FEMA Region IX

Floodplain Mapping TSDN
San Mateo County, California
A Central San Francisco Bay Coastal Flood Hazard Study

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BakerAECOM
An Integrated Production Team

San Mateo County, CA - Central SF Bay – Floodplain Mapping TSDN

Document History

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Revision History

Version Number	Version Date	Summary of Changes	Team/Author
01	September 19, 2014	Initial Condition	Krista Conner
02	September 29, 2014	Revisions for AECOM QC Round 1	Krista Conner
03	October 10, 2014	Revisions for AECOM QC Round 2	Krista Conner

Client Distribution

Name	Title/Organization	Location
Kathleen Schaefer	FEMA	MIP, see Appendix C.

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1. Task Summary

1.1. Introduction

BakerAECOM has completed the Floodplain Mapping activities in accordance with the scope of work developed under the Standard Ops Task Order HSFE09-12-J-0005 for Contract No. HSFEHQ-09-D-0368. This project was initiated to update flood hazard mapping information for the San Francisco Bay shoreline of San Mateo County, California north of the San Mateo Bridge (Route 92). The flood hazard study analysis and results are presented in a separate report, *A Central San Francisco Bay Coastal Flood Hazard Study—San Mateo County, California Coastal Analysis Report*, dated July 25, 2014.

A map of the county and the study location are shown in Figures 1 and 2. A description of the Floodplain Mapping activities from the Production & Technical Services Statement of Work is presented below.

1.2. Scope of Work

BakerAECOM shall delineate the base and 0.2-percent-annual-chance floodplain boundaries and any other applicable elements for the Central and South Bay study areas. BakerAECOM shall incorporate all new or revised coastal modeling.

Standards:

Floodplain mapping work shall be performed in accordance with the standards specified in the Pacific Guidelines, Guidance for Coastal Flood Hazard Analyses and Mapping in Sheltered Waters (FEMA, 2008).

Data Capture Standards

DCS Certification Form – BakerAECOM will use the provisionally released version of the DCS in place on March 31, 2009, for this SOW.

Floodplain Boundary Standards (FBS)

In accordance with FEMA Revised PM 38 – Implementation of Floodplain Boundary Standard (Section 7 of MHIP V1.0), BakerAECOM will provide FBS self-certification including Attachment B documentation from the Floodplain Boundary Standard Audit Procedures, stating delivered flood map products are in compliance.

In addition, the relevant standards are listed in Table 1.

Table 1. Applicable Standards for Project Activities

	Activities														
Applicable Standards	**Field Survey**	**Topographic Data**	**QA/QC Topographic Data**	**Base Map**	**Coastal**	**QA/QC Coastal**	**Hydrology**	**QA/QC Hydrology**	**Hydraulic Analysis**	**QA/QC of Hydraulic Analysis**	**Floodplain Mapping & Redelineation**	**QA/QC Flood-plain Mapping**	**DFIRM Dbase**	**QA/QC DFIRM Database**	**Preliminary Map Products**	**Post-Preliminary Processing**
Guidelines and Specifications for Flood Hazard Mapping Partners and Procedure Memorandums	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
FEMA's Geospatial Data Coordination Policy		X		X												
FEMA's Geospatial Data Coordination Implementation Guide		X		X												
Engineer Manual 1110-2-1003, Hydrographic Surveys (USACE), January 1, 2002	X															
"Numerical Models Accepted by FEMA for NFIP Usage," Updated April 2003					X	X	X	X	X	X						
NFIP Metadata Profile Specifications		X	X								X	X	X	X	X	X
Document Control Procedures Manual															X	X
44 CFR Parts 65, 66, and 67		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

1.3. Study Location

San Mateo County is located in north-central California, south of the City of San Francisco, as shown in Figure 1. The San Francisco Bay shoreline forms the north-eastern boundary of the county. This study covers the entirety of the San Francisco Bay shoreline within San Mateo County, north of the San Mateo Bridge (Route 92). A separate report, prepared by BakerAECOM as a part of the Bay Area Coastal—South flood hazard study, analyzes the portion within San Mateo County south of the San Mateo Bridge.

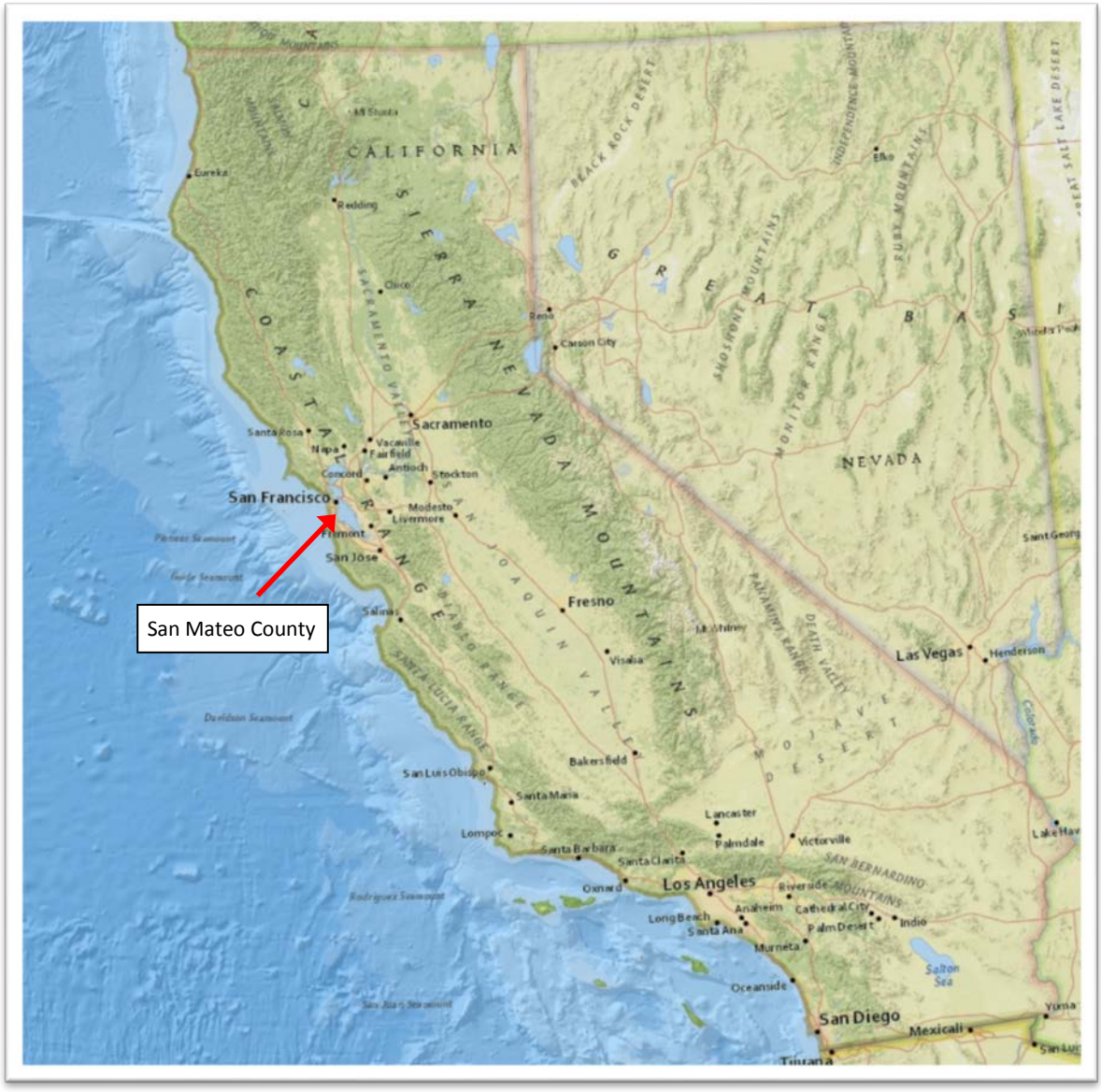


Figure 1. San Mateo County, CA

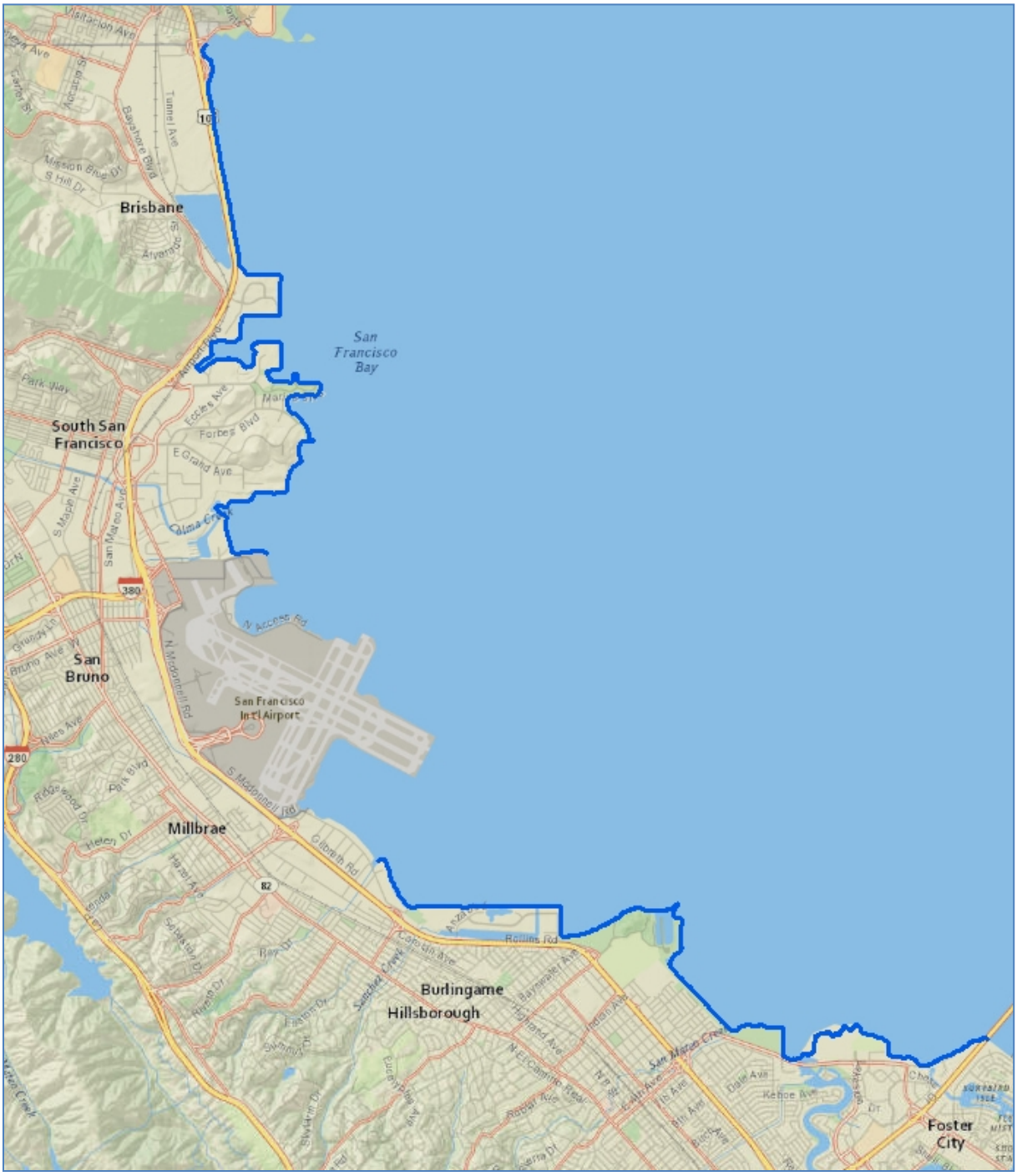


Figure 2. San Francisco Bay studied shoreline shown in blue

(Note San Francisco International Airport is not included in this study)

2. Methodology

2.1. Coastal Study Processing

This section summarizes the development of flood hazard mapping information for the San Francisco Bay shoreline of San Mateo County, California north of the San Mateo Bridge. The flood hazard study analysis and results are presented in a separate report, *A Central San Francisco Bay Coastal Flood Hazard Study—San Mateo County, California Coastal Analysis Report*, dated July 25, 2014.

Results from the flood hazard study analysis and modeling are used to delineate the floodplain boundaries and to determine the base flood elevations (BFEs) and flood zone designations. Coastal base flood elevations include the effects of waves. Flood zone designations are based on the severity of the wave hazard.

The primary coastal flood hazards for San Mateo County are wave runup, overtopping, overland wave propagation and inundation from elevated stillwater levels. More than one of these coastal flood processes may affect a given reach of shoreline. In those cases, the process that resulted in the more hazardous flood conditions—that is the greater BFE and/or flood zone designation—is mapped.

2.1.1. Transects and Transect Baseline

The transect shapefile, S_CST_TSCT_LN, is a modified version of the transects that were used for the coastal analyses. Transects were truncated at the shoreline, represented by the transect baseline, S_TSCT_BAS_LN, in the Flood Insurance Rate Map (FIRM) database. The 3.2-foot contour was used as the transect baseline for this study and is the starting location of the WHAFIS analysis. Typically, the 0-foot contour is chosen to be the transect baseline; however, in the San Francisco Bay the 0-foot NAVD contour is approximately equivalent to the Mean Lower Low Water datum. The 0-foot contour is often located hundreds of feet seaward of the wet/dry shoreline visible on aerial imagery. Since it is required that the transect baseline be shown on the digital FIRM, the great discrepancy between the location of the wet/dry shoreline and the 0-foot contour could cause confusion for end-users. Thus, although FEMA's guidelines recommend the use of the 0-foot contour for the transect baseline, the MSL contour at 3.2 feet NAVD was identified as a more appropriate baseline for the analyses and mapping.

If the end user is interested in the transects used for runup analysis, the transects submitted with the coastal analysis should be used to determine the seaward extent of bathymetry used for that analysis. Some transects were also truncated at the landward end so as not to extend more than 500 feet into the landward-most X Zone.

2.1.2. Flood Zone Delineations

Three flood risk designations were used for the mapping of the coastal floodplain in San Mateo County: Zone VE, Zone AE, and Zone X.

2.1.2.1 Zone VE

VE Zones are coastal high hazard areas where wave action and/or high-velocity water can cause structural damage during the 1-percent-annual-chance flood. VE Zones in San Mateo County were identified using the following criteria for the 1-percent-annual-chance flood conditions:

- The **wave runup zone** occurs where the ground profile is 3.0 feet or more below the 2-percent wave runup elevation and where the runup height above the stillwater elevation is greater than 3 feet.
- The **wave overtopping splash zone** is the area landward of the crest of an overtopped barrier, in cases where the potential wave runup exceeds the barrier crest elevation by 3.0 feet or more.
- The **high-velocity flow zone** is landward of the overtopping splash zone (or area on a sloping beach or other shore type), where the product of depth of flow times the flow velocity squared (hv^2) is greater than or equal to 200 ft^3/sec^2.
- The **breaking wave height zone** occurs where 3-foot or greater wave heights could occur.

The actual VE Zone boundary shown on the FIRM is defined as the farthest inland extent of any of the criteria listed above. VE Zones are subdivided into elevation zones, and whole-foot BFEs are assigned.

2.1.2.2 Zone AE

AE Zones are areas of inundation by the 1-percent-annual-chance flood, including areas with wave heights less than 3.0 feet and runup heights less than 3.0 feet above the stillwater. These areas are subdivided into elevation zones, and whole-foot BFEs are assigned.

2.1.2.3 Zone X

X Zones are areas above the 1-percent-annual-chance flood level. On the FIRM, a shaded X Zone area is inundated by the 0.2-percent-annual-chance flood, and an unshaded X Zone area is above the 0.2-percent-annual-chance flood.

The 0.2-percent-annual-chance floodplain was not mapped for areas where wave runup is the dominant flood hazard; it was only mapped in areas of inundation. The 0.2-percent-annual-chance floodplain is the area with ground elevations above the 1-percent-annual-chance stillwater elevation and below the 0.2-percent-annual-chance stillwater elevation.

2.1.3. Interpretation of Modeling Results

2.1.3.1 Runup Reaches

The majority of the San Francisco Bay shoreline of San Mateo County north of the San Mateo Bridge is highly developed with large revetments and seawalls armoring the shore. The dominant wave hazard for this type of shoreline is wave runup. Reaches of shoreline where the dominant wave hazard is wave runup are distinguished with shore-perpendicular Special Flood Hazard Area (SFHA)/Flood Zone Boundary Lines (also known as Zone Break Lines or Gutters) separating segments of shoreline with differing runup elevations. The placement of the gutter lines is based on engineering judgment that took into account the slope of the ground, the orientation of the shoreline relative to the predominate wind and wave forces, and the presence of shore protection structures, such as revetments, that affect flood hazards at the shoreline.

The BFE for a runup reach is the 1-percent-annual-chance wave runup elevation, or total water level (TWL). The flood zone designation of Zone VE or Zone AE is based on the magnitude of wave runup above the stillwater level. A VE Zone is mapped for transects with runup heights greater than 3 feet; an AE Zone is mapped for transects with runup heights less than 3 feet. This 3-foot runup height flood zone designation criterion was recently created to augment the existing guidance based on runup depth and is documented in FEMA Operating Guidance No. 9-13 Operating Guidance for Designation of Zone VE based on Wave Runup Height (2013).

With the response-based approach that was used for this study, there is not a single stillwater level that is associated with the 1-percent-annual-chance runup elevation. Therefore, a runup height for the 1-percent-annual-chance runup elevation cannot be explicitly calculated. Instead, the flood zone designation is based on the runup heights for the runup annual maxima that were used in the extreme value analysis. If the runup height above the stillwater was greater than 3 feet for at least one of the annual maxima, that transect and the associated reach of shoreline was designated Zone VE. If none of the annual maxima events had a runup height greater than 3 feet, the reach was mapped as Zone AE.

