

DRAFT FOR REVIEW AND COMMENT

List of Possible Petaluma General Plan Measures Related to Climate Change

First Draft- Roger Leventhal and Jessie Feller 5/16/22

This memo provides a draft list of possible Petaluma General Plan (GP) land use measures related to climate change impacts, particularly predicted changes in flooding from rainfall hydrology and sea level rise as well as excessive heat and fire. The potential compounding impacts of climate change happening at both ends of the watershed on flooding will impact the City and its future planning in profound ways that need to be addressed under this and future general plans. Since the General Plan is primarily concerned with land use issues and regulations, we have focused on land use measures that we believe fit under the domain of a GP document. Other important measures associated with climate change, such as GHG reduction fall under separate regulations such as building codes which are the focus of other requirements and codes. The proposed measures below recognize that we need to work with the natural environment and plan development around the natural constraints and opportunities of the Petaluma landscape. As the climate changes, this view of planning will become more and more important in any local and regional planning efforts.

The GPAC consulting report on climate change focused on direct coastal flooding as the main SLR impact but there are other aspects of climate change that were not as well described, and these include the following:

- Anticipated changes in rainfall patterns that produce higher rainfall intensity coupled with longer periods of drought can result in less infiltration. Also, infiltration is not uniform across Petaluma and the Adobe clays have very low infiltration capabilities. Therefore, plans for significant flood protection due to higher intensity rainfall (flash flooding) need to emphasize sufficient floodway conveyance area, floodwater storage and attenuation and not rely on infiltration; both smaller distributed storage across low impact development (LID) measures (bioswales, roadcuts, rain barrels) but mainly through larger storage basins and preservation of floodways.
- Groundwater tends to track with mean tide elevations so as the Bay/River tides increase, groundwater will increase and becomes first nuisance flooding and impact roadways and utilities before the City experiences direct river flooding. Areas will experience water-logged conditions that damages building footings and utilities not properly designed for saturated conditions. There will be an increase in I&I impacts to both stormdrains and water/sanitary pipes that will also impact their performance.
- As gravity drainage against higher bay levels becomes less effective, other approaches for floodwaters will be needed either through increased storage and pumping to the river (expensive) and increased infiltration where possible.

- Dredging is mentioned in the Climate Report as a SLR measure, but this is both problematic and incorrect. Dredging is an unsustainable construction process that has negative impacts on the environment and generates large amounts of GHGs and obtains only very short-term flooding benefits at a high environmental and construction cost. Sediment from the Bay immediately begins to silt in following the dredge. River dredging should not be relied upon for flood protection under existing or SLR conditions.

Overarching Philosophical Comments

Preparing for climate change in river and bay front communities like Petaluma will require a change in thinking. Much like the Dutch approach to adaptation, the City and residents need to focus on planning for coastal defenses and the need to both stop direct coastal flooding as well as provide space for accommodating fluvial (rainfall) flooding with the use of design with nature approaches (which require space) in conjunction with more traditional engineering approaches. At some point in time in the future, maintenance of barriers to direct coastal flooding (i.e. levees and walls) as well as the required pumping facilities will overwhelm the ability of engineers to combat the forces of water. Retreat will become a forced reality so it will happen either planned or unplanned.

In Petaluma, the modern “urbanist” goals of dense urban infill runs up against the folly to not build more infrastructure in areas that will be flooded and have to be retreated at some point. The community will have to deal with opposing ideals and given the complexity and magnitude of the problem, everything needs to be on the table for review and debate with a ‘climate lens’, including long held ideals of the urban growth boundaries (UGB), plans for a dense urban transit and bike/pedestrian downtown, and the preserving and conservation of the natural areas in their current state and condition given the rapidly changing future environment.

Specific General Plan Measures for Review and Consideration

The following is a draft list of potential GP measures (we have labeled as “CC” for climate change related measures for review and comment).

CC1-Flood and Floodway Preservation – Floodplains are as much a part of a creek or river as the active channel. The floodplain in fluvial systems shall be preserved for passage of flood events without impacting life or property. The FEMA maps are only first approximations of flooding but not the only source of flooding information and currently doesn’t account for SLR in their flood insurance maps (FIRMS).

City shall develop floodplain maps using publicly available 2D modeling tools (HEC-RAS) that identify flooding areas under mid-century (2050) State of California estimates of three feet and for end of century (2100) estimates at six feet of SLR. These areas shall be preserved in their current state and new development discouraged in these areas. Existing development shall be regulated to prevent expansion and development of additional structures that impact space for flood waters to spread out. In the Petaluma River itself, the floodplain shall be preserved and left in its natural condition to attenuate wind-waves.

CC2-Preserve Areas for Construction of Future Direct Coastal Flood Defenses – At currently predicted levels of SLR for 2100, there will need to be coastal defenses constructed consisting of walls and levees and potentially nature based approaches where possible. Therefore, the City will identify the required

right of way needed for construction of these defenses to at least year 2100 elevations including required maintenance roads for levees and maintenance staging areas. Development in these areas will be prohibited to avoid constraints and gaps in the coastal defense system. These plans shall include identification of locations for future pump stations and access roads as pumping will need to become more important as bay tide levels increase.

