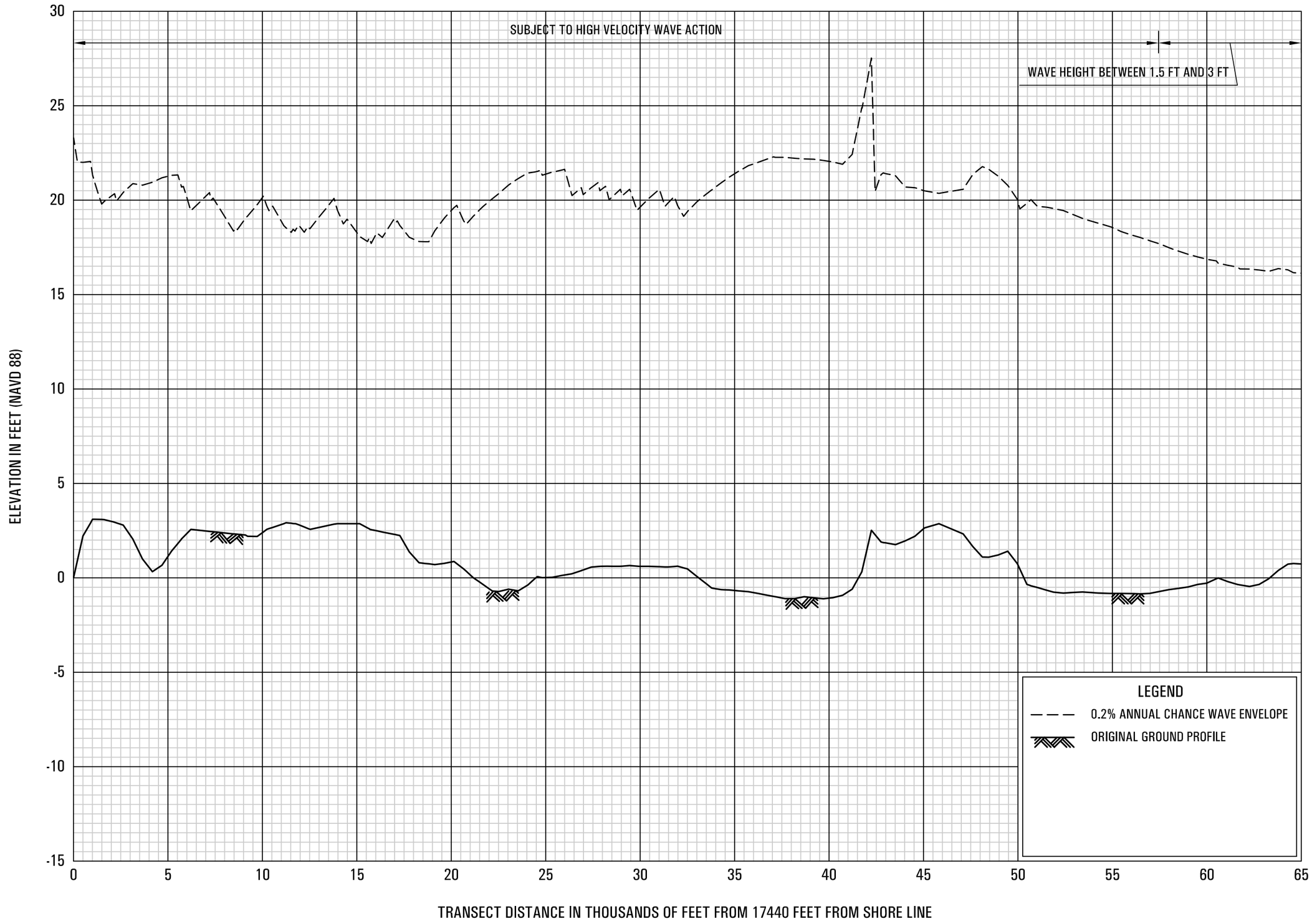
TRANSECT 17

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

97P



0.2% ANNUAL CHANCE WAVE ENVELOPE

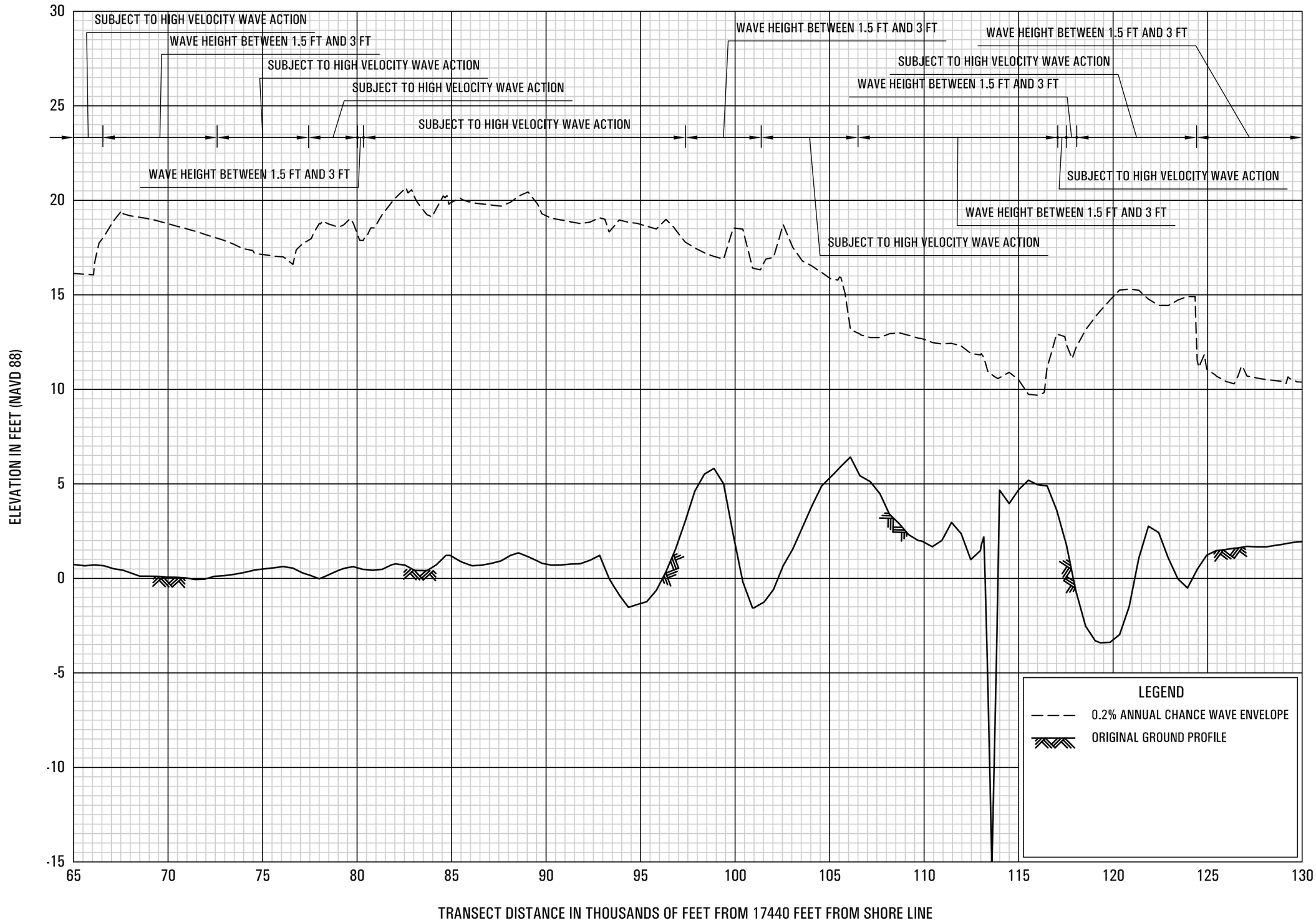
TRANSECT 18

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

98P



0.2% ANNUAL CHANCE WAVE ENVELOPE

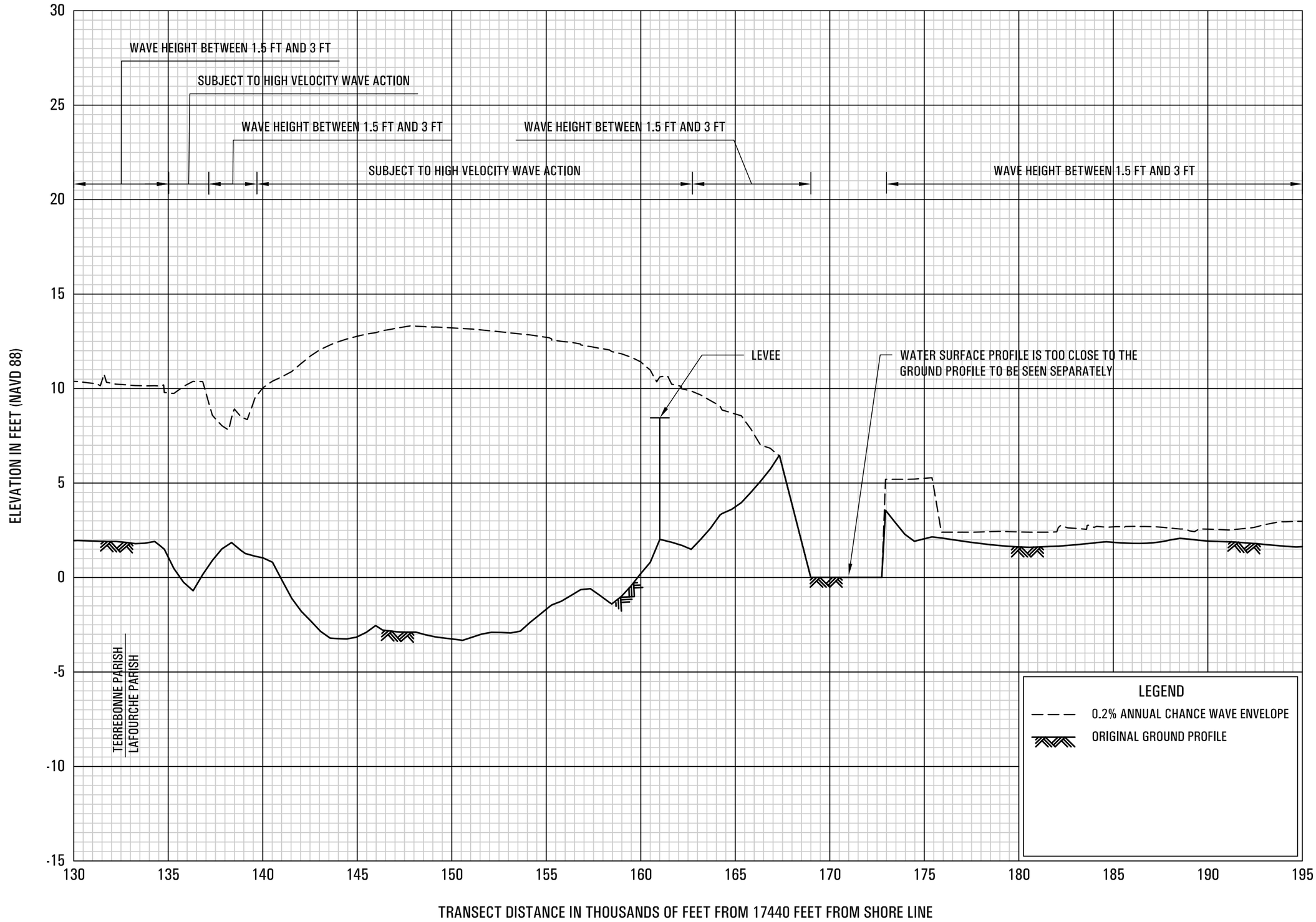
TRANSECT 18

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

99P



0.2% ANNUAL CHANCE WAVE ENVELOPE

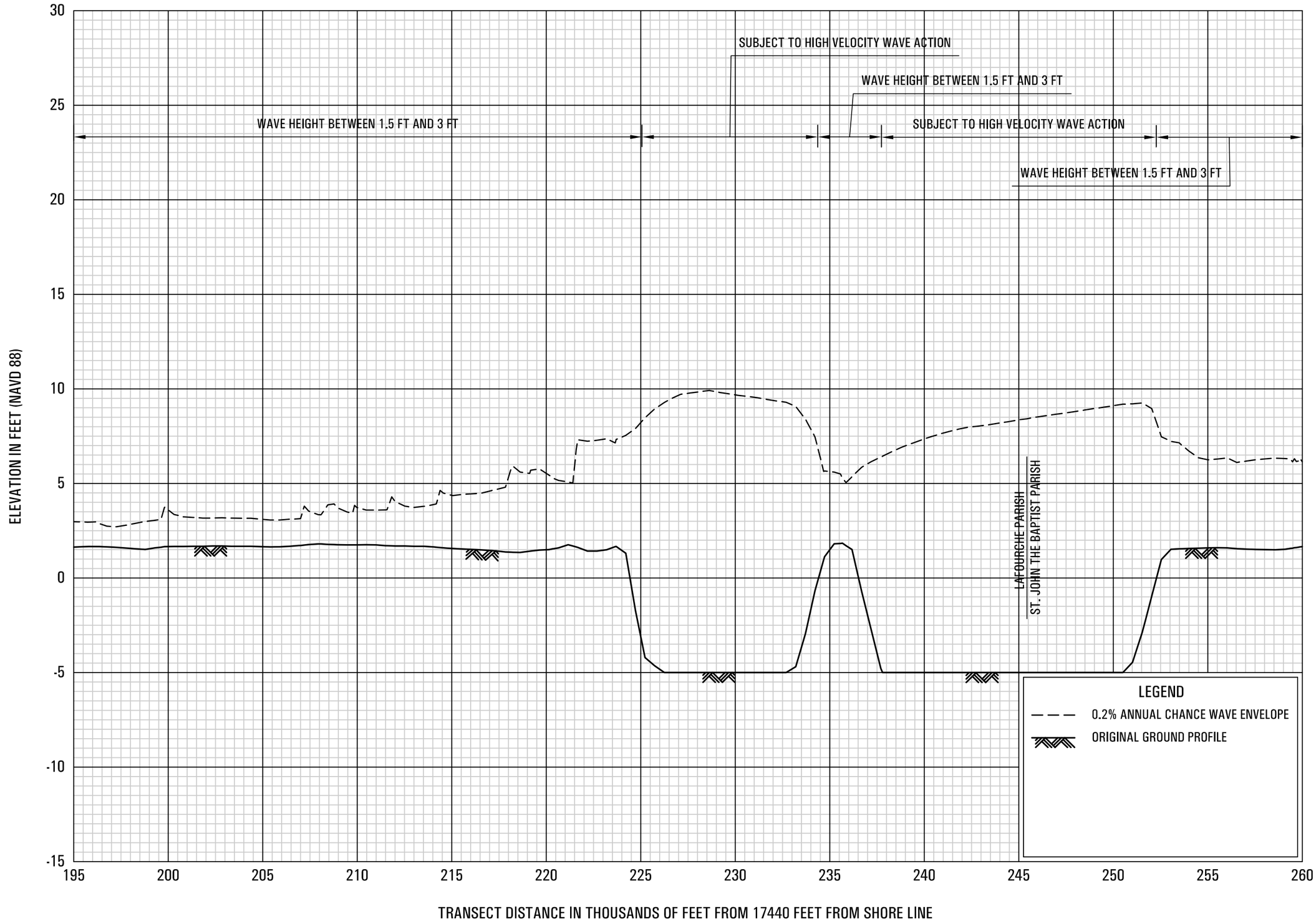