2.1.3.2 Overtopping

Areas landward of barrier crests that are affected by wave overtopping were shown to be very narrow by the wave overtopping analysis, on the order of 5 feet (Figure 3). Overtopping areas are often mapped as Zone AO; however, limitations of map scale do not allow for mapping such narrow zones. Therefore, the overtopping zone was combined with the Zone AE or Zone VE mapped at the shoreline based on runup. In other words, the Zone AE or Zone VE boundary is mapped set back from the crest of the barrier by a distance equal to the width of the overtopping zone.

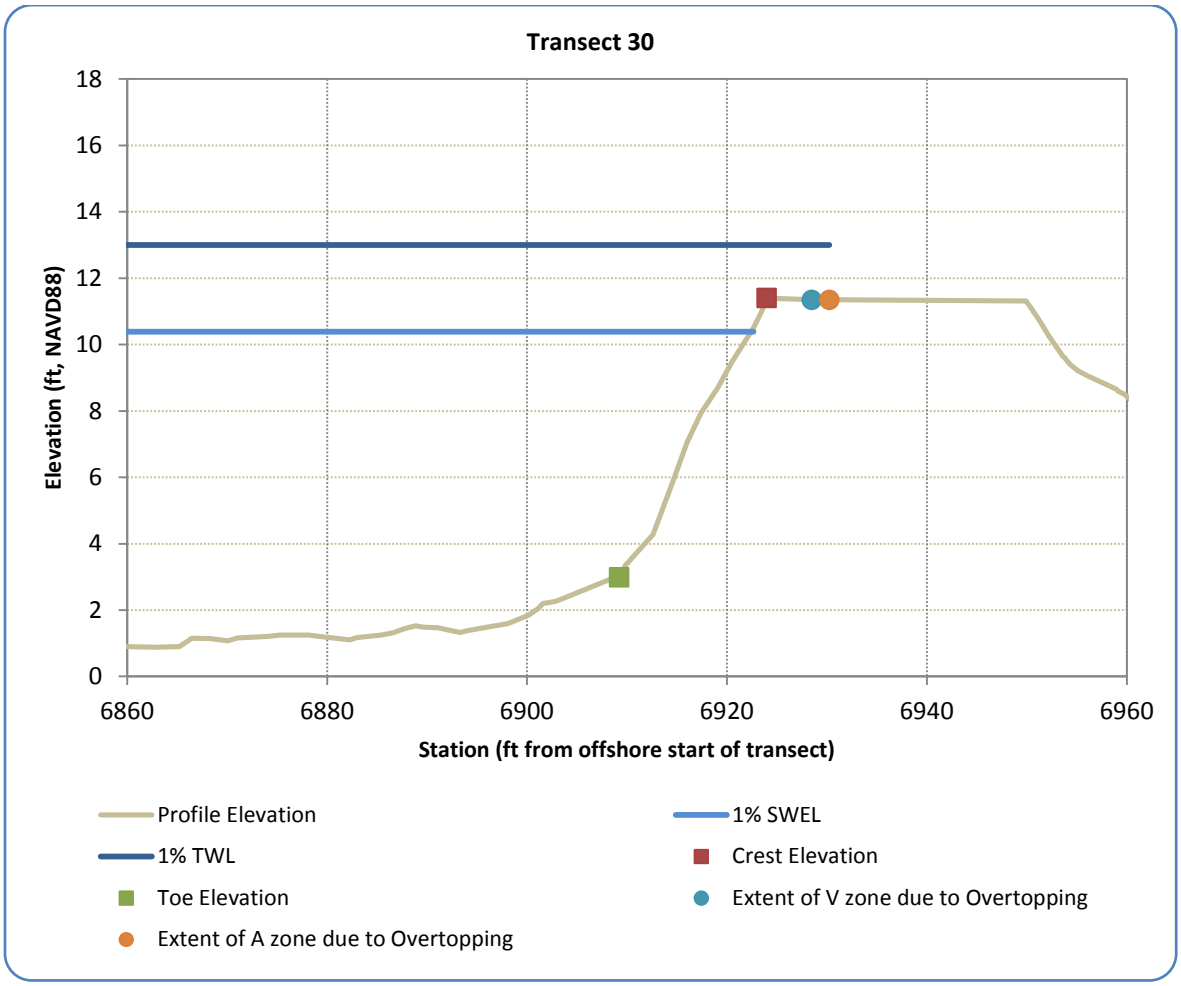


Figure 3. Schematic of runup and overtopping results

2.1.3.3 Overland Wave Propagation

Overland wave propagation was evaluated for transects that are inundated by the base flood. These areas are typically characterized by marsh or other low-lying areas along the coast, such as salt ponds. Overland wave propagation was modeled for two scenarios. The two scenarios were compared along the transect and the more hazardous condition for a given point was used to determine BFEs and flood zone designations. Comparison profiles are included in Appendix C of the coastal analysis report (BakerAECOM, 2014), and an example is shown in Figure 4 for reference.

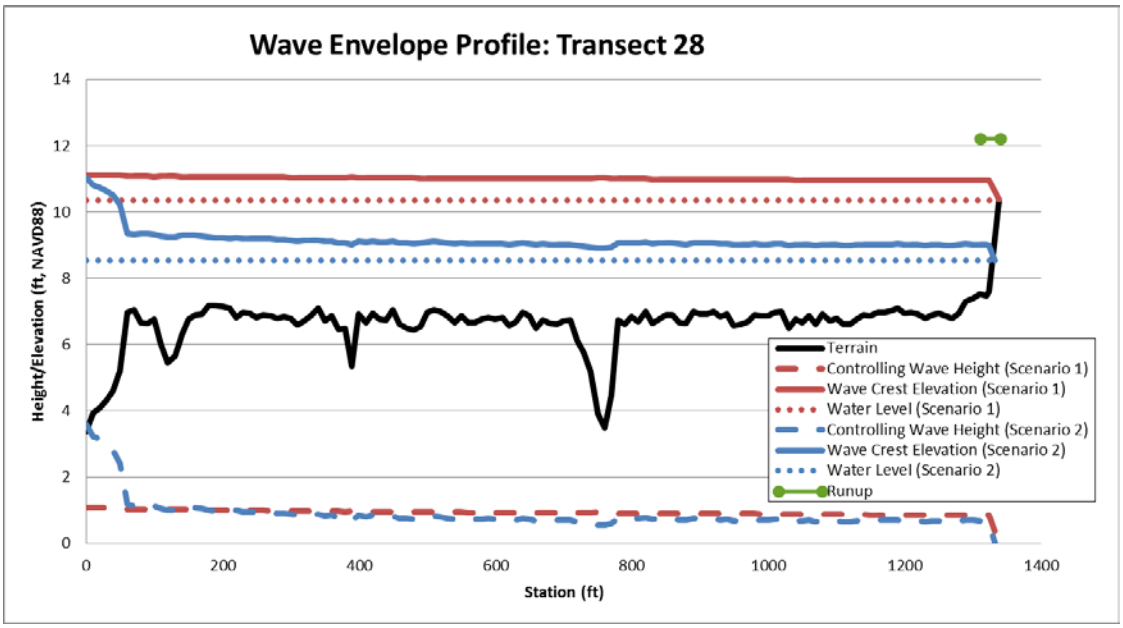


Figure 4. Sample wave envelope profile showing results of overland wave propagation and inland runup analyses

Wave runup on an inland shoreline was calculated for the one transect subject to overland wave propagation that had incident wave heights greater than 1 foot at the inland shoreline, transect 28. The result from that calculation is shown on the wave envelope profile and is incorporated into the floodplain mapping (Figure 4). Inland runup on narrow, undeveloped features such as salt marsh dikes was not mapped due to limitations in map scale and lack of development potential.

2.1.3.4 Inundation

The 1-percent-annual-chance stillwater elevation was determined for each transect; it ranges between 10.18 and 10.47 feet (NAVD). Areas inundated by stillwater flooding with minimal wave hazard effects were mapped as Zone AE. The SFHA boundary is located at the point where the ground elevation equals the stillwater elevation. The BFE in these areas is rounded to the nearest whole-foot, though the boundary is mapped using precision to the tenth of a foot. All inundation areas are mapped as Zone AE (EL 10). Inundation flooding is mapped inland to the point where it meets continuous high ground or where it encounters flooding from another flooding source. Roadways such as Highway 82 were considered to be barriers to flooding in areas where they were continuously above the 1-percent-annual-chance stillwater elevation. Inundation from coastal flood waters was mapped behind non-accredited levees. However, per guidance from FEMA Region IX, the interior of the Foster City levee system has not been mapped at this time and the flood hazard information is retained from the currently effective FIRM.

2.1.4. Mapping Summary

Table 2 indicates the flood hazard processes that controlled the floodplain mapping flood zone designations and base flood elevations for each transect in northern San Mateo County. Detailed descriptions of the analysis and results can be found in *A Central San Francisco Bay Coastal Flood Hazard Study—San Mateo County, California Coastal Analysis Report*, dated July 25, 2014 (BakerAECOM, 2014).

Mapping of Brisbane Marina reflects the wave sheltering effects of the breakwaters, which was not accounted for in the analysis. The wave heights during extreme events in the vicinity of this marina breakwater and Oyster Point Marina are 2 to 3 feet. Given these relatively small waves, the breakwaters are assumed to be stable under base flood conditions. The exact heights of the breakwaters are not known, but it can be assumed that they would diminish wave energy partially or completely; therefore, a Zone AE designation is appropriate. The BFE within the marinas is 11 feet to acknowledge the potential for partial wave transmission if the breakwaters are overtopped or submerged during flood conditions.

Table 2. Summary of 1%-Annual-Chance Mapping Considerations

Transect Number	VE Zone Mapped	VE Zone Basis	Runup Mapped	Overtopping Mapped*	Overland Wave Propagation Mapped	Inundation Mapped	Inland Runup Mapped
1	X	Runup	X	X			
2	X	Runup	X	X		X	
3	X	Runup	X			X	
4	X	Runup	X	X			
5	X	Runup	X		X	X	
6			X				
7	X	Runup	X			X	
8			X			X	
9	X	Runup	X				
10	X	Runup	X				

Transect Number	VE Zone Mapped	VE Zone Basis	Runup Mapped	Overtopping Mapped*	Overland Wave Propagation Mapped	Inundation Mapped	Inland Runup Mapped
11			X				
12						X	
13	X	Runup	X	X		X	
14			X	X		X	
15			X				
16	X	Runup	X	X			
17	X	Runup	X				
18	X	Runup	X	X			
19			X	X	X	X	
20	X	Runup	X				
21	X	WHAFIS			X	X	
22	X	WHAFIS			X	X	
23	X	Runup	X		X	X	
24	X	Runup	X		X	X	
25	X	Runup	X		X	X	
26	X	Runup	X				
27	X	Runup	X				
28	X	WHAFIS			X	X	X
29	X	Runup	X	X		X	
30	X	Runup	X	X			
31	X	Runup	X	X			

*See Section 2.1.3.2 for description of overtopping mapping.

2.1.5. Limit of Moderate Wave Action (LiMWA)

Per FEMA *Procedure Memorandum No. 50—Policy and Procedures for Identifying and Mapping Areas Subject to Wave Heights Greater than 1.5 feet as an Informational Layer on Flood Insurance Maps (FIRMs)*, the LiMWA was mapped for northern San Mateo County. The LiMWA delineates the 1.5-foot wave height contour, separating areas with wave heights greater than 1.5 feet from areas with wave heights less than 1.5 feet. It is mapped only in areas of overland wave propagation where VE Zones are mapped based on wave heights. Per recent guidance developed by FEMA Headquarters, the LiMWA is not mapped if VE Zone conditions do not exist. It is also not mapped in areas where wave runup is the dominant flood hazard. The only location in the study reach with mapped LiMWA is near transects 21 & 22.

2.2. Non-Studied Streams and Tie-In Locations

There are several streams not studied for this PMR that fall on the PMR panels that are independent of the Central San Francisco Bay. These streams were reviewed for consistency with the NOAA 2010 San Francisco Bay Area LiDAR Terrain. Streams that are outside the coverage of the NOAA 2010 LiDAR were reviewed using the 2006 2-foot LiDAR-derived topographic data received from San Mateo County (HJW GeoSpatial, 2006). Acquisition of the 2006 LiDAR data began in October 2005 and a second flight was

required in January 2006 to fill in gaps and areas of minimal coverage. The data is projected in California State Plane Coordinates, Zone 3, NAD83 and NAVD88. BakerAECOM determined that the LiDAR data met FEMA's quality standards for use as 2-foot contour data. The 2006 LiDAR terrain was also used in the March 21, 2014 Preliminary San Mateo PMR to incorporate the interior drainage mapping from the San Mateo Bayfront Levee accreditation analysis (MIP Case # 13-09-0456S).

Inland tie-ins for the coastal study include the following and are coded STUDY11:

- New 0.2% annual-chance delineations near Industrial Way in the City of Brisbane and between Park Boulevard and Millwood Drive in the City of San Bruno. The area near Industrial Way connects inland approximate zones to new coastal AE. The area between Park Boulevard and Millwood Drive connects two 0.2% zones that were previously separated by Zone D.
- New Zone D delineations within the City of San Bruno along San Bruno Creek and El Zanjon Creek (Crystal Springs Creek). See Section 2.4 of this report for more information.
- Zone A redelineations for San Andreas Lake and Lomita Channel.
- Zone AH redelineations along San Antonio Ave in San Mateo County and the City of San Bruno previously coded FIRM1, and Zone AH redelineations in the City of Burlingame previously coded FIRM14.
- Zone AE and 0.2% redelineation within the channel on San Mateo Creek from approximately 300 feet upstream of South Norfolk St. to US 101, in the City of San Mateo. In addition, San Mateo Creek profile 40P has been updated to reflect new coastal elevations.

Many of the very large inland 0.2-percent-annual-chance zones were retained without revision because they appear to reflect shallow, nuisance flooding zones in urbanized areas that are based on experience and not necessarily topography.

The large countywide Zone X Unshaded (Zone X – Area of Minimal Flood Hazard) has been compiled from previous community-based FIRMs and the new SF Bay Coastal Study. It is coded STUDY10.

Other non-studied streams were reviewed and found to be generally consistent with the NOAA 2010/Geo 2006 terrain. One exception is the upper reaches of San Mateo Creek, where the floodplain mapping has been found to be inconsistent with the NOAA 2010/Geo 2006 terrain. This area has already been added to CNMS through the San Mateo Bayfront Levee PMR study (MIP Case # 13-09-0456S).

2.3. Incorporation of LOMCs

One LOMR has been issued within the study area since the effective FIS date of October 16, 2012.

LOMR #13-09-1038P is on panels 41, 42, 43, and 44 and is being partially incorporated for this PMR. The new coastal information supercedes the flood hazard information in this LOMR up to the railroad crossing between San Mateo Ave and South Linden Ave. Upstream of the railroad crossing the LOMR has been incorporated into this PMR. These areas are coded LOMC16. There are no affected FIS

components for this revision. Screen captures comparing the proposed revision to the LOMR, and supporting information is included in Appendix E.

At the time of this report, a meeting to review of the incorporation of LOMR #13-09-1038P with additional FEMA Region IX staff is pending and may result in future revisions.

In addition, at the time of this report, there are no cases in progress in San Mateo County.

2.4. BakerAECOM Redelineation of Select Zone D Areas

BakerAECOM, in discussion with FEMA Region IX, redelineated Zone D areas within the panels affected by this PMR. The process was:

1. Select Zone D area of interest
2. Check for hydrographic features / drainage patterns in Zone D
3. Create buffer around flow paths. For this study, three methods were used to make the buffer, depending on surrounding topography:
    a. In moderately steep areas (overbank side slopes more shallow than ~3:1), used 100-ft buffer on each side (200-ft total).
    b. In very steep areas (overbank side slopes consistently steeper than ~3:1), follow contours 30’ - 40’ above stream if it resulted in narrower buffer.
    c. When very flat and 100-ft buffer doesn’t cross the next contour line, extended buffer to next contour but cross checking the orthophotography to confirm is marshy area, tree line, etc.
4. Measure Drainage Area – Continue the buffer area upstream to a point where contributing drainage area is 0.25 square mile or topography is extremely steep.
5. The buffer area becomes the delineation of Zone D. All other areas converted into unshaded Zone X.

This process resulted in retention of Zone D areas in the headwaters of San Bruno Creek and along El Zanjon Creek (Crystal Springs Creek). More information can be found in Appendix E.

2.5. Levees

A levee is a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding. For purposes of the NFIP, FEMA will only recognize in its flood hazard and risk mapping effort those levee systems that meet, and continue to meet, minimum design, operation, and maintenance standards that are consistent with the level of protection sought

through the comprehensive floodplain management criteria established by NFIP regulations, CFR 44 60.3. It is the responsibility of the community or other party seeking recognition of a levee system at the time of a flood risk study to provide the data outlined in 44 CFR 65.10. If the levee owner provides adequate information to certify that the levee provides protection from the base flood, FEMA considers the levee accredited, thus showing on the FIRM the protection provided by the levee for the 1-percent-annual-chance flood.

