San Francisco Bay Conservation and Development Commission
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TO: All Engineering Criteria Review Board Members

FROM: Rafael Montes, Senior (Staff) Engineer (415/352-3670; rafael.montes@bcdc.ca.gov)

SUBJECT: **Approved Minutes of May 28, 2015 BCDC Engineering Criteria Review Board Meeting**

1. **Call to Order.** The meeting was called to order by the Chair Dr. Roger Borcherdt at approximately 1:00 p.m., in the Milton Marks Conference Center-Monterey Room, 455 Golden Gate Avenue, San Francisco, California.

2. **Roll Call.** The following Board Members were present: Dr. Roger Borcherdt, Board Chair, Professors Mary Comerio (UC Berkeley) and Martin Fischer (Stanford), Mr. Jim French, G.E., Mr. William Holmes, S.E., Mr. Frank Rollo, G.E. and Mr. Bob Battalio, P.E.. The members of the staff present were Ms. Ming Yeung, Permit Analyst, Mr. Bob Batha, Chief of Permits, Mr. John Bowers, Staff Counsel, Mr. Brad McCrea, Regulatory Program Director and Mr. Rafael Montes, Staff Engineer and Board Secretary.

Prior to the meeting there were introductions of the audience in the room. In attendance were Mr. Robert Beck, Mr. Wilson Meany, Mr. Kheay Loke, Mr. James Suh of the Treasure Island Development Authority, Mr. Uri Eliahu, Mr. Pedro Espinoza, Mr. Stefanos Papadopoulos, Mr. Josef J. Tootle of ENGEO, Mr. Marc Percher, Mr. Brad Porter, Mr. Dilip Trivedi of Moffatt & Nichol, Mr. Miles Gullingsrud of Treasure Island Job Corps Center and Mr. Malcolm Johnston of Treasure Island Yacht Club.

3. **Approval of the Meeting Minutes of February 28, 2015.** Chair Borcherdt solicited comments from the Board members regarding the last Board's meeting minutes of February 28, 2015 with respect to the review of the Brooklyn Basin and MOTCO projects in the Cities of Oakland and Martinez, California. There were no comments or changes. Mr. Holmes moved the motion to approve, which was seconded by Mr. French, and commended Mr. Montes for a good job in capturing the comments made at the meeting. The Chair entertained a vote to approve the minutes. They were approved unanimously.

4. **Summary of Transcript of Treasure Island Project.** Note: a 186 page verbatim transcript of the meeting is available upon request and on BCDC's website. Please contact Rafael Montes at Rafael.montes@bcdc.ca.gov for further information. The project proponents and their technical consultant representatives met with the ECRB for the second time to report on project progress and address comments from the first meeting on January 22, 2015 in reference to Sub-Phase 1A. This phase of the project includes the Causeway between Yerba Buena Island (YBI) and Treasure Island (TI), a ferry pier and breakwaters and public access areas on the southwest side of TI.

Progress on the project has been made to about 50 percent of the phase project area. Based on this progress sub-phase 1A has, therefore, become Sub-Phases 1B, 1C and 1E that divides the project in the so-called areas of Waterfront Plaza/Ferry Terminal, Cityside Waterfront/Park 1 and Park 2 and Clipper Cove Promenade 1. Further, the intent of the meeting was to address and respond to the ECRB review comments and present additional soil explorations and pier progress design in the areas of the Ferry Pier, Breakwaters, Perimeter Shoreline, the Causeway and seismic instrumentation. The applicant reiterated that the TI Redevelopment Project encompassed the whole of the island, the Causeway and the north half of YBI.

Mr. Joe Tootle of ENGEO, the geotechnical consultant, informed the Board that additional subsurface explorations had been done offshore of the area where the ferry terminal and breakwaters would be placed to further the design of the Ferry Pier and South Breakwater. He also summarized the actions to be taken onshore to stabilize the ground from the potentially liquefiable fills that constitute the filled areas and from the natural sand shoals underlying such fills. The actions would include vibro-compaction and soil/cement mixing activities. He also informed the Board that the Causeway would be completely rebuilt. The existing Causeway consists of artificial fills supporting a roadway access from YBI to TI. The rebuilding scheme would consist of the removal of the artificial fills to be replaced with engineered fill (compacted fill).

