

To: Mayor and City Council

From: Craig Middleton, City Manager

Subject: **Receive and discuss the recommendation of the Committee to Protect Belvedere’s Seawalls, Levees, and Utilities regarding the proposed design alternatives to protect the City from flooding and sea level rise; provide direction to staff on next steps, including which design alternatives to study further**

Recommendation

Consider the recommendations of the Committee to Protect Belvedere’s Seawalls, Levees, and Utilities and provide direction to staff.

Background

On Thursday, June 6, 2019, the Committee completed its deliberations and authorized its chairman, Jim Lynch, to convey its recommendations to the City Council. Chairman Lynch will deliver an oral presentation at the June 10th City Council meeting.

Staff presented the Committee with its own thoughts and recommendations in a staff report to the Committee, dated June 5, 2019. This staff report is attached for your information. Committee recommendations, as expressed on June 6, are generally consistent with the staff recommendations.

Should the Council consider the recommendations and direct staff to proceed with further analysis of a limited number of project options for accomplishing seismic strengthening, utility protection and flood prevention, we will move expeditiously to engage our consultants in such work.

Fiscal Impact

Funding for additional analysis and costing of project options would come from a grant from the Department of Water Resources, State of California, which is expected to provide 55% of the funds. The remaining 45% of costs are included in the proposed FY19/20 budget. Other funds, also included in the FY19/20 proposed budget, would fund public outreach and miscellaneous costs associated with next steps.

Attachment

Staff Report to Committee to Protect Belvedere’s Seawalls, Levees and Utilities, June 5, 2019



CITY OF BELVEDERE

Staff Report

TO: Committee to Protect Belvedere's Seawalls, Levees and Utilities

FROM: Craig Middleton, City Manager
Robert Zadnik, Public Works Manager

SUBJECT: Considerations and Staff Recommendations

DATE: June 5, 2019

Recommended Motion/Item Description

Consider the information provided to the Committee and the staff recommendations. Determine a set of recommendations to the City Council that facilitate a set of next steps for addressing seismic, flooding and climate related vulnerabilities.

Background

The City Council established the Committee to Protect Belvedere's Seawalls, Levees and Utilities ("Committee") on May 13, 2019. The Committee was created in order to review information and make recommendations related to a number of vulnerabilities that the City faces – severe storm events, sea-level rise, and earthquakes – and the associated failure of utility systems, access routes, and flood prevention infrastructure. The Committee has 11 members, including two members of the City Council and 9 residents from neighborhoods throughout the City. The City Manager and Public Works Manager staff the Committee.

The Committee has received materials and oral briefings on: flood risk to public infrastructure and private dwellings; risks to key utility systems that service much of the City (electrical, gas, water, sewer and fire suppression); vulnerability of levees, seawalls, access roads and utility systems to seismic events that can reasonably be expected to occur over the next three decades; and vulnerability of the same to projected levels of sea-level rise over the same period and beyond.

The Committee has also reviewed numerous options for addressing the City's vulnerabilities and strengthening its resilience. These include a number of engineered approaches to reinforcing seawalls and levees; raising current seawall heights; and creating offshore islands, beaches or other structures to dissipate wave energy. Some of these solutions can be accomplished entirely within the jurisdictional boundaries of Belvedere; others will require the cooperation and

participation of the neighboring Town of Tiburon. All options would require regulatory approval, environmental analysis, and more refined costing prior to their implementation by the City.

Information about the cost of each alternative has been provided to the Committee. However, these cost estimates are conceptual at this point, and are therefore useful primarily as a tool in comparing various alternatives. The Committee has not been charged with determining how best to fund its recommended approach; that task will be taken up by Belvedere's Finance Committee when more detailed cost information becomes available later in the year.

The Committee has also had an opportunity to consider recommendations from Matthijs Bouw, a prominent urban architect/planner from the Netherlands, as to the importance of looking for options that are adaptable to changing conditions and that offer "co-benefits" that improve the livability of our community. Bouw also pointed out that future regulatory regimes may be more supportive of offshore nature-based elements than is currently the case, and that a longer-term approach that allows for continued adaptation may be the best way to take advantage of evolving perspectives.

The Committee has been asked by the City Council to present its recommendations on June 10th in public session. The Council would then be in a good position to give direction to consultants and staff as to its priorities and preferences relative to the next body of analysis. The Council could also call for public meetings to be held, preferably in the Fall of 2019, at which vulnerabilities and solutions, as well as livability enhancement questions could be discussed. As better cost numbers are developed, the Council could also charge the Finance Committee with the task of developing financing options. Most financing options that are envisioned currently would ultimately require the support of Belvedere's voters.