Within northern San Mateo County, levee systems are currently identified along the San Francisco Bay in the communities of the City of San Mateo and the City of Foster City. The levee system fronting the community of North Shoreview in the City of San Mateo is not accredited on the effective FIRM. The Bayfront levee in the City of San Mateo, located between transect 26 and the City of San Mateo/Foster City boundary, was accredited by FEMA in a letter addressed to the Honorable Brandt Grotte, Mayor of San Mateo, dated March 15, 2012. The Foster City levee, located at transects 29, 30, and 31, was accredited by FEMA in a letter addressed to the Ray Towne, Director of Public Works for the City of Foster City, dated July 23, 2007. The Foster City levee is shown as an accredited levee on the effective FIRM.

The effective FIRM for San Mateo County north of the San Mateo Bridge (Route 92) shows the City of Foster City and the southern half of the City of San Mateo with flood zone designations of Zone X (Protected by Levee). The northern half of the City of San Mateo is mapped with a flood hazard designation of Zone AE with a BFE of 10 feet (NAVD88).

Wave runup was evaluated at the shorelines of all levees for the purpose of establishing a BFE seaward of the levees. In addition, the maximum wave runup elevation was also evaluated for all transects that intersect bayfront levees at the City of San Mateo and Foster City. The maximum wave runup is required for evaluation to determine if the levee heights meet levee freeboard requirements for accredited levees, per Title 44 of the Code of Federal Regulations (CFR), 65.10 (b)(1)(iii):

> For coastal levees, the freeboard must be established at 1 foot above the height of the 1-percent-annual-chance wave or the maximum wave runup (whichever is greater) associated with the 1-percent-annual-chance stillwater surge elevation at the site.

A corollary to the above, which is important in areas with relatively small wave action, further stipulates that:

> Under no circumstances will a freeboard of less than 2 feet above the 1-percent-annual-chance stillwater surge elevation be accepted. [44CFR 65.10 (b)(1)(iv)]

Inundation and overland wave propagation was not evaluated for areas that are behind currently accredited levees and mapped as Zone X (Protected by Levee).

FEMA Region IX is in close coordination with the City of Foster City regarding their levee system. It has been agreed that, at this time, the flood hazard information from the March 21, 2014 Preliminary FIRM for San Mateo County will be retained for the interior of these levee systems. The flood hazard

information will be revised at a later date to update the areas associated with the levee structures in Foster City.

Furthermore, there is an additional levee system that is associated with the City of San Mateo, which ties in with the Foster City levee system. The mapping behind the City of San Mateo levee was not changed, as the coastal analysis north of the San Mateo Bridge indicates that those levees satisfy freeboard requirements with the exception of segment P2430. Segment P2430 is less than 0.1-ft freeboard deficient based on calculations at the time of this report. FEMA Region IX is in coordination with the City regarding this deficiency (see Section 3). Thus, the mapping (Zone X/Area With Reduced Flood Risk Due to Levee, and other SFHAs) from the concurrent 3/21/2014 Preliminary PMR is shown as-is inside the City of San Mateo corporate limits.

Further details on the levee status, flood hazard analysis study approach, levee freeboard assessment, and levee height requirements may be found in the aforementioned July 25, 2014 report. For additional information about the Foster City levee system south of the San Mateo Bridge, please refer to the separate Bay Area Coastal—South flood hazard study report.

3. Exceptions

As described in the previous section, accredited levee segment P2430 is 0.1-ft freeboard deficient compared to the 1% annual chance Stillwater elevation of 10.3 ft, NAVD88. Since the 'deficiency' may be a product of mathematical rounding of vertical datum conversion values between the various sources, the subject is planned for discussion with BakerAECOM staff, the City of San Mateo, and FEMA Region IX at an upcoming meeting. For the interim, the mapping (Zone X/Area With Reduced Flood Risk Due to Levee, and other SFHAs) from the concurrent 3/21/2014 Preliminary PMR is shown as-is inside the City of San Mateo corporate limits.

The San Mateo Creek levee reach, and other redelineation issues are described with screenshots and text in Appendix E.

4. Results and Conclusions

The 1-percent and 0.2-percent-annual-chance floodplain elevations for the Central San Francisco Bay models for San Mateo County were mapped primarily on the NOAA 2010 LiDAR Terrain. Water bodies and flooding sources on the FIRM panels, excluding the San Francisco Bay, were redelineated based on effective information, where applicable. The San Mateo County 2006 LiDAR was used as a secondary terrain source for inland mapping. Draft FIS components updated to reflect the tie-in of the coastal and riverine studies are located in Appendix F.

5. Draft FIS Text

FIS Section 3.3 Coastal Hazard Analyses

For San Francisco Bay, storm surge, swell-wave and wind-waves were modeled at a regional scale using numerical models to deterministically predict water levels and wave conditions in the bay. The regional modeling was conducted in two phases. The first phase focused on the North and Central Bay (DHI, 2011); the second phase focused on the South Bay (DHI, 2012). Coastal flooding hazards were then evaluated with one-dimensional (1D) transect-based models. Results from the North and Central Bay regional study are used in the coastal flood hazard analysis from the northern border of San Mateo County to the northern end of San Francisco International Airport (transects 1-13); the South Bay results were used from south of the airport to the San Mateo Bridge (Route 92) (transects 14-31).

The MIKE 21 Flow Model (HD) and MIKE 21 Spectral Wave (SW) model developed by DHI Water & Environment were used for the regional surge and wave modeling. The hydrodynamic model included the effects of tide, storm surge, and riverine discharge. The methodologies and model setup of the two regional modeling studies were very similar. Two notable differences between the two studies are the simulation period and the wave models. The North/Central Bay study simulated a 31-yr period from 1973 to 2003 and modeled both Pacific Ocean swell and locally generated wind-waves

(seas). The South Bay study simulated a 54-yr period from 1956 to 2009 and only modeled the locally generated wind-waves. The South Bay study did not model swell waves because swell from the Pacific Ocean does not penetrate that far south into the bay.

The frequency and magnitude of storm surge and wave heights were derived statistically from the synthesized 31- or 54-year records.

Water level and wave information from the regional hydrodynamic and wave models was used as input to the 1D flood hazard analyses. Wave setup, runup, overtopping, and overland wave propagation were analyzed at representative transects. Transects are shown on the FIRM panels and depicted in the Transect Location Maps (Figures X-X). Transect profile elevations were based on the National Oceanic and Atmospheric Administration (NOAA) 2010 Central San Francisco Bay Area LiDAR, collected February to April, 2010. Bathymetric information was derived from USACE dredging surveys and NOAA/ National Ocean Service (NOS) Geophysical Data System (GEODAS) bathymetric data. In areas where the two datasets overlapped, the USACE data was given priority.

Levee crest elevations for transects 27 and 28 were obtained from the as-built Bayfront Levee Containment plan, entitled "City of San Mateo Bayfront Levee Profile B Alignment," signed by Mr. Charles D. Anderson, P.E., and dated January 25, 2012. Data from surveys performed by Wilsey Ham Civil Engineers between June 2008 and March 2011 were provided by the City of Foster City for crest elevations of the levee pedway surrounding the city. These data were used to supplement the LiDAR data to more accurately reflect the existing conditions of the levee pedway.

Overland wave propagation modeling, using FEMA's Wave Height Analysis for Flood Insurance Studies (WHAFIS) model, Version 4 (FEMA, 1988; Divoky, 2007), was performed for transects with gently sloping profiles where the prevailing ground is inundated by the stillwater flood level alone. WHAFIS solves the wave action conservation equation and incorporates wind-generated wave growth and dissipation by marsh grasses, rigid vegetation, and buildings.

Wave runup was calculated for transects with coastal armoring or steeply sloping ground profiles in the vicinity of the flooded shoreline. Runup was calculated using one of two methods, depending on shoreline characteristics. The Direct Integration Method (FEMA, 2005) was used to calculate runup for transects with natural, gently sloping ($m < 0.125$) profiles. The Technical Advisory Committee for Water Retaining Structures (TAW) (van der Meer 2002) method was used for shorelines with shore protection structures and steeply sloping ($m \geq 0.125$) natural shorelines. The total runup elevation is also referred to as the total water level (TWL). Annual TWL maxima were selected from the hindcast time series, and the generalized extreme value (GEV) distribution was employed to determine the 1-percent-annual-chance TWL from the annual maxima at each transect. Wave overtopping was evaluated for transects where the runup elevation exceeded the barrier crest.

Transect Data Table

Transect	XY Coordinates (Geographic Latitude/Longitude)		Stillwater Elevation (feet NAVD 88)[1]				Zone	BFE
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance		
1	-122.393	37.69998	8.93	9.80	10.26	11.61	VE	14[2]
2	-122.389	37.68289	8.94	9.82	10.29	11.69	VE AE	13[2] 10
3	-122.384	37.67729	8.93	9.81	10.28	11.69	VE AE	10[2] 10
4	-122.388	37.67019	8.98	9.87	10.35	11.82	VE	14[2]
5	-122.381	37.66622	8.98	9.87	10.35	11.82	VE AE	14[2] 11
6	-122.374	37.6618	8.99	9.87	10.36	11.83	AE	11[2]
7	-122.38	37.65962	9.00	9.91	10.41	11.95	VE AE	13[2] 10
8	-122.377	37.6563	9.00	9.91	10.41	11.94	AE AE	11[2] 10
9	-122.378	37.65341	9.01	9.92	10.43	11.99	VE	12[2]
10	-122.38	37.6502	9.02	9.94	10.45	12.03	VE	14[2]
11	-122.383	37.64801	9.03	9.95	10.47	12.06	AE	11[2]
12	-122.392	37.64601	9.02	9.94	10.46	12.04	AE	10
13	-122.39	37.6413	9.02	9.94	10.46	12.05	VE AE	13[2] 10
14	-122.362	37.59475	9.04	9.79	10.18	11.26	AE AE	11[2] 10
15	-122.355	37.59214	9.04	9.79	10.18	11.26	AE	11[2]
16	-122.351	37.59203	9.05	9.80	10.20	11.31	VE	12[2]
17	-122.345	37.59209	9.05	9.81	10.20	11.33	VE	12[2]
18	-122.336	37.59209	9.05	9.82	10.22	11.37	VE	12[2]
19	-122.331	37.5882	9.05	9.82	10.23	11.39	AE AE	12[2] 10
20	-122.322	37.5917	9.06	9.83	10.24	11.42	VE	16[2]
21	-122.314	37.5889	9.07	9.87	10.30	11.55	VE AE	11 10-11
22	-122.315	37.58521	9.08	9.88	10.31	11.58	VE AE	11 10-11
23	-122.315	37.58344	9.08	9.88	10.31	11.58	VE	12[2]

Transect	XY Coordinates (Geographic Latitude/Longitude)		Stillwater Elevation (feet NAVD 88)[1]				Zone	BFE
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance		
							AE	10
24	-122.312	37.5806	9.08	9.88	10.32	11.60	VE AE	12[2] 10
25	-122.308	37.57741	9.08	9.89	10.33	11.63	VE AE	12[2] 10
26	-122.3	37.57557	9.08	9.90	10.34	11.66	VE	12[2]
27	-122.296	37.57149	9.09	9.91	10.36	11.70	VE	12[2]
28	-122.289	37.57449	9.09	9.92	10.37	11.72	VE AE	11 11-12
29	-122.281	37.5743	9.10	9.93	10.38	11.74	VE AE	13[2] 10
30	-122.276	37.57135	9.11	9.94	10.39	11.77	VE	13[2]
31	-122.269	37.57175	9.12	9.95	10.41	11.80	VE	13[2]

[1]North American Vertical Datum of 1988
[2]Wave runup elevation

FIS Section 4.1 Floodplain Boundaries

For this FIS, new flood zones were developed and mapped for the updated San Francisco Bay coastal hazard analysis described in Section 3.3. Detailed flood hazard boundaries along San Francisco Bay were delineated using the NOAA 2010 San Francisco Bay Area LiDAR, collected February to April 2010 (NOAA, 2010).

Areas inundated by stillwater flooding with minimal wave hazard effects were mapped as Zone AE and the flood hazard boundary is located at the point where the ground elevation equals the stillwater elevation. In areas subject to wave runup, the flood hazard boundary is located at the point where the ground elevation equals the runup elevation, or where overtopping occurs, the boundary is located at the inland extent of overtopping. The Base Flood Elevation (BFE) in these areas is rounded to the nearest whole-foot, though the boundary is mapped using precision to the tenth of a foot. Inundation flooding is mapped inland to the point where it meets continuous high ground or encounters flooding from another flooding source.

FIS Section 9.0 Bibliography and References

1. Danish Hydraulic Institute (DHI, 2011). Regional Coastal Hazard Modeling Study for North and Central San Francisco Bay, Final Draft Report, October 2011. Prepared for Federal Emergency Management Agency as part of the FEMA Services Group (DHI, Nolte Associates and Fugro).

2. Danish Hydraulic Institute (DHI), 2012. Regional Coastal Hazard Modeling Study for South San Francisco Bay, Final Draft Report, September 2012. Prepared for Alameda County Flood Control District and Federal Emergency Management Agency, Region IX.

3. Federal Emergency Management Agency (FEMA, 2005). Final Draft Guidelines for Coastal Flood Hazard Analysis and Mapping for the Pacific Coast of the United States. Washington, D.C.

4. van der Meer, J.W. (2002). Wave Run-up and Overtopping at Dikes. Technical Report, Technical Advisory Committee for Water Retaining Structures (TAW), Delft, The Netherlands.

5. Federal Emergency Management Agency (FEMA, 1988). Wave Height Analysis for Flood Insurance Studies (Technical Documentation for WHAFIS Program Version 3.0). Washington, DC.

6. Federal Emergency Management Agency, Operating Guidance for Designation of Zone VE based on Wave Runup Height, Washington, D.C., May 6, 2013.

7. Divoky, D. (2007). Supplementary WHAFIS Documentation: WHAFIS 4.0 A Revision of FEMA's WHAFIS 3.0 Program. Atlanta, GA.

8. National Oceanic and Atmospheric Administration (NOAA). San Francisco Bay, California LiDAR; Classified LiDAR Point Cloud Data. February-April 2010.

9. National Oceanic and Atmospheric Administration (NOAA). Geophysical Data System (GEODAS) bathymetric data. 1960-2007.

10. US Army Corps of Engineers (USACE). Bathymetric Survey San Francisco Bay.

6. References

1. BakerAECOM. (BakerAECOM, 2014). A Central San Francisco Bay Coastal Flood Hazard Study—Alameda County, California Coastal Analysis Report. July 25, 2014.
2. Federal Emergency Management Agency, Coastal Flood Hazard Analysis and Mapping Guidelines Focused Study Report—Flood Hazard Zones, Washington, D.C. February, 2005.
3. Federal Emergency Management Agency, Guidance for Coastal FloodHazard Analyses and Mapping in Sheltered Waters, Washington, D.C., February, 2008.
4. Federal Emergency Management Agency, Operating Guidance No. 9-13. Operating Guidance for Designation of Zone VE based on Wave Runup Height, Washington, D.C., May 6, 2013.
5. Danish Hydraulic Institute (DHI), 2011. Regional Coastal Hazard Modeling Study for North and Central San Francisco Bay, Final Draft Report, October 2011. Prepared for Federal Emergency Management Agency as part of the FEMA Services Group (DHI, Nolte Associates and Fugro).
6. Danish Hydraulic Institute (DHI), 2012. Regional Coastal Hazard Modeling Study for South San Francisco Bay, Final Draft Report, September 2012. Prepared for Alameda County Flood Control District and Federal Emergency Management Agency, Region IX.
7. HJW GeoSpatial, San Mateo County LiDAR Data Acquisition, October 2005 & January 2006.

