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City of San Bruno
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Dept. of Public Services
Engineering Division

IN REPLY REFER TO: APPEAL RES

November 10, 2016

The Honorable Jim Ruane
Mayor, City of San Bruno
567 El Camino Real
San Bruno, California 94066-4299

Case No.: 11-09-1227S
Community: City of San Bruno
San Mateo County,
California
Community No.: 060326

RE: California Coastal Analysis and Mapping Project / Bay Area Coastal Study

Dear Mayor Ruane:

This letter responds to the August 23, 2016, submittal from the City of San Bruno (and supported by San Mateo County) regarding the Preliminary Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for San Mateo County, California dated August 13, 2015. The submittal included a letter dated August 23, 2016, and an August 19, 2016 report concerning the proposed Special Flood Hazard Area (SFHA), Base Flood Elevations (BFEs), flood depths, and flood risk zones caused by overland flooding and wave effects from San Francisco Bay as presented on the City of San Bruno Preliminary FIRM panels, 06081C0043F, 06081C0044F, 06081C0131F, and 06081C0132F.

The City of San Bruno's submittal is considered an appeal because it satisfied the requirements defined in Title 44, Chapter I, Part 67 of the Code of Federal Regulations (44 CFR Part 67), and was submitted during the 90-day appeal period for the aforementioned Preliminary FIRM and FIS report.

The appeal submitted by the City of San Bruno includes an August 19, 2016 report prepared by Moffatt & Nichol entitled "FEMA APPEAL DOCUMENT, City of San Bruno" (hereinafter referred to as the M&N Report). Along with the M&N Report, there was a digital data submission organized by modeling scenarios discussed in Section 3.3 of the M&N Report. The data for each scenario included XP-SWMM 1D/2D integrated hydraulic model files, model inputs and outputs in ArcGIS format, and an animation showing the inundation during the simulated flood event.

The City of San Bruno letter and M&N Report asserts that the methodology used to generate the coastal floodplain boundaries (SFHA) and BFEs inland of San Francisco Bay in the area of San Bruno, and specifically for the Belle Air neighborhood, as shown on the August 13, 2015 Preliminary FIRM panels is technically incorrect.

FEMA received all data necessary to resolve this appeal on August 24, 2016.

The City of San Bruno letter contends that its appeal is supported by new overland flow modeling with limited duration flooding. The approach will account for high tide flows from San Francisco Bay that are unsteady and not in a "static state," and better determines the 1-percent-annual-chance SFHA and BFEs when included in the XP-SWMM modeling. The M&N Report and supporting documentation submitted as part of the City of San Bruno appeal assert that the Preliminary FIRM methodology utilizes overly simplistic assumptions, including representation of the stillwater flood level from the San Francisco Bay

as a static (steady state) water surface influencing the flood inundation mapping. As a result, the M&N Report suggests the 1-percent-annual-chance flood hazards represented in the Preliminary FIRM are overstated, and that flooding in the Belle Air neighborhood is not accurately depicted given the complex hydraulic connectivity and distance inland from San Francisco Bay.

The M&N Report and supporting documentation are the basis of assertions that the City of San Bruno's alternative modeling provides a more refined definition of the existing conditions 1-percent-annual-chance flood hazard using a dynamic hydraulic analysis approach to determine overland flows. The submitted analysis consists of use of the "XP-SWMM model which is a fully dynamic hydraulic and hydrologic modeling software that combines 1D calculations for upstream to downstream flow with 2D overland flow calculations" (M&N Report, Section 3). The alternative modeling is purported to provide a better estimation of the overland flow processes and amount of tidal floodwaters that can pass into and out of the Bay, creeks, channels and low-lying floodplains.