Mr. Porter of Moffatt & Nichol, the ferry pier consultant, informed the Board of the 50-percent design progress on the project. Two big-diameter mono-piles would support the two-span, fixed pier from the shoreline to the floats offshore. The pile next to the shoreline would be driven far outside the potential displacement of the rock dike that supports the artificial fills of the TI. He also explained that the north breakwater piles would be either batter piles or concrete piles. No specific spacing between these piles has been determined.

There was much discussion about the potential for rock dike displacement and the effects of potential liquefaction relative to the piles of the pier. The latter used criteria recommended by ASCE 61-14 for the design of piers and wharves. The guide piles design criteria of the float next to the pier were still under consideration. The seismic capacity and potential vulnerabilities (non-redundant component) of the piles were discussed. As described, the large-diameter mono-piles would rely more on the magnitude of deformation than on their strength to resist a ground motion. Mr. French questioned the reliability and degree of confidence with the approach taken

to the magnitude of deformation approximations and estimates. Mr. Percher of Moffatt & Nichol explained the elastic reactions of the piles would not result in a rupture or collapse but rather lateral movement. The approach to the design criteria of the piles followed the new soil borings explorations done prior to the meeting.

The risk criteria for the Ferry Terminal used Risk Category 2 of the California Building Code (CBC) that recognize the Causeway as the primary means off the island in a major earthquake. Therefore, the terminal must remain operational and be designed to a 72-year return earthquake event following the recommendations of ASCE 61-14. There was disagreement between the Board and the team regarding this level of earthquake design as the Board thought it to be not sufficiently conservative based on the limited access off the island. The Board was expecting a "zero-damage or operational" approach to the design criteria such as would be used in a more conservative 475-year return event criteria. There were questions regarding alternate methods of exiting the island during an emergency, such as Pier 1 at the opposite side of the island. However, it was explained that this structure had not been analyzed and could also be out of service after a strong motion event. It was the opinion of the Board that a 72-year-return event approach may not result in the ferry terminal being operational after a strong motion event. However, Mr. Percher stated that the Causeway being the main access to the San Francisco-Oakland Bay Bridge would be operational and its criteria would meet the 475-year-return criteria.

There was much discussion about the stability and vulnerabilities regarding the slope deformations outboard of the shoreline and about the densified soil mixing (DSM) methods of soil strength enhancement along the shoreline in the specific area of sub-phase 1.

Mr. Dilip Trivedi did a presentation on the breakwaters and responded to concur about overtopping of the breakwaters. The top of the proposed breakwaters would be higher than the perimeter of the shoreline. Upon questioning from Mr. Bob Battalio, it was described that in light of potential sea level rise projections, the structures could be modified to meet rising water levels. There was explanation and discussion about possible sedimentation, but based on historical photographs, predominant wave conditions and location, sedimentation was not likely.

There was discussion about whether there had been evaluations of other alternate locations that would involve less fill than the proposed ferry terminal would require, such as the use of Pier 1 on the opposite side of the island that does not require breakwaters. Mr. Trivedi provided information from the CEQA analysis that evaluated other alternatives. However, he said that this location provided the shortest and quickest route to San Francisco. Further, he added that other areas of the study showed inadequate depths which may require dredging in potential sensitive habitats such as areas in the south part of Clipper Cove and between YBI and TI. Mr. Beck of TIDA added that the shorter ride to San Francisco would encourage greater ridership as an option to driving. Mr. Suh indicated that the applicant was already working with BCDC about fill removal mitigation. There was a brief discussion of the design of the south breakwater in relation

to differing directional and simultaneous incident and reflected waves that could increase the loads on the pilings. This could affect the float pilings and may impact operations of the terminal. Leaving a gap through the breakwater system could be a solution to dissipate potential converging wave conditions.

There was a break of 5-10 minutes.

After the break, there was discussion about the DSM at Clipper Cove, the ferry pier and Cityside Park, north of the north breakwater. The PLAXIS model used for the simulation of ground deformation showed that for a Loma Prieta earthquake, the deformations inland were zero or less than half a foot. Mr. Tootle explained the use of PLAXIS analysis in reference to the liquefied strength of the soil.

