San Francisco Bay Conservation and Development Commission
455 Golden Gate Avenue, Suite 10600, San Francisco, California 94102 tel 415 352 3600 fax 415 352 3606

March 7, 2017

TO: All Engineering Criteria Review Board Members

FROM: Lawrence J. Goldzband, Executive Director (415/352-3653; larry.goldzband@bcdc.ca.gov)
Rafael Montes, Senior (Staff) Engineer (415/352-3670; rafael.montes@bcdc.ca.gov)

SUBJECT: **Alameda Landing Waterfront Project Engineering Design Criteria Review Meeting (25% Design)**
(For Board consideration on March 21, 2017)

Project Summary

Project Name. Alameda Landing Waterfront Site

Applicant. Catellus Development Corporation (Catellus) and the City of Alameda

Project Representatives. Bill Kennedy (Catellus), Damir Priskich (Catellus), Dave Irving (Catellus), Richard Rodgers PE GE (Langan), Juan Baez, PhD PE (AGI), Steve Dickenson, PhD PE (New Albion Geotechnical), Doug Schwarm, PE (Atlas Geotechnical), Gayle Johnson PE (SGH) and Dan Schaefer PE (BKF Engineers)

Project Description. The project proponents propose to develop a 40-acre lot at the terminus of Fifth Street, in the City of Alameda, Alameda County. The project site is on the northwest side of Alameda island along the Oakland-Alameda Estuary and opposite Jack London Square. This would be the last phase of the original 218-acre Bayport and Alameda Landing Master Planned Project, approved and originally entitled by the City of Alameda in 2000. The project site is a formerly industrial area, previously used as the U.S. Navy's Fleet Industrial Supply Center (FISC). The proposed project would include approximately 15,000 square feet of retail; 10,000 square feet of office space; a 124-room hotel; 40,000 square feet of warehouse; 445 housing units, including apartments, townhomes and detached single-family homes; and an 8-acre waterfront park, including a ferry or water shuttle landing and a kayak launch.

The proposed development would include the reutilization of a portion of the former FISC wharf area. This 1940's era wharf (which predates BCDC) was designed and constructed to support heavy rail and crane loading with thickened deck sections and dense pile spacing in areas that would remain to support the waterfront promenade. The soils inland of the wharf sections would be geotechnical stabilized with a combination of techniques to control lateral displacement and support the intended building loads.

The wharf is approximately 3,300 feet long and width varies between 100 and 150 feet at its west and east ends, respectively. A portion of the northern warehouse floor slab is integrated into the wharf, and is above the water and rock slope protection. The wharf is supported on square precast reinforced concrete piles of varying dimensions between 16 and 18 square inches. The top of the wharf deck is cast-in-place concrete ranging in thickness from 10 to 24 inches. The wharf deck elevation is at approximately 13.27 feet.[1]

The ground surface beneath the deck ranges from approximately three to 10 feet below the top of the wharf deck (Elevations 3 to -4 feet MHHW or 9.27 to 5.27 feet NAVD88) from approximately 150 to 60 feet south of the northern edge, and slopes downward to the north to approximately 30 feet below the wharf deck (Elevation -23 feet MHHW or -16.73 feet NAVD88) at the northern edge of the wharf, which is close to the elevation of the bottom of the inner harbor to the north. The majority of the shoreline slope below the marginal wharf has rock protection.

Geotechnical Information. According to the geotechnical reports (Langan Treadwell Rollo and Advanced Geosolutions, Inc. or AGI), the ground surface is relatively flat, and the buildings in the upland areas outside of the Bay are supported on deep foundations such as Raymond and/or concrete piles. The warehouse buildings have differential settlements between the pile-supported building floor inside and the surrounding concrete and/or asphalt drive isles used to access the buildings and wharf area. The project proponents would keep the outermost 100 feet of the existing wharf structure for use as public access. Beyond the 100-foot area at the edge of the wharf structure, the existing structures and roadways would be demolished and replaced with three- to four-story residential buildings, commercial/retail buildings, parks and new infrastructure (roadways and underground utilities). It is anticipated that up to seven feet of fill would be placed to reach planned building pad elevations.

The portion of the existing wharf structure that is to remain would be governed by the 2016 CEBC (California Existing Building Code) Section 403 “Alterations.” A pushover analysis using ASCE 61-14 (with a MCE load per ASCE 7 would be used to verify the condition and structural improvements, if any, to the existing structure. The design goal is collapse prevention in an MCE event.

The reports’ subsurface findings indicate that the underlying fill, including the rock slope revetment, are susceptible to liquefaction-induced settlement and lateral spreading.

According to the AGI’s soil foundation structure interaction analysis, the project plans to use a deep soil mixing (DSM) buttress along the shoreline to act as a stiff soil block using soil elements. The DSM buttress along the shoreline is proposed as a ground improvement technique to improve the existing infill soils and to buffer the wharf from excessive ground lateral deformations (lateral spread). Other soil improvement methods that would be implemented where future structures are to be built are Rapid Impact Compaction and vertical wick drains with a sur-charge pile.

[1]All vertical elevations, except as indicated, are given in reference to NAVD88 datum.

