San Francisco Bay Conservation and Development Commission
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March 16, 2016

TO: All Engineering Criteria Review Board Members

FROM: Lawrence J. Goldzband, Executive Director (415/352-3653; larry.goldzband@bcdc.ca.gov)
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SUBJECT: **WETA San Francisco Ferry Terminal Project Follow-up Engineering Criteria Review Meeting (Meeting No. Two)**
(For Board consideration on March 30, 2016)

Project Summary

Project Name. Water Emergency Transportation Authority San Francisco Ferry Terminal Expansion.

Applicant. Water Emergency Transportation Authority (WETA)

Project Representatives. Michael Gougherty (WETA), Jim Hurley, Steven Reel and Uday Prasad (Port of San Francisco), Ingrid Maloney, Azadeh Bozorgzadeh, Dilip Trivedi, and Jim Brady (Moffatt & Nichol), John Gouchon (Langan Treadwell Rollo), Boris Dramov and Ivana Micic (ROMA Design Group).

Presenters: Mike Gougherty (WETA), Ingrid Maloney and Dilip Trivedi, P.E. (Moffatt & Nichol) and John Gouchon, G.E. (Langan).

Project Summary. The project includes the expansion of San Francisco ferry facilities in the area of the South Basin to include the relocation of Gate E, and the construction of two new gates – Gates F and G. The project would require the demolition of the existing approximately 21,023 square-foot deck and piles of Pier 2 and the dredging of approximately 20,479 cubic yards for the new gates. Further, the project includes areas of public access such as a promenade and a plaza between the Agriculture Building and the existing Ferry Terminal Plaza.

An interim 105-foot long gangway will be installed from the ferry promenade to the Embarcadero promenade for a second means of egress and public access from the south (south of Ag Building). To address sea level rise (SLR) concerns, the project is designed for a life of 50 years to 2068 based on the project start of construction in 2018. Further, the facility is designed with an adaptive response to SLR to the year 2100.

The project's seismic design will follow a performance-based approach (Performance Group IV or Risk Category IV) outlined in American Society of Civil Engineers (ASCE) standards for buildings and structures designated as "essential facilities." Essential facilities are defined as those intended to remain operational in the event of extreme environmental loading from wind or earthquakes.

Project Background. The Project's engineering criteria were originally reviewed by the ECRB on October 22, 2015. During such meeting the ECRB raised many concerns on issues regarding the project's structural and geotechnical criteria, commented on the project's coastal engineering criteria and recommended responses to its comments. In addition, to comply with the BCDC policies regarding the safety of fills, the Board recommended consideration of a seismic instrumentation plan for the project. Seismic instrumentation would provide information of strong ground motion relative to the project's engineering design and could assist in validating its engineering criteria.

Today's engineering criteria review would address the following ECRB comments:

Coastal Engineering Criteria

1. Explain whether the coastal design criteria had been compared with the original downtown terminal design of the 1990s regarding the similarities in loadings and waves results.
2. Keeping in mind that FEMA 100-year return elevations, which was meant to be provisional, compared well with the URS and the Boston Harbor reports, explain whether there has been a thorough review of the deck elevations in light of potential queries reporting relatively small waves.
3. The project's impacts from wind speeds may have been set based on direction; therefore, compare the 100-year return wind magnitude, applied not solely based on wave height/wave period and segregated by direction, in all directions.
4. The governing wave/fetch exposure seems to be from the north east as opposed to from the north where the Pier 14 breakwater would protect the project. Therefore, please submit the modeling report of the study of wave/fetch exposure that would describe the worst-case wave exposure.
5. The coastal wind conditions report indicates that the design criterion of a 100-year return design wave was 3.4 feet with a period of 4.6 seconds. However, the table reference under the slide of the "Coastal Conditions" that noted the north wind-direction conditions seemed to indicate that the wave height was higher in correlation with a smaller period; As a result, could it be assumed that the wavelength of the period as opposed to the wave height governs in this region?
6. Since the criteria involved the use of a dynamic analysis (wave height criteria) when looking at the response of the float, there should be a discussion of the effects and reflection on the guide piles and the interaction between the waves, the float and the guide piles, a naval architecture component, which would inform the structural dynamic analysis.
7. Explain the effect of the curb at the edge of deck of the ferry promenade and explain the adaptive approach to sea-level rise in the future.

Structural Engineering Criteria

1. Provide evaluation and description of the criteria with regard to potential seismic damage on the concrete piles and possible load capacity exceedance from a Maximum Credible Earthquake type and explain the results of any kinematic effects on the structure.
2. Provide a detailed evaluation of the sliding joints with respect to the design for horizontal and nominal vertical displacement.
3. Explain the rationale/purpose of the steel sliding joint next to the Ag Building in light of their design difficulties. Would a pedestrian barrier be more effective and serve its purpose?
4. The Board had concerns about the Occupancy Level IV (Risk Category IV) designation of the structure and requested a description of evacuation contingency plans for the project. What are the access/egress strategies during an emergency?

