MEMORANDUM

June 4, 2008

TO: MEMBERS, PORT COMMISSION
    Hon. Kimberly Brandon, President
    Hon. Rodney Fong, Vice President
    Hon. Michael Hardeman
    Hon. Ann Lazarus
    Hon. Stephanie Shakofsky

FROM: Monique Moyer
      Executive Director

SUBJECT: Informational Presentation Regarding the National Flood Insurance Program

DIRECTOR'S RECOMMENDATION: Informational Item – No Action Required

Summary

On May 8, 2007, Port staff made an informational presentation to the Port Commission regarding the federal National Flood Insurance Program (NFIP) and the Federal Emergency Management Agency’s (FEMA) current effort to develop a Flood Insurance Rate Map (FIRM) of San Francisco.

On September 21, 2007, FEMA published a preliminary FIRM for San Francisco depicting Special Flood Hazard Areas (SFHAs). An SFHA is defined as an area subject to flooding during a flood having a 1 percent chance of occurrence in any given year (also referred to as the 100-year flood or base flood.) The preliminary FIRM shows SFHAs along San Francisco’s coastline, including most of the Port’s finger piers. Initial analysis by the Port’s Chief Harbor Engineer at the time indicated that most of the Port’s finger piers have a freeboard (or clearance) of one foot or more above the Total Water Elevations projected by FEMA during the occurrence of the base flood. On October 23, 2007, Port staff briefed the Port Commission regarding FEMA’s preliminary FIRM and the Chief Harbor Engineer’s analysis.

Following release of the preliminary FIRM, FEMA provided the City and County of San Francisco (“City”) with a 60-day comment period wherein residents, businesses, City development partners and the City provided technical comments on the preliminary FIRM. This 60-day comment period ended on December 22, 2007; and the City submitted written comments to FEMA on that date. Subsequently, FEMA agreed to delay publication of a final FIRM until after a more detailed analysis of flood hazards is complete, provided that the City agreed to join the NFIP in the
MEMORANDUM FOR: ROBERT L. VICKERS  
FEMA REGIONAL DIRECTOR  
REGION IX

FROM: Jeffrey S. Bragg  
Administrator  
Federal Insurance Administration

SUBJECT: New Construction and Substantial Improvements of Structures on Piers in V-Zones

This is in response to your memo of October 29, 1985, regarding the issuance of variances by communities for new construction and substantial improvements of structures on piers in V-Zones. New construction on such piers can be permitted only by issuance of a variance to 44 CFR 60.3(e)(3) which requires that all new construction in V-zones be located landward of the reach of mean high tide. Substantial improvements that meet standards in §60.3(e)(4) and (5) can be permitted, but other substantial improvements would require a variance to these provisions.

In your memo you propose that communities be advised not to grant variances for new construction on piers unless the pier and the structures built on the pier can withstand the effects of the 100-year storm. You propose to apply §60.3(e)(4) to the pier itself and to require that the structure be anchored to the pier in accordance with that provision. In general, I agree that this is a reasonable position to take since it balances the economic benefits of the pier to the community against the increase in hazard and potential increases in public liabilities as a result of placing structures on a pier. However, I do have number of additional comments.

The community should regard the pier as part of the support system of the structure for the purpose of determining compliance with §60.3(e)(4) and (5). It is unlikely that the pier itself or structures on the pier will withstand a 100-year flood unless the lowest horizontal structural member of the pier is at or above the
100-year or base flood elevation. Extreme caution must be taken in
determining this elevation, since the base flood elevations shown
on the FIRM may not accurately reflect wave height conditions that
exist seaward of the reach of mean high tide. In addition, §60.3
(e)(5) would be applicable since obstructions below the pier deck
could result in failure of the pier during more frequent events.

The Region should make it clear to the community that it is their
decision to grant a variance to permit this type of construction on
a pier and that FEMA neither recommends nor endorses this type of
variance. If FEMA were to make any recommendation at all, it must
be that all new structures be located landward of the reach of mean
high tide at the landward end of the pier. This position is important
since the National Flood Insurance Program (NFIP) will not insure
structures entirely over water and since FEMA may not be able to
justify providing disaster assistance for reconstruction of
structures on the pier under some circumstances.

All variances for new construction and substantial improvements
on piers must comply with NFIP variance criteria at §60.6(a) which
have been incorporated into the local floodplain management measures.
When FEMA reviews variances granted by a particular community to
determine if they are consistent with the objectives of sound
floodplain management, those same criteria are to be used. In the
case of new construction on a pier in a V-zone, the applicable
variance criteria are at §60.6(a)(3) and (4). Prior to issuing a
variance, the community must make a formal finding that the variance
would be consistent with these criteria. It is highly unlikely
that a community could do so unless the equivalent of base flood
protection was provided. I suggest in your discussion with these
communities that you emphasize the need to comply with these variance
criteria.

