TO: Engineering Criteria Review Board (ECRB) Members

FROM: Lawrence J. Goldzband, Executive Director (415/352-3653; larry.goldzband@bcdc.ca.gov)
Rafael Montes, Staff Engineer (415/352-3670; Rafael.montes@bcdc.ca.gov)
Elena Perez, Coastal Program Analyst (415/352-3612; elena.perez@bcdc.ca.gov)

SUBJECT: Latitude Project (previously referred to as the Terminal One Project), City of Richmond, Contra Costa County (35% Design)
(For Board consideration on August 8, 2017)

Project Summary

Project Name. The Latitude Project (previously referred to as the Terminal One Project), City of Richmond.

Applicant. Laconia Development LLC (Laconia) and the City of Richmond.

Project Representatives. Cleve Livingston (Laconia); Lina Velasco (City of Richmond); Sam Yao and Max Argo (SGH); Jeff Fippin, Pedro Espinosa, and Todd Bradford (ENGEIO); Jason White (BKF Engineers); and Scott Cataffa and Justin Aff (CMG).

On June 7, 2016, the ECRB and the Design Review Board received a preliminary briefing on the project. There were no Board motions at the time. The Project returned to the ECRB at its May 24, 2017 meeting, at which time the Latitude Project team made a presentation to the Board that addressed the following points:

1. Project Overview (Laconia)
2. Landscape Design (CMG)
3. Existing Condition Analysis
   a. Geotechnical Condition Assessment (ENGEIO)
   b. Structural Condition Assessment of Wharf (SGH)
4. Flooding and Sea Level Rise Analysis (BKF)
5. Shoreline Protection Analysis (SGH)
6. Basis of Design – Wharf (SGH)
   a. Design Codes and Standards
   b. Seismic Design Methodology
7. Anticipated Retrofit Options (SGH and ENGEIO)
Although there were no Board motions at the conclusion of the May 24th meeting, the project presentation afforded the members of the Board the opportunity to question the Latitude consultants and comment on the analysis performed by the Latitude Project team. Included as an enclosure to this Staff Report is a list of points that the Board asked the Latitude team to address in their follow-up to the May 24th meeting, together with the Project consultants’ summary responses to the Board’s comments.

The August 8th ECRB meeting that is the subject of this staff report serves as a follow-up to the May 24th project presentation.

A copy of the minutes of the May 24, 2017 ECRB meeting is provided for reference.

**Project Description.** The Latitude Project (“Project”) contemplates the redevelopment of a 13-acre shoreline site located in the Point Richmond area of the City of Richmond which previously served for over 80 years as a port terminal and tank farm. The Project proposes to replace these heavy industrial port-related land uses with a mix of public park and private residential uses, the two principal components of which will consist of:

1. An approximately 5.5-acre public waterfront park that would run the length of the Project’s approximately 1,100-foot shoreline frontage and would feature the existing Terminal One Wharf repurposed for public use and a shoreline extension of the Bay Trail (the “Waterfront Park”); and
2. An approximately 8.7-acre residential neighborhood with 316 residential dwelling units (consisting of 21 single-family homes, 295 stacked condominium flats in five multi-story buildings that would be constructed over two single-story parking podiums) that will be developed on the interior of the site, beyond the Commission’s 100-foot shoreline band.

One of the signature elements of the Latitude land use program involves reusing the existing Richmond Municipal Wharf No. 1 as a public recreational amenity that is the centerpiece of the Project’s Waterfront Park. This 1915 era wharf is approximately 555 feet in length and 90 feet in width, with coverage of almost 50,000 square feet.

The wharf was originally designed to support a large warehouse facility (approximately 70 feet in width and 525 feet in length), which was constructed on the wharf and occupies most of the deck area, excepting an 18-foot-wide, 555-foot-long wharf frontage and a 30-foot-wide clear area at the western end of the wharf. Approximately 57,000 square feet of additional warehouse space was added in the early 1920s on the landward edge of the wharf. This additional space was tied into the original space along the wharf’s northern reach, resulting in approximately 94,000 square feet of contiguous warehouse space under one roof. The warehouse will be demolished to allow reuse of the wharf and redevelopment of the Latitude site.