Sources of state, local and federal funding will also be explored. While no known grants are open at this time, it is speculated that a Federal Infrastructure bill may be available in the future. Under this scenario, projects that are shovel-ready would likely be first in line for funding.

Considerations

At this juncture, as the Committee prepares to consider the whole of the information presented and develop its recommendations, staff would stipulate the following as particularly relevant issues:

- There is a near-term significant possibility of failure of parts of the Beach Road seawall due to insufficient anchoring and undermining of the structure by wave action over decades.
- Combined still water and wave run up from a 100-year storm in today's conditions will overtop the levees at low points.
- Portions of the levee at San Rafael Avenue are low relative to expected future king tide levels, and sheet flow of still water through these low-level areas of the levee would

cause widespread flooding. This condition is exacerbated by settling of the levee, which is expected to continue, and will lower its height relative to water levels in the Bay.

- Significant flooding at San Rafael and Beach Road levees, and/or sustained exposure through frequent flooding or overtopping events, would have a deleterious effect on utilities. Salt water incursion will cause damage to electrical transformers and sewer lift stations, causing disruption in service primarily to residents of Belvedere Island.
- The State of California estimates conservatively that water levels in the Bay are likely to rise by 1.1 feet within the next 30 years; and by 3.5 feet by the end of the century.
- A significant seismic event would likely cause deformation of levees, particularly at Beach Road, where the seawall could move seaward seven or more feet. A major factor is the presence of unstable liquefiable sands and bay mud that exist below each levee. Anchoring walls to the more stable stratum beneath these soils would provide significant levels of stability.
- Utility pipes embedded in each of the levees are made of rigid material - steel or clay - which is not flexible and is therefore subject to breakage during a seismic event.
- Fire suppression, which depends to a great degree on pressurized fire hydrants throughout the City, would be severely hampered if supply lines embedded in the levees were to be disrupted by a seismic event. It is often the case that residential gas lines break during major earthquakes, which could create a significant fire risk with only limited capability for addressing it.
- Belvedere Island and much of the Lagoon area is accessed by Beach Road and San Rafael Avenue. Ingress and egress for the population, as well as for first responders, is dependent on these two access routes, as emergency access capability via water has not yet been developed. Significant deformation of the levees, or sustained flooding, could result in the island becoming isolated from the mainland for extended periods of time.
- The cost of repairing a major seawall or utility system failure, in the aftermath of a region-wide seismic or flooding event, could well exceed the cost of taking preventative measures prior to such an event. Obtaining financing during an emergency could be difficult and the cost of financing undeterminable.

While one can reasonably debate the level of near-term or longer-term risk related to these vulnerabilities (earthquakes and sea level rise projections are based on probabilities), it is staff's view that these vulnerabilities are real; that they present significant risks to the people of Belvedere and to the public assets of the City; and that they are not confined to any single neighborhood.

Recommendations

The Council and City staff are looking to the Committee for recommendations as to how best to protect the City's residents and public infrastructure. Importantly, it is hoped that the Committee will assist in narrowing the range of options that have been considered, so that the City can focus its further work and limit the expense associated with the next phase of study.

Staff would, at this juncture, offer some thoughts as to priorities:

- Given the very real present vulnerability of the Beach Road seawall, as well as the ever-present risk of an earthquake, enhancing the near-term stability of this seawall should be a high-priority item.
- Given the age and rigidity of the current infrastructure (water supply, fire suppression, and gas and sewer lines) embedded in both Beach Road and San Rafael Avenue levees, efforts should be made to encourage PG&E, MMWD, Sani 5 and other utility providers to replace their underground utility structures with more flexible options as soon as possible.
- The City has worked for years to underground its electrical utilities in order to achieve a variety of benefits, not the least of which is fire protection. Because of the ever-present risk of fire and its potentially devastating consequences, particularly to Belvedere Island, any solution should strengthen the survivability of water supply lines embedded in the levees. This should be a high priority.
- Sea-level rise estimates vary, but all point to significant rises in bay levels over the next several decades. To be good stewards of public resources, seawalls and other protective infrastructure should be designed so as to be adaptive to changing circumstances. Configurations and approaches that are most adaptable should be given priority consideration.
- While the focus of this effort is primarily related to the protection of public assets; the provision of public safety to Belvedere citizens; and the avoidance of future catastrophic costs for infrastructure repair and replacement, actions to build a more resilient City are also likely to have a positive effect on home values and insurance rates.

We are grateful for the opportunity to learn lessons from projects in the nearby area, and from the experiences of other cities, which have been grappling with the complexities inherent in projects that must address multiple challenges. While the creation of offshore berms or islands may not be effective against sea-level rise (as stated by the county environmental engineer), they may be worthy of further consideration for their environmental and wave attenuation benefits.