Mr. Trivedi did a briefing on the SLR projections to mid-century and end-of-century for the perimeter improvement of the shoreline throughout Sub-Phase 1. There were some questions from Mr. Battalio regarding 100-year wave run-up elevations or total water levels, and he recognized there were differences for each side along the perimeter as some parts of the island were not affected by waves such as the Clipper Cove. Mr. Trivedi added that the perimeter of TI would be raised to an elevation as high as +15.5 feet NAVD88. The shoreline would accommodate up to 3 feet of SLR. He pointed out that by end-of-century, places areas such as Clipper Cove may require a levee which there was existing real estate to build one. Mr. Battalio commented on the future FEMA maps that could result in designating all the living quarters within the 100-year flood zones. Mr. Trivedi assured the Board that the promenade at the shoreline would be protected and beyond the FEMA flood zone.

There were Board questions about the sources of suitable fill around the Bay. The applicant mentioned that some of this material had already been secured from sources such as the Caldecott Tunnel project. However, there was some brief discussion about the suitability of the material since it could be laden with hydrocarbon residue. The soil material would be used to raise the grades of the island and in the process of compacting the soils.

There was plenty of discussion regarding the Causeway and the geotechnical strategy to be used in rebuilding it, which would involve the removal of large portions of existing soils that would be replaced with engineered fill so as to stabilize this critical section of roadway and access to the island in general. The two water sides of the Causeway would be replaced and stabilized, approximately 50 feet below the existing surface, leaving the middle section intact. DSM improvements would be one way to stabilize the areas. There would be access both ways during this construction stage that would involve the removal of one section of roadway at a time.

Mr. Johnston, a member of the audience, raised a question regarding the Causeway in relation to Clipper Cove. His concern was about the future marina at Clipper Cove, which could result in a breakwater that could cut off tidal influence to the Cove and result in much pollution of the area. He thought that the reconstruction of the Causeway could be done by installing a culvert through the rebuilt Causeway. This structure would allow for water flow to the Cove from the west (San Francisco side of the Bay). The Board picked up on the idea and there was some

brief discussion of the alternative. However, Mr. Suh reminded the Board that this Clipper Cove Marina and breakwater were not part of the review, and, therefore, there was insufficient information to share with them. He said the Clipper Cove marina project may not happen. In addition, he said that the Clipper Cove project would require its own environmental study and review process.

Returning to the Causeway proposal, the Board asked questions about the analysis of displacement between the hard-rock surfaces of YBI and the softer Bay-mud areas of TI with a land bridge, consisting of the Causeway as the bridge. Critical infrastructure would be routed through the Causeway such as utilities, access roads and pedestrian walkways.

There was much discussion about the proposal for the Causeway posing a geotechnical challenge. Mr. French indicated that this issue should be studied and analyzed as there was no indication of the project having addressed all the geotechnical challenges at this time. Mr. French having made this comment, the question by the Board regarding alternative means of ingress to and egress out of TI emerged again. Chair Borcherdt commented favorably on the construction of a bridge with seismic joints at both ends as an alternative to a consolidated-soil Causeway. However, he acknowledged that a bridge was not a proposal being presented by the applicant. Mr. Tootle said that he would bring the concerns back to the team designing the utility pipelines since these would be integrated into the current compacted-soil proposal of the Causeway.

Seismic instrumentation was the last item of discussion. Mr. Tootle indicated that their program would be consistent with the California Geological Survey's Strong Motion Instrumentation Program (CGS-SMIP). He described the locations and types of instruments being studied for instrumentation. He also mentioned the existing sensors in the island managed by SMIP. Chair Borcherdt thanked him for the efforts, but noted that the applicant should really be discussing and developing the efforts in conjunction with CGS-SMIP and not go it alone without them. He referred to the BCDC/Bay Plan policy section 3, in reference to the requirement of seismic instrumentation on all major fill projects. Further, he indicated that the applicant should coordinate with the State agency to know the location of the existing array and types of sensors. He indicated specific locations at the Causeway and at Sub-Phases 1C, 1B and 1E that could be candidate areas for instrumentation and mentioned types of sensors that could be useful, based on his own experience. Therefore, he encouraged the team to talk with Dr. Tony Shakal of CGS to explore all the possibilities for this effort. Lastly, he brought out some notes from the EIR report, dated 2009 and prepared by Ross Boulanger, Jim Mitchell, Ed Idriss and Ray Seed, which recommended slope inclinometers on the north side of the island.