SGH, the Project’s marine structural engineer, reports that the wharf is supported by piles with typical grid spacing of 10 feet in both directions. (See SGH’s report entitled “Condition Assessment and Design Criteria for Structural Evaluation of the Wharf,” a copy of which was included with the materials that were presented to the Board at its May 24, 2017 meeting and is also enclosed with this Staff Summary.) The majority of the piles are square 16-inch precast
reinforced concrete piles. The reinforced concrete wharf deck is supported by concrete beams and girders that span between the piles. The elevation of the wharf deck is approximately 13.0 feet NAVD88. The ground surface below the wharf ranges from approximately 2 to 22 feet below the underside of the deck. A rock/gravel dike extends under the wharf for a distance of approximately 64 feet from the land side of the wharf.

**Geotechnical Engineering Criteria.** According to the Geotechnical Report prepared by ENGEO, the project’s geotechnical engineer, (see ENGEO’s revised July 14, 2017 report entitled “Existing Geotechnical Conditions and Seismic Slope Stability”, a copy of which is enclosed with this Staff Report), the soil on the landside of the wharf consists of artificial fill, a layer of Young Bay Mud (YBM), a thin layer of stiff to hard clay and medium dense to dense sand, and bedrock. The land was originally reclaimed by dredging a trench into the Young Bay Mud near the current shoreline and backfilling the trench with a mixture of sand and rock; some Young Bay Mud exists below this “rock dike.” The landside fill was placed behind the rock dike. The landward piles supporting the wharf were driven through the rock dike. The liquefaction susceptibility analysis notes that the lower portion of the sand layer on the bayside of the wharf is potentially liquefiable.

The inland soil is subject to slope instability during seismic events requiring mitigation. Without mitigation, under the current Building Code-level earthquake, the slope could move between 1 to 2 feet in the direction of the Bay; this deformation could extend into the areas of proposed development impacting the soils below or land-sliding to the waterside of the wharf. Along the western shoreline, a historic swale was backfilled prior to original site development. The fill and alluvium in this former swale area is potentially liquefiable.

To address concerns regarding shoreline instability, the Project plans to use a deep soil mixing (DSM) buttress along the shoreline both to substantially reduce the potential for lateral spreading and to buffer the wharf from excessive ground lateral deformation. In the area of the historic swale that runs along the Project’s western edge, the buttress will include closed cells to reduce the flow of potentially liquefiable soil towards the Bay.

In order to evaluate the soil-structure-interaction between the existing wharf foundations and the soil, ENGEO developed soil load-displacement “springs.” They also performed a site-response analysis to develop a site-specific seismic spectra accounting for the complex site response due to the significant thickness of soft soil over bedrock at the site. In addition, ENGEO performed an analysis of the slope displacement under the wharf in front of the DSM buttress using “pinning” forces from the existing piles, developed in coordination with SGH. This analysis concludes that the planned ground improvement would assist in reducing seismic-induced slope deformation to a low enough amount that adequate egress conditions from the wharf structure will exist after the Building Code-level earthquake.

**Structural Engineering Criteria.** The Latitude Project’s structural engineer, SGH, performed an evaluation of the structural integrity of the existing wharf. The results of this evaluation are summarized in the enclosed “Condition Assessment and Design Criteria” report. The principal design criteria governing this evaluation are the criteria established by the 2013 California Building Code (CBC). The wharf is classified as Risk Category II per Table 1604.5 in the CBC and is required to achieve a level of seismic performance for life safety protection in the CBC Design
Earthquake. The seismic evaluation of the structure was performed using a displacement-based seismic performance criterion per CBC CH31F. The displacement demands were calculated by using the “refined method” in CBC CH31F, which is similar to the “substitute structure method” in ASCE 61–14 “Seismic Design of Piers and Wharves”. The displacement capacity of the structure was estimated based upon the strain limits in CBC CH31F or ASCE 61-14, whichever is more stringent. In addition, all capacity-protected members were separately checked for the Design Earthquake.

To evaluate the wharf structure under seismic inertial loads, nonlinear pushover analyses was performed using both upper bound soil/rock springs and lower bound soil/rock springs as recommended by the Project’s geotechnical engineer, ENGEO. The pushover analyses took into account the structure mass, structural effective period, and seismic spectra considering appropriate levels of damping.

