ATTACHMENT 6:

Monitoring, Assessment, and Performance Measures

SANTA CLARA VALLEY WATER DISTRICT

Proposition 1E Round 2
Stormwater Flood Management Grant Program
Berryessa Creek Flood Protection Proposal

Attachment

6

Santa Clara Valley Water District
Berryessa Creek Flood Protection Project Grant Proposal

Monitoring, Assessment, and Performance Measures

In accordance with PSP requirements, **Attachment 6** consists of the following items:

- ✓ A description of the monitoring, assessment and **performance measures** that will be used to quantify and verify project performance. Project goals, desired outcomes, targets, performance indicators, and measurement tools and methods are all discussed.
- ✓ Appendices with supporting monitoring plan documentation.

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Project Goals and Objectives

The goals and objectives for the Berryessa Creek Flood Protection Project are presented in **Table 6-1**. As noted in this table, providing natural flood protection integrating a variety of benefits and minimizing long-term maintenance to ensure benefits persist are key goals of the Project. The District will implement specific performance and monitoring measures to quantify and verify how well the Project is meeting objectives through Project completion in 2017 and over the long-term.

Table 6-1. Project Goals and Objectives

Project Goals	Project Objectives
Provide flood protection benefits to existing communities within the Berryessa Creek Watershed	Construct the necessary improvements to enable the removal of more than 2,400 homes, businesses and schools in surrounding communities from the current 100-year flood zone for Berryessa Creek as delineated by the Federal Emergency Management Agency (FEMA).
Incorporate watershed restoration benefits	Reduce erosion and sedimentation within Berryessa Creek by constructing improvements to reduce channel bank failures and increase the sediment storage capacity that will enable plant colonization.
	Improve water quality through reduced erosion and sedimentation control and creek maintenance
	Provide opportunities to expand existing trail systems(and thus recreation) by up to 6 miles along the creek via the construction of a pedestrian bridges and maintenance roads that could serve multiple uses, including trail use.
	Promote watershed restoration through the reestablishment of natural wetlands, riparian, and upland habitats.
Improve maintenance effectiveness and efficiency	Improve access for long-term maintenance
	Reduce maintenance requirements associated with sediment removal and repair work caused by bank failures.
	Reduce maintenance requirements associated with trash and graffiti removal caused by existing blight conditions.

Project Performance Measures by Objective

The Project exemplifies an integrated flood protection and habitat restoration project that yields multiple benefits in terms of improved flood management and reduced flood frequency, protection of public health and public/private property, improved water quality, both in terms of ecosystem restoration and reduced sedimentation, expanded recreation opportunities, and proactive response to the effects of climate change.

Table 6-2 provides a summary of the specific performance measures identified for each objective. The sections that follow provide a more detailed description of the general performance measures that the District will use to quantifying and/or verifying performance towards meeting each of the stated Project objectives. It should be noted that specific performance measures are also required by the Letter of Map Revision (LOMR) process, in order to formally remove benefiting properties from the 100-Year flood zone. Similarly, regulatory permits for the Project will require the preparation and implementation of a Mitigation Monitoring Plan (MMP) that sets specific performance measures for new riparian and wetland habitats in terms of percent cover at 5- and 10-years following Project completion.

Table 6-2. Project Objectives and Performance Measures

Project Objectives	Performance Measures
Construct the necessary improvements to enable the removal of 3,400 homes, businesses and schools in surrounding communities from the current 100-year flood zone for Berryessa Creek as delineated by the Federal Emergency Management Agency (FEMA).	6.1 Coordinate the completion of the Letter of Map Revision process for applicable Flood Insurance Rate Maps (FIRM) with the Cities of Milpitas and San Jose
	6.2: Produce "As Built" drawings
	6.3. Maintain project engineered design capacity in perpetuity through the integration of the Project into the District's Stream Maintenance Program
Reduce erosion and sedimentation within Berryessa Creek by constructing improvements to reduce channel bank failures and increase the sediment storage capacity that will enable plant colonization.	6.4. Document sediment removal, vegetation management, and bank protection activities
Improve water quality through reduced erosion and sedimentation control and creek maintenance	6.3. Maintain project engineered design capacity in perpetuity through the integration of the Project into the District's Stream Maintenance Program
	6.4. Document sediment removal, vegetation management, and bank protection activities
	6.5. Quantify the amount of trash removed from the Project annually
Provide opportunities to expand existing trail systems (and thus recreation) by up to 6 miles along the creek via the construction of a pedestrian bridges and maintenance roads that could serve multiple uses, including trail use.	6.6. Coordinate with the City of San Jose Parks and Recreation Department
Promote watershed restoration through the reestablishment of natural wetlands, riparian, and upland habitats.	6.7. Facilitate the creation of habitat acreages specified in the Project's permits
Improve access for long-term maintenance	6.3. Maintain project engineered design capacity in perpetuity through the integration of the Project into the District's Stream Maintenance Program
Reduce maintenance requirements associated with sediment removal and repair work caused by bank failures.	6.4. Document sediment removal, vegetation management, and bank protection activities
Reduce maintenance requirements associated with trash and graffiti removal caused by existing blight conditions.	6.5. Quantify the amount of trash removed from the Project annually