TRANSECT 18

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

100P



0.2% ANNUAL CHANCE WAVE ENVELOPE

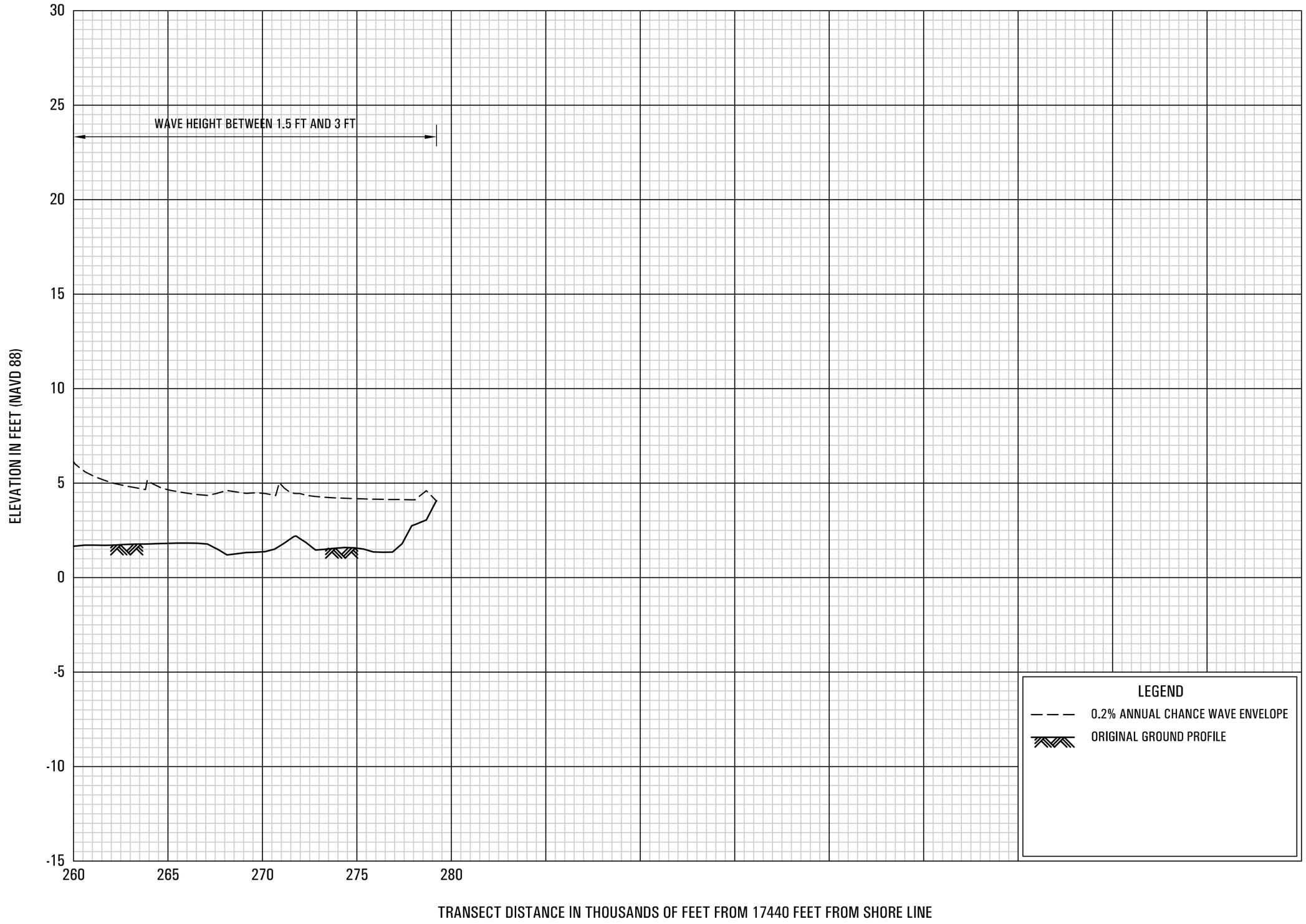
TRANSECT 18

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

101P



0.2% ANNUAL CHANCE WAVE ENVELOPE

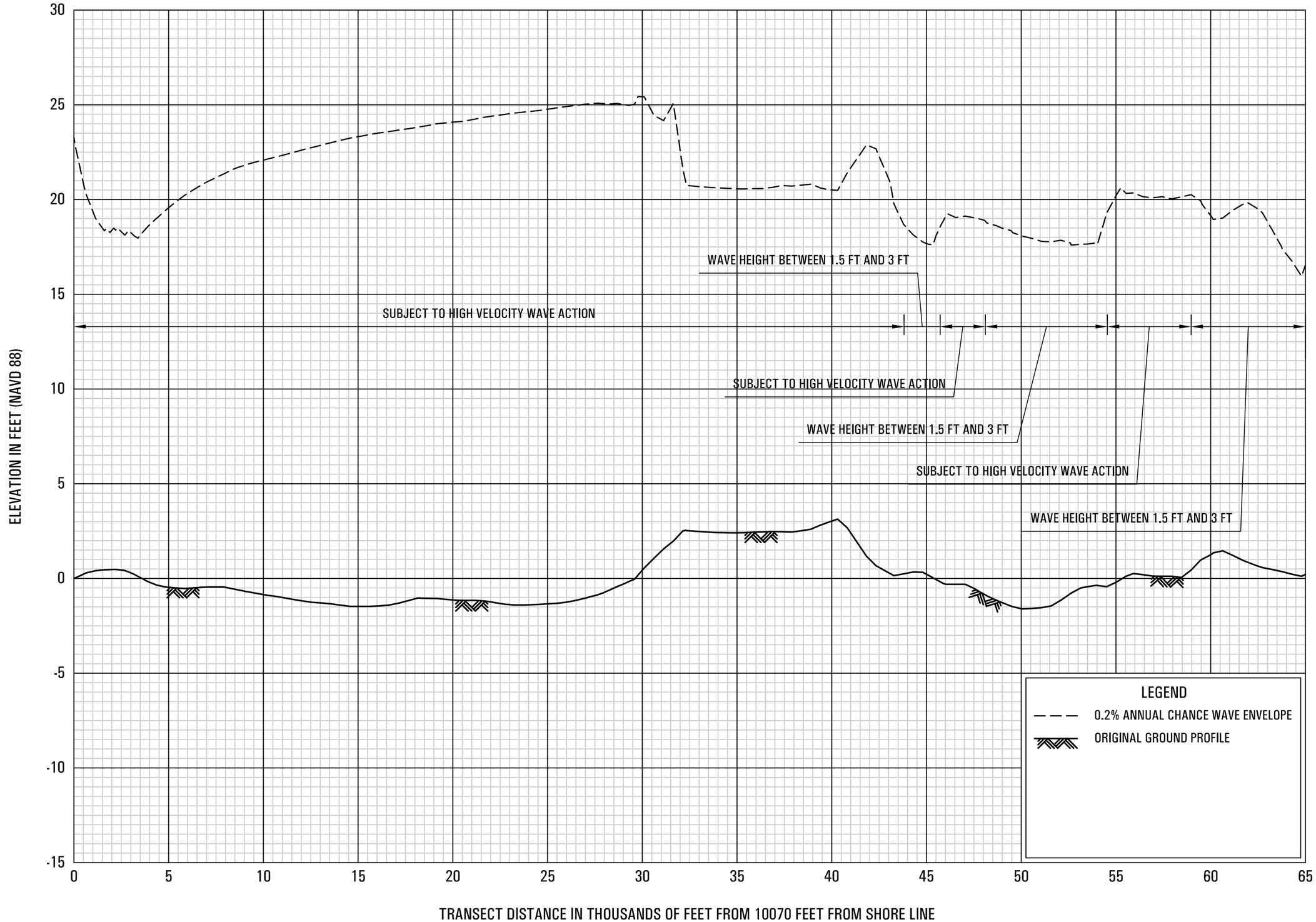
TRANSECT 18

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

102P



0.2% ANNUAL CHANCE WAVE ENVELOPE

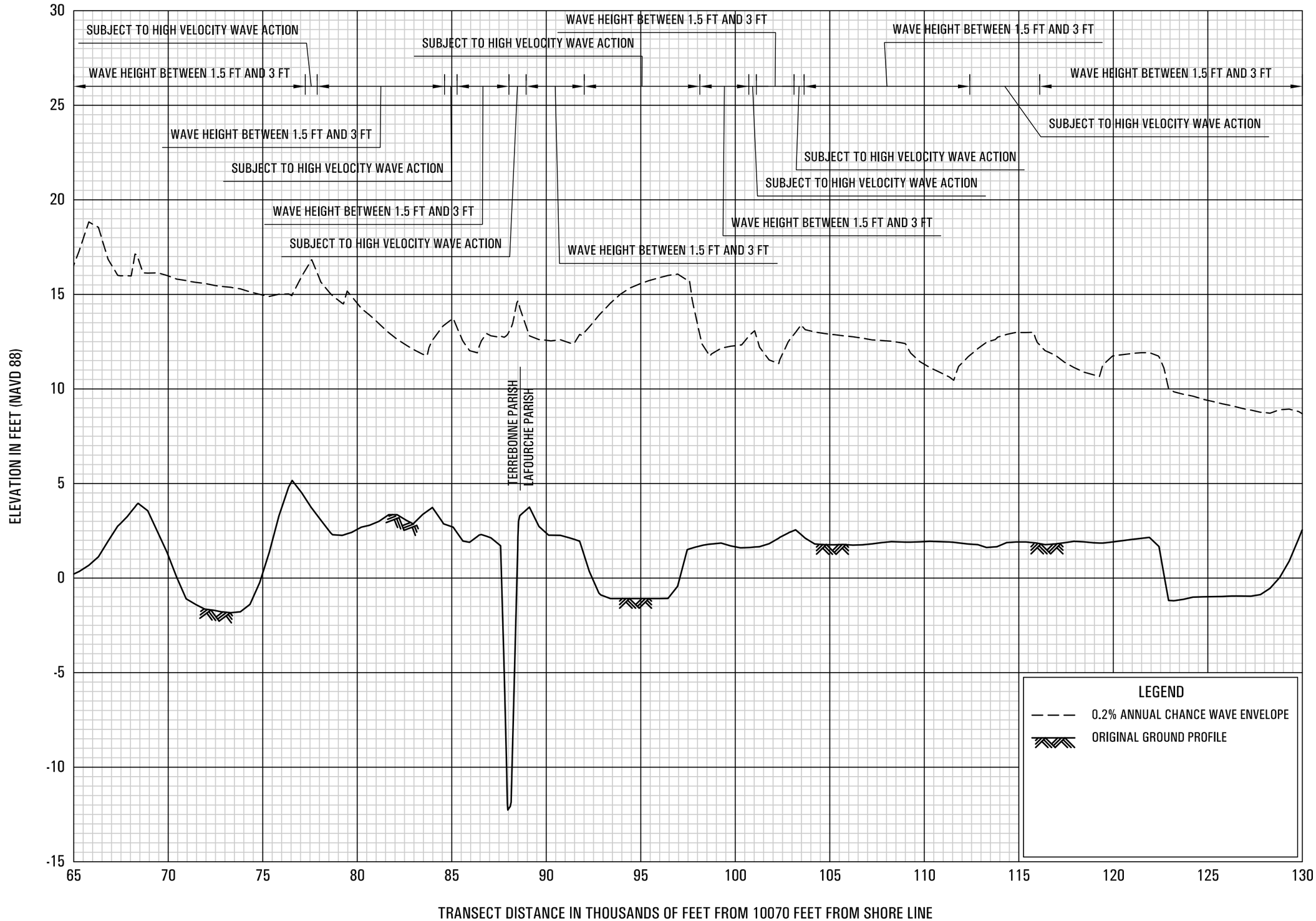
TRANSECT 19