If you have further questions regarding this issue please contact
Frank Thomas, Assistant Administrator, Office of Loss Reduction at
646-2717.
meantime. FEMA expects that analysis to be complete in 2009; and will issue a revised preliminary FIRM at that time. Currently, the City is completing the process of adopting a Floodplain Management Ordinance and preparing the necessary documents to join the NFIP.

On December 14, 2007, Port staff submitted detailed comments that were included in the City’s December 22, 2007 comments to FEMA. Port comments on FEMA’s preliminary FIRM demonstrate the absence of significant flood hazards on portions of Port property and the ability of finger piers to withstand forces associated with the base flood (see Appendix A). Chief Harbor Engineer Ed Byrne certified the Port comments submitted to FEMA. FEMA is currently evaluating these comments. The City Flood Administrator and the Port are working with FEMA to ensure that the Port’s comments are incorporated into the final FIRM. Appendix B contains a revised flood map reflecting the Port’s comments.

If San Francisco is mapped with SFHAs on a final FIRM (as suggested by the preliminary FIRM), federal law provides a statutory period of time within which the Mayor and the Board of Supervisors must decide whether to join or not to join the NFIP.

The City Administrator’s Office has convened a working group of City departments including the Port to analyze FEMA’s preliminary FIRM; develop a recommended Floodplain Management Ordinance (the “Floodplain Management Ordinance,” a precursor to San Francisco joining the National Flood Insurance Program), and plan for implementation of the Floodplain Management Ordinance. Port staff expect that Supervisor Elsbernd will introduce the Floodplain Management Ordinance for consideration by the Board of Supervisors at its June 10, 2008 meeting.

This staff report outlines the following:

1. Port comments submitted to FEMA regarding its preliminary FIRM;
2. Key Port-related provisions of a proposed Floodplain Management Ordinance the City Administrator plans to introduce for Board of Supervisors consideration through the Office of Supervisor Sean Elsbernd;
3. Development ramifications for the Port;
4. Steps the Port Commission and Chief Harbor Engineer may need to take in the future in response to construction projects located in flood prone areas; and
5. Requests the Port and the City have made and will continue to make to FEMA regarding its interpretation of flood hazards associated with Port finger piers in SFHAs identified by FEMA (if any).

Based on the City’s progress toward adopting a Floodplain Management Ordinance, FEMA now intends to issue a revised preliminary FIRM for San Francisco in early to mid-2009, after completing the more detailed analysis Port and City staff requested in 2007. After reviewing comments and appeals related to the revised preliminary FIRM, FEMA will finalize the FIRM and publish it for flood insurance and floodplain management purposes.
Background

The NFIP is a federally managed program created in 1968 to reduce the risk posed by floods throughout the United States. Under the NFIP, the Federal government provides financial backing for affordable flood insurance in exchange for the adoption of floodplain management regulations by communities participating in the program. The NFIP is managed by FEMA.

The NFIP is a flood risk management program that consists of:

1. FIRMs, developed by FEMA, that identify SFHAs typically near riverine or coastal areas that have a 1% chance of flooding in a given year (base flood or 100-year flood) and other related data;

2. Federally backed, affordable flood insurance for property owners in communities that join the NFIP by applying to FEMA and adopting a floodplain management ordinance; and

3. The following incentives to encourage local communities to join the NFIP:
   - Federally-regulated lenders (including Fannie Mae and Freddie Mac) may not make, purchase, increase or extend any loan on an insurable structure in a SFHAs unless the owner has flood insurance;
   - Residents and businesses may not purchase federally backed flood insurance if the community does not join the NFIP;
   - Federal agencies may not provide financial assistance for acquisition and construction purposes in SFHAs if a community does not join the NFIP; and
   - FEMA cannot provide flood-related disaster assistance in SFHAs to communities and individuals in communities that do not join the NFIP.

Most communities that are mapped with SFHAs join the NFIP.

San Francisco FIRM

City staff has been cooperating with FEMA by providing topographical and related data about shoreline features. DPW has taken the lead in hiring URS Corporation to advise the City during this process.

The analysis and certifications included in the December 14, 2007 Chief Harbor Engineer’s report (Appendix A) show that:

1. the Port’s piers and wharfs are structurally sufficient to withstand the effects of wave action and most of the pier decks are above the expected wave heights and therefore should be removed from the SFHA and shown on the maps as Zone X (defined as an area of minimal flood hazard);
2. the Port’s seawall sections are structurally sufficient and have adequate height above the expected wave heights to provide protection against the base flood and therefore the landside improvements should be removed from the SFHA and shown on the maps as Zone X; and

3. the breakwaters are structurally sufficient to provide protection to many areas of the Port waterfront by reducing the wave height. Since the breakwaters provide significant flood protection, the Port requested that FEMA should re-analyze the projected Base Flood Elevations in the areas behind the breakwaters to account for their effect.