Professor Fischer raised a question regarding 2- and 3-dimensional project drawings regarding the civil work. He suggested that 3-D drawings could guarantee understanding between the contractor and the design and quality control team in order to minimize cost overruns and to insure minimal impacts on the Bay. Mr. Percher said that because this project would be design-built, it would be up to the builder-designer to opt for this 3D strategy.

Professor Fischer also asked the Board whether it had addressed all the points brought up by BCDC in their request for technical advice.

There was much discussion as to whether all the topics that t he ECRB had requested additional information had been resolved. One of these topics was regarding the level of conservatism/caution used to address the adequacy of the design of the terminal based on a 72-year return level earthquake rather than on more stringent criteria such as provided by a 475-year return.

Mr. French opined that the applicant's technical team had the right engineering criteria in place and that, in his estimate, was in the process of completing it.

There was a discussion of all the points and issues raised throughout the meeting. The Board resolved that there would be no need for a third meeting. Chair Borcherdt indicated that the applicant had done spectra development for the Causeway and the ferry building based on best estimates for the seismic velocity, but he encouraged the applicant to compare these spectra with those for areas where various soil improvement methods have been implemented. In other words, he suggested the site-specific spectra available to compare with the improvement areas rather than relying on code-supplied factors.

Mr. French added the recommendation to not ignore the significance of "uncertainties" in the deformation, slope stability analysis by a factor of 2 or less. And Mr. Rollo cautioned the team to err on the side of conservatism. The Board spent some time formulating a recommendation regarding the adequacy of the current 72-year return design. The Board also discussed the decision by the applicant to categorize the risk level of the ferry terminal as Risk Level 2 rather than 4, criteria that would affect the level of emergency response and preparedness of the structure. Such a risk level would affect the pier and entire terminal structure.

Based on all the information above a motion was drafted as described below:

ECRB Motion: Preamble with the understanding that:

The ECRB reviewed the engineering criteria for Sub-Phase 1A of the TID Project on January 22, 2015 when the project was in an earlier design stage less of than 35 percent

The Applicant's consultants (ENGEO and Moffat and Nichol) have provided additional information as documented in Technical Memorandum No. 3 (TM No. 3; May 13, 2015) including:

a. ENGEO responses to ECRB Sub-Phase 1A review comments;
b. Reference 1: "ENGEO Draft Design Geotechnical Report, Infrastructure improvements, TI, Sub-Phases 1B, 1C, and 1E";
c. Reference 2: "Additional Subsurface Exploration Draft Package";
d. Reference 3: M&N May 2015 Progress Pier Design"; and
e. Sea Level Risk Assessment and Adaptive Management Plan.

The following ECRB review comments are based on referenced information and pertain only to the shoreline within BCDC's jurisdiction for Sub-Phases 1B, 1C, and 1E;

The ECRB suggests that the Sub-Phase 1B, 1C, and 1E portions of the TI Redevelopment Project move forward. The ECRB suggests that additional review of Sub-Phases 1B, 1C, and 1E by the ECRB in a public meeting shall not be necessary provided written responses from the applicants to the items listed below are acceptable to BCDC staff.

a. **Site-Specific Response Spectra for Site Class F Sites**

(1) Considering that ASCE 7-10 and CBC 2013 standards require site-specific methods be used to estimate Response Spectra for sites classified at Sites Class F, the ECRB suggests that the applicants develop site-specific response spectra using estimated seismic velocity logs that account for variations in thickness of underlying soil layers to bedrock at the Ferry Terminal site and at two or more sites along the Causeway. The applicant is also encouraged to compare these spectra with those derived for areas where various soil improvement methods have been implemented.