To evaluate the kinematic loading effects from lateral ground movements, SGH performed a nonlinear pushover analysis. The seismic kinematic loads were imposed onto the wharf by incrementally increasing the kinematic displacements onto the piles in the pushover analyses. The structural capacity was checked at each kinematic displacement increment until it failed structurally in shear or flexure. In addition to the structural evaluation of the kinematic loading effects, the pushover analysis was also used to determine pile pinning forces along the potential stability failure surface for the geotechnical slope stability analysis.

The wharf structure was evaluated for a combination of seismic inertial loads and seismic kinematic loads in accordance with CBC CH31F. The results of this seismic land evaluation indicate that the existing wharf structure does not satisfy the performance criteria established by the CBC.

The results of SGH’s seismic evaluation of the existing wharf without seismic retrofit are summarized in the following table:

<table>
<thead>
<tr>
<th>Component</th>
<th>Demand</th>
<th>Capacity</th>
<th>D/C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Displacement (in)</td>
<td>6.58</td>
<td>4.02</td>
<td>1.64</td>
</tr>
<tr>
<td>Concrete Pile Shear (kip)</td>
<td>55</td>
<td>30</td>
<td>1.83</td>
</tr>
</tbody>
</table>

In order to bring the wharf structure into conformity with the CBC criteria, SGH developed a seismic retrofit program that is designed to increase the lateral resistance to seismic loading by tying the wharf to new landward piles that will be installed along the wharf’s northern edge. This retrofit methodology has been implemented on wharf structures in California following the Loma Prieta Earthquake.
SGH has summarized both the results of its seismic evaluation of the existing Terminal One Wharf and the retrofit program that will be employed to address the identified deficiencies, in a report entitled Structural Assessment and Seismic Retrofit of Latitude Wharf, a copy of which is enclosed with this Staff Report.

**Structural Ratings.** SGH conducted a structural visual inspection of the wharf in order to rate the current conditions of the piles, beams, girders and deck. The results of SGH’s condition assessment were summarized in the enclosed Condition Assessment and Design Criteria report. The condition assessment report indicates that the original piles, as constructed in 1915, were subsequently covered with four to seven-inch thick shotcrete encasements that extend up to several feet from the wharf deck. Very little of the original piles were observed and some of the piles were not accessible for observation.

The SGH condition assessment rated each of the 626 piles supporting the wharf in accordance with rating criteria established by the American Society of Civil Engineers Manual of Practice 130 to reflect the extent of cracking, spalling, chemical deterioration, loss of concrete cover, and other damage/section loss. Each pile was assigned to one of four rating categories:

1. “Minor” – light cracking up to 1/16\(^\text{th}\) inch in width, occasional corrosion stains or small pop-out (33 piles);
2. “Moderate” – Rounding of corners up to 1 in. deep and structural cracking up to 1/16\(^\text{th}\) in. in width (439 piles);
3. “Major” – Cracking up to ¼ in. in width, open or closed spalls, and concrete disintegration due to chemical deterioration (126 piles); and
4. “Severe” – Structural cracks wider than ¼ in. in width, exposed rebar and loss of concrete cover due to steel corrosion or chemical deterioration (28 piles).

In addition, the 28 piles that were found to have “severe” damage/section loss were further rated as to the percentage of section loss – with 22 of the 28 piles found to have less than 25% section loss; 3 piles found to have 25%-50% section loss; and 3 piles found to have 50%-75% section loss.

Prior to this 2016/2017 inspection, another consultant, J.J. Miller & Associates, had conducted an earlier visual inspection of the wharf in 2005. Although the previous inspection employed different criteria to rate the condition of the wharf, SGH found that a comparison of the two condition assessments suggests a worsening in the structural ratings over the course of the last 11 years.