Floodplain Management Ordinance

To join the NFIP, San Francisco needs to adopt a Floodplain Management Ordinance. California has recently updated model floodplain management ordinances for flood-prone communities. San Francisco is looking to federal regulations and the California ordinance for coastal communities as potential models.

The purposes of the ordinance are to:

a. Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights or velocities;

b. Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;

c. Control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters;

d. Control filling, grading, dredging, and other development which may increase flood damage; and

e. Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas.

Existing structures in SFHAs are grandfathered, meaning that these structures are not required to meet the building code requirements of a local floodplain management ordinance until such time as substantial modifications to an existing structure trigger these requirements.

The major impacts of these restrictions to new development in San Francisco will be:

- The first floor of structures in SFHAs must be constructed above the Base Flood Elevation. In some areas not susceptible to wave run-up, commercial structures may be flood-proofed instead. In areas susceptible to wave run-up, structures must be anchored and portions of structures below the Base Flood Elevation must include break-away members.
For piers: except for extraordinary situations, construction is limited to functionally-dependent (i.e., maritime) purposes or to historic preservation. Note that the Chief Harbor Engineer’s comments on FEMA’s FIRM took exception to FEMA’s determination that the finger piers are located in the flood area, thus there are currently no flood restrictions or requirements on these structures because the Chief Harbor Engineer’s comments have been incorporated in the draft flood prone area map prepared by the Department of Public Works.

Floodplain management ordinances adopted by NFIP participants may provide for variances for exceptional circumstances, including historic preservation and extraordinary hardship. Under the NFIP, variances are granted by the local jurisdiction, in this case, the City or Port. However, the improper granting of variances could jeopardize continued participation in the NFIP.

The proposed ordinance has the following specific impacts on the Port:

1. In the Findings section, the Board of Supervisors finds that new development, including historic rehabilitation, on piers or land that is seaward of the reach of mean high tide can be reasonably safe from flooding. The Board of Supervisors urges the Port to take steps to implement long-term floodplain management controls that both address any flooding risks and allow the City to implement the Waterfront Land Use Plan and the Capital Plan.

2. The Definitions section includes definitions of functionally-dependent use (i.e., maritime use), historic structure and substantial improvement tailored to Port needs.

3. The Administration section of the ordinance assigns to the City Administrator the role of Floodplain Administrator, whose responsibilities include designation of flood hazard areas, coordinating City department response and reporting to FEMA (among others), this section acknowledges the Chief Harbor Engineer's responsibility for reviewing building permit applications for buildings and structures within the Port Commission's jurisdiction to determine whether the appropriate building standards have been satisfied, and whether the site is reasonably safe from flooding.

4. The Standards of Construction section of the ordinance requires the Port’s Chief Harbor Engineer and the Floodplain Administrator to consult and coordinate with FEMA to create appropriate building standards for developing any finger piers located in flood prone areas in Port jurisdiction, before publication of FEMA's final FIRM for San Francisco.

5. The Variance section of the ordinance authorizes the Port’s Chief Harbor Engineer to issue hardship variances where there is no increased flood risk as a result of the variance and requires issuance of variance for either a) historic structures or b) functionally-dependent uses.

Appendix C contains key Port-related provisions of the draft Floodplain Management Ordinance.
Development Ramifications

In consultation with the City Attorney and its development partners, Port staff are still analyzing the potential ramifications of the City’s decision to adopt a floodplain management ordinance, should it decide to do so. Other cities, like Juneau, Alaska and Boston, Massachusetts, have been able to build on piers even though they are members of NFIP and are thus subject to FEMA regulations. The following possible ramifications assume the City will join the NFIP and are subject to further City Attorney analysis and review and comment by FEMA.

Historic finger piers and wharves: For resources that are either individually listed or contributory to a district that is listed in the National Register of Historic Places (or eligible for such listing), or listed in a state or local historic inventory, the Port will be able to issue variances for mixed use development. Most of the Port’s finger piers will meet this test. Exceptions are: Pier 27, the Pier 29 Administrative Office Building, Pier ½, Pier 39, Piers 30-32 and piers south of Pier 48 including Pier 50.