We also appreciate the early involvement of the Bay Conservation and Development Commission (BCDC) and urge continued interaction with regulators as the project moves into subsequent phases of design.

Advice provided by Matthijs Bouw to view various solutions as parts of an integrated whole, and to plan for long-term multiple benefits for Belvedere, is well-taken.

In order to facilitate conversation by members of the Committee, staff proposes the following specific design and sustainability recommendations for consideration:

1. That the City Council undertake to develop designs and schematic-level cost estimates for the following:
 - Seismic strengthening of both levees to ensure against their deformation in the event of significant earthquake.
 - A raised seawall along San Rafael Avenue to protect against a rise in sea level of 1.1 feet plus some wave protection, designed so as to be adaptable to higher sea levels if needed. Staff recommends the configuration that would involve construction of a vertical seawall with plantings and a walking path on the street side of the wall (Alternative 2). This alternative would provide the best integration with a sheet pile approach to seismic strengthening. It would also protect the privacy of adjacent homeowners by preserving the walking trail at street level.
 - A raised seawall along Beach Road to be located in the median strip. Of the alternatives presented, this configuration (Alternative 2B) would have the least visual impact on homes on the bay side of Beach Road. It would also require fewer openings in the wall, and would therefore serve more reliably as a flood barrier. (Further refinement and adaptation of this wall with respect to co-benefit designs could be considered during the later Planning Design Review phase.)
2. That the City conduct further analysis of a berm or wall on the bay side of 6-7 homes on West Shore Road. While staff believes that a bay side berm or wall would likely offer the most benefit for residents of West Shore Road, this preferable option requires more analysis to determine its feasibility. The option of raising the road at the intersection may suffice, at least for the next several decades. A new option (Alt. 5) that would construct a floodwall in the center of West Shore Road may merit further investigation; however, road width, parking and traffic flow constraints may be disqualifiers.
3. That the City initiate discussions with the Town of Tiburon about its preferences for dealing with potential flooding risks to both its downtown district and to Belvedere, and that these discussions inform decisions by Belvedere as to how best to deal with flood risks from Tiburon. The goals of these discussions would be: 1) to agree on a reliable solution that would be most beneficial to Tiburon and Belvedere, and 2) to determine whether to include Tiburon flood control barriers in a first round of projects; to construct a flood wall within Belvedere's city jurisdiction; or to study the issue further.

4. That the City initiate discussions with utility providers with the objective of ensuring the timely replacement of key pipes and conduits in levees with flexible products that will improve systemic viability in the event of a significant earthquake.

In addition to these recommendations, staff believes that Belvedere is in a unique position to share its experience in dealing with the set of complex issues presented by climate related and seismic challenges, and to educate others. As well, in order to demonstrate the City’s willingness to contribute to addressing the root causes of climate change, the City should redouble its efforts to reduce its reliance on carbon-rich sources of energy. Staff would therefore urge consideration of the following additional recommendations:

5. That the City seek to develop partnerships with scientific, environmental and educational organizations with the goals of: 1) using Belvedere’s experience as an early implementer of resilience measures to educate others about challenges and possible solutions to issues related to sea-level rise and climate change; 2) providing opportunities for students and citizens to assist in monitoring impacts and identifying potential co-benefits and opportunities to enhance the natural environment in Belvedere and beyond; and 3) participating in regional and national conversations about the resilience challenges faced by small communities.
6. That the City and its residents endeavor to reduce their reliance on carbon-based fuels and energy sources by promoting “deep green” energy; committing to replace its gasoline-powered municipal fleet over time; and installing solar panels on municipal buildings where feasible.

Fiscal impact of staff recommendations

As has been mentioned many times throughout the Committee’s deliberations, cost estimates are very preliminary at present. Based roughly on conceptual cost estimates that Stetson Engineers has provided to this Committee, the costs associated with staff’s recommendations are as follows:

Project	Cost range (\$M)
Seismic strengthening of Beach Road and Floodwall in Median (2B)	8.8 – 10.8
Seismic strengthening of San Rafael Avenue Levee	5.5
Concrete floodwall on bay side of landscaped pedestrian pathway	1.6 – 2.1
Floodwall on bay side of six homes on West Shore Road, or Raise of intersection/other	NA 1.1 – 1.8
Total Cost Range	17 – 20.2
Total Adjusted Cost Range (with 30% contingency)	22.1 – 26.3

Any potential costs to Belvedere related to flood control measures undertaken in Tiburon are unknown at this time. Any costs to Belvedere associated with prioritizing the replacement of rigid utility pipes and conduits are also unknown at this time.

Any costs associated with staff recommendations #5 and #6 could be accommodated within the City's annual operating and capital budgets

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