Appendix G

Water Quality Objectives for Use in Designing and Implementing Projects with Impacts to Creeks or Wetlands

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The San Francisco Bay Regional Water Quality Control Board (Water Board) is charged with maintaining the beneficial uses of waters of the state in the San Francisco Bay Region, as presented in the *San Francisco Bay Basin Water Quality Control Plan* (Basin Plan), which is the Board's master water quality control planning document (http://www.waterboards.ca.gov/sanfranciscobay/basin_planning.shtml#2004basinplan).

If a project will impact waters of the State, project proponents are required to apply to the Water Board for Waste Discharge Requirements (WDRs), before implementing the project. If the project will also impact waters of the U.S., project proponents are also required to apply to the Water Board for Clean Water Act Section 401 certification. The Water Board reviews applications for WDRs and/or certifications to ensure that potential impacts to waters of the state have been avoided and minimized to the maximum extent practicable.

To assist project proponents in designing projects in a manner that avoids and/or minimizes impacts to waters of the State, the Water Board has developed a technical reference circular (Circular) that provides guidance for applicants on how to design projects that protect and restore stream and wetland system functions. Project proponents are encouraged to consult this Circular when developing projects with potential impacts to creeks or wetlands. (http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stream_wetland/streamprotectioncircular.pdf). The Water Board intends to periodically revise and update this Circular to take advantage of emerging science and management practices.

Projects that impact creeks or wetlands should strive to achieve three water quality objectives—Watershed Hydrology, Stream Dynamic Equilibrium, and Stream and Wetland System Habitat Integrity.

Watershed Hydrology: The hydrologic connectivity between headwaters and estuary, surface water and ground water, and landscape, floodplain, and stream channel should be protected to produce the pattern and range of flows necessary to support beneficial uses identified in the Basin Plan and a functional ecosystem.

Stream Dynamic Equilibrium: Stream attributes, including hydrologic and sediment regimes, vegetation communities, channel forms, slopes, and floodplain areas, should be protected in a manner so as not to arrest natural hydrogeomorphic processes nor accelerate an imbalance resulting in excessive erosion or deposition of sediment, cause nuisance, or otherwise adversely affect beneficial uses. Watershed processes contribute to a dynamic balance over time between sediment loads and surface water flows which produce complex, fluctuating, and resilient systems.

Stream and Wetland System Habitat Integrity: Stream and wetland system habitats should be maintained by protecting the type, amount, and complexity of wetland and

riparian vegetation, the extent of riparian areas, and the substrate characteristics necessary to support aquatic life.

Achievement of these water quality objectives protects and restores the physical integrity and associated functionality of stream and wetland systems, which include perennial, intermittent, and ephemeral streams and wetlands and their associated riparian areas. The following four principles should be used in developing projects, in order to achieve the water quality objectives:

1) *Water Quality Functions and Land Use*: Functioning stream and wetland systems provide a wide range of water quality benefits that support the beneficial uses identified in the Basin Plan. Many land use activities have the potential to substantially degrade water quality functions of stream and wetland systems. Therefore, project proponents should recognize the intrinsic connections between land use activities and the structures, processes, and functions of stream and wetland systems.

2) *No Net Loss*: Stream and wetland system areas, functions, and beneficial uses in the Region have been substantially degraded from historic levels as a result of human activities. Therefore, the remaining resources are especially valuable. Projects and associated mitigation measures should be consistent with the California Wetlands Conservation Policy (No Net Loss Policy, Executive Order W-59-93) to ensure no net loss and achieve a long-term net gain in the quantity, quality, and permanence of stream and wetland system areas, functions, and beneficial uses.

3) *Climate Change Adaptation*: Stream and wetland system protection and restoration are a critical element of a strategy for reducing adverse impacts of greenhouse gas emissions and adapting the region's water resource management to account for the adverse effects of climate change and sea level rise. Protecting and restoring stream and wetland system functions, including floodwater storage, groundwater recharge, carbon sequestration (e.g., in riparian vegetation and wetland soils that are rich in organic matter), and maintaining aquatic life and wildlife habitat connectivity are important to mitigate for the adverse effects of climate change.

4) *Watershed Approach*: Many water quality and ecosystem problems are best identified, prioritized, addressed, and solved using a watershed approach. A watershed approach helps to address cumulative impacts on water quality, and encourages the development of watershed plans and partnerships that coordinate the planning, use, and protection of stream and wetland system resources. Project proponents should consider their project's affects when multiple individual effects are added or interact with other effects in a watershed to create cumulative adverse impacts to water quality. Project proponents should include all appropriate and practicable measures to avoid and minimize potential direct, secondary, and cumulative temporary and permanent impacts to water quality and beneficial uses

The following tables summarize goals for achieving the Water Quality Objectives.

