DRAFT
Technical Memorandum

Santa Clara Valley
Urban Runoff
Pollution Prevention Program

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TO: **Management Committee**

FROM: **Program Staff**

DATE: **March 1, 2006**

SUBJECT: **Watershed Characterization and Sampling Design Rationale - *Coyote Creek Watershed***

Introduction and Background

Environmental monitoring and waterbody assessments are key components in the Santa Clara Valley Urban Runoff Pollution Prevention Program (Program). Environmental monitoring provides information needed to: (1) assist the San Francisco Bay Regional Water Quality Control Board (Water Board) in characterizing receiving water quality in urban watersheds consistent with the priorities of the Santa Clara Basin Watershed Management Initiative (SCBWMI) and the Program; (2) develop an understanding of baseline conditions in waterbodies; (3) identify the need for site-specific water quality investigations to address questions that might arise while conducting screening-level monitoring efforts; and, (4) conduct waterbody assessments aimed at determining the condition of, and potential impacts to water bodies and Beneficial Uses (Uses).

Since FY 02-03, the Program has developed and implemented Annual Monitoring Program Plans (Annual Plans) in fulfillment of Provision C.7 of its National Pollution Discharge Elimination System (NPDES) Permit. The Annual Plans identify monitoring activities that are implemented each year as part of the Program's Multi-Year Receiving Waters Monitoring Plan (Multi-Year Plan). The Multi-Year Plan is based on a rotating watershed approach designed to monitor all watersheds in Program's jurisdiction during an eight year period, while maximizing available resources in any given year (SCVURPPP 2004). Monitoring activities conducted under the Multi-Year Plan are part of a monitoring and assessment process, which provides a formalized structure for conducting environmental monitoring and assessment activities over a number of years. The process includes the following steps: 1) Watershed characterization (e.g., characterization memo); 2) Screening level monitoring (i.e., status and trends); 3) Waterbody assessment; and, 4) Investigative monitoring projects (e.g., watershed/sediment analyses and HMP pilot monitoring project).

The Program implemented its first Annual Plan during FY 02-03 in Coyote Creek watershed. At that time, the Program decided to focus its FY 02-03 monitoring activities

in Coyote Creek subwatersheds (i.e., Upper Penitencia Creek and Lower Silver-Thompson Creek) because the City of San Jose had recently conducted extensive monitoring in the Coyote Creek mainstem during 1999-2001 as part of the Stream Augmentation Project. As described in the Program's FY 06-07 Annual Plan, the Program is now rotating back to Coyote Creek to conduct status and trends monitoring and investigative monitoring projects.

Watershed Characterization Memo

The main purpose of the memo is to provide a brief summary and update of pertinent water quality data and watershed information collected to-date in the watershed(s) that are scheduled to be monitored during the subsequent year (i.e., Coyote Creek watershed in FY 06-07). The watershed characterization memo includes a compilation of existing data sources and a summary of the geologic and geomorphic setting, vegetation, land uses and associated water quality issues. The status of biological communities and relevant beneficial uses in the watershed(s) is also provided. This watershed characterization memo includes a summary of existing data and information resources; descriptions of the relevant watershed attributes, and lists key issues relevant to the development of the proposed sampling design for Coyote Creek watershed in FY 06-07.

Information Resources

Several data and information resources from Coyote Creek (with focus on watershed area downstream of Anderson Dam) were evaluated to identify baseline data for a range of environmental indicators. Existing watershed monitoring and assessment information originated from the following projects:

Monitoring Data

<u>First Flush Study (Soller et al. 2005)</u>
The City of San Jose investigated how the occurrence and magnitude of first flush events in stormwater may influence the effective management of urban runoff pollution. Concentrations of pollutants were characterized from sites in Coyote and Guadalupe Creek Watersheds during eight storms. Pollutants included total and dissolved metals, pesticides and PAHs.

<u>Mercury, PCB and Organochlorine Pesticide Monitoring (KLI 2002)</u>
The SCVURPPP collected PCBs, mercury, and organochlorine pesticide data in 2000 and 2001 in several stormwater catchment locations within the Coyote Creek Watershed as part of the Joint Stormwater Agency Program (JSAP), a San Francisco Bay region wide pollutant study.

<u>Stream Maintenance Program (SCVWD 2001, 2002)</u>
The SCVWD conducted sediment removal activities (dredging) within Lower Silver-Thompson Creek between 2001 and 2005 as part of its Stream Maintenance Program. The SCVWD characterizes the sediment material to be removed to satisfy waste discharge requirements established by the RWQCB and local sanitary landfills. Sediment characterization includes analysis for concentrations of metals (includes mercury), organics (includes pesticides, PAHs and PCBs) and sediment grain size.

Results of the sediment analysis are documented in the SCVWD's Annual Sediment Characterization Report.