We have examined the M&N Report and all submitted supporting documentation. The following is a discussion of the deficiencies found in the appeal methodology:

- (1) The appeal did not claim there were any errors with FEMA's Bay Area Coastal Study modeling approach, but asserted that the approach was generalized and therefore overstated the hazard in comparison with the XP-SWMM 1D/2D modeling approach. The M&N Report also did not use any of the Bay Area Coastal Study analysis of wave effects and overland wave propagation analysis, since the appeal area is inland and removed from any wave effects. In general, the modeling presented in the M&N Report provides an alternative approach to the steady state approach (constant water level) used by FEMA for SFHA and BFE mapping, but no justification for why the City of San Bruno believes the Preliminary FIRM and FIS is scientifically or technically incorrect. The M&N Report states that the Preliminary FIS approach to map coastal flooding limits using a steady-state (static) 1-percent-annual-chance stillwater elevation (SWEL) and projecting that static water level inland from the San Francisco Bay shoreline is overly simplistic and significantly overstates the SFHA boundaries, BFEs, and base flood depths, but does not provide any evidence that the study is scientifically or technically incorrect.
- (2) The M&N Report's primary appeal concern is with the FEMA-adopted method for the Bay Area Coastal Study, which assumes the "Natural Valley" or "Without Levee" approach. In this approach the 1-percent-annual-chance SWEL is extended behind or landward of non-accredited structures and non-levee embankments to a point where the 1-percent-annual-chance SWEL floodplain boundaries are equal to controlling ground elevations. In the appeal areas, this would be a flood elevation of approximately 10.4 feet NAVD88. This approach adopted in San Francisco Bay is detailed in the FEMA July 2013 report, "Analysis and Mapping Procedures for Non-Accredited Levee Systems" (also known as the Levee Analysis Mapping Procedure, LAMP), and has been deemed by FEMA to be the appropriate procedure for application landward of the San Francisco Bayfront in the absence of new modeling.
- (3) The M&N Report proposes an alternative approach using the XP-SWMM model, which covers the City of San Bruno and the City of South San Francisco appeal areas. (The resolution of the City of South San Francisco submittal is handled separately from this appeal by the City of San Bruno). The XP-SWMM model used in this submittal is an accepted computer program for FEMA FISs, but has not been applied in any of the recently adopted FEMA Bay Area Coastal Studies. The M&N Report presents this alternative modeling approach with the claim that it can better account for the rise and fall of the tide and the flow over and around topographic features such as San Francisco Airport (SFO), and flow up streams, creeks and channel hydraulically

linked from the San Francisco Bay flood source to the appeal area (and the Belle Air neighborhood). However, the M&N Report on upstream to downstream and overland flows in the XP-SWMM model did not provide any calibration or comparative analysis between measured data and computed results. Without validation, the modeling domain cannot be verified as being able to replicate the surge and tidal inundation processes for overland flow and flood routing up channels and streams.

- (4) The “design storm” hydrograph used in this submittal is event-based and developed to represent a single event consistent with a 1-percent-annual-chance flood. The M&N Report noted that the configuration of peak tides and flood duration is based on three historic coastal flood events in January 1983, December 1983, and February 1988. The resulting combination is scaled to a peak storm tide of 10.4 feet NAVD88 equal to a 1-percent-annual-chance flood level used in the Preliminary FIS and FIRM at the boundary with San Francisco Bay. The hydrograph used in this submittal was based on measured event data for the January 1983 storm, December 1983 event, and February 1988 event as recorded at the NOAA Alameda gage. It was not clear why more representative local gage measurements for the three events along the western bay shoreline were not used, such as those measurements at NOAA tide gages at Oyster Point Marina (NOAA #4392) and San Mateo Bridge (NOAA #4458), located north and south of the appeal area.
- (5) The most notable deficiency found in the M&N Report and technical approach is the use of the event-based approach, which conflicts with the latest recommendations developed by FEMA for the Pacific Coast region in 2005 for use in San Francisco Bay and open Pacific coast. In this FEMA Pacific coast guidance, an approach was presented for evaluating the 1-percent-annual-chance flood, based on the concept of “system response analyses” rather than traditional “event analyses.” This means that the open waters of inland bays and oceans should follow the response approach, which uses a historic record of measured or predicted wave conditions along with simultaneously measured or predicted water-levels to determine site-specific storm response parameters, such as maximum water levels at points of interest. This approach is more robust than an event analysis that relies on a set time-dependent wave level condition with a specific duration. To be consistent with a “system response analysis,” the appeal should have utilized water levels driven by the FEMA 54-year hindcast study as boundary condition forcing to the XP-SWMM modeling. This would allow for the largest response from each of the 54 years to be used as annual maxima for the entire period of record and analyzed (by statistical analysis) to determine the 1-percent-annual-chance flood response for overland flow conditions. Any new modeling should follow the FEMA Pacific region guidance and use of the existing spatially varying 54-year time series along the boundary for tidal forcing.
- (6) NFIP regulations require submittal of the proposed map and resulting revisions to the Preliminary FIRM and FIS. This would be included in a digital data submission for Preliminary FIRM revisions, and show the flooding limit boundaries of the 1-percent-annual-chance SFHAs, BFEs, and all tie-ins to surrounding Preliminary and Effective FIRM mapping. Revisions to the Preliminary FIS should include all changes to the text, tables, and figures describing the revised modeling approach and revised results to be shown on a Revised Preliminary FIRM. In review of the City of San Bruno appeal submittal, we found no such proposed revisions to the August 13, 2015 Preliminary FIRM or FIS products.