Alteration or attached exterior addition to an historic structure: Provided that the alteration or addition will not preclude the structure's continued designation as an historic structure, such alterations or additions will not trigger a substantial improvement under the ordinance. The Exploratorium’s proposed new connector building between Piers 15 and 17 would meet this test because the building would be an exterior addition to Pier 15 and would not preclude Pier 15’s continued designation as an historic structure.

Maritime use: For docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities, the Port will be able to issue variances for substantial improvements. A new cruise terminal at Pier 27 and portions of Pier 50 would meet this test.

Thus, it appears that under the ordinance and federal regulations that govern local administration of flood hazards, most types of development and capital improvements contemplated under the Port’s Waterfront Land Use Plan and the Capital Plan can proceed. The type of development least likely to be accommodated in the proposed regulatory structure is a non-maritime use in a new structure that is not connected to a historic structure and which is constructed seaward of the reach of mean high tide. However, modifications to the advice given by FEMA related to construction on piers in V-Zones (see Appendix D) may provide a means to permit such construction.
Chief Harbor Engineer Standards of Construction for Flood Prone Areas

Should new construction or improvements on existing structures be located in areas either currently or in the future designated as flood prone, the Port’s Chief Harbor Engineer will develop, in consultation with FEMA and the City’s Floodplain Administrator, standards of construction for these projects. Current national standards include provisions for the design and construction of structures within flood hazard areas. It is anticipated that these national standards will be modified to suit the Port’s unique topographical and climatic conditions and will be incorporated into the Port’s Building Code, subject to Port Commission approval. The Port’s Building Code will then be used to as the standard for construction.

FEMA “Comfort” Letter

The Port, in consultation with the City Administrator and its development partners, intends to request a formal letter from FEMA affirming the approach to managing flood risks contemplated by the City’s Floodplain Management Ordinance, including its treatment of finger piers. Port staff will urge FEMA to accept the Port comments on the preliminary FIRM to modify and expand on the advice provided in the FEMA advice letter regarding construction on piers in V Zones contained in Appendix D.

Recommended Next Steps

Port staff will continue consulting with City and FEMA staff regarding FEMA’s FIRM mapping effort, the NFIP and the possible development of a San Francisco Floodplain Management Ordinance. Additionally, Port staff will:

1. Along with other City staff and consultants, meet with FEMA to encourage them to publish a preliminary FIRM with the most accurate data possible, including a Base Flood Elevation;

2. Participate in briefings for members of the Board of Supervisors and Board hearings on the topic;

3. In consultation with City staff, develop a proposed study of the feasibility of providing flood control improvements along the San Francisco shoreline to reduce coastal flood hazard risks, and SFHA designations by FEMA, that currently exist along the San Francisco waterfront, subject to future Port Commission review and approval;

4. Develop Standards of Construction for Flood Prone Areas, subject to approval by the Port Commission and incorporate into the Port’s Building Code; and

5. Consult with the City’s state and federal legislative delegations to determine the appropriate sources and timelines for funding for flood control projects.

Prepared by: Brad Benson
Special Projects Manager
Appendix A
Port Comments on FEMA’s Preliminary FIRM for San Francisco
Port of San Francisco

Comments on the FEMA Preliminary Flood Insurance Rate Map

by

Port of San Francisco Engineering Division
14 December 2007

Edward F. Byrne
Chief Harbor Engineer
Engineering Report
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IMPORTANT NOTE: Copies of appendices may be obtained by contacting Chief Harbor
Engineer Ed Byrne at (415) 274-0400. These appendices are too voluminous to include in this
report.

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A. INTRODUCTION

1. Background

This report documents and provides the technical basis for the Port of San Francisco’s (Port) response and comments to FEMA’s Preliminary Flood Insurance Rate Map (FIRM) published on September 21, 2007. The analysis and certifications included in this report show that: 1) the Port’s piers and wharfs are structurally sufficient to withstand the effects of wave action and most of the pier decks are above the expected wave heights and therefore should be removed from the Special Flood Hazard Area (SFHA) and shown on the maps as Zone X; 2) the Port’s seawall sections are structurally sufficient and have adequate height above the expected wave heights to provide protection against the 100-year flood event (1% annual chance flood) and therefore the landside improvements should be removed from the SFHA and shown on the maps as Zone X; and 3) the breakwaters are structurally sufficient to provide protection to many areas of the Port waterfront by reducing the wave height. Since the breakwaters provide significant flood protection, the Port requests that FEMA should re-analyze the projected 100-year flood elevations in the areas behind the breakwaters to account for their effect.