(2) Considering that the longitude coordinate of 121+ degrees W for the ENGEO borehole used to obtain a seismic velocity log appears to be incorrect, the ECRB recommends that a map showing the correct coordinates and location for the borehole be provided.

b. **Ferry Terminal**

(1) Considering the San Francisco BCDC Bay Plan policies and the desire to minimize fill in San Francisco Bay, the ECRB suggests that references be provided to document why the current proposal location for the Ferry Terminal and associated breakwaters was chosen as opposed to alternate locations that may have been considered in the EIR and other studies.

(2) ASCE 61–14 provides the guidance for the 72–year return for Ferry structures. However, this structure will be on an island with limited access and egress routes. Therefore, the Board had concerns over the levels of design safety. Considering the low design ground motion exceedance levels implied by a 72–year recurrence interval, the ECRB recommends that additional access and egress routes for the island be evaluated for possible implementation in case of emergencies.

c. **Shoreline Geotechnical Hazards.** Considering the important role that deformation analyses plays in several of the geotechnical aspects of the project, the ECRB recommends that the applicants address the significance of the uncertainties in the seismic deformation analysis for various parts of the project and the impact of typical uncertainty on their design, erring on the side of conservatism.

d. **Causeway.** Considering that the causeway connects TI to YBI and large variations in seismic displacements are expected along the causeway due to changes in geologic conditions from one island to the other, the ECRB recommends that the applicants address these variations in expected seismic displacements and their impact on public access and utilities on the causeway.

e. **Policy #3–Instrumentation.** Compliance with the San Francisco Bay Plan Policy #3 requires a plan for both installation and long–term maintenance of strong motion instrumentation installed on critical components of the project as acknowledged in TM No. 3 (ENGEO response to comment 12).

(1) Considering the relevance of strong-motion recordings to future development of TI, the ECRB recommends development of a cooperative instrument installation and long-term maintenance program between the TIDA and the California Strong-Motion Instrumentation Program (CSMIP) of the California Geological Survey. The ECRB recommends that a "Technical Specification Letter" documenting the objectives and detailed instrumentation installation and maintenance plan be developed jointly by the applicants and CSMIP for approval.

(2) The ECRB recommends consideration of the following instrumentation projects:

(a) As suggested in part in TM No. 3 by ENGEO, borehole seismic sensor arrays with three component accelerometers and pore-pressure transducers appropriately placed on the Causeway and within a DSM and a stone-column stabilization structure could be especially beneficial in understanding the seismic performance of the structures and improving the seismic safety of future TID projects. Display of some of the data in real time is suggested to facilitate decision making in the case of an emergency.

(b) As indicated by ENGEO, installation of the required number of monument pairs to monitor lateral and vertical movements of dikes, stabilization structures (DSM and stone column), and Causeway will need to be installed and measured over long periods of time.

(c) The ECRB recommends further consideration of the Instrumentation Recommendation for Slope Inclinometers of Professors R. Boulanger, I. Idriss, J. Mitchell, and R. Seed as stated in their review of the ENGEO Geo Design Conceptual Report for TI, February 2009 (Appendix 5H). *"General: It would be advisable to install slope inclinometers as soon as possible to begin to monitor the lateral components of the ongoing deformations in the northwest corner of the island; it can take some time to measure sufficient movements as to be useful here. Additional samples and laboratory tests can then be performed to characterize both the secondary compression (volumetric creep) behavior and the deviatoric creep behavior of the Young Bay Muds. The ongoing settlement data, and the slope inclinometer data, along with this laboratory data, can then be used to characterize both secondary compression and deviatoric creep behavior in this area. This, in turn, can then be used to analyze and predict future settlements and movements associated with proposed densification of the upper sands, placement of additional fill, and loads from proposed shallow founded structures."*

Motion: (Frank Rollo): As amended and summarized in a draft motion outline prepared by Roger Borcherdt that includes all of the above items.

Motion Second: Jim French

Motion Amendment: The Board recommends that elevation of (TI) dwellings be evaluated for consistency with the NRC 2012 high curve.

5. **Adjournment.** There being no further old or new business, the meeting was adjourned at approximately 5:00 p.m.

Respectfully submitted,

RAFAEL MONTES, P.E.
Board Secretary

Approved, with no corrections at the
Engineering Criteria Review Board Meeting of August 11, 2015.