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We have resolved this appeal in accordance with the requirements of 44 CFR Part 67. We have reviewed the submitted data, assumptions, and modeling and determined that the preliminary SFHA, BFEs, flood depths, and flood risk zones for coastal flooding from the San Francisco Bay into the appeal area are correct as shown on the August 13, 2015 Preliminary FIRM and in the Preliminary FIS report. Therefore, no change is warranted at this time. Please submit any comments regarding this appeal resolution within 30 days of the date of this letter to the following address:

FEMA Region IX, Mitigation Division
1111 Broadway, Suite 1200
Oakland, California 94607
Attention: Juliette Hayes, Chief
Risk Analysis Branch


If you feel that the technical issues originally raised have not been adequately addressed by this resolution letter and that an acceptable resolution will not be feasible through the submittal of additional comments or revised modeling, as outlined above, please note that FEMA makes a Scientific Resolution Panel (SRP) available to support the resolution process. SRPs are independent panels of experts in hydrology, hydraulics, and other pertinent sciences established to review conflicting scientific and technical data and provide recommendations for resolution. An SRP is an option after FEMA and a local community has been engaged in a collaborative consultation process without a mutually acceptable resolution.

Your community may contact Juliette Hayes, FEMA Risk Analysis Branch Chief, by telephone at (510) 627-7211 or by email at juliette.hayes@fema.dhs.gov for information on the specific eligibility requirements for the SRP or refer to the enclosed SRP Fact Sheet. To request that an SRP review your scientific or technical data, your agency and impacted communities must complete the enclosed SRP Request Form and submit it to the address above within 30 days of the date of this letter.

If we do not receive any comments or the completed SRP Request Form from your community during the 30-day review period associated with this resolution, we will finalize the Preliminary FIRM and FIS report for San Mateo County and the appeal area by issuing Letters of Final Determination. The letters to the impacted communities explain the adoption/compliance process and state the date when the Preliminary FIRM and FIS report will become effective.

We appreciate the City of San Bruno's comments and commitment to having the most accurate flood hazard information available reflected on the FIRM and in the FIS report for San Mateo County. If you have any questions regarding this matter, please contact Juliette Hayes at (510) 627-7211 or juliette.hayes@fema.dhs.gov.

Sincerely,



Juliette Hayes, Chief
Risk Analysis Branch

Enclosures:
SRP Fact Sheet
SRP Request Form

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cc: Brian Perkins, Representative Jackie Speier's Office, 14th District
Dave Pine, San Mateo County Supervisor, District 1
Jimmy Tan, San Bruno Deputy Public Services Director/City Engineer
James Eto, State NFIP Coordinator, Department of Water Resources