Appendix A-1: TSDN Deliverables Checklist

Appendix A-1: Digital Data Submission Checklist
from Guidelines and Specifications for Flood Hazard Mapping Partners [April 2003]

TSDN CATEGORY	DATA TYPE	DATA SUBMITTED
General Documentation	Special Problem Reports Index	
	Special Problem Reports	
	Contact Reports Index	
	Contact Reports	
	Meeting Minutes/Reports Index	X
	Meeting Minutes/Reports	X
	Correspondence with/from FEMA	X
	Correspondence with/from Contractor	
	Other General Correspondence	
Engineering Analyses	Hydrologic Analyses Index	
	Summary Report of Hydrologic Analyses	
	Computer Models, Calculations, and Execution	
	Summary Report for Independent QA/QC	
	Hydraulic Analyses Index	
	Cross Section Information	
	Floodway Analyses	
	Key To Cross-Section Labeling	
	Computer Models, Calculations, and Execution	
	Cross-Section Plots	
	Computer Models, Calculations, and Execution	
	Summary Report for Independent QA/QC	
	Key To Transect Labeling	
	Transect and Surge Data	
	Wave Height Information	
	Computer Models, Calculations, and Execution	
	Summary Report for Independent QA/QC	
	Shallow Flooding Models, Calculations, and	
	Summary Report for Independent QA/QC	
	Ice-Jam Flooding Models, Calculations, and	
	Summary Report for Independent QA/QC	
	Alluvial Fan Flooding Models, Calculations,	
	Summary Report for Independent QA/QC	

San Mateo County, CA - Central SF Bay – Floodplain Mapping TSDN

TSDN CATEGORY	DATA TYPE	DATA SUBMITTED
Draft FIS Report	FIS Report Narrative (Complete)	X
	FIS Report Narrative (Revisions Summary)	
	Summary of Discharges Table	
	Floodway Data Table	
	Summary of Elevations Table	
	Transect Location Map	X
	Surge Elevations Table	X
	Flood Profiles	X
	Certification of Compliance for Work	X
	Other Relevant Data	
Mapping Information	Mapping Information Index	X
	Topographic Mapping (Hardcopy Version)	
	Topographic Mapping (Digital Version)	
	Summary Report for Independent QA/QC	X
	Work Maps (Hardcopy Version)	
	Work Maps (Digital Version)	X
	Work Map Delineation Summary	
	Preliminary DFIRM (Hardcopy Version)	
	CD-ROM with DFIRM Data	
	USGS Digital Orthophoto Quadrangle(s)	
	Soil and Vegetation Maps	
	USGS Topographic Quadrangle Maps	
	Flood Hazard Boundary Map	
	Community Maps	
	All Other Maps	
	DFIRM Database Data (Basic)	X
	DFIRM Database Data (Enhanced)	
	Digital Data Submission Checklist	
	Narrative	X
	Photogrammetric Survey Documentation	
	GPS Survey Documentation	

San Mateo County, CA - Central SF Bay – Floodplain Mapping TSDN

TSDN CATEGORY	DATA TYPE	DATA SUBMITTED
Miscellaneous Reference Materials	Field Survey Notes/Notebook	
	SCS/NRCS Flood Hazard Analyses Report(s)	
	USGS Floodplain Information Report(s)	
	USACE Feasibility Study Reports	
	Watershed Studies	
	Site Visit Photographs	
	Community Population and Demographic	
	Tax Base Reports	
	Legal References	
	(Other Relevant Materials)	

Appendix A-2: Meeting Minutes/Report Index

MEETING MINUTES/REPORT INDEX		
Community Name and State:	**San Mateo County, California**	
Community ID No.	**06081C**	
Compiled By:	**Krista Conner**	
Date TSDN Submitted:	**10/10/2014**	
Report Date	**Report Subject**	**Firm/Agency Contacted**
09/8/2014	Region IX BAC Study San Mateo Mapping Meeting/Webex	FEMA Region IX
9/11/2014	Region IX BAC Study San Mateo & Santa Clara Mapping Meeting/Webex	FEMA Region IX

Appendix A-3: Digital Data Submission Checklist

Appendix A-3: Mapping Information Index

MAPPING INFORMATION INDEX		
Community Name	San Mateo County	State: California
Community ID No.	06081C	
Compiled By:	BakerAECOM	
Date TSDN Submitted:	October 10, 2014	

Type / Purpose of Map	Date	File Type	File Name	Projection	Exhibit No.
Submittal Info	10/10/2014	SHP	S_Submittal_Info	NAD83 UTM Zone 10N	1
Metadata	10/10/2014	XML	06081C_Floodplain_metadata.xml	N/A	2
TSDN	10/10/2014	PDF	06081C_SFBC_Floodplain_TSDN.pdf	N/A	3
Final Floodplain Mapping Layers	10/10/2014	SHP	S_BFE S_Cst_Tsct_Ln S_Fld_Haz_Ar S_Fld_Haz_Ln S_Gen_Struct S_LiMWA S_Profil_Basln S_Stn_Start S_Tsct_Basln S_XS	NAD83 UTM Zone 10N	4
Final Floodplain Mapping Layers	10/10/2014	DBF	L_Cst_Model L_Cst_Tsct_Elev L_Source_Cit L_Xs_Elev Study_Info	N/A	5

Appendix A-4: Certification of Compliance

Appendix A-4: Certification of Compliance

CERTIFICATION OF COMPLIANCE	
Project Name:	A Central San Francisco Bay Coastal Flood Hazard Study
Statement of Work No:	HSFEHQ-09-D-0368 Task Order HSFE09-12-J-0005
Statement/Agreement Date:	
Certification Date:	October 10, 2014

Tasks/Activities Covered by This Certification (Check All That Apply)	
☐	Entire Project
☐	Topographic Data Development
☐	Hydrologic Analyses
☐	Hydraulic Analyses
☑	Coastal Flood Hazard Analyses
☑	Floodplain Mapping
☐	Other (Specify):

This is to certify that the work summarized above was completed in accordance with the statement/agreement cited above and all amendments thereto, together with all such modifications, either written or oral, as the Regional Project Officer and/or Assistance Officer or their representative have directed, as such modifications affect the statement/agreement, and that all such work has been accomplished in accordance with the provisions contained in Guidelines and Specifications for Flood Hazard Mapping Partners cited in the contract document, and in accordance with sound and accepted engineering practices within the contract provisions for respective phases of the work.

Name:	Lisa Winter, PE
Title:	Coastal Engineer
Firm/Agency Represented	BakerAECOM
Registration No:	MD PE #36705
Signature:	

Figure M-11. Certification of Compliance Form

Appendix B: Floodplain Mapping QA/QC Reviews

Appendix C: Digital Data on the MIP

- K:/R09/CALIFORNIA_06/SAN_MATEO_06081/SAN_MATEO_081C/11-09-1227S/SubmissionRepository/Floodplain/2144306
- Correspondence
- General
- Mapping
    - Spatial Files
    - Supporting Documents
        - Coastal Study Data
        - FBS
        - Supplemental
    - Topographic Data

Appendix D: Summary of Coastal Analyses Results Tables

The summary of results tables from the coastal analysis report (BakerAECOM, 2014) are included below for ease of reference. The reader is referred to the coastal analysis report for detailed descriptions of the source data, methodologies, assumptions and discussions of these results.

Table D-1. Summary of Results (Table 10; BakerAECOM, 2014)

Transect Number	Shoreline Structure	Runup Method	WHAFIS	1% SWEL (ft NAVD)	0.2% SWEL (ft NAVD)	1% Wave Crest Elevation (ft NAVD)	1% Runup Elevation (ft NAVD)	Overtopping (Y/N)
1	Revetment	TAW	—	10.26	11.61	11.84	13.68	Y
2	Revetment	TAW	—	10.29	11.69	11.52	12.63	Y
3	Revetment	TAW	—	10.28	11.69	10.40	10.25	N
4	Revetment	TAW	—	10.35	11.82	11.91	13.71	Y
5	Revetment	TAW	YES	10.35	11.82	11.61	13.87	Y
6	Revetment	DIM	—	10.36	11.83	12.02	10.68	N
7	Revetment	TAW	—	10.41	11.95	11.63	13.31	Y
8	Revetment	DIM	—	10.41	11.94	12.07	11.10	Y
9	NA	TAW	—	10.43	11.99	11.76	12.25	N
10	Revetment	TAW	—	10.45	12.03	11.93	13.80	N
11	Revetment	TAW	—	10.47	12.06	10.27	11.49	N
12	NA	DIM	—	10.46	12.04	11.62	10.42	N
13	NA	TAW	—	10.46	12.05	11.67	12.97	Y
14	NA	DIM	—	10.18	11.26	11.48	10.56	Y
15	Revetment	TAW	—	10.18	11.26	10.50	10.67	N
16	Revetment	TAW	—	10.20	11.31	10.71	12.02	Y
17	Revetment	TAW	—	10.20	11.33	10.87	12.26	Y
18	Revetment	TAW	—	10.22	11.37	11.00	12.48	Y
19	Revetment	TAW	YES	10.23	11.39	11.29	11.81	Y
20	NA	TAW	—	10.24	11.42	11.14	15.89	N
21	NA	-	YES	10.30	11.55	11.48	—	—
22	NA	-	YES	10.31	11.58	11.23	—	—
23	Levee/ Revetment	TAW	YES	10.31	11.58	11.34	12.68	N
24	Levee/ Revetment	TAW	YES	10.32	11.60	11.12	12.46	N
25	Levee/ Revetment	TAW	YES	10.33	11.63	11.34	12.49	N

Transect Number	Shoreline Structure	Runup Method	WHAFIS	1% SWEL (ft NAVD)	0.2% SWEL (ft NAVD)	1% Wave Crest Elevation (ft NAVD)	1% Runup Elevation (ft NAVD)	Overtopping (Y/N)
26	Revetment	TAW	—	10.34	11.66	11.09	12.38	N
27	Levee/ Revetment	TAW	—	10.36	11.70	11.47	12.13	N
28	Levee	-	YES	10.37	11.72	11.13	—	—
29	Levee/ Revetment	TAW	—	10.38	11.74	11.20	12.58	Y
30	Levee/ Revetment	TAW	—	10.39	11.77	11.40	13.00	Y
31	Levee/ Revetment	TAW	—	10.41	11.80	11.85	12.96	Y

Table D-2. 1-Percent-Annual-Chance TWLs, Mean Runup Slopes, and TAW Reduction Factors Used for the Runup Transects (Table 4; BakerAECOM, 2014)

Transect	Structure Description	Mean Runup Slope	Roughness Reduction Factor γ_r	1% TWL (ft, NAVD88)	Overtopped
1	Revetment	0.49	0.6	13.68	YES
2	Revetment	0.28	0.6	12.63	YES
3	Revetment	0.39	0.6	10.25	—
4	Revetment	0.39	0.6	13.71	YES
5	Revetment	0.50	0.6	13.87	YES
6	Revetment	0.07	0.6	10.68	—
7	Revetment	0.35	0.6	13.31	YES
8	Revetment	0.09	0.6	11.10	YES
9	NA	0.23	1.0	12.25	—
10	Revetment	0.34	0.6	13.80	
11	Revetment	0.31	0.6	11.49	—
12	NA	0.07	1.0	10.42	—
13	NA	0.20	1.0	12.97	YES
14	NA	0.10	1.0	10.56	YES
15	Revetment	0.24	0.6	10.67	—
16	Revetment	0.54	0.6	12.02	YES
17	Revetment	0.45	0.6	12.26	YES
18	Revetment	0.63	0.6	12.48	YES
19	Revetment	0.34	0.6	11.81	YES
20	NA	0.55	1.0	15.89	—
23	Levee/ Revetment	0.39	0.6	12.68	—
24	Levee/ Revetment	0.32	0.6	12.46	—
25	Levee/ Revetment	0.26	0.6	12.49	—
26	Revetment	0.36	0.6	12.38	—
27	Levee/ Revetment	0.47	0.6	12.13	—
29	Levee/ Revetment	0.49	0.6	12.58	YES
30	Levee/ Revetment	0.58	0.6	13.00	YES
31	Levee/ Revetment	0.46	0.6	12.96	YES

Table D-3. Splashdown and Hazard Zone Limits for the 1-Percent-Annual-Chance TWLs at Overtopped Transects (Table5; BakerAECOM, 2014)

Transect	Number of Wave Overtopping Events	1% Overtop-ping Event DWL2% (ft, NAVD88)	Crest Elevation (ft, NAVD88)	1% TWL (ft, NAVD88)	Maximum Splashdown, y_{Gouter} (ft)	Bore Propagation Distance from $_{yGouter}$ to hV^2=200 (ft)	V Zone Limit from Crest (ft)	Bore Propagation Distance from $_{yGouter}$ to h=0 (ft)	A Zone Limit from Crest(ft)	Backshore Slope Coefficient Am	zG (ft)
1	3	9.24	12.60	13.68	2.26	0.00	2.26	2.39	4.65	0.95	0.05
2	3	9.36	11.50	12.63	0.00	0.00	0.00	0.00	0.00	0.95	1.50
4	5	9.25	11.90	13.71	0.43	0.00	0.43	2.39	2.81	0.74	0.06
5	26	9.24	9.74	13.87	0.00	0.51	0.51	4.60	4.60	0.95	-
7	27	9.26	9.90	13.31	0.00	0.00	0.00	4.50	4.50	1.04	-
8	0	9.37	11.00	11.10	0.07	0.00	0.07	0.60	0.60	0.99	0.00
13	21	9.28	9.90	12.97	0.00	0.00	0.00	4.13	4.13	1.10	-
14*	10	9.38	9.30	10.56	-	-	-	-	-	-	-
16	19	8.84	10.20	12.02	0.00	0.00	0.00	2.56	2.56	0.90	-
17	0	9.21	12.22	12.26	0.00	0.00	0.00	0.33	0.33	0.83	-0.07
18	23	8.84	10.50	12.48	0.00	0.00	0.00	3.06	3.06	1.03	-
19	6	9.25	10.20	11.81	0.00	0.00	0.00	2.38	2.38	1.04	-
29	7	8.91	11.29	12.58	3.25	0.00	3.25	2.45	5.69	1.00	0.00
30	8	9.29	11.40	13.00	4.44	0.00	4.44	2.75	7.19	1.01	-0.02
31	5	9.44	11.57	12.96	3.17	0.00	3.17	2.56	5.73	1.01	-0.02

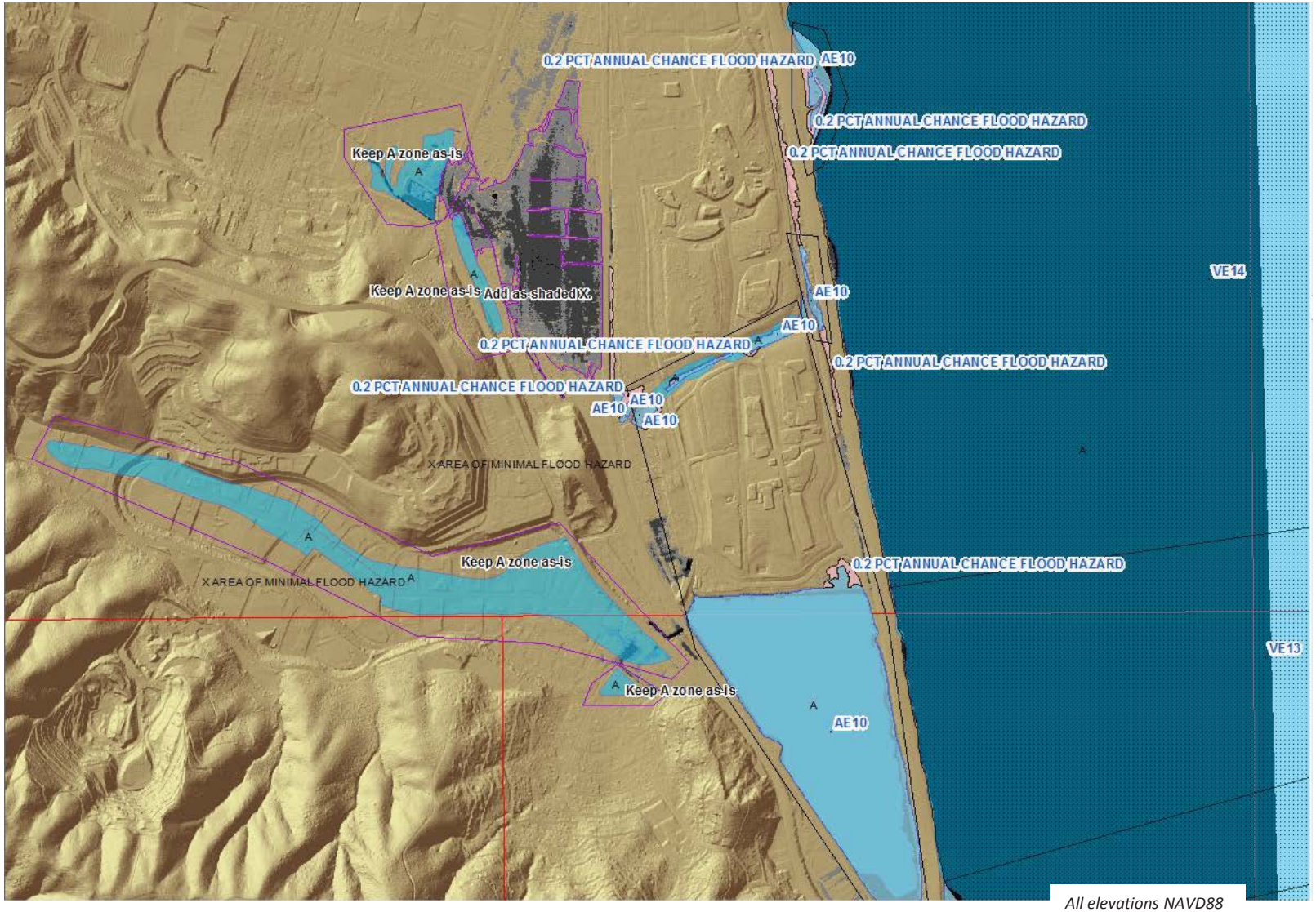
*Crest is inundated by DWL2%

Table D-4. Summary of Wave Runup Calculations Inland Along WHAFIS Transects (Table 8; BakerAECOM, 2014)

Transect	More Hazardous Condition	Approximate Station of Wave Runup	H_c (ft)	T_p (s)	slope, m	SWEL at Toe (ft)	Runup Method	Runup (ft)	TWL (ft)
28	Scenario 1	1324	0.85	2.1	0.53	10.35	TAW	1.8	12.2