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

103P



0.2% ANNUAL CHANCE WAVE ENVELOPE

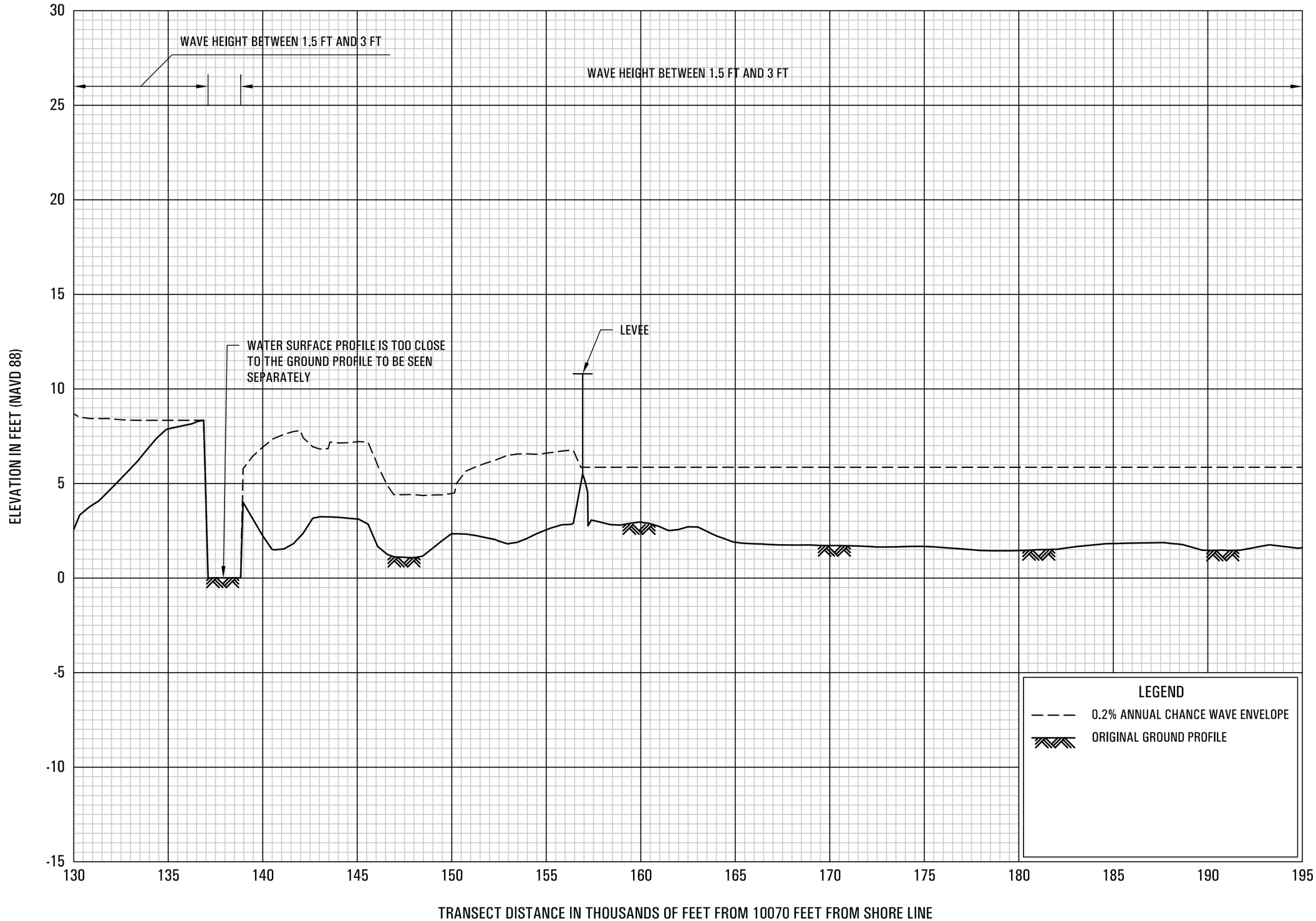
TRANSECT 19

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

104P



0.2% ANNUAL CHANCE WAVE ENVELOPE

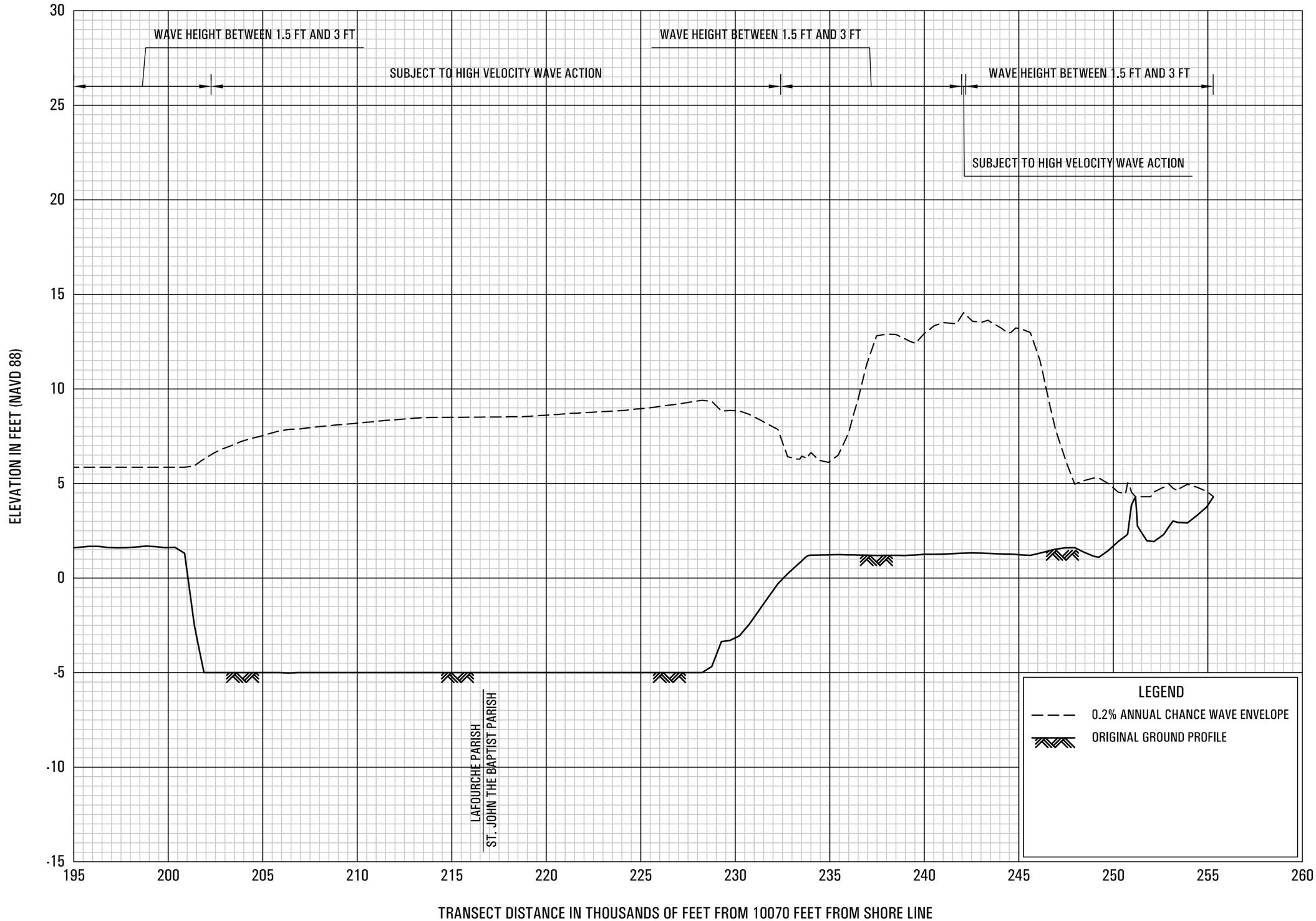
TRANSECT 19

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

105P



0.2% ANNUAL CHANCE WAVE ENVELOPE

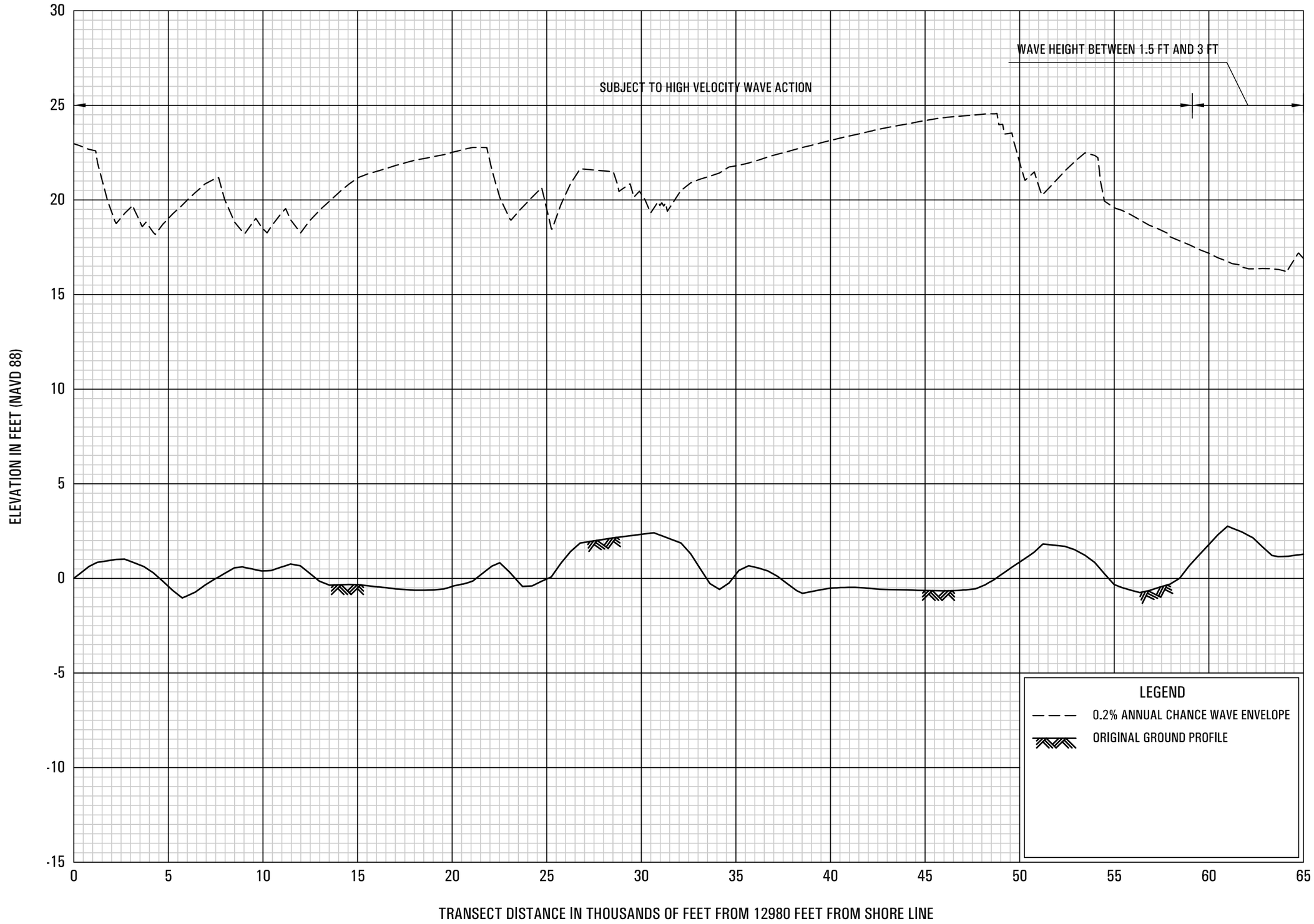
TRANSECT 19

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