FEMA’s team of coastal engineers reviewed historic data, coastal topography and performed a preliminary hydrological and hydraulic analysis including a probabilistic analysis to establish the impact 100-year flood event for the San Francisco waterfront. FEMA has now completed the preliminary analysis and has established a preliminary FIRM. This map depicts the water elevations anticipated for a 100-year flood for the Port’s waterfront. The preliminary FIRM for the Port’s waterfront is shown in Appendix A. Study of the preliminary FIRM indicates that much of the Port waterfront including the finger piers, marginal wharfs, Herb Caen Promenade and much of the Embarcadero roadway is within a SFHA designated as Zone V. Zone V is defined by FEMA for this San Francisco Bay study as:

“Areas along coasts subject to inundation by the 1-percent-annual-chance flood event with additional hazards associated with storm-induced waves. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.”

Since FEMA did not determine the BFEs for the Port’s waterfront, the preliminary FIRM is based on Total Water Level (TWL) that was established by the analysis. The TWL elevations were transmitted to the Port in a spreadsheet format accompanied with a map showing the locations where the elevations were calculated. A copy of this FEMA transmittal is included in the Appendix B. The TWL elevation includes the effect of storm surge and wave and, thus, represents the maximum expected water elevation projected by FEMA’s analysis. Initial analysis by the Port’s Engineering Division indicates that most of the Port’s finger piers, wharfs and roadways have a freeboard (or clearance) of one foot or more above the TWL elevations projected by FEMA for the 100 year storm event. FEMA informed the Port that the FEMA analysis did not account for the Port’s waterfront seawall and breakwater structures which provide considerable flood protection.
The engineering analyses and certifications included in this report demonstrate that the Port’s waterfront facilities offer considerable protection to flooding that must be considered in the determination of Special Flood Hazard areas along the Port’s waterfront. This report analyzes only the Port waterfront facilities from Pier 41 on the north to Pier 50 in the south. Port facilities to the north of Pier 41, including the Fisherman’s Wharf Area, are not addressed in this report since FEMA indicated further TWL analysis is required in this area. The Port requests that FEMA revise the analysis to include the wave dissipating effect of the existing local breakwaters in the area. The breakwaters were not included in the Preliminary FIRM analysis, so the TWL’s are erroneously indicating higher flood elevations than will actually occur.

Port facilities to the south of Pier 50 are currently used for maritime operations. The existing waterfront structures provide adequate flood protection for this use. The Port is not submitting comment on FEMA’s preliminary FIRM for any of the Port’s facilities south of Pier 50.

The structural analyses and certifications for Port waterfront facilities from Pier 41 to Pier 50, included in the Appendices, indicate that areas currently shown in FEMA’s preliminary FIRM in SFHAs are actually safe from flooding due to the protection provided by the existing facilities. The Port’s waterfront facilities were originally designed, constructed and anchored to prevent flotation, collapse and lateral movement resulting from hydrostatic and hydrodynamic loads including buoyancy. This report presents an independent analysis performed by Port Structural Engineers in accordance with the Corps of Engineer’s guidelines included in the “Criteria for Evaluating Coastal Flood-Protection Structures”, USACE Technical Report CERC-89-15. The analysis demonstrates that each of the Port’s waterfront facilities is sufficient to resist the flooding loads and forces. A FEMA Coastal Structures Form, including supporting calculations, has been completed for each facility certified by Port engineers.

The Port has a comprehensive Operations and Maintenance Manual for Waterfront Facilities that is used by Port inspection personnel to assure these critical structures continue to perform and operate satisfactorily and safely. A copy of this Manual is included in Appendix C. The Manual’s Section III has been omitted to reduce the size of this report.

2. Preliminary Flood Insurance Rate Map (FIRM) for Port Waterfront

Figure 1 shows the portion of the preliminary FIRM issued by FEMA for the waterfront in Port jurisdiction. All of the Port’s finger piers have been mapped in a V-Zone. Table 1 is an abbreviated listing of the Port’s facilities and indicates the FEMA determined TWL elevation, the Port facility elevation and the differential height between the TWL predicted by FEMA and the actual height of the pier. The Port’s facility elevation is based on the results of a survey and represents the lowest point of the facility.

In most cases the pier and wharf decks, and landside improvements are above the TWL and thus are not subject to flooding (elevation differences shown in the right hand column that are bolded). With one exception, the facility elevations that are below the TWL (bracketed by parentheses) are in the northern waterfront and are protected from wave action by the breakwaters as previously noted.
<table>
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<tr>
<th>Facility or Pier No. (Listed from north to south)</th>
<th>Elevation (ft.)</th>
<th>FEMA’s Preliminary TWL (ft.)</th>
<th>Elevation Diff. (ft.)</th>
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Table 1: Comparison of Port Facility Elevations to FEMA Projections for Total Water Level (TWL) During a 100 Year Storm Event

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<th>Facility or Pier No. (Listed from north to south)</th>
<th>Elevation (ft.)</th>
<th>FEMA’s Preliminary TWL (ft.)</th>
<th>Elevation Diff. (ft.)</th>
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<td>(0.53)</td>
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<td>94 (S end)</td>
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Table 1 Note: All elevations refer to NAVD 88.