Appendix E: Redelineation Issues and Resolutions

#1

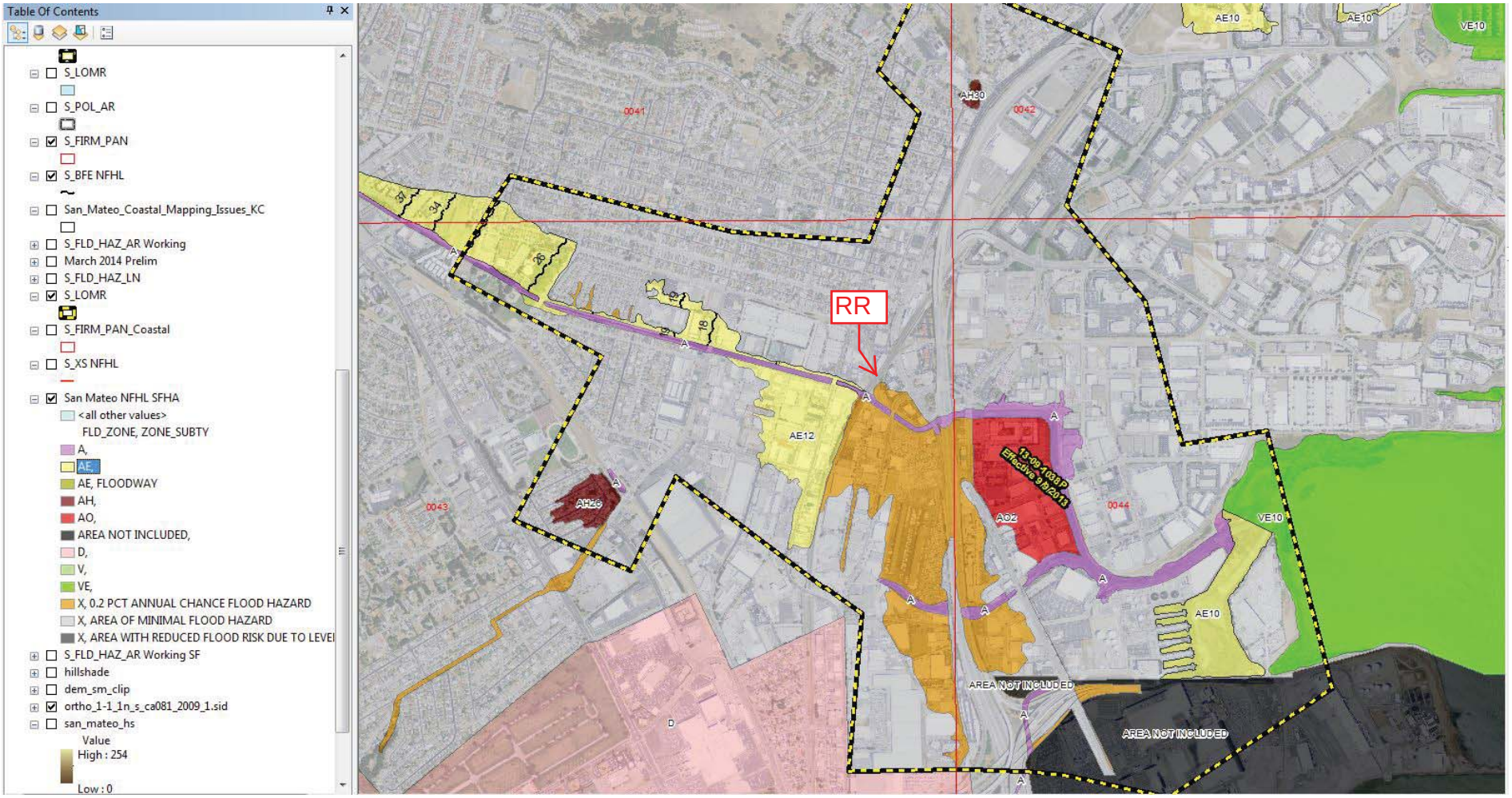


Unnamed Flooding Sources - Vistacion Valley & Guadalupe Valley - City of South San Francisco FIRM panels 0035 & 0042

Current decision: retain A zones landward of Bayshore Blvd, convert bay side A zones to coastal AE, and add new shaded X based on coastal 0.2% & shallow 1%

#2A

Colma Creek LOMR as incorporated into current NFHL



All elevations NAVD88

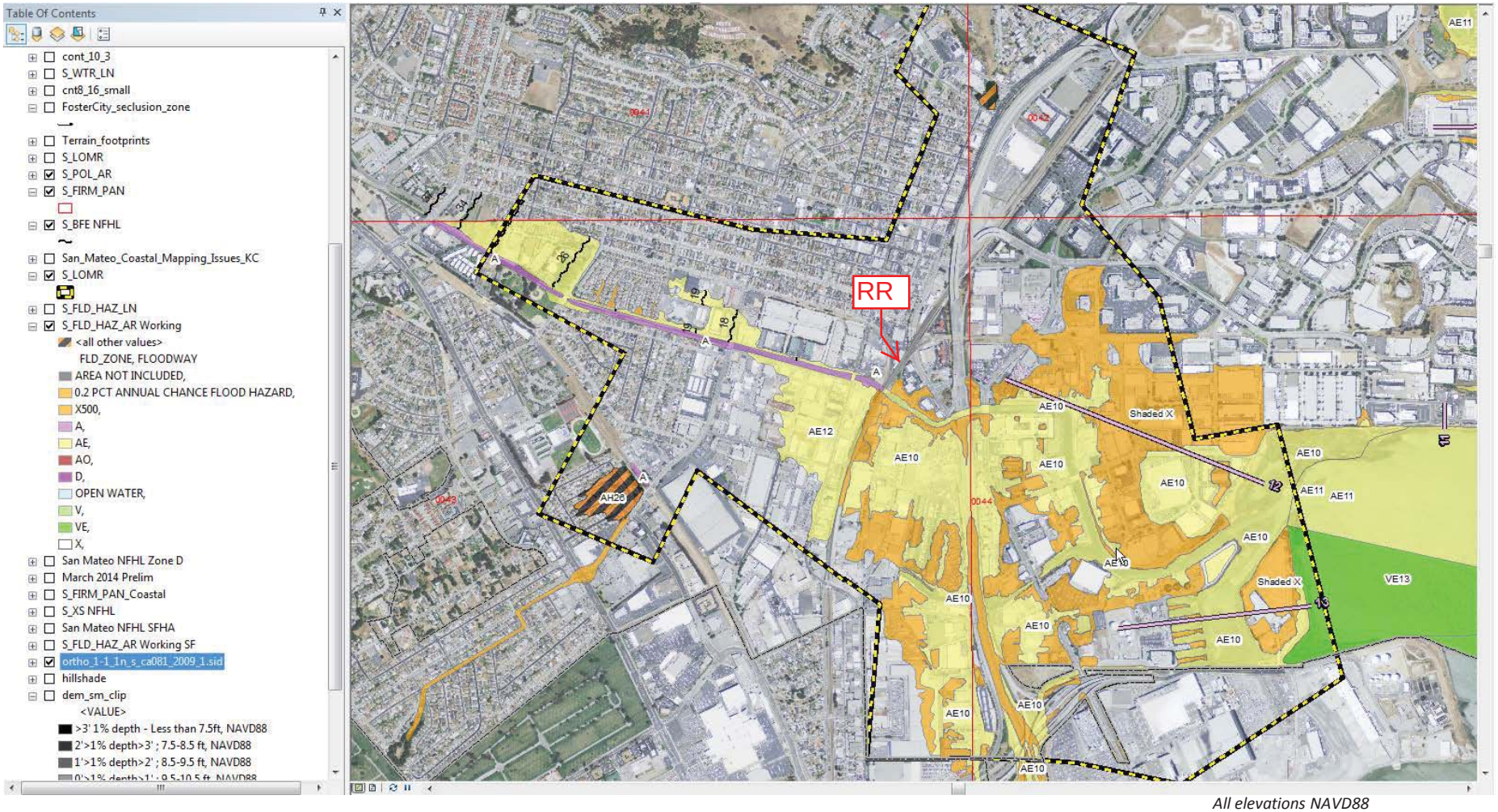
Colma Creek, Navigable Slough & San Bruno Channel- City of South San Francisco

LOMR Case 13-09-1028P - FIRM panels 0041, 0042, 0043 & 0044

Current decision: convert AO2 & A zones to coastal AE & shaded X d/s of RR

#2B

Colma Creek LOMR area as proposed in Coastal FPM



All elevations NAVD88

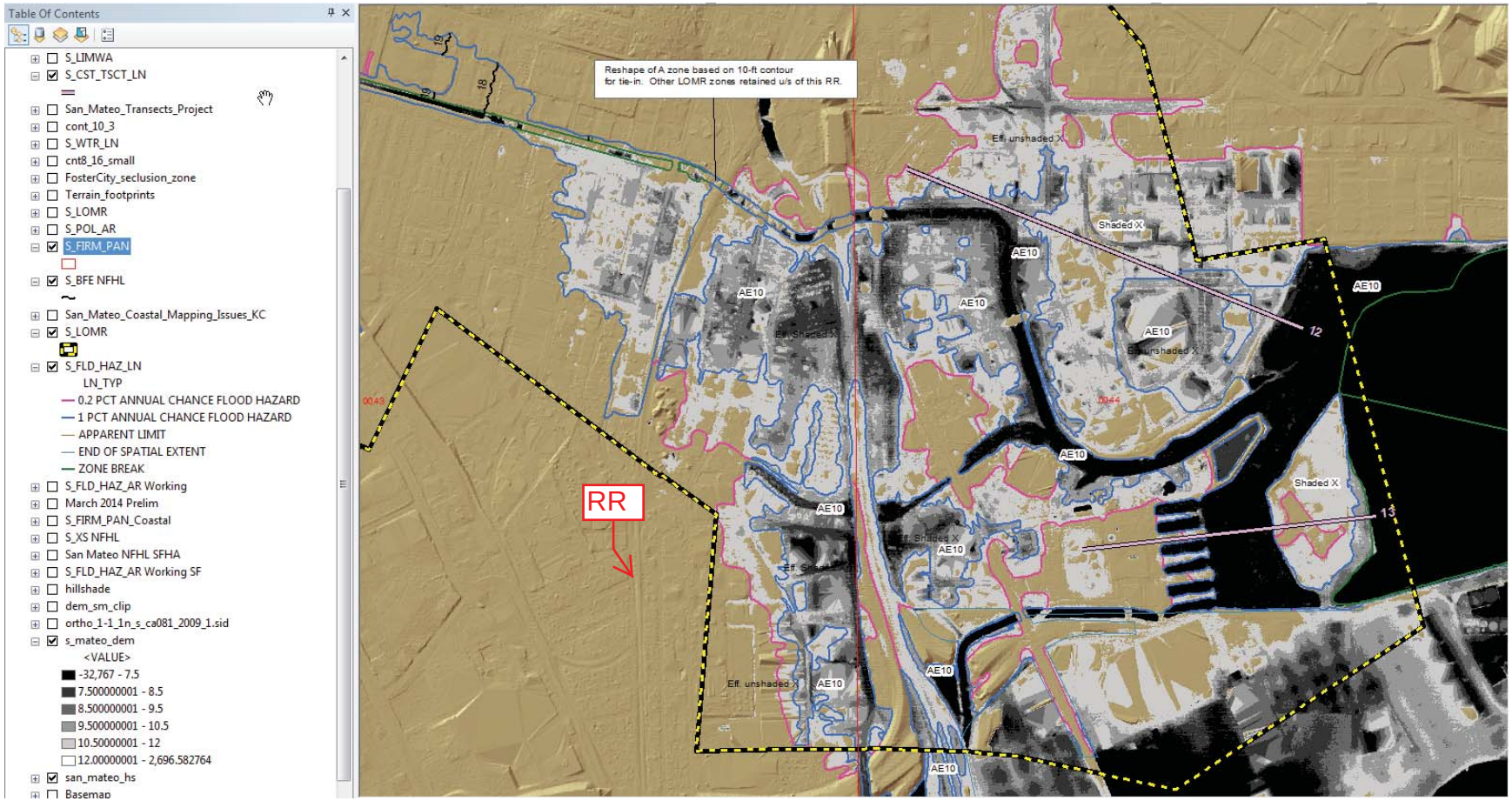
Colma Creek, Navigable Slough & San Bruno Channel- City of South San Francisco

LOMR Case 13-09-1028P - FIRM panels 0041, 0042, 0043 & 0044

Current decision: convert AO2 & A zones to coastal AE & shaded X d/s of RR

Colma Creek proposed Coastal FPM – delineations on dem symbolized as depth grid

#2C



All elevations NAVD88

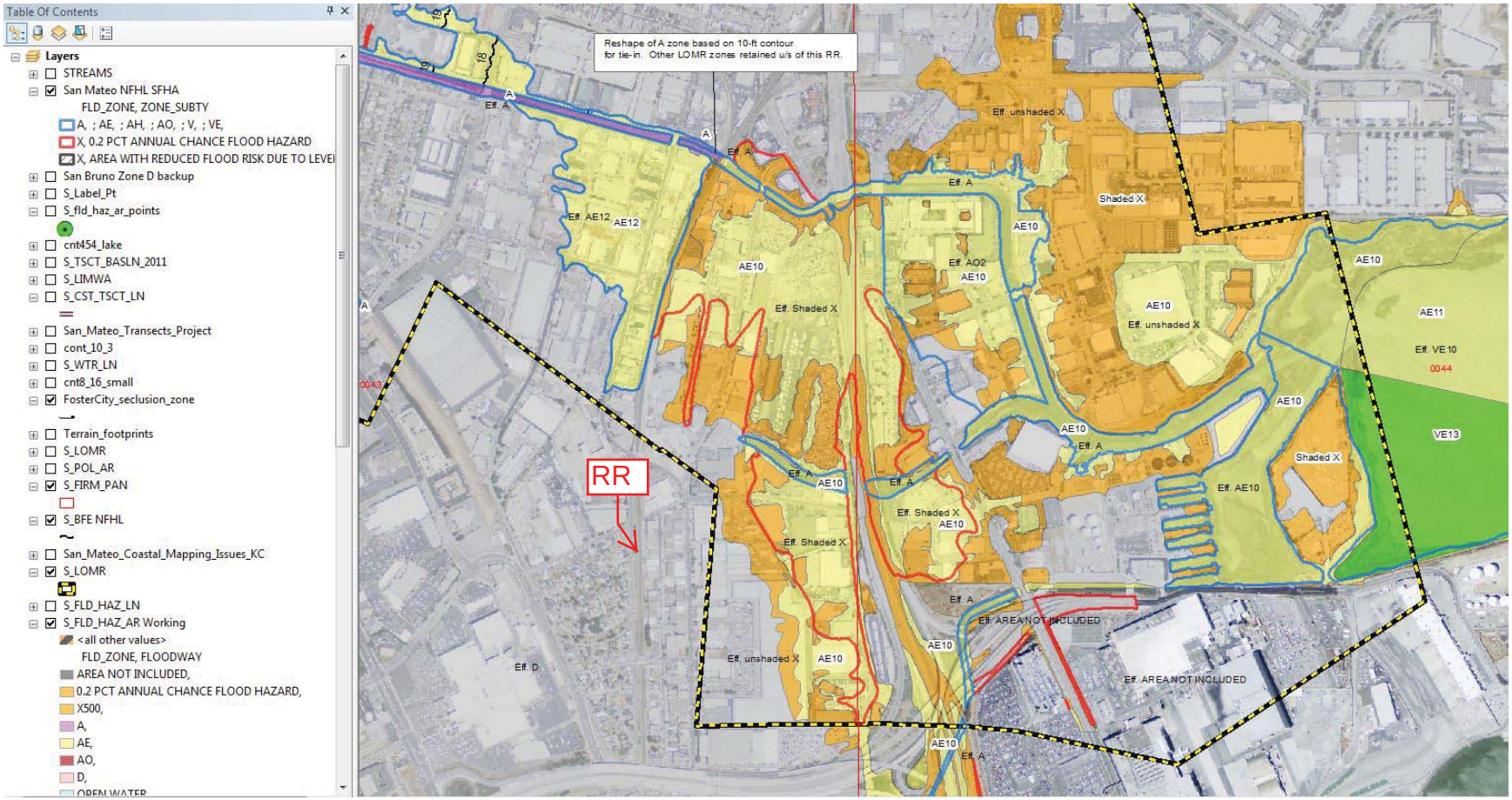
Colma Creek, Navigable Slough & San Bruno Channel- City of South San Francisco

LOMR Case 13-09-1028P - FIRM panels 0043 & 0044

Current decision: convert AO2 & A zones to coastal AE & shaded X d/s of RR

#2D

Colma Creek LOMR vs. proposed Coastal FPM



All elevations NAVD88

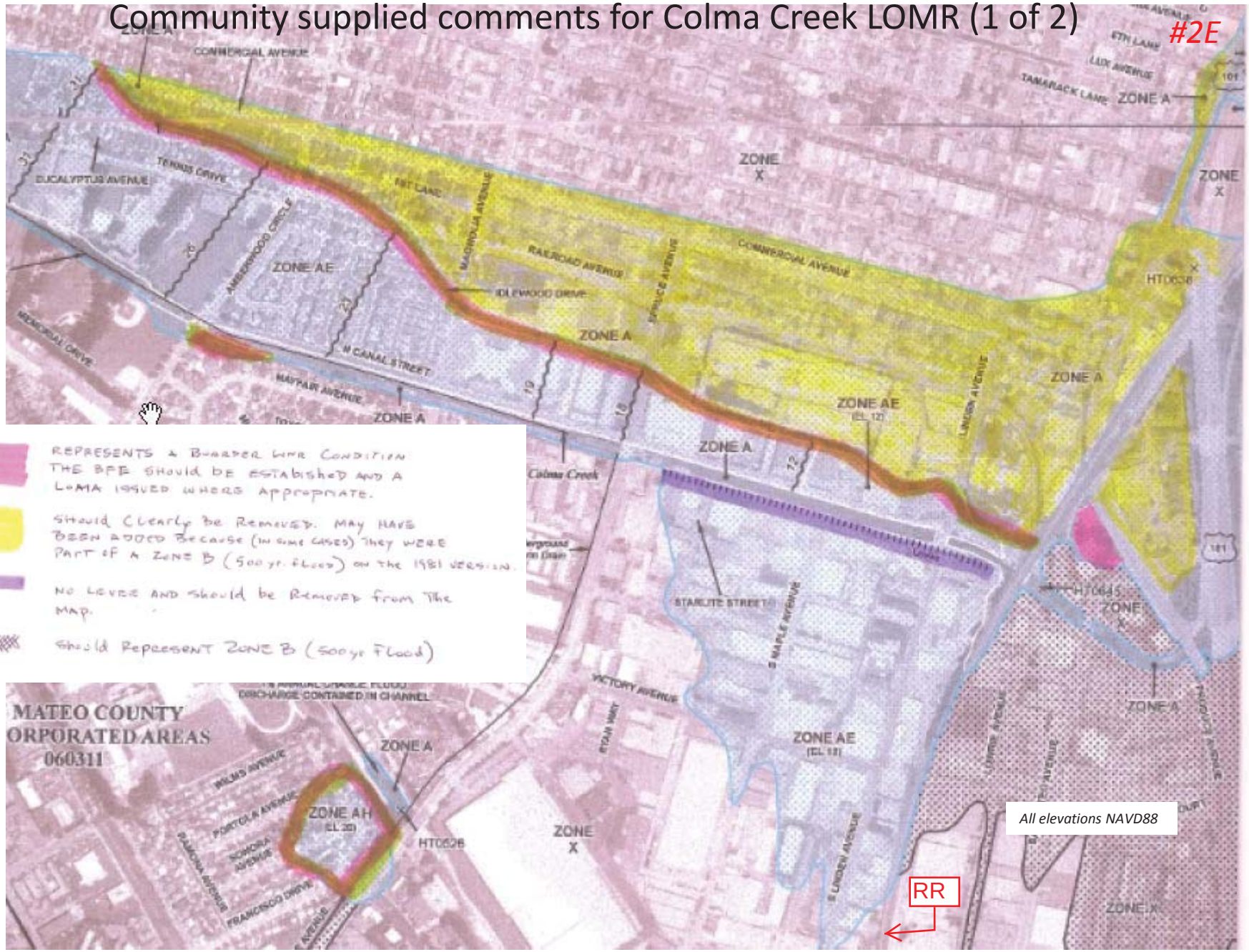
Colma Creek, Navigable Slough & San Bruno Channel- City of South San Francisco