Geotechnical Engineering criteria

1. Provide results of the FLAC analysis pertaining to the project. FLAC is a numerical modeling code for advanced geotechnical analysis of the rock, soil and structural support in three dimensions. This analysis model would provide external forces (earthquakes) directional vectors in relation to the structure facilities in the project.
2. The Board requested information on the pore pressures generated in the lower sands at the project site.
3. The Board encouraged the team to think about whether the model (FLAC) went far enough to the east (bayward) in ascertaining any potential kinematic loading of the piles and floats, and whether there was too much boundary effects by cutting the current model where it ended. Potential movement on top of some of the lower liquefiable and softening sands may be holding it in place at the edge of the model.
4. Explain the application of the kinematic loads to the facilities' piles and the force distribution (moments) at the top of the piles as they connect to the deck. Further, explain how these loading forces were modeled in FLAC.
5. Regarding evaluation of liquefaction and impacts of lateral spreading on the piles and performance of the entire structure, if liquefaction were to occur, what effects would it have on pile capacities, i.e. downdrag, and on lateral strengths and displacement? In addition, when the assumptions were made for the shear strength for the section of sand in the area, the combinations in the strength parameters (large cohesion plus significant friction angle) seemed pretty high; therefore, the Board requested a review of these parameters again.
6. Knowing that the structure will be classified as an essential facility, the applicant is encouraged to have a strategy for the access aspect for when a strong motion event occurs.

The response memorandum enclosed in the materials included additional engineering issues raised by the Port of San Francisco regarding wave uplift of the existing steel plate joints and pile driving.

Law and Policy Considerations. The McAteer-Petris Act (Act) requires the Commission to review all proposed projects that involve fill [1] in San Francisco Bay, and prohibits the Commission from approving fill projects that, among other things, are deemed unsafe. Specifically, Section 66605(e) of the Act states that the Commission can authorize a project if the fill is constructed "in accordance with sound safety standards which will afford reasonable protection to persons and property against the hazards of unstable geologic or soil conditions or of flood or storm waters." Further, Section 66605(c) of the Act states that fill should be the "minimum necessary to achieve the purpose of the fill."

To carry out its responsibilities, the Commission adopted policies on the safety of fills. *San Francisco Bay Plan* Policy No. 1 states, in part, that the Commission has appointed and empowered the ECRB to: "(a) establish and revise safety criteria for Bay fills and structures thereon;… (d) with regard to inspection of marine petroleum terminals, make recommendations to the California State Lands Commission [CSLC] and the U.S. Coast Guard [USCG], which are responsible for regulating and inspecting these facilities; (e) coordinate with the [CSLC] on projects relating to marine petroleum terminals fills and structures to ensure compliance with other Bay Plan policies and the CSLC's rules, regulations guidelines and policies;…." Policy No. 2 states, in part, that "[e]ven if the Bay Plan indicates that a fill may be permissible, no fill or building should be constructed if hazards cannot be overcome adequately for the intended use in accordance with the criteria prescribed by the [ECRB]."

Enclosed Material

1. Memo to Mike Gougherty, WETA from Ingrid Maloney, Dilip Trivedi, N&N; John Gouchon, Langan Treadwell & Rollo, prepared by prepared by Moffatt & Nichol, March 1, 2016.
2. "San Francisco Downtown Ferry Terminal Expansion/San Francisco, CA/Coastal Engineering Assessment," prepared for Water Emergency Transportation Authority under contract to ROMA Design Group, San Francisco, California, dated October 3, 2015, January 29, 2016 and March 1, 2016.
3. "Geotechnical Investigation/San Francisco Ferry Terminal-Phase 2/San Francisco, California," prepared for Water Emergency Transportation Authority c/o ROMA Design Group, prepared by Langan Treadwell Rollo, 19 February 2016.

[1] Fill is defined in the McAteer-Petris Act as "earth or any other substance or material, including pilings or structures placed on pilings, and structures floating at some or all times and moored for extended periods, such as houseboats and floating docks" (Section 66632(a)) .

4. “San Francisco Downtown Ferry Terminal Expansion South Basin/San Francisco, CA/Engineering Analysis Report 30% Design,” Prepared for Water Emergency Transportation Authority under contract to Roma Design Group and dated January 29, 2016, February 22, 2016 and March 3, 2016.
5. “South Basin Downtown Ferry Terminal Expansion/30% Architectural & Engineering Drawings,” prepared for WETA by Roma Design Group in association with Moffat & Nichol and Simpson Gumpertz & Heger, and dated March 1, 2016.
6. “South Basin Downtown Ferry Terminal Expansion/Illustrative Drawings of 30% Design,” prepared for WETA by Roma Design Group dated January 29, 2016.