In order to address the deterioration/damage/section loss identified in the condition assessment and ASCE MOP 130 ratings, SGH will develop a pile repair and maintenance program. The project will repair piles using the pile encasement method as presented at the May 24, 2017 ECRB meeting and included in the enclosed Condition Assessment and Design Criteria report. This pile repair method is to encase the damaged piles with fiber-reinforced plastic casings with reinforcement, and then to infill the space between the casing and pile with high strength cement grout. This pile inspection/maintenance plan will follow the guidelines in California Building Code Chapter 31F. The plans and specification of the pile repair design and pile maintenance plan will be produced in the final construction documents.
Hydrologic/Hydraulic Assessment, Flood Risk, and Sea Level Rise (SLR) Projections. BKF, the Project’s civil engineer, performed a hydrologic/hydraulic impact evaluation to determine the design parameters that are required to mitigate the flood risks associated with a 100-year storm event and with projected rise in sea level. The results of BKF’s evaluation are summarized in the firm’s hydrologic impact report entitled “Memorandum on Evaluation of Terminal One Base Flood Elevation and Area of Inundation” (the “Hydrologic Impact Report”), a copy of which was included in the materials that were presented to the Board at its May 24, 2017 meeting and will be included now as well.

The BKF Hydrologic Impact Report describes the ways in which the Latitude Project has been designed to accommodate a Base Flood Elevation (BFE) of 11 feet, as assigned to the southwesterly portion of the Latitude site, including the entirety of the Latitude shoreline, by the most recent FEMA Flood Insurance Rate Map issued September 30, 2015. In addition, the design of the Latitude Project anticipates a rise in sea level of 16 inches by 2050 and 55 inches by 2100 per the 2012 report by BCDC and NOAA Coastal Services Center entitled “Vulnerability and Risk Assessment Report.”

Setting aside for the moment considerations of sea level rise, in order to mitigate the flood risks associated with a 100-year storm event, BKF’s Hydrologic Impact Report recommended setting the minimum finished floor elevation for all structures at 13 feet – a level that provides an additional measure of protection by adding two feet of freeboard to the 11-foot elevation that would otherwise be required to accommodate the BFE. To address the additional flood risks associated with a rise in sea level of 16 inches, however, BKF’s 2015 report recommended (a) the minimum finished floor elevation of all landside structures be set at 14.3 feet (consisting of a BFE of 11 feet plus 24 inches of freeboard plus 16 inches of sea level rise) and (b) the minimum finished elevation of Shoreline Drive be set at 12.3 feet (consisting of a BFE of 11 feet plus 16 inches of sea level rise), to allow for emergency vehicle circulation.

To protect against a rise in sea level in excess of 16 inches, BKF’s Hydrologic Impact Report further recommended the Latitude Project employ adaptive strategies, including in particular, an earthen berm or flood wall along the shoreline.

The strategy proposed by BKF in its 2015 report has been subsequently revised to provide the Latitude Project with an additional level of protection against the risks associated with a 100-year flood and sea level rise. In this regard, the changes that have been made to the design of the Latitude Project include:

1. Raising the minimum finish floor elevation of all ground level residential structures to 16.0 feet;
2. Setting the minimum finished elevation of the Bay Trail at 14.5 feet; and
3. Designing the Bay Trail Loop to function as a protective embankment and flood barrier shielding the area inside the Loop from the impacts of a 100-year storm event and sea level rise.
At the May 24, 2017 meeting of the ECRB, the Board proposed using a three-foot rise in sea level as reasonable criteria for project design, with a rise in sea level of greater than three feet to be addressed by way of an adaptive plan. In response to the Board’s input, BKF has prepared a memorandum addressing “Design Features and Adaptive Measures to Mitigate Flood Risk Associated with 100-Year Storms and Sea Level Rise” (the “Flood Risk Mitigation Memorandum”), a copy of which is enclosed with this Staff Report. BKF’s Flood Risk Mitigation Memorandum includes an evaluation of the extent to which the design of the Latitude Project can adequately accommodate a 3-foot rise in sea level and a description of the adaptive strategy the Latitude Project will employ to address a rise in sea level of greater than three feet.

**Design Features of the Terminal One Wharf.** The existing elevation of the Latitude Wharf is approximately 13 feet. The plans for repurposing the wharf for public use, however, contemplate overlaying the wharf with five to six inches of reinforce concrete. In addition, the wharf improvements will also include raised programmed space that will be framed by an 18-inch high stem wall and will occupy a portion of the area previously occupied by the warehouse. This programmed space will have a finished elevation approximately 18 to 36 inches above the top of the wharf deck. As a result, the minimum finished elevations of the wharf deck and the raised program area will be approximately 13.5 feet and 15.0 feet, respectively.