LOMR Case 13-09-1028P - FIRM panels 0043 & 0044

Current decision: convert AO2 & A zones to coastal AE & shaded X d/s of RR

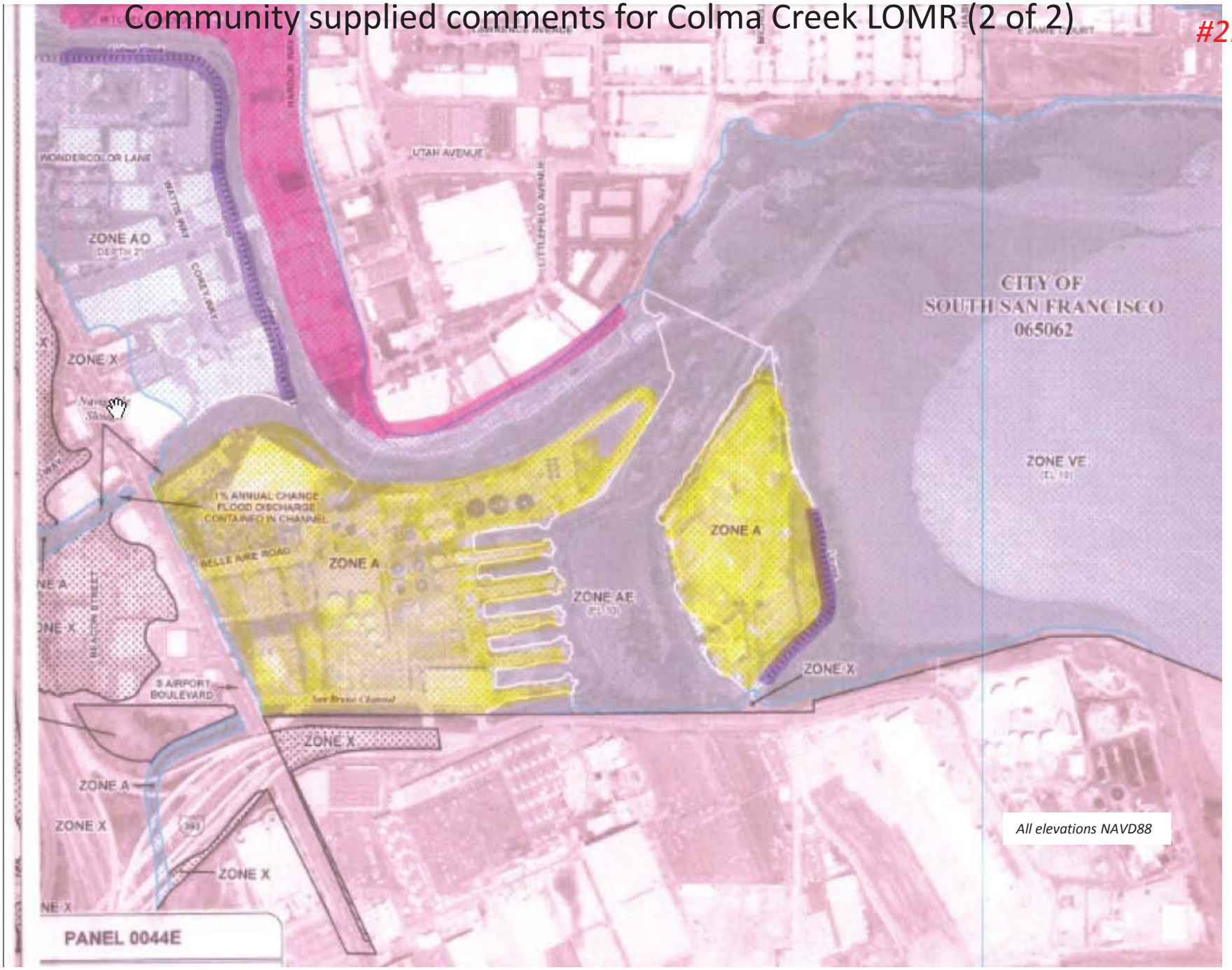
Community supplied comments for Colma Creek LOMR (1 of 2)

#2E

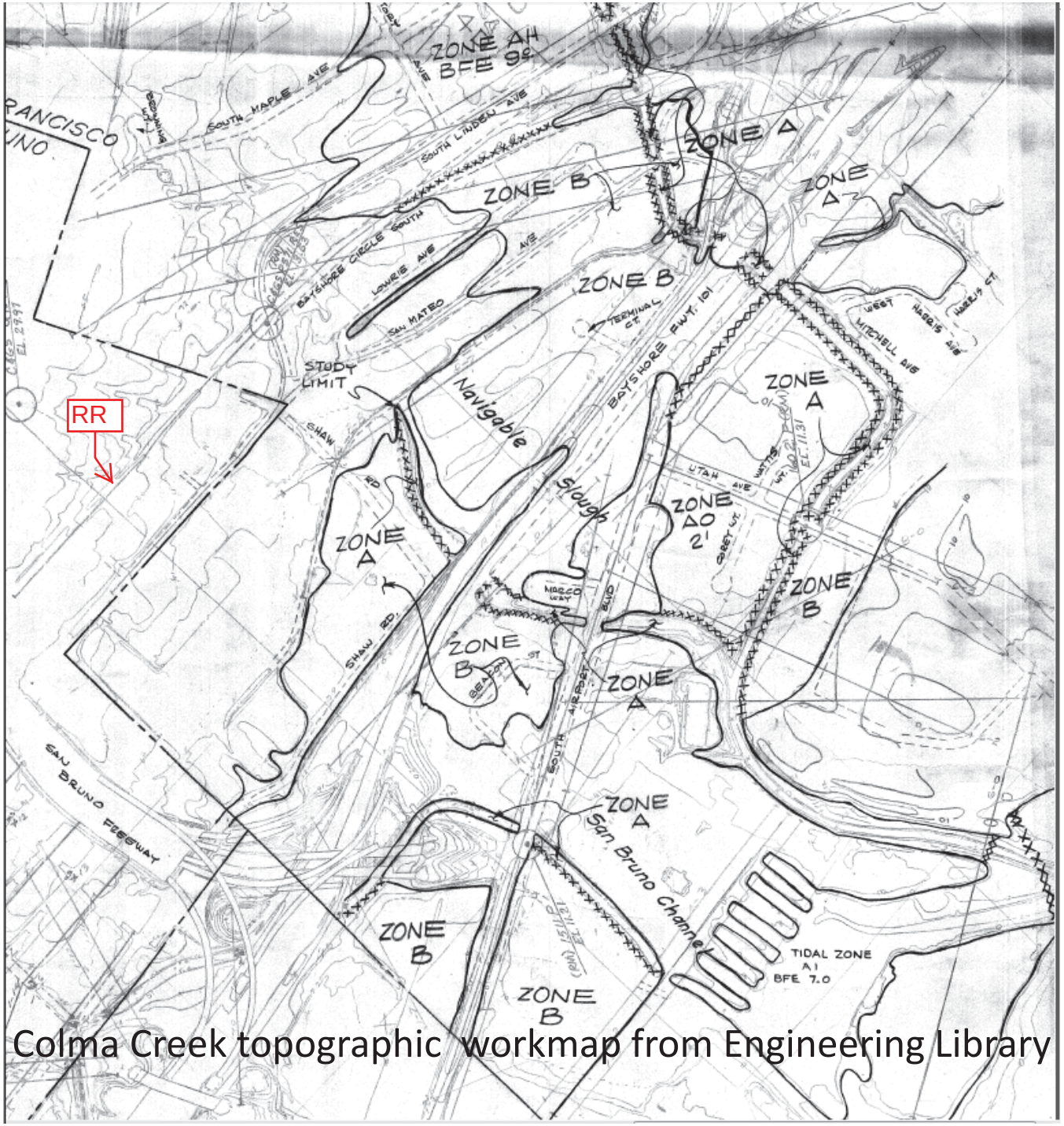


Community supplied comments for Colma Creek LOMR (2 of 2)

#2F



#2G



Colma Creek topographic workmap from Engineering Library

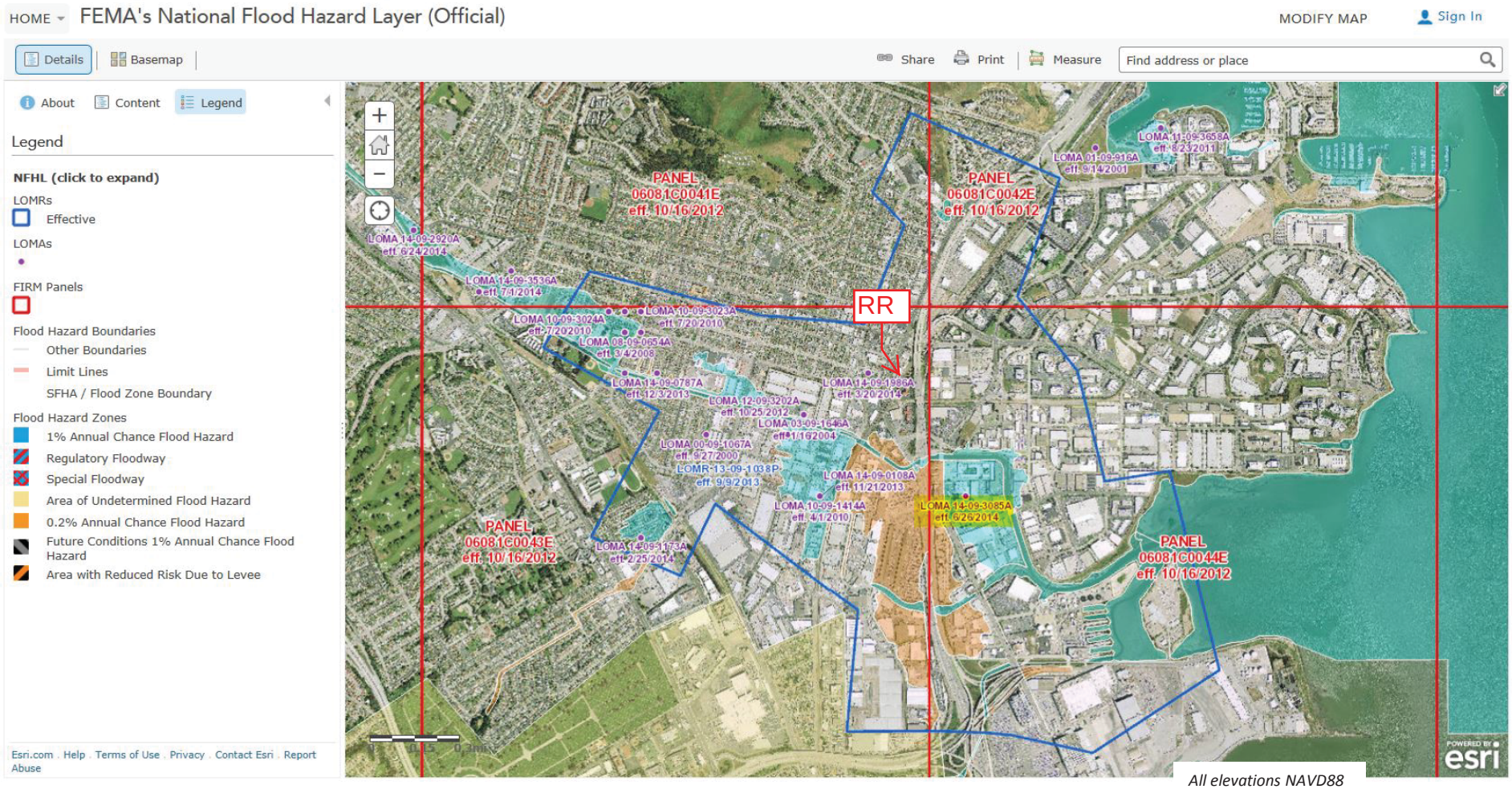
North (approx.)

All elevations NGVD29

Colma Creek LOMR in NFHL showing recent LOMAs.

#2H

Only case in proposed coastal FPM revision area is 14-09-3085A; currently shown in AO2, proposed to be in shaded X