106P



0.2% ANNUAL CHANCE WAVE ENVELOPE

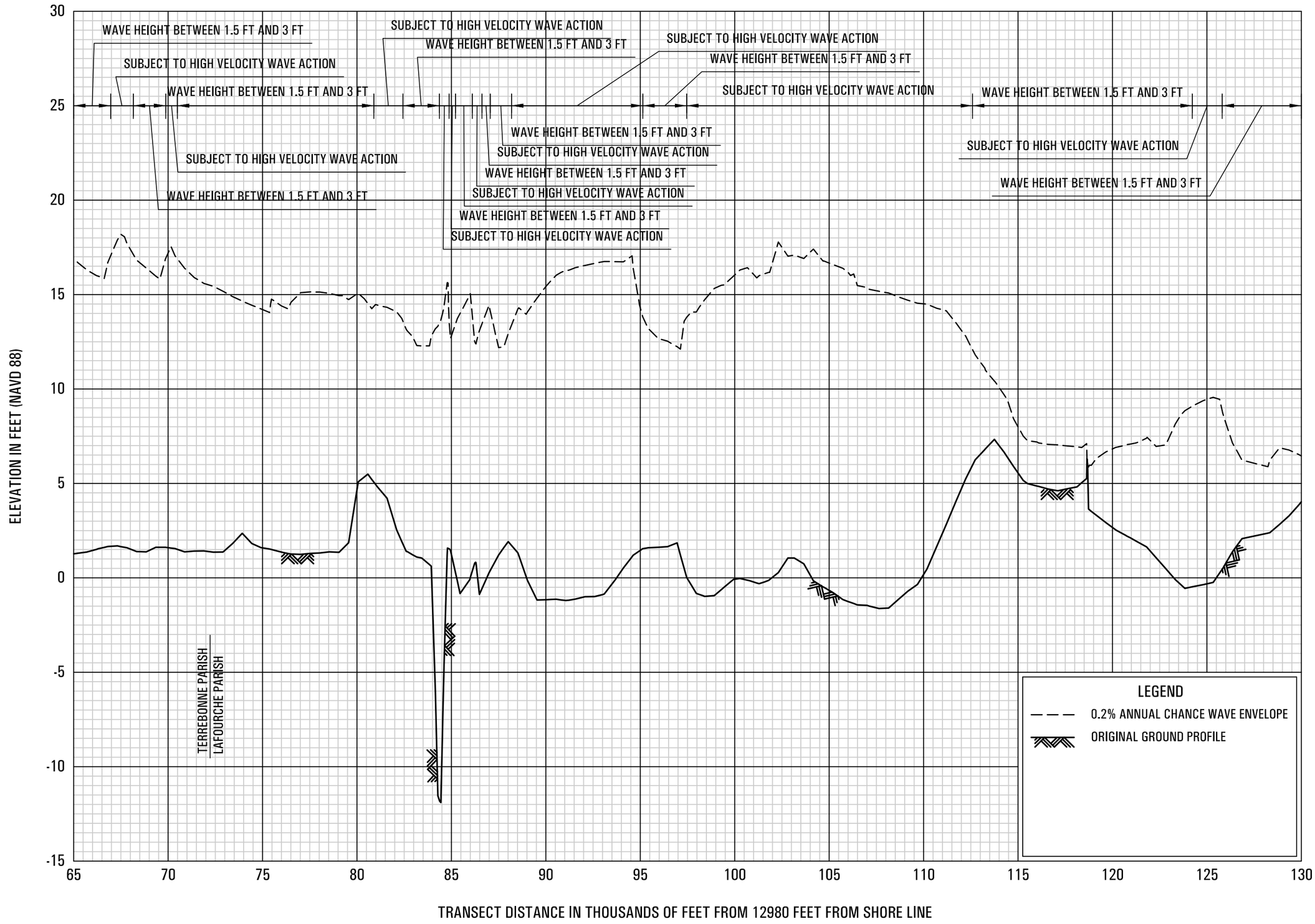
TRANSECT 20

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

107P



0.2% ANNUAL CHANCE WAVE ENVELOPE

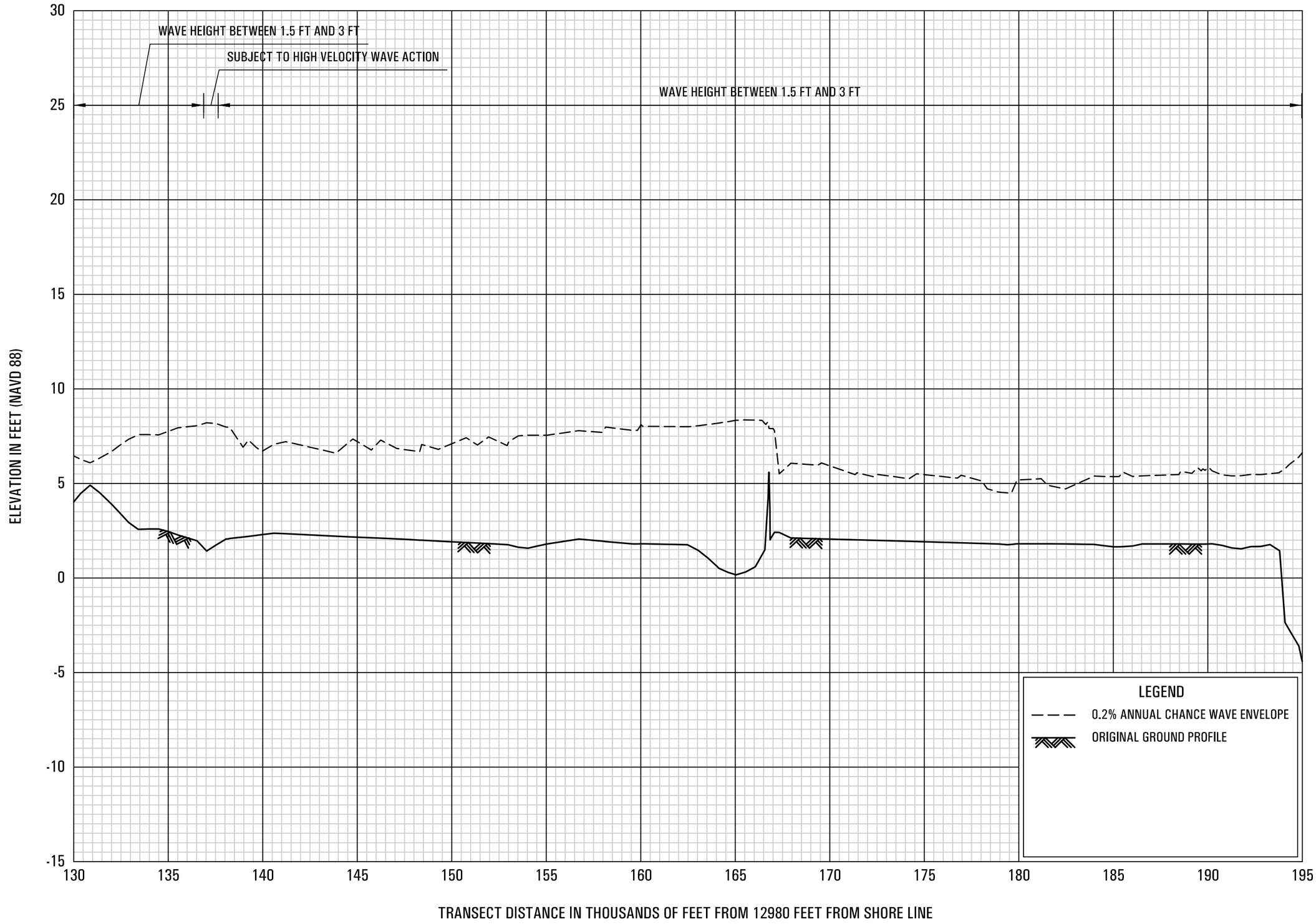
TRANSECT 20

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

108P



0.2% ANNUAL CHANCE WAVE ENVELOPE

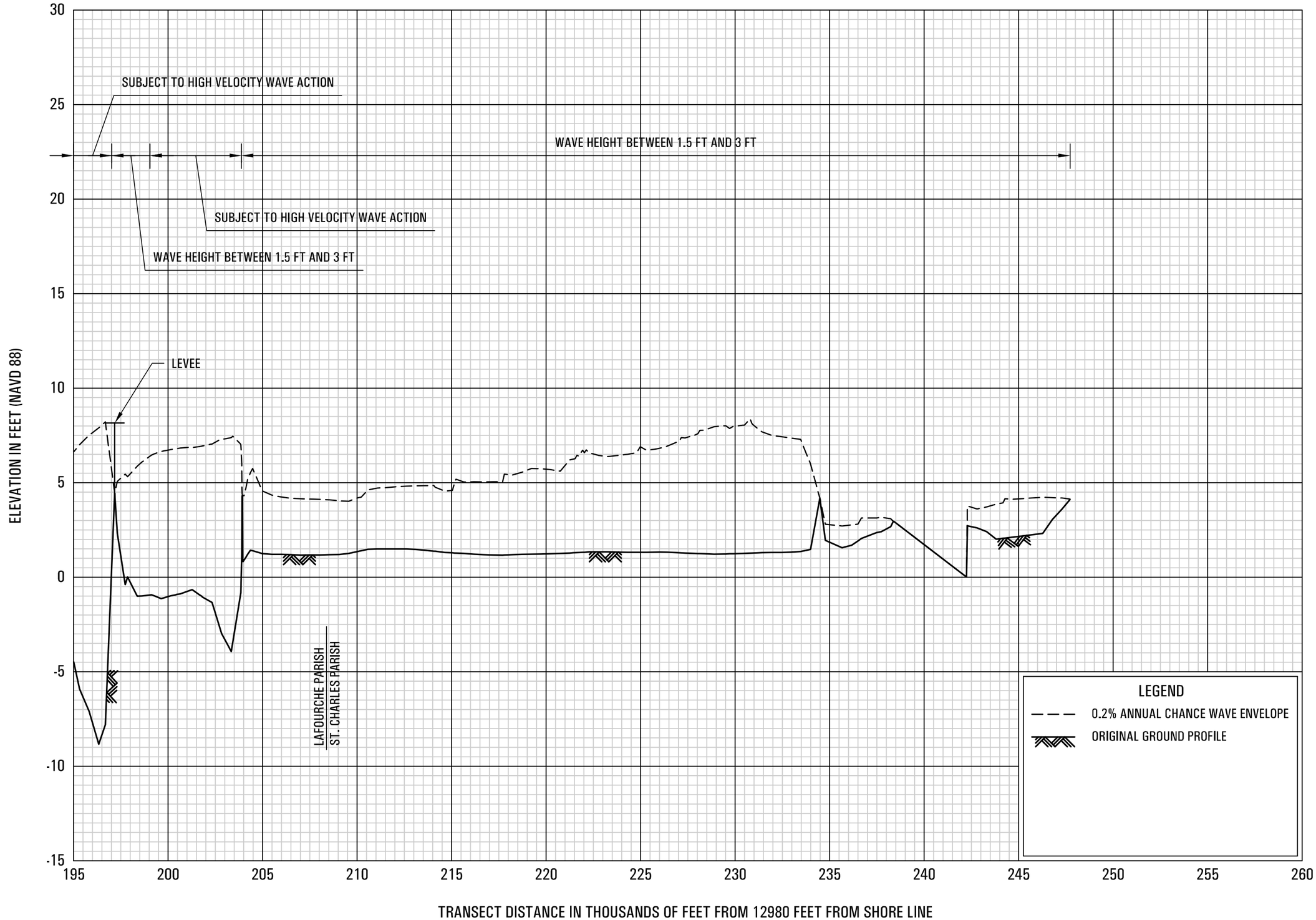
TRANSECT 20

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

109P