Objective 1: Remove more than 2,400 homes, businesses and schools from the 100-Year Flood Zone

The Project will increase stormwater conveyance and retention capacity of flood control channels along Berryessa and Penitencia Creeks to provide 100-year flood protection for more than 2,400 parcels in the Cities of Milpitas and San Jose that are currently located within the 100-year floodplain.

> ***Performance Measure 6.1*:** The District will coordinate the completion of the Letter of Map Revision process for applicable Flood Insurance Rate Maps (FIRM) with the Cities of Milpitas and San Jose to support the removal of communities from the 100-year flood plain. This will include preparing the revisions to applicable FIRMs and the provision of all technical information, including modeling output and data, planning level design analyses and calculations for new/revised project features, topographic mapping, and surveys for changes made to the proposed project should be incorporated into the LOMR package for final review.

***Performance Measure 6.2*:** The District will produce "As Built" drawings for all project elements following the close out of construction to provide evidence of the constructed Project. Photo-documentation also will be provided to illustrate pre- and post-construction Project conditions and may correspond with those developed for compliance with the Project MMP.

***Performance Measure 6.3*.** The Project's engineered design capacity will be maintained in perpetuity through the integration of the Project into the District's Stream Maintenance Program (SMP) (2006). Maintenance activities for the Project will be documented annually in the SMP's Annual Report.

Objective 2: Reduce erosion and sedimentation within Berryessa Creek

Erosion and sedimentation along the Berryessa Creek and its tributaries are a major issue when it comes to impeded stream flow and channel capacity, degraded water quality, and establishment of native habitat. Implementation of the Project will widen channels to reduce erosion on banks, and will create a proper bankfull channel to transport sediments.

***Performance Measure 6.4*.** The District will specifically document all sediment removal, vegetation management, and bank protection activities undertaken for the Project. Documentation will include a description and photograph(s) of the maintenance issue (e.g. sedimentation, vegetation control), the measures recommended to correct the problem, the date the corrective action was completed, and confirmation that the measure is effective.

Objective 3: Improve water quality through reduced erosion and sedimentation control and creek maintenance

The banks of the Berryessa Creek and its tributaries are currently subject to varying degrees of erosion and sedimentation, which degrades the overall water quality of the creeks. Implementation of this Project will result in reduced sedimentation and erosion and will therefore improve water quality.

***Performance Measure 6.3*.** The Project's engineered design capacity will be maintained in perpetuity through the integration of the Project into the District's Stream Maintenance Program (SMP) (2006). Maintenance activities for the Project will be documented annually in the SMP's Annual Report.

***Performance Measure 6.4*.** The District will specifically document all sediment removal, vegetation management, and bank protection activities undertaken for the Project. Documentation will include a description and photograph(s) of the maintenance issue (e.g. sedimentation, vegetation control), the measures recommended to correct the problem, the date the corrective action was completed, and confirmation that the measure is effective.

***Performance Measure 6.5*.** The District shall quantify the amount of trash removed from the Project annually using the San Francisco Bay RWQCB's Rapid Trash Assessment. This information will be provided to the San Francisco Bay RWQCB (Region 2) for its use in calculating total load reductions to Lower Silver Creek.

Objective 4: Provide opportunities to expand existing trail systems (and thus recreation)

Implementation of this Project will provide new recreational amenities for City of Milpitas and the northern portions of the City of San Jose, including pedestrian bridges and multiple-use trails that will extend for up to 6 miles along the Berryessa Creek.

Performance Measure 6.6. The District shall coordinate with the City of San Jose Parks and Recreation Department to encourage the integration of the Project into the City's trail network as specified in its adopted Trails Master Plan (e.g. Greenprint). This District shall document and track correspondence with the City of San Jose Parks and Recreation Department to encourage the implementation of its Trails Master Plan for portions that would integrate with the Project. The District

will provide documentation in support of these efforts through Year 5 of the monitoring plan. The San Jose Trails Master Plan is provided as Appendix 6-6 to this Attachment.