BKF’s Flood Risk Mitigation Memorandum includes an evaluation of the extent to which the design features of the wharf, as summarized above, can accommodate a three-foot rise in sea level and a discussion of adaptive measures that may be employed to address increases in sea level of over three feet.

**Engineering Assessment of Shoreline Protection.** SGH performed an engineering assessment of shoreline protection at the Latitude site (see SGH’s “Condition Assessment and Design Criteria” memorandum). The waves in a 100-year storm event were evaluated using software STWAVE, which simulates depth-induced wave refraction and shoaling, depth- and steepness-induced wave breaking, diffraction, wave growth because of wind input, and wave-wave interaction. The analysis model employed by SGH utilizes the NOAA Digital Elevation Model (DEM), and the field data collected at Alameda Naval Air Station over a period of 45 years. The SGH analysis indicated that the shoreline along the wharf extending to the southeast is somewhat shielded by the existing breakwater, making these regions less susceptible to storm waves. SGH also found the northwest shoreline has the highest exposure. In either case, SGH determined that the site requires rip-rap that meets the minimum requirements of Caltrans RSP Class “Light”.

Field inspections indicated that the existing rip-rap at the project site ranges from Class Light to 1 ton in size. As a result, SGH concluded, the existing rip-rap was adequately sized for shoreline protection of the site. The southeast shoreline currently extends to a grade of +8.0 ft. above MLLW with RSP placed to the full extent. SGH recommends that a splash apron be placed to extend the current RSP inland by 4 feet in this region in order to avoid potential ponding and erosion of the back soil behind and beneath the rip-rap.

In the discussion that took place at the ECRB’s May 24, 2017 meeting, concerns were raised regarding potential sea level rise induced flood impacts to the low-lying portion of the shoreline east of the wharf and south of the Bay Trail. BKF’s Flood Risk Mitigation Memorandum includes a detailed discussion of these concerns and proposes an adaptive strategy to address them.
Law and Policy Considerations. Section 66605 of the McAteer-Petris Act allows the Commission to approve fill only when public benefits from fill clearly exceed public detriment from the loss of the water areas, and should be limited to water-oriented uses or minor fill for improving shoreline appearance or public access to the Bay. Authorized fill shall meet certain additional criteria, including among others, that the fill be 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.”

Bay Plan Policies. The applicable BCDC Bay Plan policies in relation to the proposed project include policies on Safety of Fills, Shoreline Protection, Public Access and Climate Change.

Policies on the Safety of Fills

1. **Policy No. 1** states, in part, that the Commission has appointed and empowered the ECRB to “establish and revise safety criteria for Bay fills and structures thereon.”

2. **Policy No. 2** states, in part, that “even 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.”

3. **Policy No. 3** states, “[t]o provide vitally needed information on the effects of earthquakes on all kinds of soils, installation of strong-motion seismographs should be required on all future major land fills. In addition, the Commission encourages installation of strong-motion seismographs in other developments on problem soils, and in other areas recommended by the U.S. Geological Survey, for purposes of data comparison and evaluation.

4. **Policy No. 4** states, in part, that “[a]dequate measures should be provided to prevent damage from sea level rise and storm activity that may occur on fill or near the shoreline over the expected life of a project. The Commission may approve fill that is needed to provide flood protection for existing projects and uses. New projects on fill or near the shoreline should either be:

   (a) set back from the edge of the shore so that the project will not be subject to dynamic wave energy,

   (b) be built so the bottom floor level of structures will be above a 100-year flood elevation that takes future sea level rise into account for the expected life of the project,

   (c) be specifically designed to tolerate periodic flooding, or

   (d) employ other effective means of addressing the impacts of future SLR and storm activity.”