Stream Channel Geomorphology Monitoring (SCVWD unpublished)
The SCVWD surveyed channel cross sections, surveyed continuous longitudinal profiles and conducted pebble counts in Upper Penitencia Creek and Thompson Creek. The baseline geomorphic data was collected to assist in bank erosion and sediment removal projects associated with the Stream Maintenance Program and to provide information necessary for designing stream channels that maintains stream function and flood protection as part of Capital Improvement Projects.

Stream Augmentation Study (Tetra Tech 1999, 2000 and Hopkins et al. 2002)
The City of San Jose, as part of the Stream Augmentation Study, collected water samples at ten stream locations during the dry season months between 1999 and 2001. Water samples were analyzed for general water quality, metals, nutrients, pathogens, pesticides, and acute and chronic toxicity for all three years. Organic compounds (e.g., PAH, PCBs and Dioxin) and algal biomass were only collected in the last year of the study. Fish and benthic macroinvertebrate communities were also sampled at selected sites as part of the study.

Stormwater Environmental Indicator Demonstration Project (SCVURPPP 2001)
The SCVURPPP collected continuous general water quality data, aquatic habitat survey data and fish populations (eighteen sites) and benthic macroinvertebrate community assemblages (nine sites) and pollutant concentrations in bedded sediment samples (nine sites) in the Coyote Creek watershed in 1999 as part of the Stormwater Environmental Indicator Demonstration Project (SEIDP).

Bay Area Stream Fisheries Project (Leidy unpublished stream survey data)
Rob Leidy of U.S. EPA conducted stream surveys for 79 streams in the San Francisco Bay Area between 1992 and 2002. Fish community assemblage information was collected at twenty-eight stream locations in Coyote Creek watershed; twelve of the locations were located in the Coyote mainstem below Anderson Reservoir, and sixteen locations were located in Coyote Creek above Coyote Reservoir and tributaries to Anderson Reservoir. Stream survey results were documented in a report published on the San Francisco Estuary Institute (SFEI) website and released as an Access database.

Benthic Macroinvertebrate Study (Carter and Fend 2000)
The U.S. Geological Survey (USGS) sampled benthic macroinvertebrate (BMI) community assemblages at eleven stream sites along Coyote Creek and seven stream sites along Upper Penitencia Creek in the spring and fall of 1997. The USGS also generated biological metrics that describe the characteristics of the BMI assemblages.

Fisheries Aquatic Habitat Collaborative Effort (SCVWD 1999)
The aquatic habitat along Coyote Creek (from Montague to Anderson Dam) and Upper Penitencia Creek (from mouth to 1 mile below Cherry Flat Reservoir) was surveyed by the SCVWD as part of the Fisheries Aquatic Habitat Collaborative Effort (FAHCE). Water temperature data and a survey of fish barriers were also collected as part of the study.

Waterbody Assessments

Limiting Factors Analysis (LFA) (Stillwater 2005)

The Upper Penitencia Creek LFA was conducted by Stillwater Sciences for the SCVURPPP to fulfill the Program's NPDES permit requirements to conduct watershed analysis of creeks that are potentially impaired by sediment from anthropogenic activities. The objectives of the Upper Penitencia Creek LFA were to identify and fill information gaps related to physical and biological factors controlling population dynamics of steelhead (*Oncorhynchus mykiss*) and to identify the impacts of sediment on steelhead relative to other potential limiting factors. Based on the available existing information and reconnaissance surveys, focused studies were developed to test hypotheses regarding potential limiting factors for steelhead in Upper Penitencia Creek. The focused studies addressed the following factors: fish passage barriers, gravel permeability, pool filling, overwintering habitat, and summer rearing and growth.

Field data collected for the Upper Penitencia Creek LFA included: 1) snorkel survey of steelhead population during spring and fall season; 2) physical habitat assessment in Arroyo Aguague; 3) permeability measurements at potential steelhead spawning sites; 4) volume of fine sediment within pools; and 5) estimated embeddedness of large substrate at potential juvenile overwintering sites. The study assessed existing aquatic habitat data, fish passage impediments, and water temperature data collected in the FAHCE study (see below).

Preliminary findings, as identified in the December 7, 2005 Draft Upper Penitencia Creek LFA Report, included: 1) No barriers to upstream migration below natural waterfalls in Upper Penitencia Creek and Arroyo Aguague were identified, although a passage impediment in Alum Rock Park may limit passage opportunities at some flow levels; 2) Seasonal low flows in the downstream reaches may limit steelhead outmigration success in some years, especially if channel drying occurs before the end of the outmigration period (typically March–May); 3) Gravel permeability is low but not likely limiting smolt production due to habitat limitations at other life stages; 4) Pool filling is low, indicating high sediment transport capacity relative to sediment supply; 5) Preliminary analysis suggests that overwintering habitat is likely the key limiting factor for steelhead prior to smolt outmigration; 6) Potential limitations to steelhead density and fish growth may exist in Upper Penitencia Creek due to low streamflows and warm water temperatures during the summer period.