B. BACKGROUND ON PORT FACILITIES AND MAINTENANCE PROGRAMS

1. Existing Structures

The Port of San Francisco’s current improved waterfront began to take shape after the 1906 earthquake with the construction of the Port’s concrete seawall along the water’s edge. The Port’s waterfront structures consist of seawalls, marginal wharves, piers and breakwaters. Appendix D presents a detailed plan of the Port’s waterfront facilities. Following is a brief description of each of these waterfront structures.

a. Seawalls

The seawall was constructed in a number of different sections from 1908 to 1920 and is the primary flood control structure along the waterfront. The seawall construction varies considerably over the Port’s waterfront; however, in the zone between Piers 41 to Pier 50 the seawall is generally a significant pile supported concrete structure that serves a dual purpose of retaining the land and protecting the landside improvements from the Bay waters. The seawall in many places was constructed with a marginal wharf, a piled deck structure extending from the top of the seawall
away from the land and over the water. The marginal wharf in many cases is also used to structurally reinforce the seawall and, with its deck structure, provides additional flood protection by preventing wave over-topping. The seawall base is protected on the bay side by rip-rap to prevent scour during storm and tidal conditions. Appendix E presents the Port’s analysis, certification and recent inspection reports for the Port’s seawall sections from Pier 41 to Pier 50.

The analyses demonstrates that the 30 differing seawall construction sections, from Pier 41 to Pier 50 that make up the Port’s seawall structure, are sound, structurally capable and have sufficient elevation to protect the landside improvements from the effects of the 100 year flood. Thus, the areas located landside of the seawall should not be in SFHA and should be designated in Zone X. In cases where marginal wharfs are attached to the seawall, the analysis shows that these wharfs have sufficient structural capacity and height above the 100 year flood elevations to have the decks be designated in Zone X. The marginal wharf analysis and certification are included with the pier analysis in Appendix G.

b. Breakwaters

Breakwaters along the Port’s waterfront are used to protect and shelter the Port’s harbors and marinas. In performing this function, the breakwaters eliminate storm waves in the sheltered areas and thus protect the shoreline from wave action and run-up. There are seven breakwaters on the waterfront starting with the Aquatic Park Breakwater on the northern most end of the Port. Between Aquatic Park and Pier 45 is the Fisherman’s Wharf Breakwater, is a significant concrete breakwater designed and installed by the Corps of Engineers. Immediately adjacent to the Fisherman’s Wharf breakwater is Pier 45, an earthfill pier with embankments covered in rip-rap. Pier 45 also protects the Fisherman’s Wharf area. Pier 39 has two breakwaters, one to the east and the other to the west. Both the Pier 39 breakwaters are constructed of concrete panels and pilings. The Ferry Building and Ferry Plaza areas are protected from wave action originating from the south Bay by the Pier 14 breakwater, the newest breakwater on the waterfront. This breakwater was installed in 2000, is composed of concrete panels and steel pilings and is used to protect the ferry landing areas along the Ferry Plaza. The South Beach Yacht Harbor is protected by concrete panel, concrete pile breakwaters that extend from Pier 40 southward to China Basin and then closes to the land at the AT&T Ballpark. Appendix F presents the Port’s review, inspection reports and certification for these seven breakwaters.

Since the Port could only locate the design drawings for the Pier 14 Breakwater, review of the other six breakwaters was based on review of inspection reports, current condition assessment and past performance. These breakwaters have performed very well during past storm events and on-going inspections indicate that six of the seven breakwaters, the Aquatic Park Breakwater being the exception, are sound, structurally capable and have sufficient elevation to protect the landside improvements from the effects of the 100 year flood. The Port therefore requests that FEMA should re-analyze the TWL’s in the areas behind the breakwaters to account for their effects.

The Aquatic Park Breakwater is the one exception. This breakwater has restricted access and needs repair due to piling deterioration, however, it continues, and will continue to provide protection to the adjacent waterfront for the near future. The Port understands that the US National Parks Department is pursuing funding to make these needed repairs. In the meantime, the Port will continue the regular inspections of this breakwater.
c. Piers & Wharfs

The Port of San Francisco has many finger piers integrally connected to and extending from the seawall, or seawall-marginal wharf structure, outward and away from the land, over the water. Most of these piers were constructed from 1908 through 1930, with some constructed as recently as 1970. The piers provide only minor flood control measures in that they limit the size of a wave that can pass below the structure by the presence of the beams and decking. The piers are generally constructed of concrete decks supported by concrete beams supported on piles. Some of the piers have wood decks supported on steel or concrete beams supported by piles. The piles are either reinforced concrete, concrete jacketed wood piles, or wood piles. Appendix G presents the Port’s analysis, certification and recent inspection reports for the Port’s piers from Pier 41 to Pier 50.