Objective 5: Promote watershed restoration through the reestablishment of natural wetlands, riparian, and upland habitats.

Performance Measure 6.7. Facilitate the creation of habitat acreages specified in the Project's permits (e.g. 404 Permit) for emergent wetlands, open water/emergent wetlands, riparian habitat, and Uplands. The Project will demonstrate the creation of natural wetlands, riparian, and upland habitats. The District will complete additional resource permitting and define mitigation requirements and performance measures for the post-construction condition.

Objective 6: Improve access for long-term maintenance

Performance Measure 6.3. The Project's engineered design capacity will be maintained in perpetuity through the integration of the Project into the District's Stream Maintenance Program (SMP) (2006). Maintenance activities for the Project will be documented annually in the SMP's Annual Report.

Objective 7: Reduce maintenance requirements associated with sediment removal and repair work caused by bank failures.

Performance Measure 6.4. The District will specifically document all sediment removal, vegetation management, and bank protection activities undertaken for the Project. Documentation will include a description and photograph(s) of the maintenance issue (e.g. sedimentation, vegetation control), the measures recommended to correct the problem, the date the corrective action was completed, and confirmation that the measure is effective.

Objective 8: Reduce maintenance requirements associated with trash and graffiti removal

Performance Measure 6.5. The District shall quantify the amount of trash removed from the Project annually using the San Francisco Bay RWQCB's Rapid Trash Assessment. This information will be provided to the San Francisco Bay RWQCB (Region 2) for its use in calculating total load reductions to Berryessa Creek.

Monitoring Methods

This section provides an overview of the monitoring system to be used to verify Project performance with respect to the project goals identified in the Proposal. This discussion includes a description of where and how the data will be collected and the types of analyses to be used to measure the Project's performance in meeting the overall goals and objectives of the IRWM Plan.

Flood Protection and Capacity Maintenance

LOMR Process. The primary means of monitoring the benefits derived from the Project's flood control improvements is the completion of the (LOMR) process and approval of revised FIRMs for the Project vicinity.

The District has not decided on whether to apply for a conditional LOMR or a regular LOMR. If a conditional LOMR (CLOMR) is submitted based on a certain design, the approved LOMR from FEMA is then conditioned on the completion of that design. A standard LOMR can only be approved after the construction of the project is completed. Typically there is no additional work required for a conditional

letter except for the notification to FEMA of the completion of project construction and submission of the 'as-built' plans as evidence of compliance with the conditions of the CLOMR.

FEMA recommends using the conditional letter since it avoids costly retrofits if, or usually when, FEMA requires something that was not anticipated during the original design and construction of the Project. A conditional letter generally guarantees that after the project is finalized the FIRM will be revised. Based on this direction, the District anticipates submitting a CLOMR application typically around completion of the 90% design plans and specs – however, the lag time should be greater than 90 days before construction will begin. This will allow Project Team sufficient time to coordinate, resolve, and incorporate FEMA's review comments into the final Engineer's Report and final environmental document. All submittal documents and correspondences will be carefully documented for future verification and submittal use when preparing for a LOMR package. After issuance of a CLOMR, all technical support data, including but not limited to, modeling data and outputs, planning level design analyses and calculations for new/revised project features, topographic mapping, and surveys for changes made to the Project will be incorporated into the LOMR package for final review.

Stream Maintenance Program. Beyond the LOMR process, the District would also continue to implement its Flood Protection and Stream Stewardship Program (2010) (see Appendix 6-1) to maintain the flood carrying capacity of the Project facilities. This program has funding through 2016 and the District is currently conducting public outreach to extend the life of the program another 10 years. The monitoring frequency and focus of District inspections for all Project facilities will include the following:

- 100 percent of flood protection facilities are inspected a minimum of two times annually to assess their condition and readiness to convey design flows.
- Field maintenance programs are provided at a 100 percent level of service for preventative and corrective maintenance as prescribed in the District's SMP.
- 100 percent of identified bank or channel bottom erosion threats to flood protection infrastructure are repaired.

These activities would be covered under the umbrella of the District SMP (included in Appendix 6-2), which outlines the procedures for implementing all of the District's routine stream maintenance activities, including three major types of activities: sediment removal, vegetation management, and bank protection. The SMP outlines specific measures, protocols, policies, and reporting requirements to ensure that routine stream maintenance projects are implemented in an efficient and environmentally-sensitive manner. The SMP is subject to future revisions as improvements and modifications are made to reflect the best available knowledge, technology, practices, and regulations.