To better understand seismic response and deformation pattern of the wharf and ground, AGI used a finite-element two-dimensional analysis computer model (PLAXIS 2D) to evaluate the seismic performance of the wharf at various cross-sections against five simulated maximum credible earthquakes (MCE) level earthquake motions. The DSM buttress was input in the analysis. Other inputs included samples from soil explorations of types of soil material ranging from the loose sandy fill at the surface to Old Bay Mud (very stiff clays up to 150 feet below).

The analysis' results of ground deformation under the wharf *without* installation of the DSM buttress ranged from 24 to 163 inches. Using the DSM buttress, the ground deformations could be limited to 12 to 14 inches. The project structural engineer, SGH, believes the wharf can handle larger deformations while maintaining life-safety egress, and such analysis will be further refined. The preliminary analysis concludes that the planned ground improvements would achieve the seismic performance requirement associated with adequate egress conditions from the wharf structure.

Flooding and Sea Level Rise (SLR) Projections. No coastal flood analysis has been provided at this time. In addition, the flood information is limited to the attachment entitled "Alameda Landing Tides and Datum Conversions," and the FEMA flood insurance rate map or FIRM. The FEMA 1-percent annual chance flood elevation (BFE) is 9.4 feet. The project's raw estimates on SLR projections are 36- and 66-inches, corresponding to a medium SLR projections of 12.28 and 14.78 feet for years 2070 and 2100. The wharf deck elevation is 13.27 feet.

Law and Policy Considerations. Section 66605 of the McAteer-Petris Act allows the Commission to approve fill[2] 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."

The Board's advice is sought regarding safety criteria for the proposed work to the wharf structure. BCDC Bay Plan policies that may be of relevance to the proposed project include those related to the Safety of Fills, Shoreline Protection, Public Access and Climate Change.

Applicable Bay Plan 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."

[2]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)) .

3. **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."

Applicable 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. 3** states, in part, that, "[a]uthorized protective projects should be regularly maintained according to a long-term maintenance program to assure that the shoreline will be protected from tidal erosion and flooding and that the effects of the shoreline protection project on natural resources during the life of the project will be the minimum necessary…"

4. **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."

San Francisco Bay Plan 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."

San Francisco Bay Plan on Climate Change

1. **Policy No. 2** states, in part, that "When 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, "Wherever feasible and appropriate, effective, innovative sea level rise adaptation approaches should be encouraged."

Request for the ECRB's Technical Advice. The Alameda Landing Waterfront Development project is projected to include a significant public waterfront and open space along the Oakland-Alameda Estuary. The engineering criteria are in the preliminary stages. Staff seeks the expertise of the Board in assessing the adequacy of the project's proposed overall safety criteria. The following are some issues of interest to staff regarding the proposed project; these do not preclude any others that may arise as a result of the Board's discussions.

1. **Seismic, Structural and Geotechnical Criteria and Flood Hazards.** The project proposes to improve the seismic lateral stability in upland areas and in the shoreline slope. Therefore, it is expected that the soil improvement would buffer the wharf from shoreline slope deformation by reducing the estimated lateral displacement in the event of a large earthquake. During such an event, the estimated "stand-alone" deformation of the wharf after ground improvement is approximately 14 inches.
    a. Considering that the wharf is 70 years old and that there are no major proposals to improve it structurally, would it be resilient to the estimated deformation without seismic improvements?
    b. Would the wharf be able to endure 50 or more years into the future and be structurally safe from earthquakes and flooding? Would it be able to adapt to the future flooding?
    c. Could water inflow into the proposed soil improvement zone or earthquake-induced displacement of the riprap against the wharf piles become a safety concern?
    d. Are the overall safety criteria considered for the wharf—which is proposed to provide public access—including associated shoreline safety improvements, sufficient to ensure its long-term protection and safety of the public?

Enclosed Material

1. "Supplemental Geotechnical Exploration/Alameda Landing Waterfront/Alameda, California/Langan Project No.: 731584113," February 19, 2016 Langan Treadwell Rollo.
2. "Geotechnical Consultation/Supplemental Exploration/Inner Harbor Shoreline Development/Alameda, California/Langan Project No.: 731584113," July 24, 2015 Langan Treadwell Rollo.
3. "Preliminary Geotechnical Studies/Inner Harbor Shoreline Development/Alameda, California/Langan Project No.: 731584113," July 2, 2014 Langan Treadwell Rollo.
4. "Memorandum to Catellus /Simpson Gumpertz & Heger Project 177517," February 28, 2017 Simpson Gumpertz & Heger.
5. "Soil-Foundation-Structure-Interaction Analysis Design Summary," October 19, 2016 Advanced Geosolutions, Inc.
6. Federal Emergency Management Agency/Letter of Map Revision Based On Fill Determination Document (Removal). June 24, 2016. Case No. 16-09-1208A.
7. Federal Emergency Management Agency/Letter of Map Revision Based On Fill Determination Document (Removal). February 19, 2015. Case No. 15-09-0461A.
8. "Alameda Landing Waterfront Development Phase - PowerPoint Presentation," March 21, 2017 Catellus.