The analysis demonstrates that the 28 Port piers, between Pier 41 to Pier 50, are sound, structurally capable and have sufficient elevation to withstand and be safely higher than the effects of the 100 year flood. Given that the piers and wharfs are constructed to withstand the impact of the waves during the 100-year flood and the decks are above the TWL, these piers should be removed from the SFHA and should be designated in Zone X.

Two Port piers between Pier 41 to Pier 50 are not included in this response: Piers 36 and 22½. Pier 36 is condemned and no longer in use, and Pier 22½ is structurally compromised and has restricted loading. These two piers are not certified and are not considered to contribute to the Port’s flood protection. The seawall sections adjacent to these piers are sound, certified and provide the necessary flood protection surrounding landside improvements.

2. Seismic Strengthening

Many of the Port’s waterfront structures have been seismically strengthened to meet San Francisco Building Code requirements for earthquake loadings. Seismically upgrading these structures is very costly and significantly increases the structures ability to handle lateral loads, which also improves its ability to withstand any hydrodynamic loads. The following piers have been seismically upgraded to meet the code requirements at the time of the upgrade: Pier 45, Pier 39, Piers 27-29, and Piers 1.5 to 5, Pier 1, Ferry Plaza, Ferry Building, and Pier 48. The seismic upgrading of these piers included repairs and seismic strengthening of the adjacent seawall and marginal wharf. Although these structures were adequate to withstand the effects of the 100-year flood prior to being seismically strengthened, the added structural capacity and upgrading has greatly increased their overall durability and reduces future maintenance requirements.

3. Port Inspection and Assessment Program

The Port has a structural inspection and assessment program for all Port facilities. The Port’s waterfront facilities including all the piers, seawall and breakwaters have been inspected within the last 4 years by California licensed Civil or Structural Engineers with experience in waterfront structures. This program is used to identify and assess any damage or deterioration to the structural systems and initiate appropriate actions in the case of damage or unsafe conditions. An inspected facility is categorized according to its condition and allowable use as follows:
Green – Unrestricted use. May require some minor repair, or minimal barricading or signage.
Yellow – Restricted use. May require limiting access and barricading until repairs completed.
Red – Unsafe notice. Requires barricading to prevent public access and use.

All of the Port’s facilities that are required to protect the landside areas from flooding have been inspected and categorized as Green – Unrestricted use. This means that there may be areas requiring minor repair or maintenance, but the structure is capable of serving its intended function and purpose and can withstand the storm loadings as was intended in its original design and its current use.

The Port’s Operation and Maintenance Manual for Waterfront Facilities is used to provide the protocol and frequency for the regular inspection and assessment of these structures. The O&M Manual includes forms required for reporting the results of an inspection and also establishes criteria for determining the priority and urgency of required repair depending on the type and location of damage. See Appendix C.

C. CONCLUSION

Based on the information presented by FEMA to the Port, flooding due to the 100-year event to the landside of the Port’s Seawall is not a current problem. The TWL elevations determined by FEMA are below the deck heights for the majority of the Port’s piers, wharfs and other waterfront facilities. The Port’s existing waterfront structures, particularly the seawall and breakwaters, protect the landside structures and facilities from flooding. These structures have been inspected and analyzed and found to safely withstand the hydrodynamic loads imposed upon them by projected 100-year flood conditions. Port engineers, having verified the capability of these structures, have certified the Port’s waterfront structures are capable of resisting the impact 1% annual chance waves, and verified that the 100-year flood heights are below the pier and wharf decks. Based on this analysis and certification, the Port hereby requests that FEMA revise the preliminary FIRMs for the San Francisco Bay from Pier 41 south to Pier 50 and remove the Port piers, wharf structures and landside improvements protected by these structures from the Special Flood Hazard Area Zone map designation and change the flood designation for these structures to Zone X.