0.2% ANNUAL CHANCE WAVE ENVELOPE

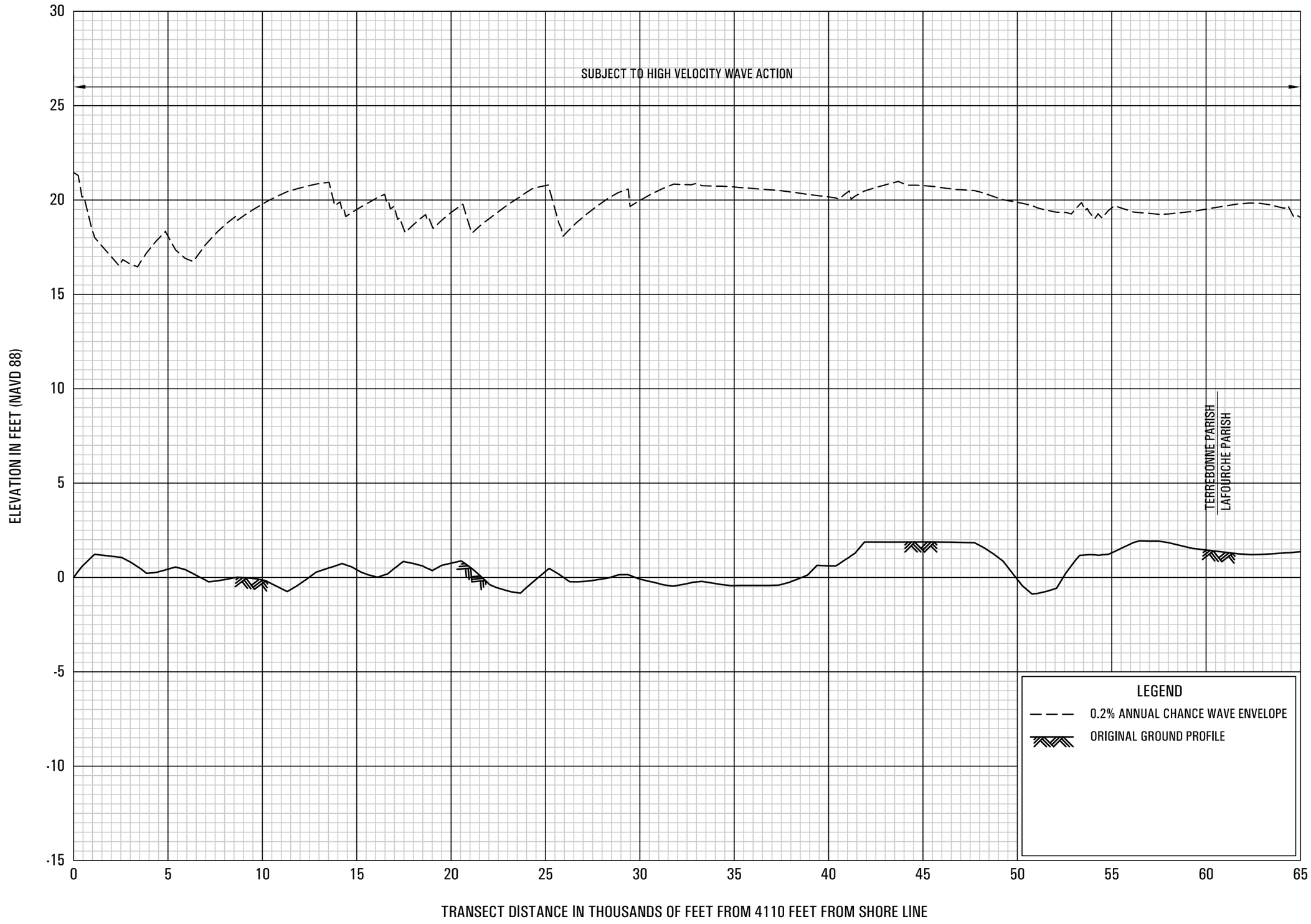
TRANSECT 20

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

110P



0.2% ANNUAL CHANCE WAVE ENVELOPE

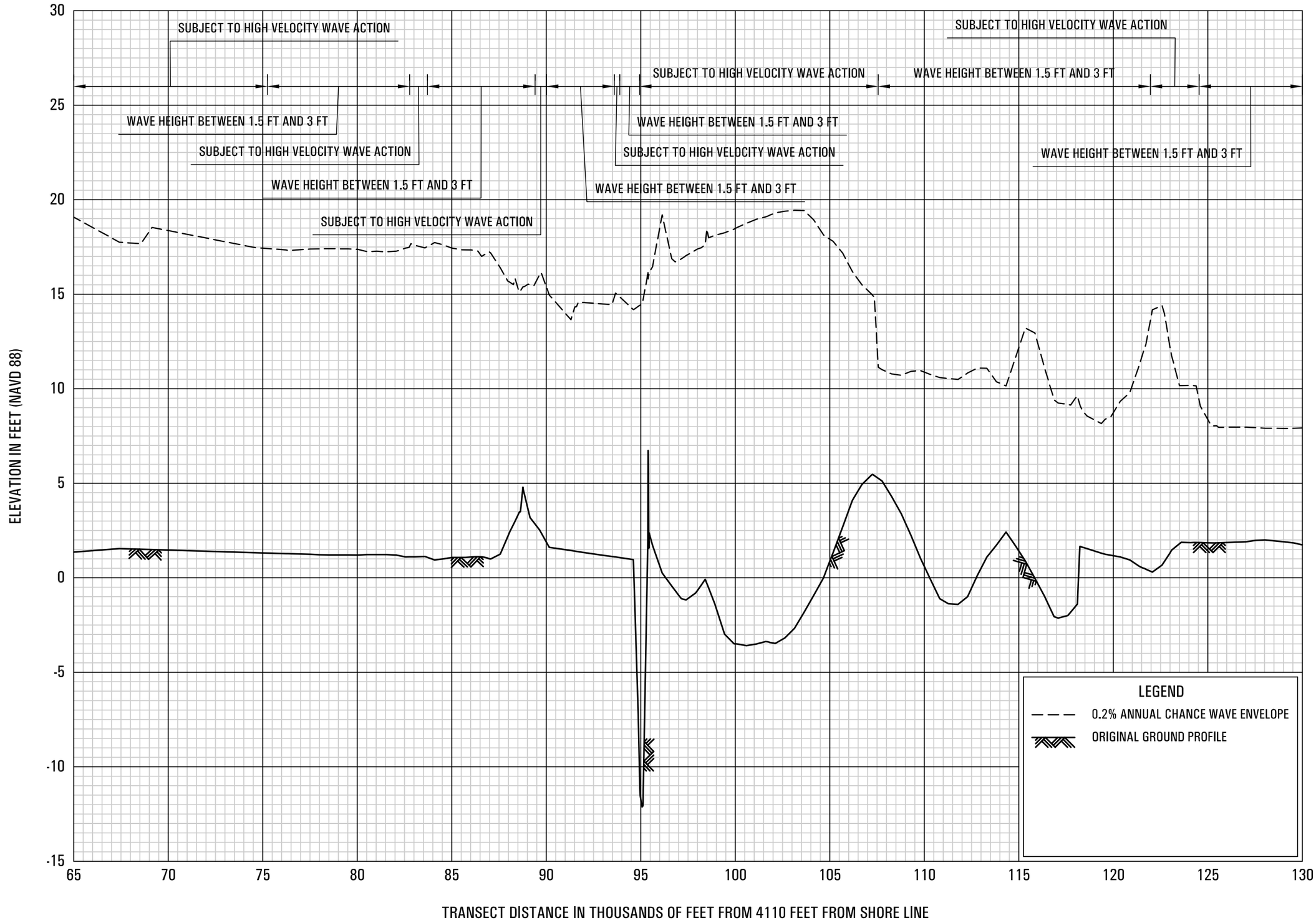
TRANSECT 21

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

111P



0.2% ANNUAL CHANCE WAVE ENVELOPE

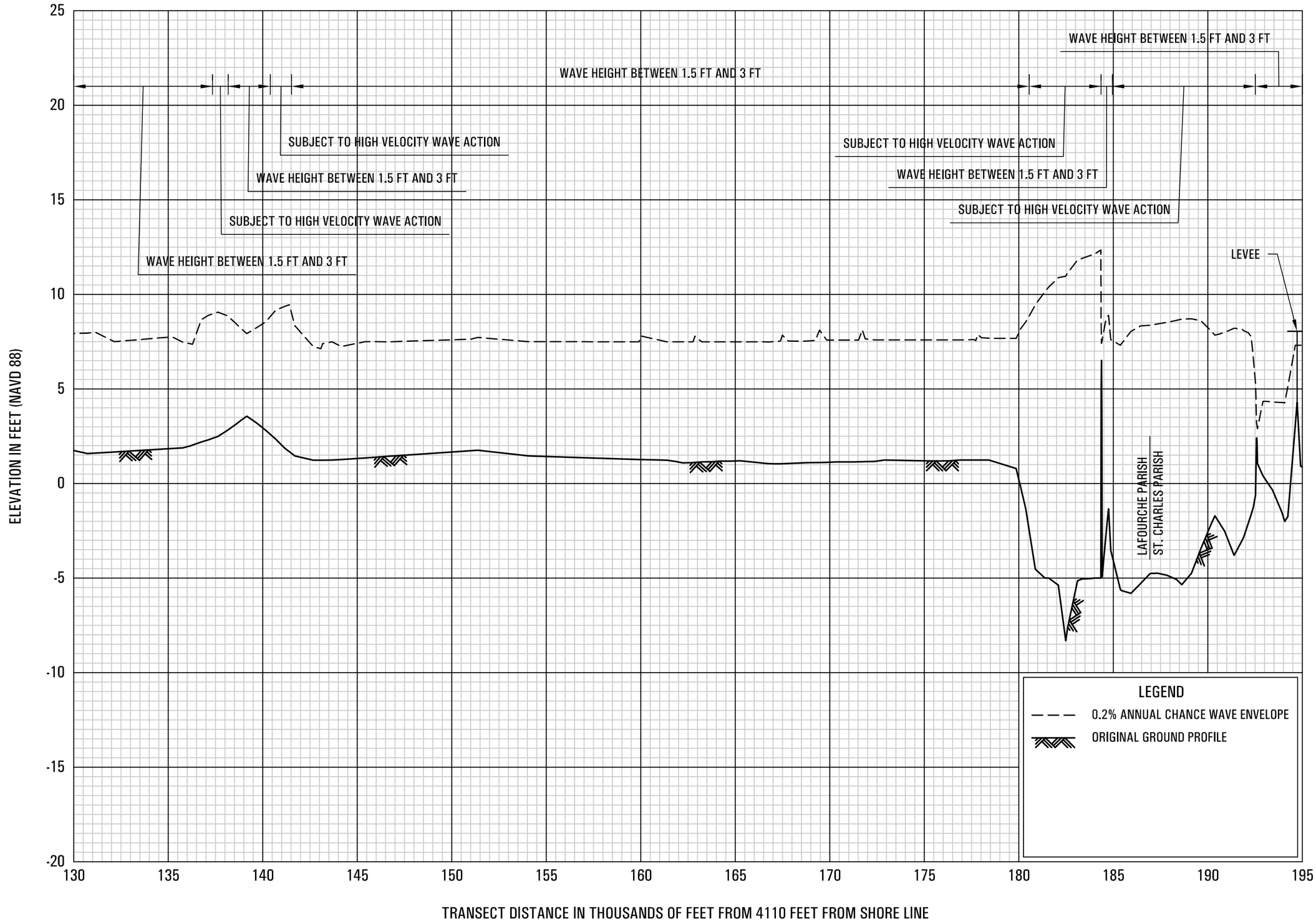
TRANSECT 21

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

112P



0.2% ANNUAL CHANCE WAVE ENVELOPE