Watershed Hydrology Goals for Stream and Wetland System Functions

Runoff flow and volume Maintain site runoff and transport characteristics (i.e., timing, magnitude, duration, time of concentration, and discharge pathways of runoff flow) such that post-project flow rates and durations mimic pre-project levels. Where practicable, incorporate measures to restore natural runoff patterns (e.g., enhance soil infiltration capacity and increase the storage of runoff) in watersheds that have been substantially altered from their pre-development conditions.
Hydrologic connectivity Maintain lateral, vertical, and longitudinal flow pathways, including connectivity between: stream channels, riparian areas, floodplains, and wetlands; surface water and groundwater; and ocean or estuary-to-headwaters at adequate levels to protect stream and wetland system functions and beneficial uses including the maintenance of, and access to, a diverse range of habitats for aquatic life and wildlife.
Natural flow regime Maintain the natural variation of flows and hydrograph characteristics (i.e., timing, magnitude, duration, and time of concentration) such that the range of flows including low, channel forming, and flood flows are of a magnitude and duration to: 1) sustain channel morphology and balance sediment transport; 2) support riparian vegetation community maintenance; 3) provide adequate flows and velocities during low flow months to satisfy aquatic life and wildlife habitat requirements; and 4) maintain seasonal flows that permit the migration or free movement of migratory fish and access to floodplain and off-channel habitat (e.g., sloughs and permanently or seasonally flooded wetlands) for aquatic life.

Stream Dynamic Equilibrium Goals for Stream and Wetland System Functions

Channel Form and Processes Where channels are modified, design projects with proper channel form (e.g., channel shape, width/depth ratio, etc.), sinuosity, slope, and floodplain areas such that the balance between sediment loads and surface flows is attained for a range of low to high discharges. This goal promotes natural bank erosion as a desirable attribute of stream and wetland systems while requiring that projects avoid: causing excessive erosion or deposition of sediment in and around the project area; creating hydraulic constrictions (e.g., undersized culverts); or require ongoing channel maintenance (e.g., dredging to maintain channel capacity, ongoing bed and bank repair, etc.). Where practicable, restore channel dimensions and slopes, riparian vegetation communities, floodplain, meander belt, and geomorphic adjustment zone widths, and adequate side slopes from the top of the banks to the top of the floodplain terraces in areas where geomorphic dynamic equilibrium has been impacted.

Drainage network Maintain the naturally occurring pattern and density of perennial, intermittent, and ephemeral streams, as well as associated aquatic habitats (e.g., wetlands) which transport water, materials, energy, and organisms through the watershed (i.e., the drainage network). Avoid changing the natural runoff pathways by filling, piping, ditching, or culverting.
Gullies and headcuts Avoid formation or expansion of headcuts and gullies. Design projects with proper channel slope and avoid reducing the landscape infiltration capacity and increasing runoff which may lead to soil erosion and gully formation/expansion.

Stream and Wetland System Habitat Integrity Goals for Stream and Wetland System Functions

Floodplain and riparian areas Maintain floodplains and/or riparian areas of adequate width to provide water quality functions such as flood water and sediment storage, water quality enhancement, and maintenance of aquatic life and wildlife habitat. Establishment and protection of functioning riparian areas is one of the most straightforward and effective strategies to protect water quality and is a critical element in adapting to the effects of climate change including changes in rainfall and runoff patterns.
Wetland hydrology Maintain the natural hydrologic regimes of wetlands, including their hydroperiods and levels of hydrologic connectivity to other aquatic habitats, at levels sufficient to support hydrophytic vegetation (where naturally present), aquatic life and wildlife habitat, and other associated beneficial uses.
Wetland and riparian vegetation Maintain wetland and riparian vegetation (both woody and herbaceous) such that the type, amount, and complexity are adequate to: maintain water temperatures appropriate to the needs of aquatic life; withstand site-specific erosive forces; and supply large woody debris of sufficient quantities to maintain aquatic habitat.
Habitat connectivity Avoid creating unnatural barriers between or among stream and wetland system and upland habitats (e.g., in-stream structures that restrict fish migration or encroachment on floodplains that restricts wildlife movement along a riparian corridor) that impact migration corridors and dispersal systems which connect aquatic life and wildlife with resources and refuges. Protecting stream and wetland system corridors can increase the resiliency of biodiversity by providing migration corridors as aquatic life and wildlife adapt to the effects of climate change on habitat conditions and distribution.