FEMA also is requested to perform an analysis of the Port’s northern waterfront which considers the breakwaters that protect that area from flooding. The Fisherman’s Wharf Harbors and the Hyde Street Harbor are completely surrounded by significant and competent breakwaters that greatly reduce the areas susceptibility to storm wave conditions. The Port anticipates that this FEMA refined analysis will lead to TWL elevations below the existing facility elevations and revise the FIRM to remove these facilities from any flood zone.
Appendix B

FEMA’s Preliminary FIRM including Port Comment
Appendix C

Key-Port Related Provisions of a Floodplain Management Ordinance

(Port-Related Findings

“FEMA's publication of a final FIRM for San Francisco may affect new development in San Francisco, especially renovation and reuse of finger piers. This Board finds that new construction on the San Francisco waterfront is an important local and state concern. The San Francisco waterfront, transferred by the State of California to San Francisco in 1969, is a valuable public trust asset of the State that provides special maritime, navigational, recreational, cultural and historical benefits to the people of the region and the State. New development, including rehabilitation of historic structures, on land that is seaward of the reach of mean high tide can be reasonably safe from flooding, provided that adequate building controls are in place. In 1997, the Port of San Francisco adopted a Waterfront Land Use Plan to guide development and use of the Port's waterfront property consistent with its trust obligations, and in 2006 the Port created a Capital Plan identifying public facilities necessary to maintaining a viable San Francisco waterfront. This Board urges the Port of San Francisco and FEMA to develop, before publication of final FIRM, long-term floodplain management controls that both address any flooding hazard risks and allow the City to implement the Waterfront Land Use Plan and the Capital Plan, as they may be amended, and achieve the goals of that Plan, including the preservation of historic piers.”

Key Definitions

“Functionally dependent use means a use that cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term includes, but is not limited to, docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities.”

“Historic structure means any structure that is:

1. Listed individually in the National Register of Historic Places or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;

2. Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;

3. Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of Interior; or

4. Individually listed on a local inventory of historic places in communities with historic preservation programs, including, but not limited to those structures that have been certified either
by an approved state program as determined by the Secretary of the Interior or directly by the Secretary of the Interior in states with approved programs.

5. Determined to be an historic resource in accordance with the City and County of San Francisco Planning Department's CEQA Review Procedures for Historic Resources.

6. In an historic district that is listed in the National Register of Historic Places.”

“Substantial improvement means any reconstruction, rehabilitation, addition, or other proposed new development of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the ‘start of construction’ of the improvement. This term includes structures that have incurred ‘substantial damage’, regardless of the actual repair work performed. The term does not, however, include either:

1. Any project for improvement of a structure to correct existing violations or state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions, or

2. Any alteration of, or attached exterior addition to, an ‘historic structure,’ provided that the alteration or addition will not preclude the structure's continued designation as an ‘historic structure.’”

Administration

“As provided by Section 4.114 of the San Francisco Charter, the San Francisco Port Commission, acting by and through its Chief Harbor Engineer, is responsible for reviewing all development permit applications for buildings and structures within the Port Commission's jurisdiction to determine whether the permit requirements of this ordinance have been satisfied, whether all other required state and federal permits have been obtained; and whether the site is reasonably safe from flooding. All building standards for construction in Port areas designated by the City Administrator as flood prone shall be consistent with the requirements of this ordinance and applicable federal and state floodplain management regulations, and shall become effective when such building standards are adopted by the Port Commission.”

Standards of Construction

Should new construction or development on existing structures be located in areas either currently or in the future designated by FEMA as flood prone, the Port’s Chief Harbor Engineer will develop, in consultation with FEMA, standards of construction for these projects. Current national standards include provisions for the design and construction of structures within flood hazard areas. It is anticipated that these national standards will be modified to suite the Port’s unique topographical and climatic conditions and will be incorporated into the Port’s Building Code. The Port’s Building Code will then be used to as the standard for construction.

Hardship Variances

“A variance from the standards provided by the section may be granted by the appropriate approval
authority for a parcel of property with physical characteristics so unusual that complying with the requirements of this ordinance would create an exceptional hardship to the applicant or the surrounding property owners. Variances shall be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief. Variance determinations shall include a showing of good and sufficient cause that:

A. **Failure to grant the variance would result in exceptional hardship** to the applicant; and

B. The granting of a variance will not result in increased flood heights, additional threats to public safety, or extraordinary public expense, create a nuisance, cause fraud and victimization of the public, or conflict with existing local laws or ordinances.”

*Historic and Functionally-Dependent Use Variances*

“Notwithstanding subsection 2A.284(e)(1) above, variances shall be issued for:

A. The repair or rehabilitation of, or exterior addition to, historic structures upon a determination that the proposed repair, rehabilitation or addition will not preclude the structure's continued designation as an historic structure.

B. New construction, substantial improvement, and other proposed new development necessary for the conduct of a functionally dependent use, provided that the structure or building is protected by methods that minimize flood damages, and that issuance of the variance does not result in additional threats to public safety or create a public nuisance.”
Appendix D
FEMA Advice Letter Regarding Construction on Piers in V-Zones