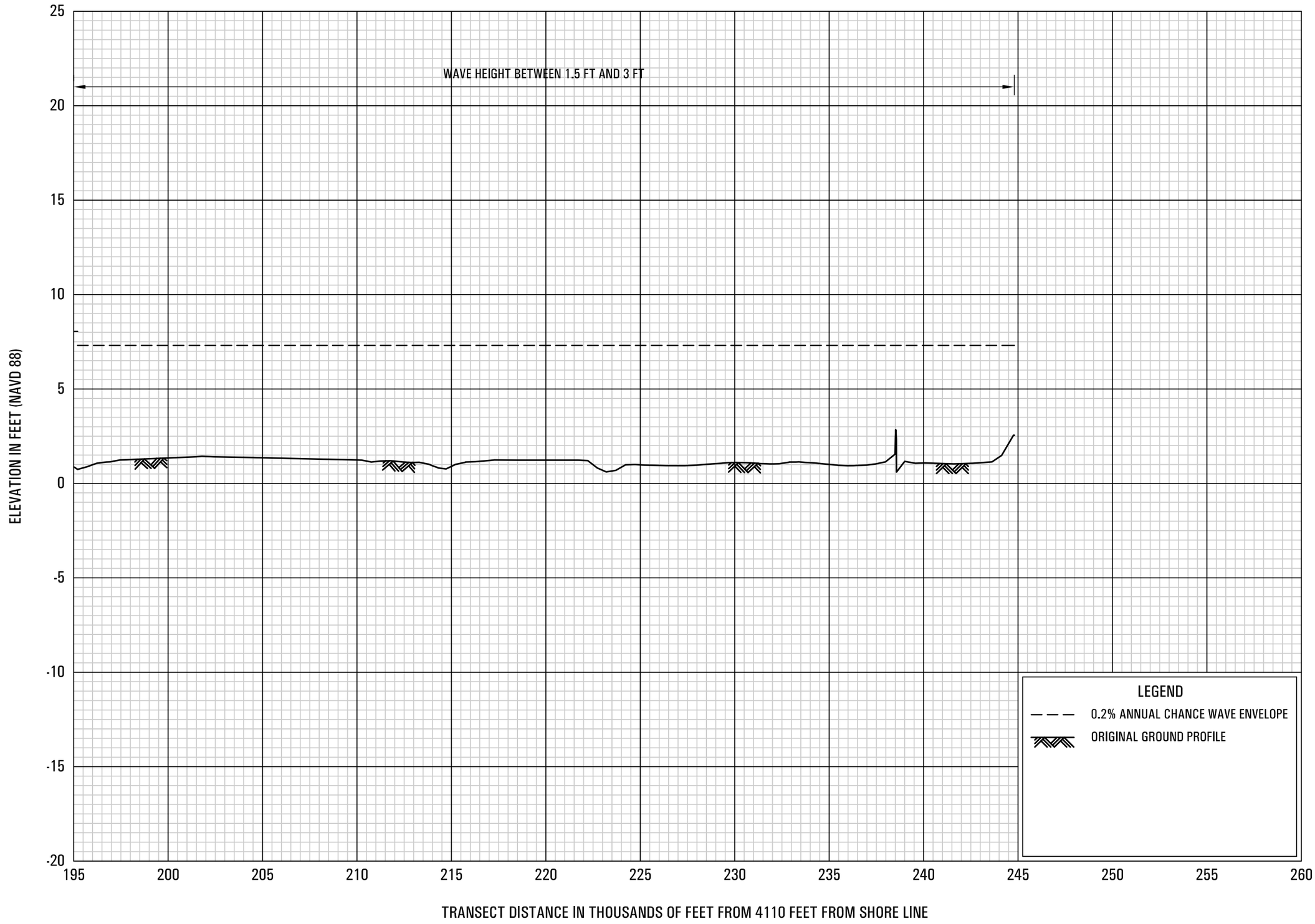
TRANSECT 21

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

113P



0.2% ANNUAL CHANCE WAVE ENVELOPE

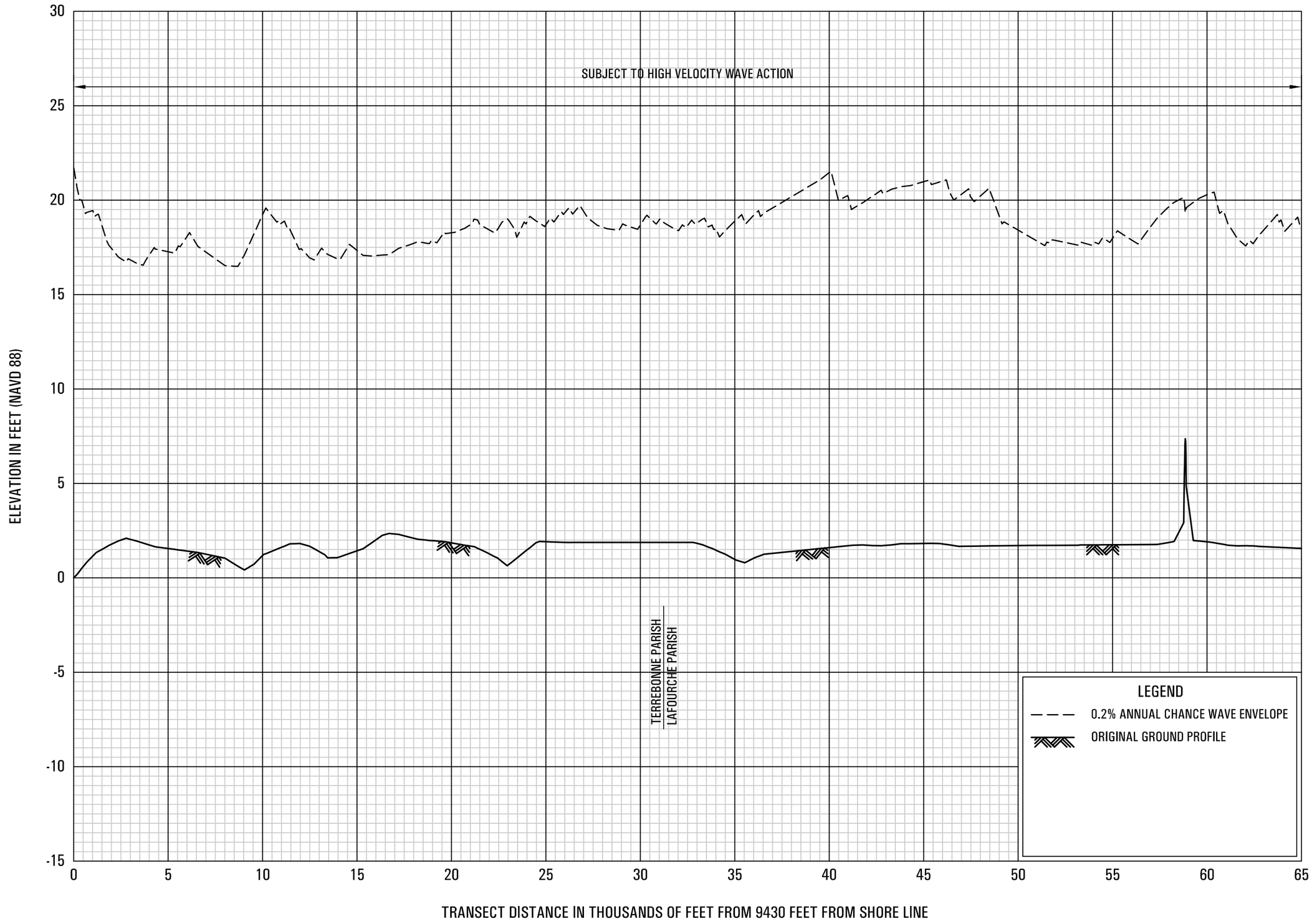
TRANSECT 21

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

114P



0.2% ANNUAL CHANCE WAVE ENVELOPE

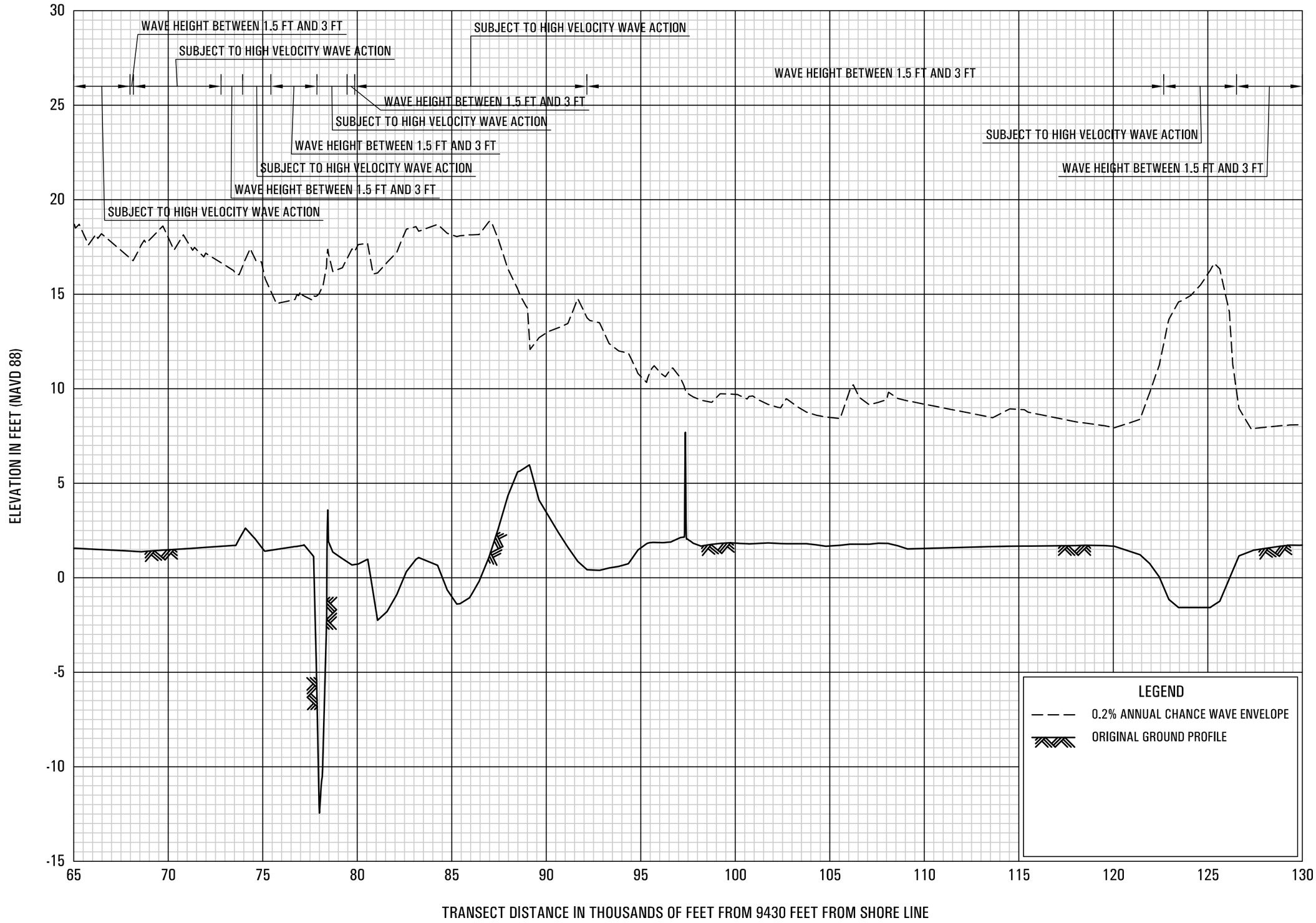
TRANSECT 22

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

115P



0.2% ANNUAL CHANCE WAVE ENVELOPE

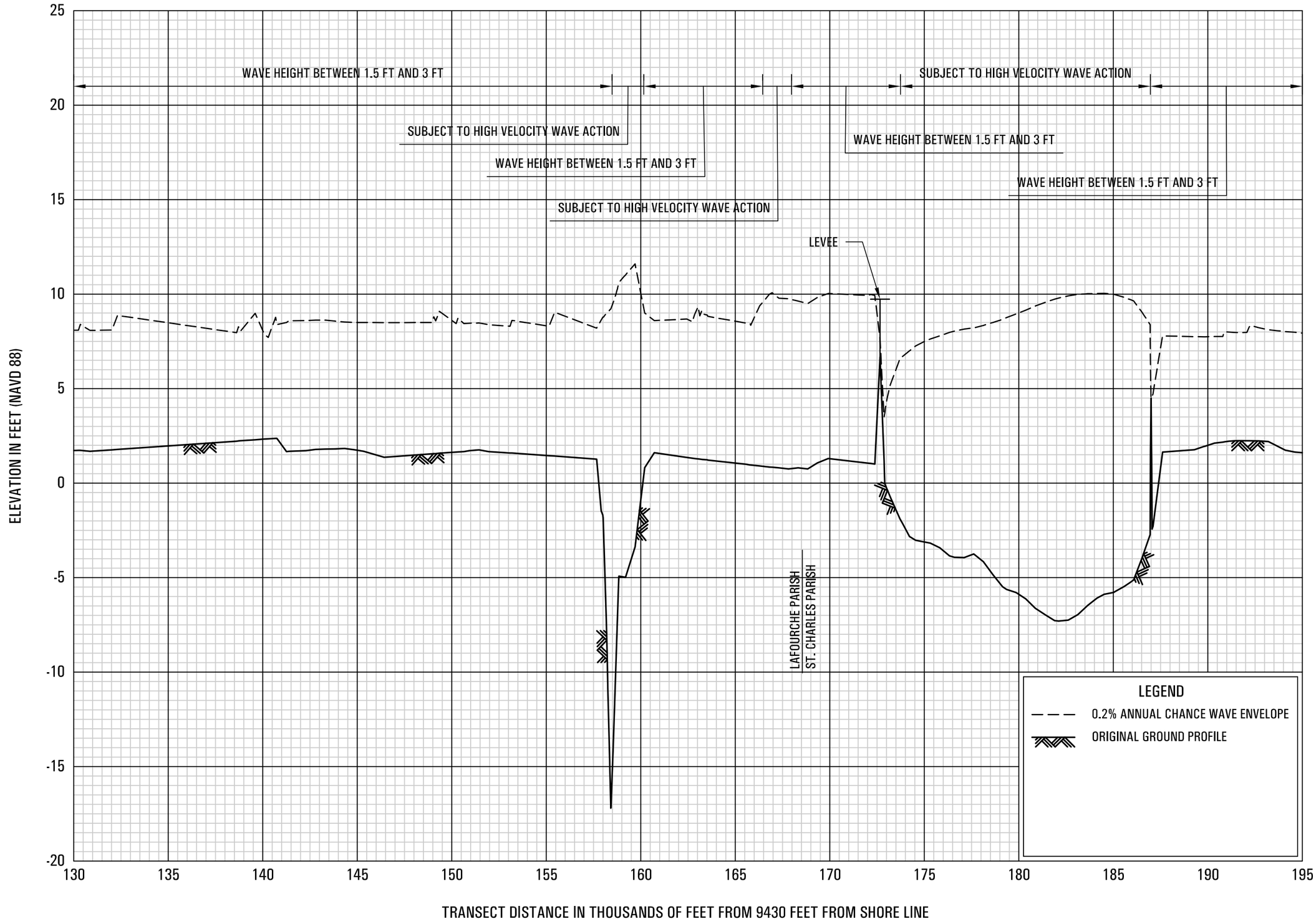