CC3-Develop Housing Development Around SLR Inundation Maps – The State has mandated more housing but without consideration of SLR inundation which then locks the City into holding the line in the current shoreline. This will not be possible at a future level of SLR given the enormous costs and impossibility of opposing the awesome forces of water with no guarantee of future State and Federal funding. Therefore, future housing and development investments need to be made in locations that are at a minimum of elevation 20 ft NAVD88 or higher to allow for a minimum of 6 feet of SLR predicted by the State for 2100. Even this elevation is likely too low and debate and consideration shall be made to increase this base elevation higher.

CC3-Incorporate Nature Based Solutions Where Appropriate – Adaptation approaches that utilize or incorporate designs that work with or build natural systems into adaptation design shall be emphasized over solely traditional engineering solutions such as rock and walls. This measure does not prohibit traditional engineering approaches, only the requirement to evaluate and incorporate natural based solutions or enhancements where appropriate and provide a rationale in any design documents to provide a design basis for their inclusion or exclusion. Green and gray approaches are the next priority after all green solutions prior to building all gray (traditional engineering) approaches. This measure will push staff and consultants to perform and document this evaluation before rejecting nature based solutions.

CC4-Evaluate Dual Use of Open Space Areas Including Ballfields and Parks for Flood Storage- Storage is key for flood mitigation to be effective and finding areas of sufficient size and undeveloped that can be used for flood storage are difficult to find in urbanized areas of Petaluma. The City shall identify and evaluate and develop plans for detention storage including the dual use of ballfields for temporary winter storage of floodwaters in the event that flooding of existing property cannot be prevented otherwise. These facilities will be funded for clean-up and rehabilitation of any fields used for temporary winter storage to allow for dry season use for sports. Effective flood protection requires breaking silos that separate different parts of government.

CC5-Floodable Development Design Requirements in 2100 SLR Inundation Areas – Future developments in areas identified as flooding by mid to end-of-century flood estimates. Any development in these areas shall be designed to meet mid-level estimates and be adaptable to end of century estimates. Developers shall design utilities for protection of under flooded conditions. Roadways and utilities shall be designed for 2050 bay levels and with sufficient ROW for raising under 2100 high GHG emission scenarios in accordance with State of California recent design guidance. Housing shall be designed to elevated to acceptable levels to avoid flooding. Streets and roadways shall be designed to convey higher flood flows without impacting driving lanes. Future hydrology is expected to include higher intensity events that mimic flash floods and will likely not be conveyable by the stormdrain system so will have to use the roadways and streets for flood flow conveyance as the urbanized floodplain in areas where a natural 100-year floodway is not achieved.

CC6-Identify and Plan for Stormwater Pumping Stations – Behind walls and rising tides, floodwaters will need to be pumped to the river as gravity flow becomes less and less effective. City wide development studies and plans shall include locations and utility hookups for future stormwater pumping stations as these will be required.

CC7-Mitigate Climate Change Heat Impacts with White Roofs and Tree Plantings – Developments shall be designed to mitigate the impacts of future climate change impacts of heat and GHG reduction through site design that utilizes white roofs to reduce heat impacts, sufficient tree plantings and roadway/trail design to provide shade.

CC8-Electrical Vehicle Charging Stations – Proposed development greater than four units shall be designed to include electric vehicle charging station facilities. A city-wide EV charging infrastructure plan shall analyze the best sites for public charging stations which take into account distance to retail, an equitable distribution across the city, and any future climate risks such as flooding as well as grid capacity.

CC9- Utilize Tools of Low Impact Development to Reduce Flooding – Development shall utilize both centralized as well as distributed flood storage and infiltration with LID. Only draught resistant plants per local plant selection guidance shall be used. Areas of lawn shall be prohibited except for Parks and ballfields and these shall be minimized. Developers shall utilize existing City approved H&H models in conformance with local Hydrology Manuals guidance.

CC10-Anticipate Higher Groundwater Elevations – As noted, groundwater may increase in alignment with bay tide levels and although the connection can be complex, especially in areas of low conductivity (like clay soils), where applicable, all utilities and developments shall be designed to anticipate the potential for higher groundwater levels in site design.

CC11-Defensible Fire Zone – Developments shall be designed with defensible fire safety zone in accordance with State and local guidelines. The City shall provide outreach through Cool Cities Challenge to neighborhoods about how best to create defensible spaces around homes and businesses.

CC12-Local Rainfall Capture Infrastructure to Address the Drought - Petaluma shall consider the development of its own reservoir or groundwater infiltration system funded through a special local tax measure to establish a local water source in the face of extreme and prolonged drought conditions. Coordinate with the local SGMA to identify the best locations and preserve these areas as necessary for future development.