Actual maintenance activities for the Project under the SMP would vary from year to year. The following provides a brief discussion of the major monitoring activities that would take place under the existing SMP for the Project. Decisions regarding the necessity of routine sediment removal and vegetation management activities (to restore channel flow capacities) will be made following the thresholds established in the Maintenance Guidelines. Beyond these activities, the SMP would also apply to more minor activities such as fence repair, trash removal, and removal of downed trees or other blockages.

- *Sediment Removal*. Sediment removal is the act of mechanically removing sediment that has been deposited within a stream. Typically, sediment is removed when it: (1) reduces stream capacity, (2) prevents facilities or appurtenant structures from functioning as intended, or (3) impedes fish passage.
- *Vegetation Management*. The District removes vegetation in and adjacent to creeks and canals to maintain the ability of channels to function for flood protection. In addition, vegetation is removed to meet local fire code requirements and to reduce combustible weeds and grasses on property adjacent to the streams within the District's jurisdiction. Vegetation management is typically implemented through mowing, discing, hand clearing, or herbicide applications.
- *Bank Protection*. Bank protection involves any action by the District to repair stream banks that are eroding as well as preventative erosion protection. The District implements bank protection when the

problem: (1) causes or could cause significant damage to a property or adjacent property, (2) is a public safety concern, (3) negatively affects transportation, (4) negatively affects beneficial uses of surface water, or (5) negatively affects riparian habitat. Repairs may take several forms ranging from the installation of "hard" structures (i.e., rock, concrete, sack concrete, gabions) to the use of "soft" structures (i.e., willow brush mattresses, log crib walls, pole plantings), or a combination of hard and soft structures. Bank protection also includes preventative maintenance to ensure that banks do not erode in the future. Such bank protection can reduce sedimentation and improve water quality.

These activities would be documented annually as part of the SMP reporting protocol.

Water Quality Monitoring

Water Quality Monitoring Program. \The monitoring of water quality improvements following the completion of the Project would be conducted under the existing Multi-Year Receiving Waters Monitoring Plan (see Appendix 6-3) (Revised March 2004), which is part of the Santa Clara Valley Urban Runoff Pollution Prevention Plan (SCVURPPP) (see Appendix 6-4). The Multi-Year Receiving Waters Monitoring Plan includes monitoring data for Coyote Creek for the following periods: 1979-1981; 1987-1996; and 2001-2009. These studies provide a baseline of information from which the water quality improvements for Berryessa Creek can be evaluated. The District will be responsible for coordinating with its co-permittees to ensure that monitoring activities for the Project are prioritized for post-construction monitoring after 2014 and that the necessary financial resources are allocated to ensure implementation.

Monitoring parameters will be focused on general water quality parameters, including temperature, pH, conductivity, turbidity, and DO.

Rapid Trash Assessment. The District would implement the RWQCB's Rapid Trash Assessment (RTA) (see Appendix 6-5) method to evaluate the condition of the Project reaches with respect to trash over time. Monitoring would be conducted biennially in conjunction with the District's SMP.

Ecosystem and Habitat Restoration and Functionality

Photo Documentation. It is anticipated that the Project's MMP will require the District to establish permanent photo documentation points for all Project elements. The location of the photo documentation site will be GPS'd to facilitate relocation and a GIS map of the location will be created as part of the first monitoring report. The photo documentation points will include landscape features that are unlikely to change over several years (buildings, other structures, and landscape features such as peaks, rock outcrops, large trees, etc.) so that repeat photos will be easy to position. The placement of a permanent T-post or metal fence post marking the photo points will improve consistency between years.

Photos will be taken from these photo documentation points each monitoring year (see **Table 6-3**) at the same camera angle, using a north, south, east, west compass bearing axis at the selected photo points, as appropriate to illustrate site conditions. Photographs will be taken from approximately five feet in height, with exact height recorded using a standardized tripod or rod to ensure consistency of height from year to year. In addition to the permanent photo stations, photographs will also be taken from the origin of each vegetation monitoring transect looking north, south, east, and west.

Table 6-3. Qualitative Score for Assessing the Health and Vigor of Planted Stock

Score	Description of Score
Excellent	No evidence of stress; minor pest or pathogen damage may be present. No chlorotic leaves, no or very minor herbivory (browse). Evidence of new growth, flowering, seed set on majority (greater than 75%) of plants observed.
Good	Some evidence of stress. Pest or pathogen damage present, few chlorotic leaves (> 5%), minor evidence of herbivory (browse). Evidence of new growth, flowering, seed set on most (greater than 50%) of plants observed.
Fair	Moderate level of stress; high levels of pest or pathogen damage, some chlorotic leaves (> 10%), some herbivory damage (few snapped leaves, stems, wear marks etc.). Evidence of new growth, flowering, seed set on some (less than 50%) of plants observed.