TRANSECT 22

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

116P



0.2% ANNUAL CHANCE WAVE ENVELOPE

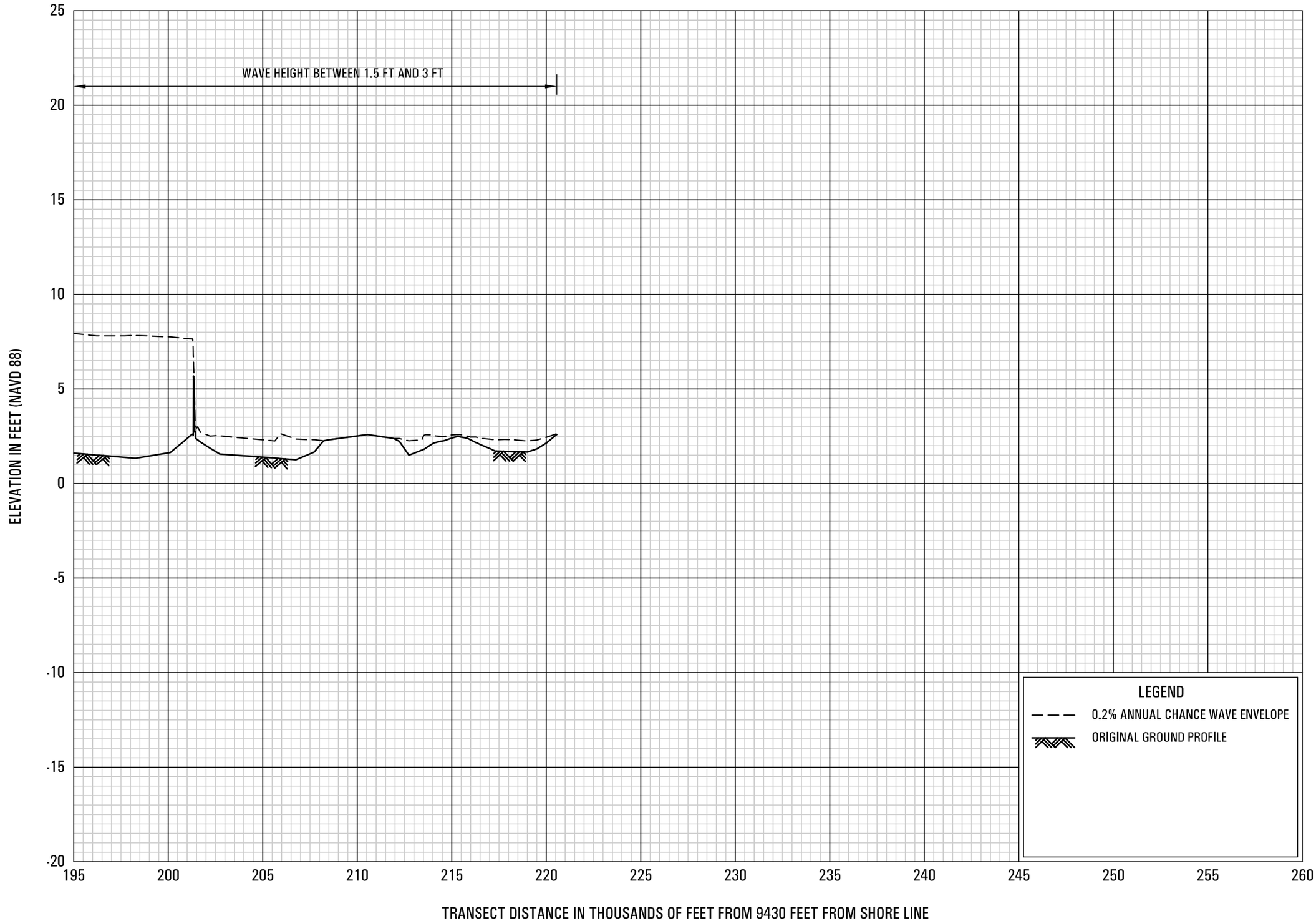
TRANSECT 22

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

117P



0.2% ANNUAL CHANCE WAVE ENVELOPE

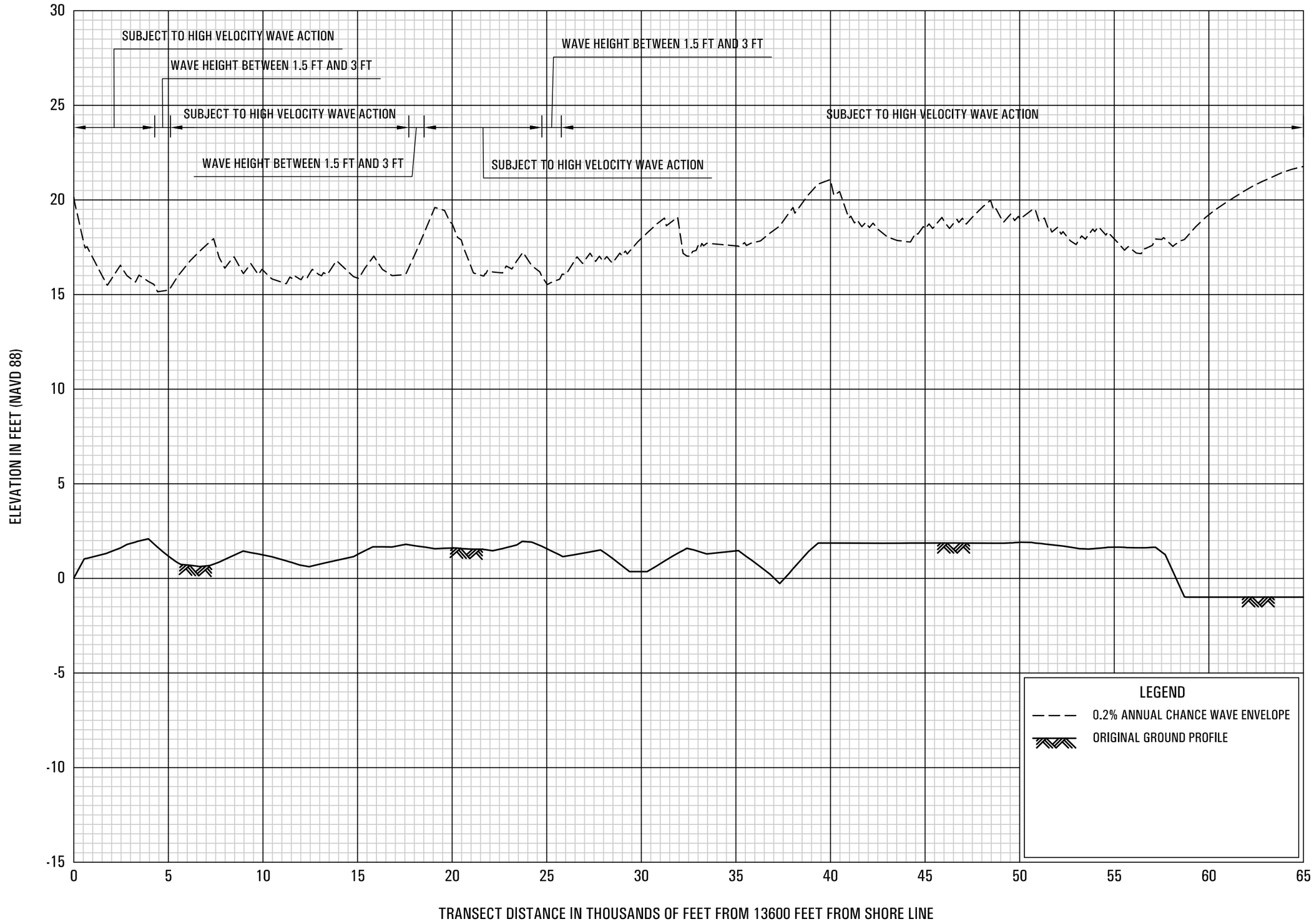
TRANSECT 22

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

118P



0.2% ANNUAL CHANCE WAVE ENVELOPE

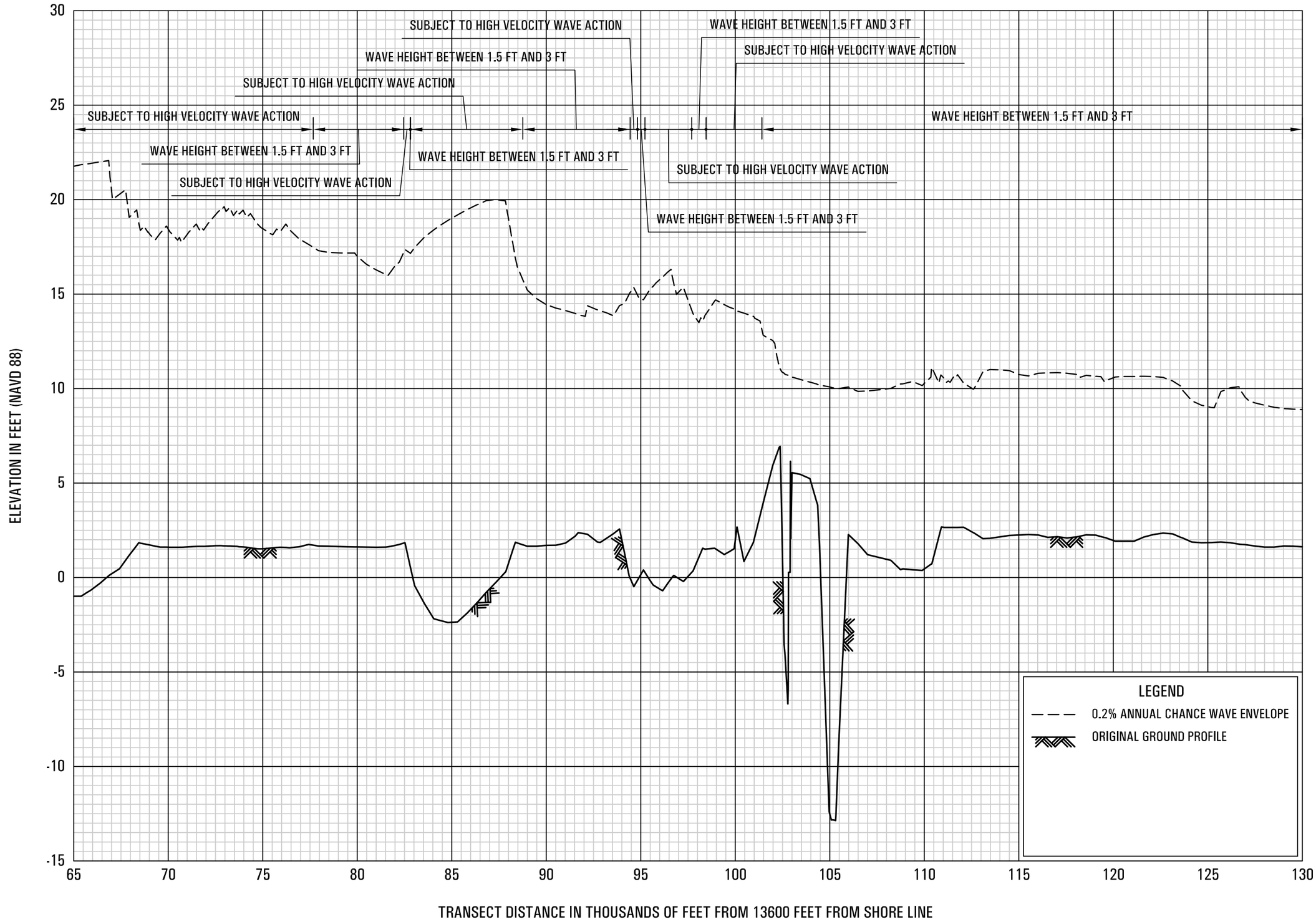