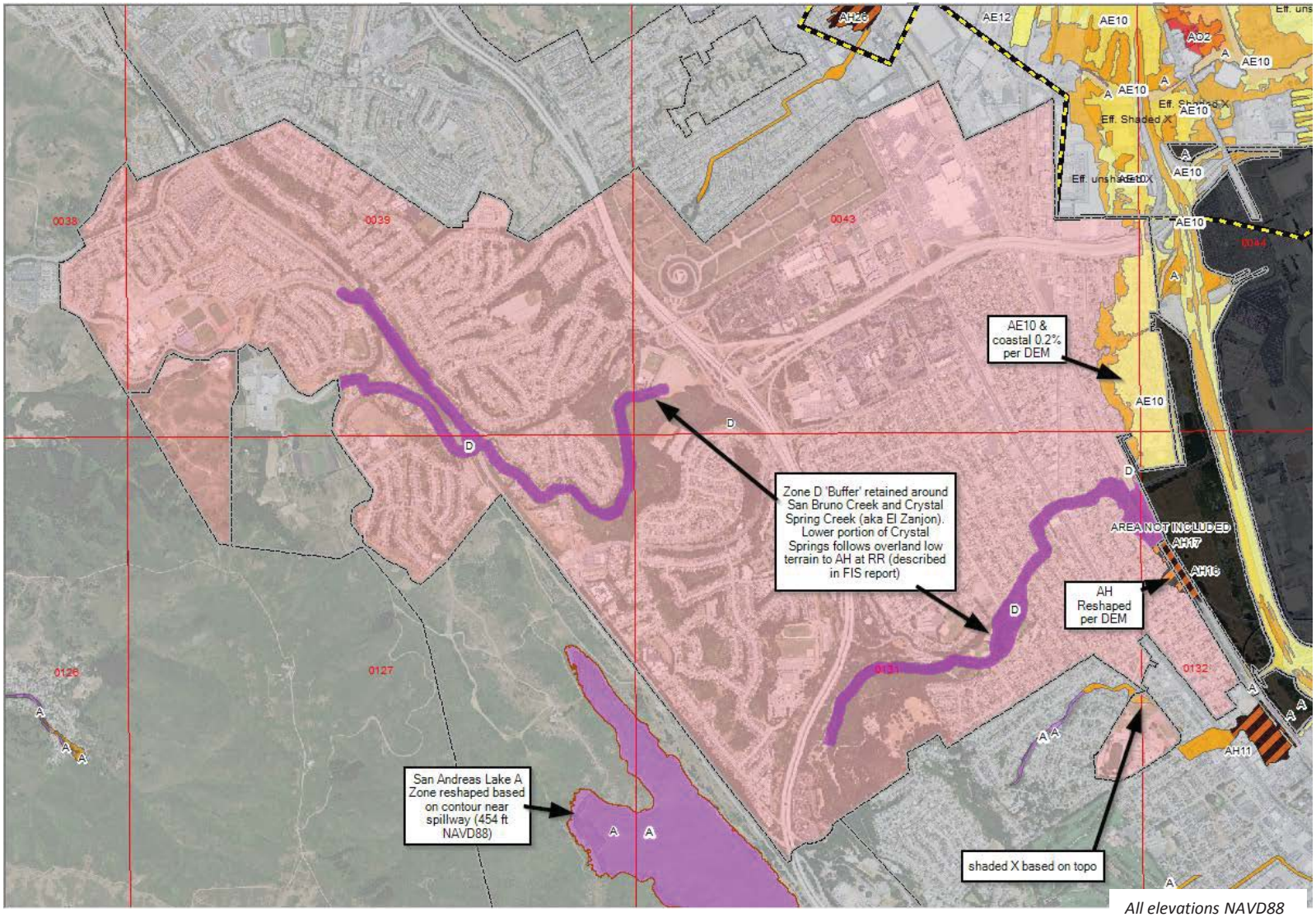
All elevations NAVD88

Colma Creek, Navigable Slough & San Bruno Channel- City of South San Francisco

LOMR Case 13-09-1028P - FIRM panels 0041, 0042, 0043 & 0044

Current decision: convert AO2 & A zones to coastal AE & shaded X d/s of RR

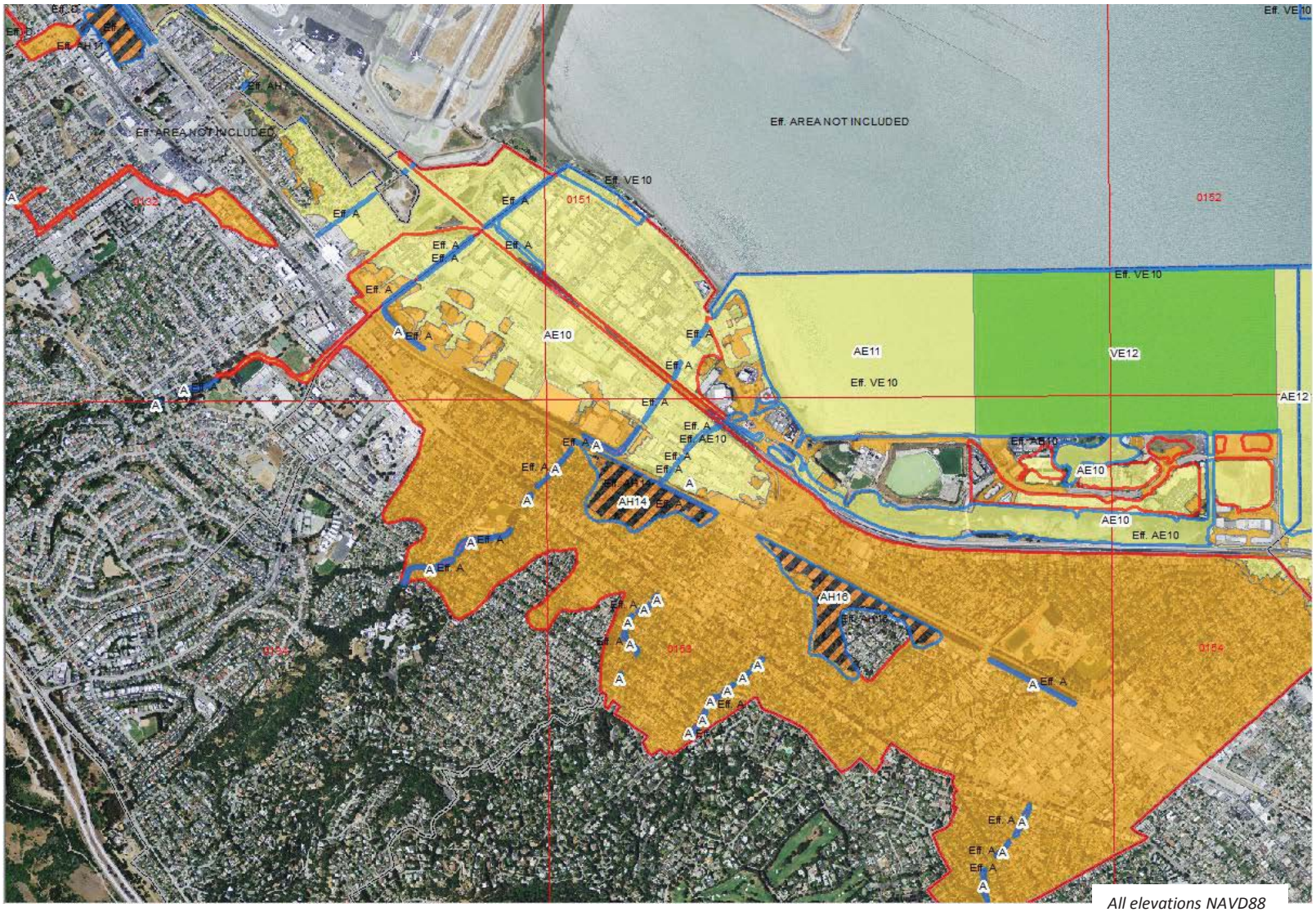
#3



San Bruno Ck, Crystal Springs Ck & Lomita channel - Citywide Zone D - City of San Bruno FIRM panels 0039, 0043, 0127, 0131, & 0132.

Current decision: convert Zone D areas within San Bruno to unshaded X except as noted

#4

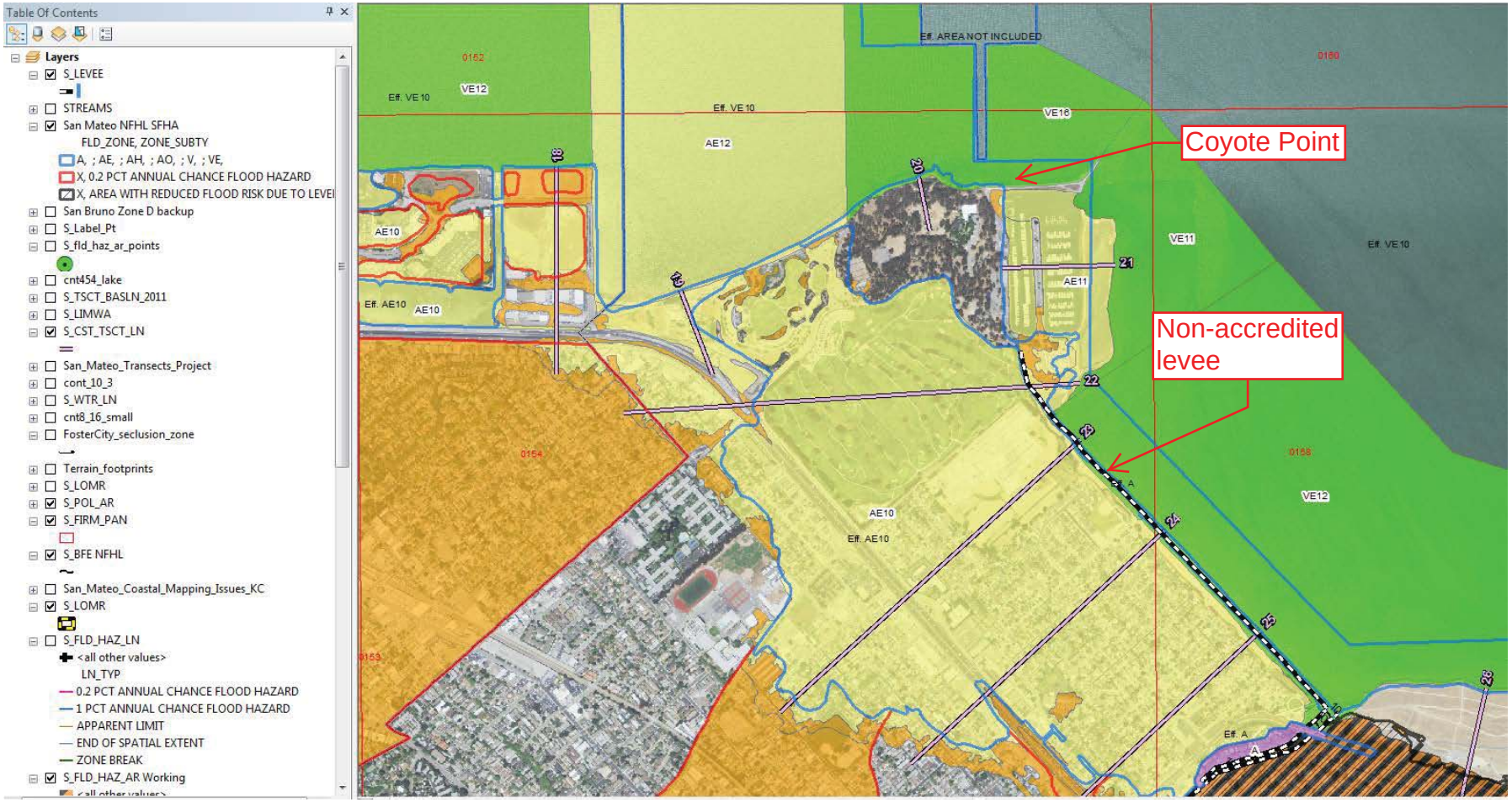


Burlingame Channel, Easton Ck, El Portal Canal, Mills Ck, Millbrae Ck, & Sanchez Ck

Cities of Millbrae & Burlingame - FIRM panels 0039, 0043, 0127, 0131, & 0132.

Current decision: retain large shaded X & narrow A zones inland from RR; reshape AH 14/16, Convert bay side narrow A zones to AE10, reshape AE based on coastal 1%

#5



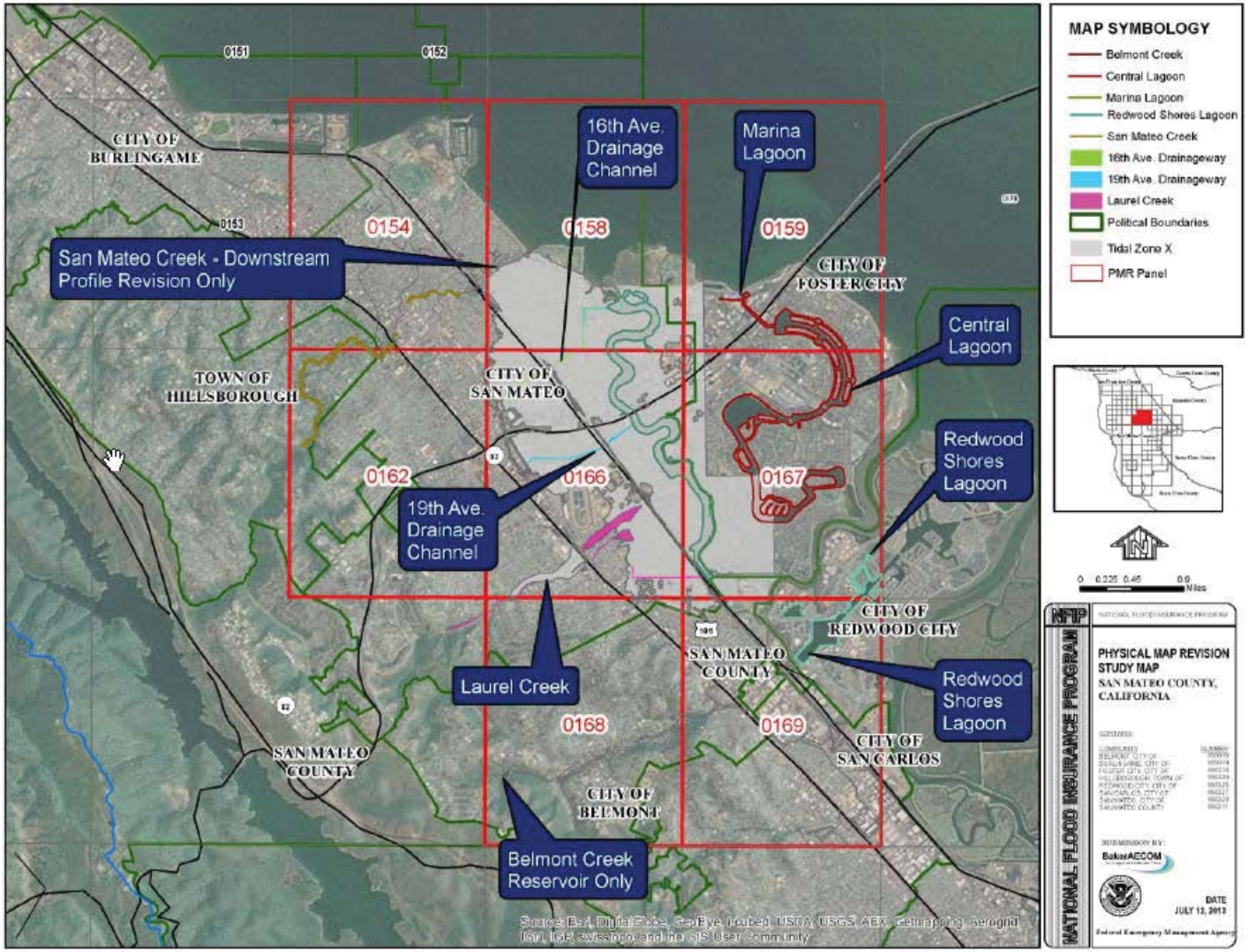
All elevations NAVD88

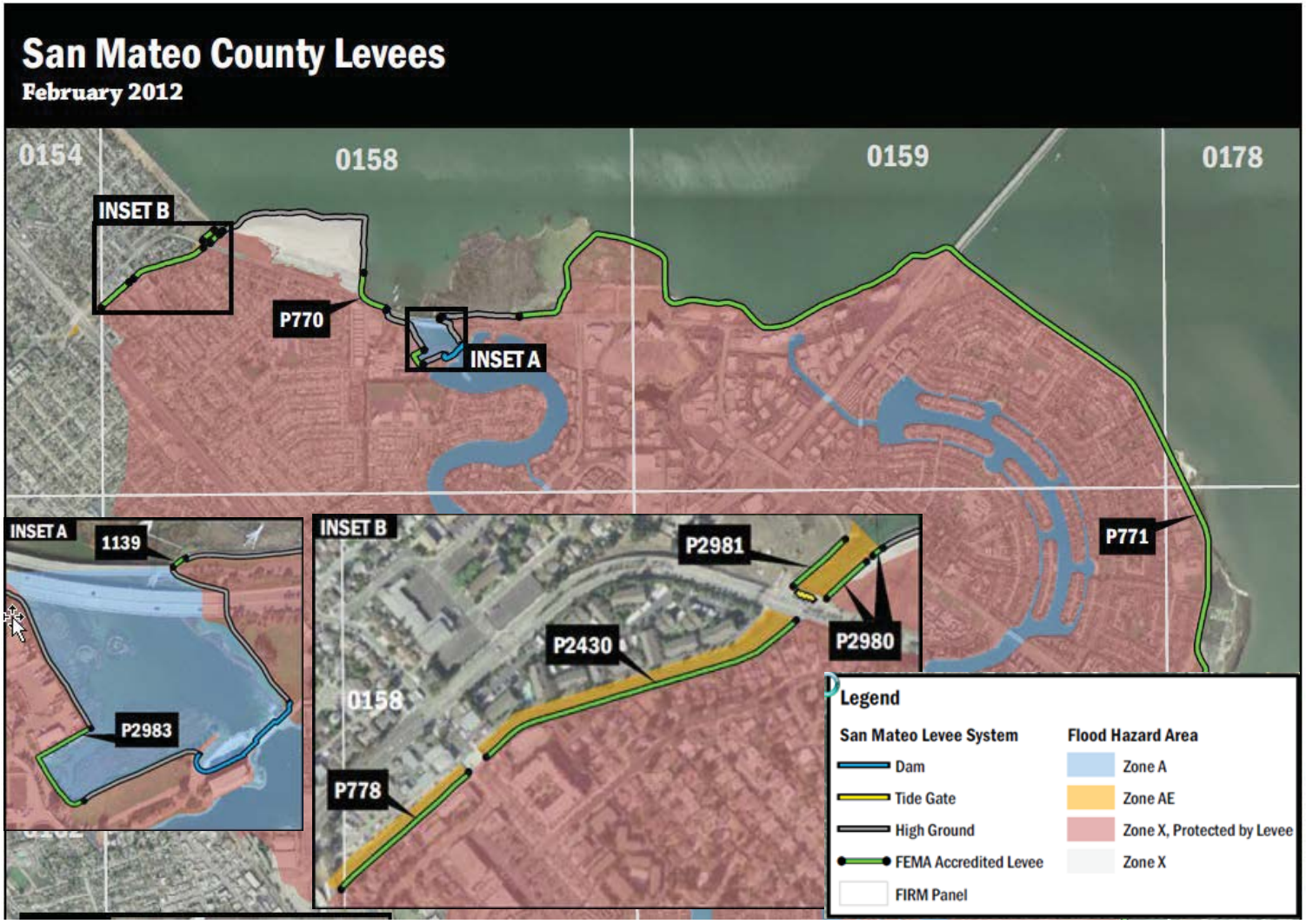
Coyote Point – VE10 → VE16 - City of San Mateo - FIRM panels 0154 & 0158.

