MONITORING, ASSESSMENT, AND PERFORMANCE MEASURES

Lower Carmel River Floodplain Restoration and Enhancement Project

Performance Measures and Monitoring Systems for the Project

The Project is expected to achieve the following objectives as described in the Work Plan and Economic Analysis - Flood Damage Reduction:

1. Reduce flood flows in urban areas
2. Increase riparian and wetland habitat
3. Recharge groundwater and base flows to the Carmel River
4. Provide habitat connection across the floodplain
5. Protect agricultural land from flooding
6. Improve water quality
7. Create Public trails and recreation

Existing conditions for flood elevations, habitat conditions, and agricultural operations have been documented and monitored through the following studies and analyses:

- Philip Williams and Associates and California Coastal Conservancy, Carmel River Reach 2: (Eastwood/Big Sur Land trust Property): Conceptual Enhancement Plan, 2000. Prepared for Big Sur Land Trust and California Coastal Conservancy.
- Big Sur Land Trust, Carmel River Parkway Vision Plan, 2005.
- Balance Hydrologics, Inc., Design Alternatives Analysis for Floodplain Restoration at the Odello Property, 2007. Prepared for Big Sur Land Trust.
- Balance Hydrologics Inc., Supplemental Analysis for Floodplain Restoration at the Odello Property, 2008. Prepared for Big Sur Land Trust.
- Whitson Engineers, Project Study Report to request Conceptual Approval, 2010. Prepared for Big Sur Land Trust, County of Monterey and Cal Trans.
- Balance Hydrologics, Inc., Groundwater Investigation and Initial Results of Monitoring at the Odello East Property, Carmel River Valley, June 2, 2010.
- Nikki Nedeff, Wetland Delineation for Odello East Property, 2010. Prepared for the Big Sur Land Trust.

These reports provide a baseline for conditions associated with pre-project conditions at the Project site and associated quantitative outcomes with regards to flood protection, habitat restoration, groundwater recharge and water quality. These four project objectives are most appropriately used for quantified performance measures as “pre-project “conditions are documented to compare against “post-project” conditions.

The following assessment and performance criteria will be used for these Project Objectives:

Flood Protection: Number of residential and commercial properties damaged in an above 25-year event with damages from 1995 and 1998 floods to use as comparable damage quantification.

Habitat Restoration (riparian and wetland habitats): Amount of acreage converted to native wetland and riparian species will be compared against existing land conditions (now primarily agricultural fields). Additional success will be measured by ratio of survival versus failure of plantings as well as assessment of recruitment of natives through invasive species control.

Groundwater Recharge: Implement a monitoring network of groundwater monitoring wells to identify appropriate design for restoration and storage features on floodplain. Utilize remnant monitoring wells to assess potential infiltration and recharge post-project. Note at this time this monitoring is not funded.

Water Quality: Through funding provided by the EPA, the Project site will be monitored for water quality parameters related to sediment and nutrients (see Table 6 for actual parameters). A water quality monitoring plan has been developed for the project and will be implemented by a qualified laboratory beginning in 2011. This work will document pre-project water quality conditions on the Project site. Sampling will also occur post-project according to the same monitoring plan.

The remaining Project objectives are more qualitative in nature and performance reporting will be whether the project was actual built and how it is being used or changes related to morphology or actual use of an area.

Connection Across the Floodplain: Results for this objective are expected in wildlife use and possible re-habitation of wetland areas in the Project area especially by California red-legged frogs. This performance assessment approach will be done for the causeway for use by wildlife through installing a wildlife camera at the causeway if approval is secured from Cal Trans for such monitoring. Use of wetland areas by new populations of species such as the California red-lgged frog will be done by onsite wildlife monitoring and surveys. An additional measure of success for the connectivity will be scour of the lagoon restoration area completed in 2004. This can be measured through monitoring condicted by California State Parks and Monterey Peninsula Water Management District for the lagoon restoration project.

Protect Agricultural Land from Flooding: This objective can be reported based on flood events.

Public Trails and Recreation: This objective can be reported once construction of trail is complete and public use is estimated or quantified.

Monitoring and assessment of Project success will largely be completed by the Big Sur Land Trust with partner agencies including Monterey County Water Resources Agency, Monterey Peninsula Water Management District, Monterey Peninsula Regional Park District, California State Parks, and Cal Trans.

Objectives	Desired Outcome	Output Indicators	Outcome Indicators	Tools & Measurement Methods	Targets	Target Units & Timeframe
Reduce flood flows in urban areas	Reduce public and private property damages from flood flows greater than a 20-year event	Complete flood protection capital improvements: (1) flood conveyance casueway; (2) levee removal and regrading	Flood damage costs and FEMA repetitive loss reports	Review of annual flood repetitive loss reports at Monterey County Water Resources Agency; review of gauging for flood flow events	Average 0.5 foot reduction in flood elevations for 100-year event	flood elevations and gauge data initiated after 2013
Increase riparian and wetland habitat	Restore 90 acres of riparian and wetland habitats	100% design plans indicating restoration features and locations for plantings and habitat features such as recharge wetlands	% of native riparian and wetland species present on site	Vegetation mapping	65% success for restoration planting	number of plants surviving initiated after 2013
Provide habitat connection across the floodplain	Provide 500 feet of additonal clearance under Highway One to connect the east side of floodplain with the west side of floodplain	500 foot causeway is constructed at Highway One	Movement of species such as California red-legged frog to East Odello	Annual red-legged frog surveys	Occupation of 1 wetland area in Odello East by California red-legged frog	1 population initiated after 2015
Protect Agricultural Land from Flooding	Remove 36-acres of Agricultural land from the 100-year floodplain	Agricultural land on south edge of Odello east is raised out of 100-year floodplain with fill from levees	Crop damages are reduced to $0	Post flood event assessments and observations	$0 in damages to crop values	Initiated 2011
Recharge groundwater and base flows to the Carmel River	Restoration actions result in areas for establishing storage areas for recharge of groundwater	Floodplain restoration design includes areas for storage and recharge to the aquifer	Recharge estimated utilizing existing monitoring wells in the floodplain	Monitoring wells and pit percolation tests correlating with restoration design for storage and recharge wetlands	Groundwater elevations at NGVD29 minimum at 4.5 feet and maximum at 20 feet	Measured groundwater elevations initiated after 2015

Improve water quality	Restored floodplain provides area for sediment and nutrients to deposit in flood events thus preventing deposition in lagoon habitat	Riparian and wetland habitats are created in 90-acres of floodplain	Sediment and nutrient levels are monitored and reported for floodplain area	EPA approved water quality monitoring program to be conducted beginning 2011/2012 through and post project construction	Measurement of pre-project and post-project for the follwing parameters: nitrate and nitrite, total phosphate, turbidity, total suspended sediments	Measured water quality parameters initiated 2011
Public Trails and Recreation	Provide a new 1.2 mile trail along the south edge of the floodplain and trail connections to Palo Corona Regional Park	Public trail is constructed	Public use of trail	NA	15 users monthly	2015