TRANSECT 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

119P



0.2% ANNUAL CHANCE WAVE ENVELOPE

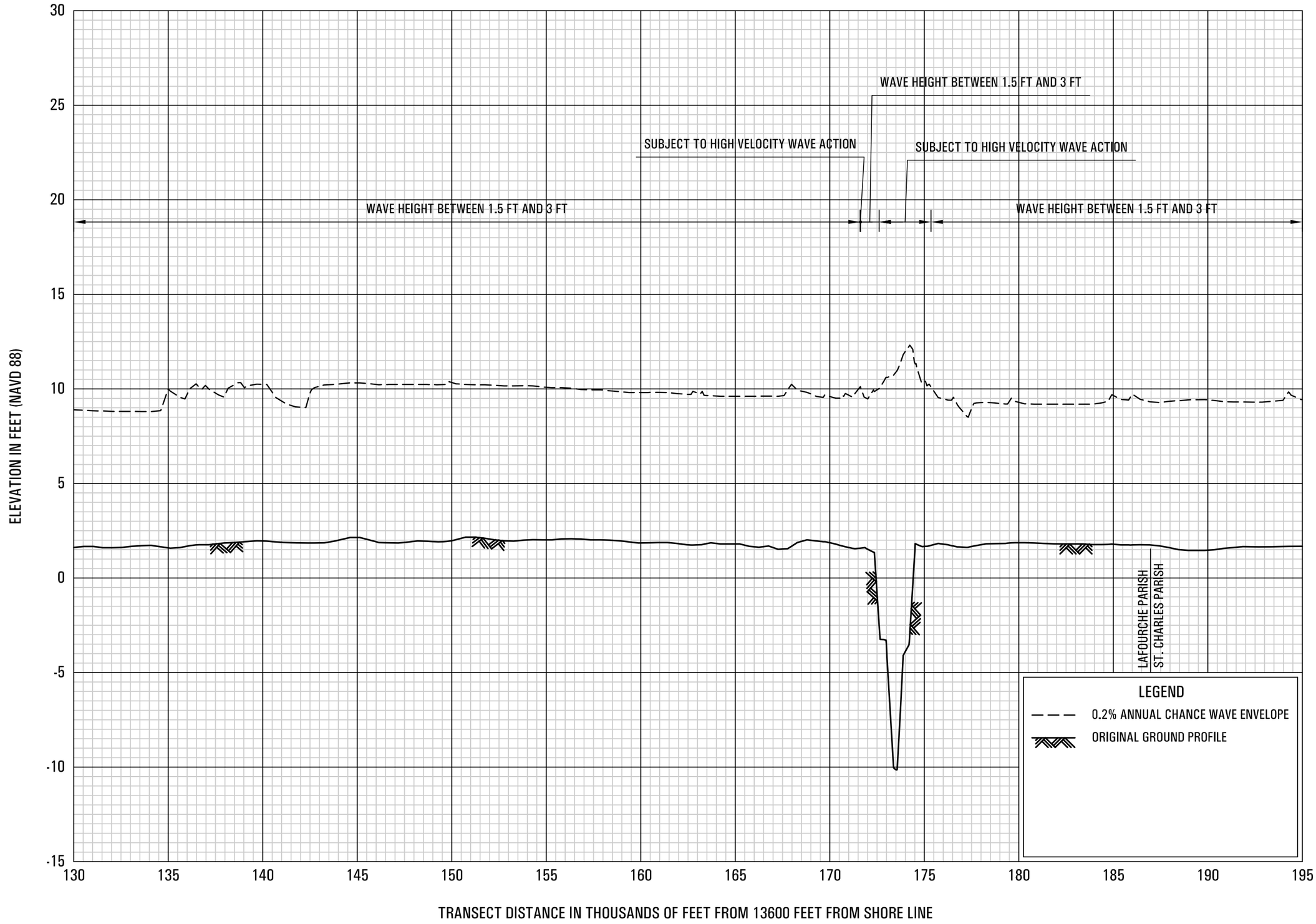
TRANSECT 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

120P



0.2% ANNUAL CHANCE WAVE ENVELOPE

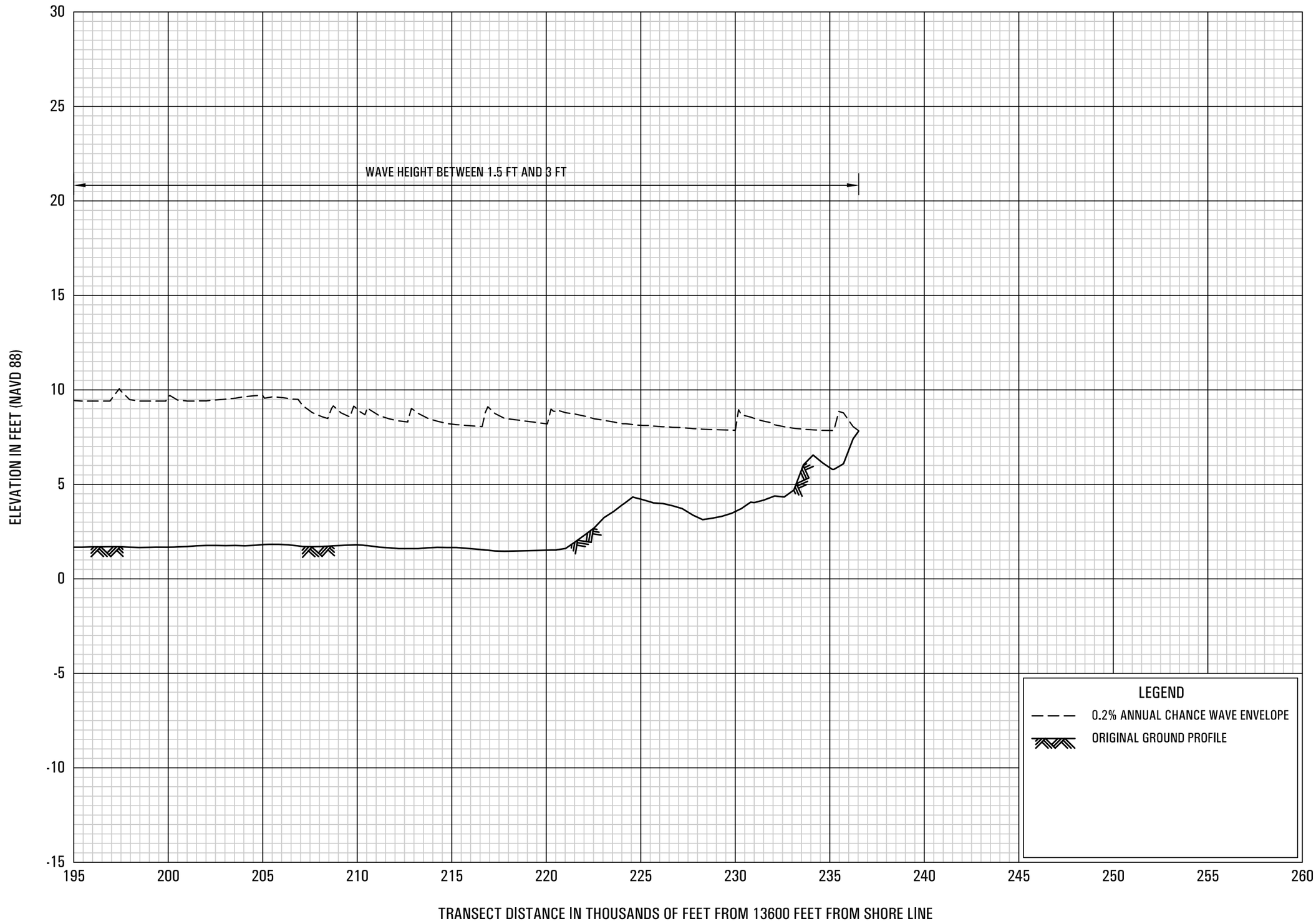
TRANSECT 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

121P



0.2% ANNUAL CHANCE WAVE ENVELOPE

TRANSECT 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAFOURCHE PARISH, LA

AND INCORPORATED AREAS

122P