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1Fill 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)).
Policies on the Shoreline Protection

1. **Policy No. 1** states, in part, that, “[n]ew shoreline protection projects and the maintenance or reconstruction of existing projects and uses should be authorized if:

   (a) the project is necessary to provide flood or erosion protection for (i) existing development, use or infrastructure, or (ii) proposed development, use or infrastructure that is consistent with other Bay Plan policies;

   (b) the type of the protective structure is appropriate for the project site, the uses to be protected, and the erosion and flooding conditions at the site;

   (c) the project is properly engineered to provide erosion control and flood protection for the expected life of the project based on a 100-year flood event that takes future sea level rise into account;...and

   (e) the protection is integrated with current or planned adjacent shoreline protection measures. Professionals knowledgeable of the Commission's concerns, such as civil engineers experienced in coastal processes, should participate in the design.”

2. **Policy No. 2** states, in part, that, “[r]iprap revetments, the most common shoreline protective structure, should be constructed of properly sized and placed material that meet sound engineering criteria for durability, density, and porosity. Armor materials used in the revetment should be placed according to accepted engineering practice....Riprap revetments constructed out of other debris materials should not be authorized.”

3. **Policy No. 4** states, in part, that, “[w]henever feasible and appropriate, shoreline protection projects should include provisions for nonstructural methods such as marsh vegetation and integrate shoreline protection and Bay ecosystem enhancement, using adaptive management. Along shorelines that support marsh vegetation, or where marsh establishment has a reasonable chance of success, the Commission should require that the design of authorized protection projects include provisions for establishing marsh and transitional upland vegetation as part of the protective structure, wherever feasible.”

Policies on Public Access

**Policy No. 5** states, in part, that, “[p]ublic access should be sited, designed, managed and maintained to avoid significant adverse impacts from sea level rise and shoreline flooding.”

Policies on Climate Change

1. **Policy No. 2** states, in part, that “[w]hen planning shoreline areas or designing larger shoreline projects, a risk assessment should be prepared by a qualified engineer and should be based on the estimated 100-year flood elevation that takes into account the best estimates of future sea level rise and current flood protection and planned flood protection that will be funded and constructed when needed to provide protection for the proposed project or shoreline area. A range of sea level rise projections for mid-century and end of century based on the best scientific data available should be used in
the risk assessment. Inundation maps used for the risk assessment should be prepared under the direction of a qualified engineer. The risk assessment should identify all types of potential flooding, degrees of uncertainty, consequences of defense failure, and risks to existing habitat from proposed flood protection devices.”

2. **Policy No. 3** states, in part, that “to protect public safety and ecosystem services, within areas that a risk assessment determines are vulnerable to future shoreline flooding that threatens public safety, all projects should be designed to be resilient to a mid-century sea level rise projection. If it is likely the project will remain in place longer than mid-century, an adaptive management plan should be developed to address the long-term impacts that will arise based on a risk assessment using the best available science-based projection for sea level rise at the end of the century.”

3. **Policy No. 5** states that, “[w]herever feasible and appropriate, effective, innovative sea level rise adaptation approaches should be encouraged.”

**Request for the ECRB’s Technical Advice.** Staff seeks the expert advice of the Board in assessing the adequacy of the proposed project’s overall safety criteria. Since the project proposes to reuse the existing 100-year old wharf as its main public access component, it is critical to assess the wharf’s long-term structural integrity, its public access future viability and the adequacy of the applicant’s proposed safety criteria that determines the repair strategy. The staff concerns are similar to those raised by the ECRB regarding public safety but more focused on the BCDC’s law and Bay Plan policies. Following are some issues raised by the staff regarding the project’s safety:

1. **Seismic, Structural and Geotechnical Criteria.** Are the proposed safety criteria appropriate that will afford protection to the public and public access structures of the wharf and adjacent Bay trail?

2. **Sea Level Rise and Flooding.** Would the wharf and public access trails be resilient to flooding by being above the 100-year flood elevation that considers future sea level rise for the expected life of the project, year 2070 and beyond or designed to tolerate periodic flooding?