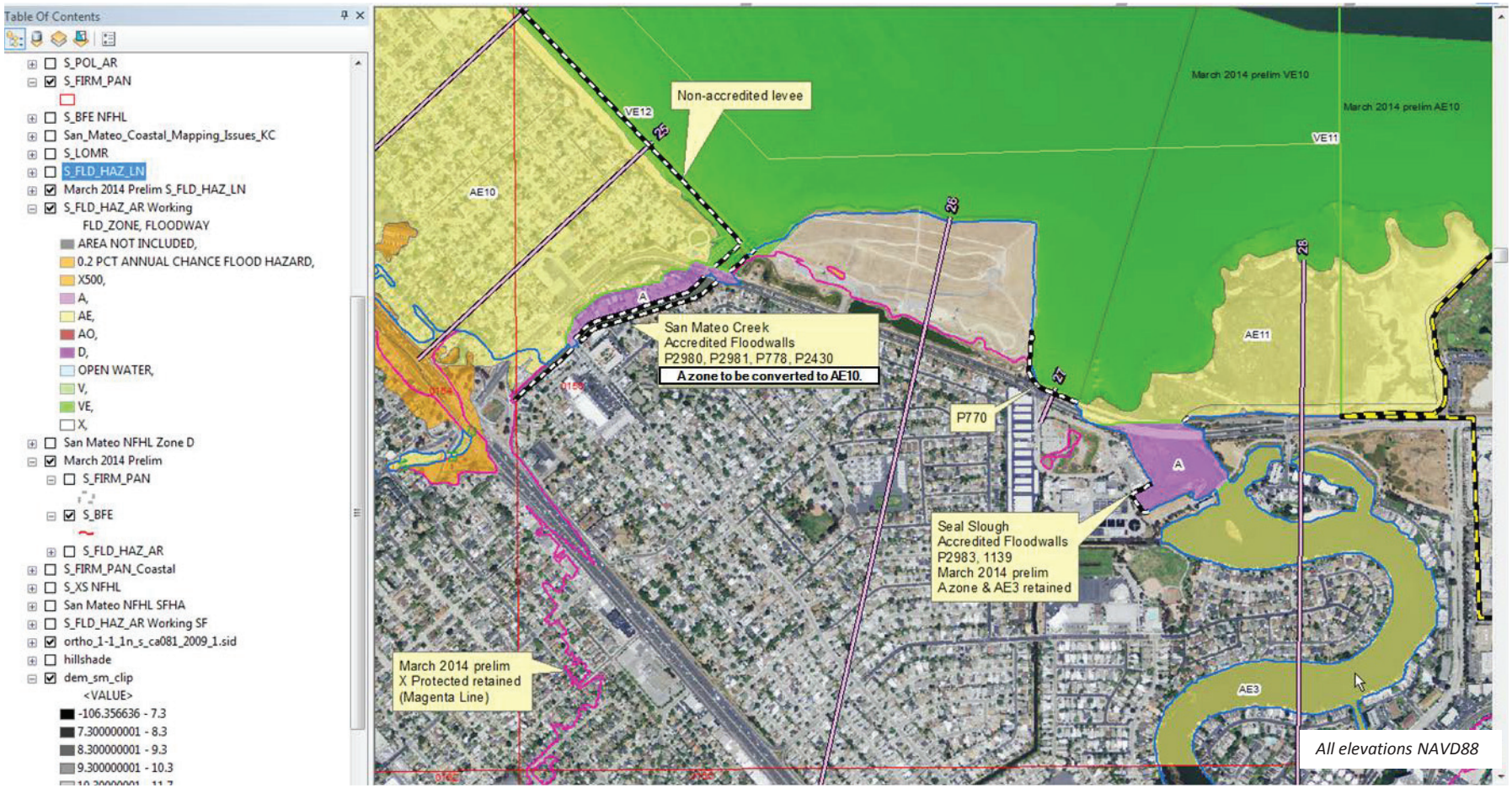
Current decision: retain large shaded X inland from RR; reshape AE based on coastal 1%; Map non-accredited levee w/ zone break along interior SFHA boundary

#6A

Overview – San Mateo & Foster City Levee PMR scope

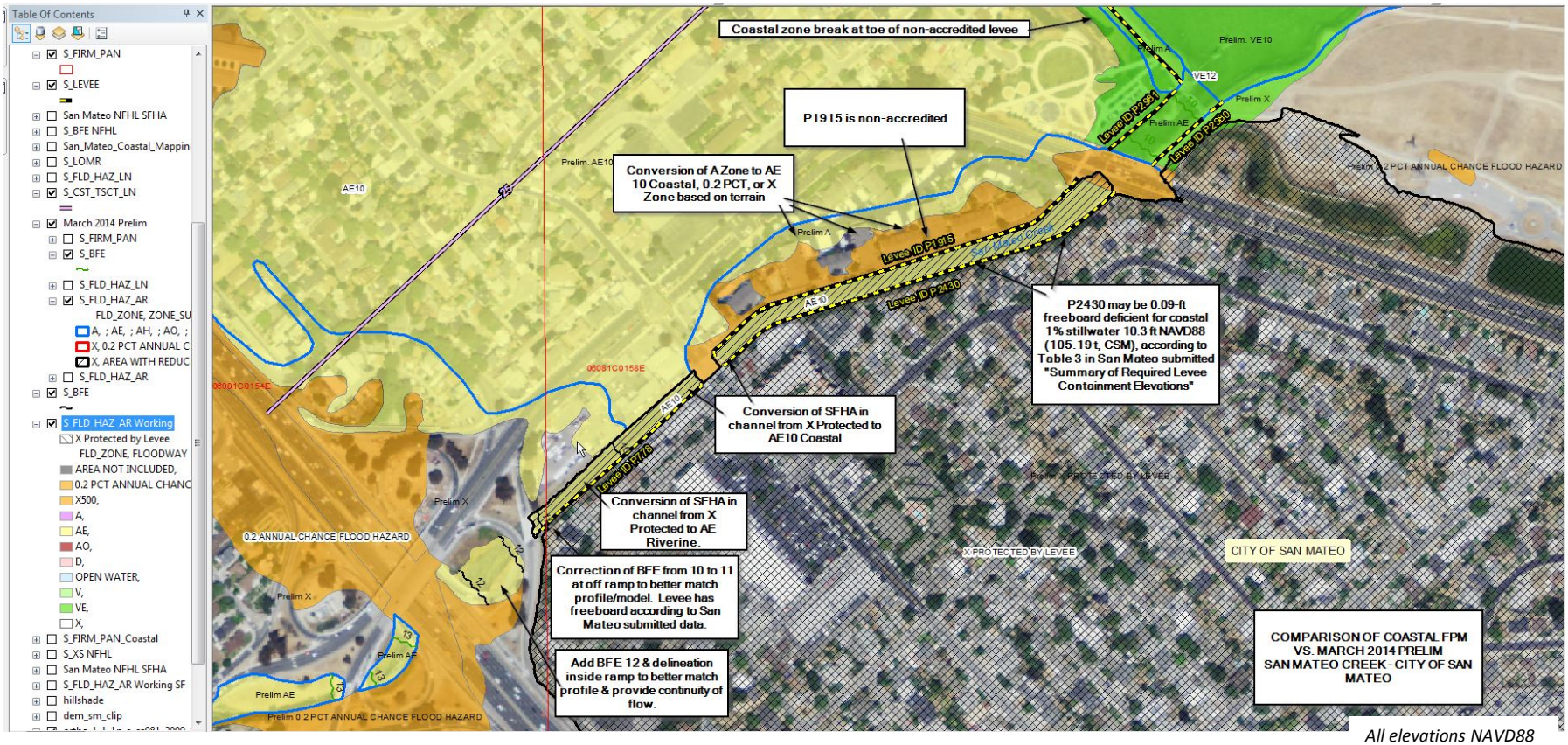



San Mateo County Levees
February 2012
0154
0158
0159
0178
INSET B
P770
INSET A
P771
INSET A
1139
P2983
INSET B
P2981
P2980
P2430
0158
P778
Legend
San Mateo Levee System
Dam
Tide Gate
High Ground
FEMA Accredited Levee
FIRM Panel
Flood Hazard Area
Zone A
Zone AE
Zone X, Protected by Levee
Zone X



Current Decision:

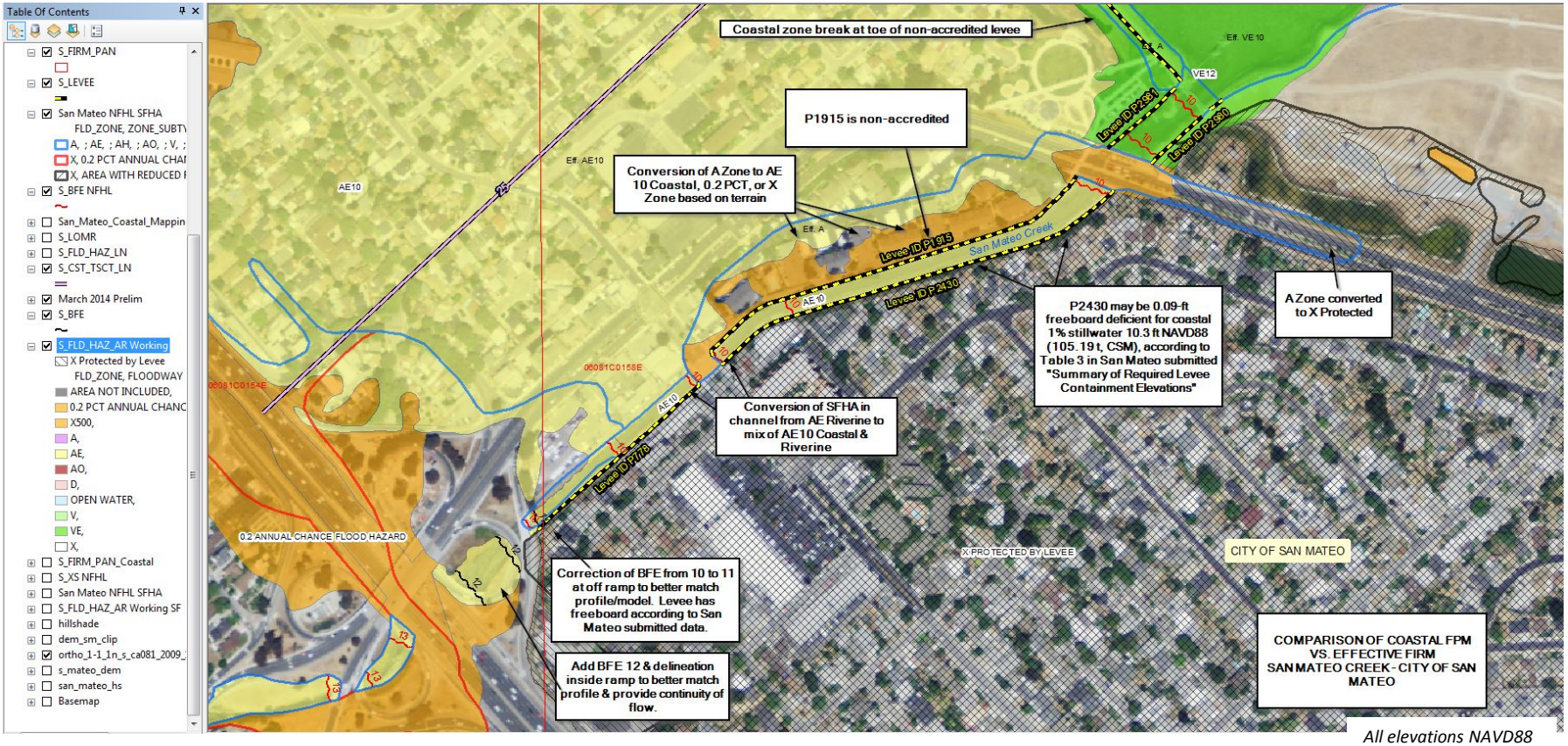
The mapping behind the San Mateo accredited levees was not changed, nor was the A zones near the mouth of Seal Slough. FIS transect ***27*** indicates that Levee ID ***P770*** satisfies freeboard requirements, as well as segments ***P2980***, ***P2981, P778.*** *Zone A near San Mateo Creek and segment* ***P2430*** *evaluated in next slides (#6D, 6E). Adjacent Foster City system discussed in slide #6F.*



All elevations NAVD88

Current Decision:

Zone A near San Mateo Creek converted to coastal AE10 & 0.2 Pct based on terrain, now connects AE10 into the San Mateo Creek channel at multiple locations. X Protected zone moved back to the accredited levee alignment, the channel adopt coastal AE10 up to its normal transition to riverine flow, and adjust the FIS flood profile to match the 1% annual chance Stillwater elevation of 10.3 ft, NAVD88.



All elevations NAVD88

Current Decision:

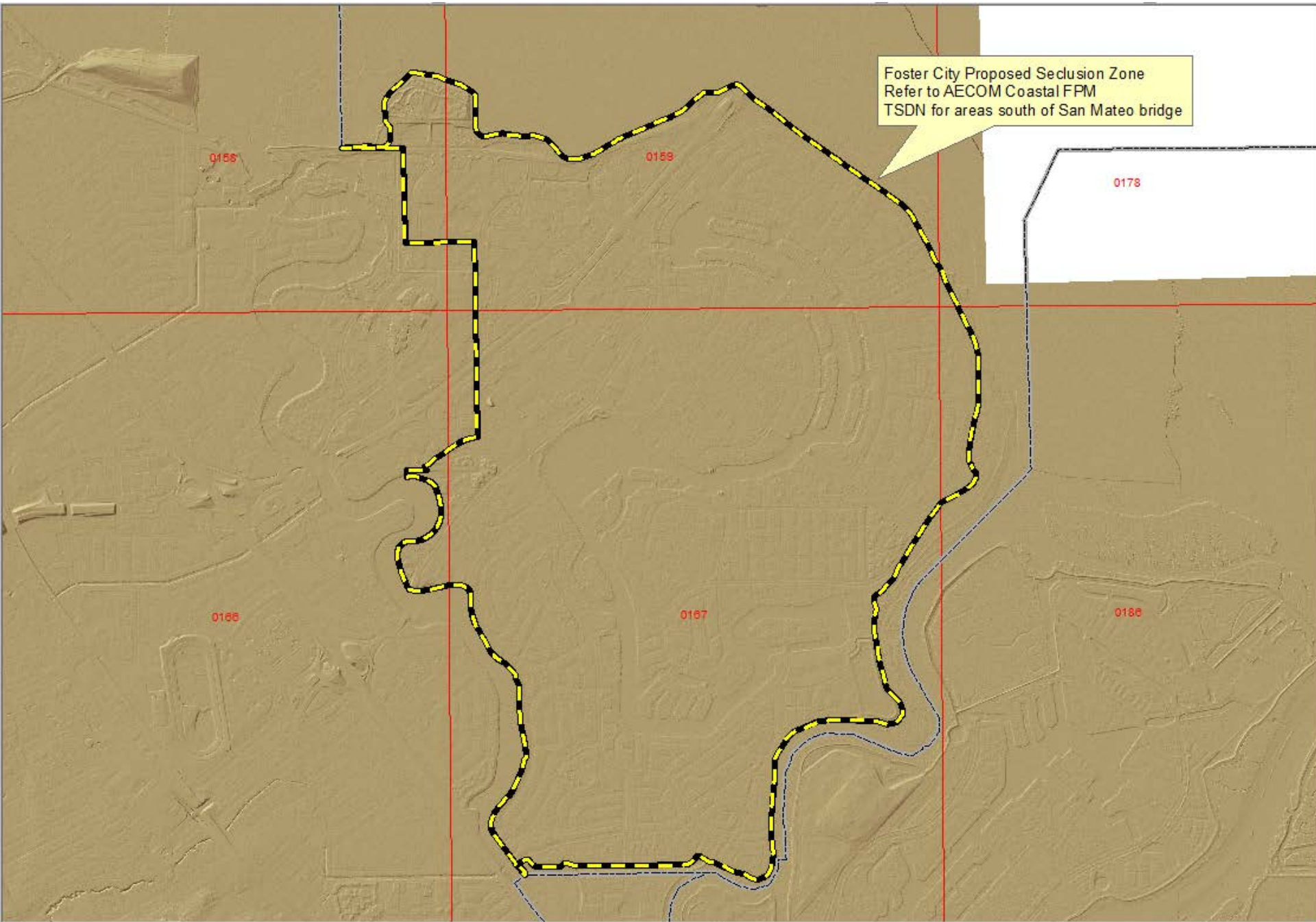
Accredited levee segment ***P2430*** is 0.1-ft deficient based on levee data but may be a product of mathematical rounding of vertical datum conversion values between the various sources; the subject is planned for discussion with BakerAECOM staff, the City of San Mateo and FEMA Region IX at an upcoming meeting. For the interim, the mapping (X Protected) from the 3/21/2014 Preliminary PMR is shown as-is inside the City of San Mateo corporate limits.

Current Decision:

In Foster City, FIS transects ***29-31*** (analysis transects *31-33*) indicate that Levee ID ***P771*** does not satisfy freeboard requirements, and propose a Seclusion Zone to be applied to the Preliminary FIRM for the Foster City.

Thus, the Protected X mapping from the concurrent 3/21/2014 Preliminary PMR is shown for Foster City inside the Seclusion Zone. Per draft Levee Seclusion Guidance, the Seclusion Zone is delineated on the landward toe of the levee (the "heel" of the levee) to the northern and eastern portions of Foster City. To the South and West, the Seclusion Zone is delineated at the limit of Zone X/Area With Reduced Flood Risk Due to Levee polygon shown in the 3/21/2014 PMR data, which generally coincides with the C/O Foster City corporate limits

#6G


Foster City Proposed Seclusion Zone
Refer to AECOM Coastal FPM
TSDN for areas south of San Mateo bridge
0158
0159
0178
0166
0167
0186

Appendix F: Draft FIS Components

COASTAL FLOOD EFFECTS FROM SAN FRANCISCO BAY

U.S. HIGHWAY 101 NORTHBOUND OFF RAMP

U.S. HIGHWAY 101 NORTHBOUND ON RAMP

STATE HIGHWAY 101

US HIGHWAY 101 SOUTHBOUND ON/OFF RAMP

E 3RD AVENUE
S HUMBOLDT AVENUE

S FREMONT STREET

S DELAWARE STREET

S CLAREMONT STREET

SEE FLOOD INSURANCE RATE MAP FOR BASE FLOOD ELEVATIONS AND COASTAL TRANSECT DATA TABLE FOR STILLWATER ELEVATIONS

CULVERT

CULVERT

CULVERT

CONFLUENCE WITH SAN FRANCISCO BAY

J. HART CLINTON AVENUE

NORFOLK STREET

A

B

C

LEGEND

- 0.2% ANNUAL CHANCE FLOOD*
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD*
- 10% ANNUAL CHANCE FLOOD*
- STREAM BED
- CROSS SECTION LOCATION

*DATA NOT AVAILABLE

ELEVATION IN FEET (NAVD 88)

60 50 40 30 20 10 0 -10 -20 -30

0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 6500

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH SAN FRANCISCO BAY

FLOOD PROFILES

SAN MATEO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN MATEO COUNTY, CA
AND INCORPORATED AREAS

40P