Score	Description of Score
Poor	High level of stress; high levels of pest or pathogen damage, many chlorotic leaves (> 30%), severe herbivory damage (massive forage damage, main stems/leaves stripped etc.). No evidence of new growth, flowering, or seed set, or only a few plants (less than 25%) with these characteristics.

Data should be collected at approximately the same time each year to standardize results (i.e., within a 2 week window, adjusted annually to account for seasonal variations in vegetation conditions, weather, precipitation, and temperature).

Table 6-4 provides an overview of the monitoring schedule over the first five years following the Project.

Table 6-4. Project Monitoring Timeline

Monitoring Element	Post-Construction Timeline[1]				
	Year 1	Year 2	Year 3	Year 4	Year 5
Vegetation Survey,[2] Photo Documentation, and General Site Inspection	X	X	X	X	X
Invasive Plant Inspection	X	X	X	X	X
Wetland Delineation					X
Open Water/Wetland Hydrologic Functioning Inspection	X	X	X	X	X
Trail Use Inspection[3]		X	X	X	X
Letter of Map Revision	X	X	X		
Multi-Year Receiving Water Quality Monitoring Plan	X	X	X	X	X
SMP Implementation	X	X	X	X	X

Notes:
1. Post-construction monitoring period will differ for each reach as they are completed.
2. Monitoring transects and quadrants.
3. Pending trail implementation by the City of San Jose.

Performance Measures Table

If the grant application is successful, upon implementation of the proposal, **Table 6-5** will be used as an outline for developing the Project monitoring plan and data management structure as described under Task 3 of the Work Plan, Attachment 3.

Table 6-5. Performance Measures Table – Berryessa Creek Flood Protection Project

Project Goals	Desired Outcomes	Targets	Performance Indicators	Measurement Tools and Methods
Provide flood protection benefits to existing communities within the Berryessa Creek Watershed	Enable the removal of more than 2,400 homes in surrounding communities from the current 100-year flood zone for Berryessa Creek as delineated by the Federal Emergency Management Agency (FEMA).	Decreased flood damages to homes and businesses Protect property, businesses, and transportation; Protect public health and safety.	Reduction in number of homes within the 100-year floodplain compared to existing conditions.	Completion of the LOMR process and approval of revised FIRMs; Production of "As-Builts."
Incorporate watershed restoration benefits	Improve water quality through reduced erosion and sedimentation control, and creek maintenance to control trash.	Improved water quality; Reduced trash impairment; improved stream hydrology and function.	Reduction in trash compared to existing conditions; general water quality improvement compared to existing conditions.	Rapid Trash Assessment (RTA) method; Measure temperature, pH, conductivity, turbidity, and DO.
Incorporate watershed restoration benefits	Promote watershed restoration through the reestablishment of natural wetland, riparian, and upland habitats.	Compliance with habitat mitigation requirements in MMP and successfully restored.	Completion of measures identified in the Project MMRP and MMP.	Implementation and compliance with Project MMRP and MMP.
Incorporate watershed restoration benefits	Expand recreation opportunities by adding a new restroom, new trail spur, and additional parking at Rancho San Antonio County Park and restoring ballfields and constructing new facilities at McKelvey Park.	Public access and recreational trail use.	Increased park usage and revenues compare to existing conditions.	Track number of park visitors and revenues.
Improve maintenance effectiveness and efficiency	Reduce erosion and sedimentation by constructing improvements to reduce channel bank failures and increase the sediment storage capacity that will enable plant colonization.	Channel stabilization Reduced erosion and sedimentation.	Reduction in turbidity compared to existing conditions; reduction in channel erosion and sedimentation compared to existing conditions.	Measure turbidity; Inspect for channel erosion and sedimentation via SMP.
Improve maintenance effectiveness and efficiency	Improve maintenance access to Berryessa Creek and its tributaries and maintain sediment removal activities.	Channel stabilization Reduced erosion and sedimentation.	Reduction in turbidity compared with existing conditions; reduction in channel erosion and sedimentation compared to existing conditions.	Measure turbidity; Inspect for channel erosion and sedimentation via SMP.

APPENDIX 6-1: Flood Protection and Stream Stewardship Program (2010)

APPENDIX 6-2: Stream Maintenance Program (SMP) (2006)

APPENDIX 6-3: Multi-Year Receiving Waters Monitoring Plan

APPENDIX 6-4: Santa Clara Valley Urban Runoff Pollution Prevention Plan (SCVURPPP)

APPENDIX 6-5: RWQCB's Rapid Trash Assessment (RTA)

APPENDIX 6-6: San Jose Trails Master Plan