3. **Shoreline Protection.** Is the proposed shoreline protection appropriate for the project site, the uses to be protected and the erosion and flooding conditions at the site? Is the protection integrated with current or planned adjacent shoreline protection measures? Can there be any nonstructural methods to protect the shoreline from erosion and

**Summary of the Proposed Presentation for the August 8, 2017 ECRB Meeting.** At the conclusion of the Project Proponent’s May 24th presentation to the ECRB, the Board recommended that the next time the Latitude Project team addressed the ECRB, the focus of the presentation should be on the issues and questions raised at the May 24th meeting. (See “List of Questions/Comments Raised by Board members at May 24, 2017 ECRB Meeting together with Summary Responses by the Latitude Project Team,” a copy of which is enclosed with this Staff Report.)
The comments made by Board members at ECRB’s May 24th meeting fell into three main subject areas: (a) the assessment of the wharf as related to public safety, (b) the impact of sea level rise with respect to the applicable design criteria, and (c) the geotechnical engineering issues associated with deep soil mixing and slope stability. The presentation of the Latitude Project team at the August 8th ECRB meeting will focus on these three subject areas and on the following more specific points of inquiry:

1. **Public Safety** of the wharf, including a discussion of:
   a. The seismic safety of the wharf: seismic kinematic load analysis, slope stability analysis, seismic inertial load analysis, retrofit design, and clarification relative to torsional effect on the seismic loads and structural resistance of the wharf (SGH and ENGEIO);
   b. The safety of the wharf under the service condition: overlaying the landscape park design over the structural layout of and seismic retrofit plans for the wharf, and providing an assessment of the structural safety margin of the wharf supporting the new park (SGH and CMG);
   c. The justification for assigning certain knowledge factors to the existing piles in accordance with the guidelines in the California Building Code (SGH);
   d. The safety margin of the wharf deck under wave loads with due consideration of SLR (SGH);
   e. The rebar continuity at the bottom of the beams (SGH); and
   f. The effects of structural chamfer at pile-deck connection on plastic hinges and structural safety (SGH).

2. **Sea Level Rise**, including:
   a. Design for three feet of sea level rise, preferably with additional freeboard, for the park and access corridor (BKF and CMG);
   b. Develop adaption strategy for five feet to six feet of sea level rise, with more detailed description of adaption strategy to understand implications relative to public access and efficiency of flood protection, e.g., drainage behind a flood protection wall (BKF and CMG);
   c. Evaluate effect of rising wave crest on erosion of soils and slope stability (BKF, ENGEIO, and SGH); and
   d. Discuss whether fill is necessary and desirable at the site for protection against SLR (BKF).

3. **Geotechnical Design**, including:
   a. Provide an overview of geotechnical design considerations (ENGEIO);
   b. Describe layout of DSM in relation to the wharf (ENGEIO); and
   c. Discuss how DSM helps to reduce lateral soil movement and stabilize the slopes during earthquakes, and how DSM buttresses perform during earthquakes (ENGEIO).
4. **Project Overview**, including:
   a. Plans to show how the promenade connects to the landside, and where the existing warehouses will be removed; and
   b. Plans to show the landscape design as submitted for DRB review.

**Material Enclosed with this Staff Report for August 8, 2017 ECRB Meeting**

1. List of Questions/Comments Raised by Board members at May 24, 2017 ECRB Meeting together with Summary Responses
2. EN GEO, Existing Geotechnical Conditions and Seismic Slope Stability, as revised July 24, 2017
3. Simpson Gumphertz & Heger, Structural Assessment and Seismic Retrofit of Latitude Wharf, August 7
4. BKF, Design Features and Adaptive Measures to Mitigate Flood Risk Associated with 100-Year Storms and Sea Level Rise, July 24, 2017
5. CMG Powerpoint Presentation to Design Review Board Describing Landscape Program for Terminal One Waterfront Park and Related Public Access Areas, July 25, 2017
6. Simpson Gumphertz & Heger, Condition Assessment and Design Criteria for Structural Evaluation of Latitude Wharf, Point Richmond, California, April 19, 2017 (also enclosed with Staff Report for May 24, 2017 ECRB meeting)
7. Simpson Gumphertz & Heger, Pile Repair Strategies, July 25, 2017
8. BKF, Memorandum on Evaluation of Terminal One Base Flood Elevation and Area of Inundation, 15 January 2015
9. May 24, 2017 ECRB draft meeting minutes
10. June 7, 2016 Joint DRB/ECRB meeting minutes