The above findings indicate that the lack of overwintering habitat for juvenile steelhead is likely to have the greatest influence on the steelhead population. In addition, juvenile outmigration may be impeded by season drying of the channel. The study identified important data gaps that are needed to reduce uncertainty associated with development and testing of the key hypotheses. These include conducting additional steelhead population surveys (at minimum, during spring 2006), outmigrant trapping of steelhead during the spring season, and detailed analysis to determine timing and magnitude of flows necessary for downstream passage for smolts.

The Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) (SCVWD 2003)

FAHCE is a multi-agency endeavor convened by the SCVWD and the Department of Fish and Game to develop an interim fisheries and aquatic habitat management plan. The goals for FAHCE include: 1) identify the contribution of SCVWD facilities and operations to existing fishery habitat conditions within the context of the variety of factors

impacting salmon and steelhead populations; and 2) identify reasonable flow and non-flow measures that will improve habitat conditions for such fish populations within the context of competing water and land use demands. The FAHCE study area included Stevens Creek below the reservoir. The FAHCE project quantified the following factors: 1) diversity, abundance, and condition of existing salmon and steelhead resources; 2) habitat quantity and quality that may limit these target fish populations; 3) types and locations of non-flow measures that could change existing conditions; and 4) alternative flow regimes that could change the conditions that limit the target fish populations.

The SCVWD conducted an extensive aquatic habitat survey for the Coyote mainstem (between Highway 237 and Anderson Dam) and Upper Penitencia Creek (between Coyote confluence and approximately 1 mile downstream Cherry Flat Dam) using a modified California Department of Fish and Game Level 4 Salmonid Habitat Classification. The survey identified the location and extent of critical salmonid habitat, including spawning gravels and juvenile habitat, and quantified potential impacts to these areas (e.g., substrate embeddedness). The SCVWD also conducted an inventory of fish passage impediments in the project area. Other data collected included continuous water temperature measurements at selected stream locations and fish population surveys.

The FAHCE Summary Report summarizes specific issues and actions for Coyote Creek watershed (SCVWD 2003). Phase I work objectives included creating a suitable spawning and rearing habitat for approximately five miles both below Anderson Dam and in Upper Penitencia Creek by, 1) releasing reservoir flows for fish; 2) improve passage at Priority 1 fish barriers (i.e., Singleton Road and Ogier Pond Quarry Ponds); 3) restoring spawning and rearing areas; 4) stabilizing banks and 5) identify and restore areas where geomorphic function is impaired. The report also recommends the following specific actions or investigations: 1) coordinated operating strategy for Cherry Flat Dam with City of San Jose needed to enhance streamflow conditions for steelhead; 2) investigate remedies to the high groundwater conditions in the Laguna Seca area (i.e., strategy that minimizes water diversion through Coyote Canal) so that a free-flowing stream can continue through Coyote Creek; 3) investigate remedies to Metcalf Percolation Ponds to reduce potential risks of entrainment and predation of salmonids.

<u>Assessment of Stream Ecosystem Functions for the Coyote Creek Watershed (SCVURPPP 2003)</u>

This Program evaluated stream ecosystem functions in the Coyote Creek Watershed using available data. The study area for this project was limited to data-rich portions of the two largest creeks in the watershed: Upper Penitencia Creek below Cherry Flat Dam, and Coyote Creek below Anderson Dam. Stream reaches were classified using factors related to geomorphology and urbanization. The existing capacities of study area reaches to support the following four physical ecosystem functions were assessed using hydrogeomorphic models: hydrologic processes and channel dynamics, aquatic habitat, riparian habitat, and landscape-level connectivity. The existing capacities of study area reaches to support aquatic fauna (macroinvertebrates and fishes) were assessed using indices of biological integrity. Selected water quality parameters were examined to assist interpreting model results.

Future capacities of stream ecosystem functions were assessed by estimating the relative positive and negative impacts of existing and near-term factors that may continue or soon influence the distribution and viability of fish and macroinvertebrate

assemblages, their habitats, and the functional capacities of supporting stream processes. Potential capacities of stream ecosystem functions were assessed by identifying where existing and future stream ecosystem functional capacities could be maintained or improved by practical, strategic management actions that have not been planned yet. Potential management actions were prioritized based on which would have the greatest positive impact on cold and warmwater fish and macroinvertebrate communities. Monitoring activities to address data gaps identified through the assessment are also described and prioritized. The final report was published in May 1, 2003.

Planned Monitoring and Assessment Studies

Mid-Coyote Flood Control Project

The SCVWD is planning to conduct an assessment of the existing condition of the fish population and physical habitat within a six mile reach of Coyote Creek (between Montague and I-280) as part of the Mid-Coyote Flood Control Project. Associated monitoring activities include physical-chemical water quality, continuous temperature measurements, fish community assemblage, out-stream migrant trapping for steelhead, aquatic habitat typing and riparian vegetation assessment. The project also includes a historical ecology study, a geomorphic stability analysis, which will include some evaluation of channel cross section and pebble count data, and suspended and bedload sampling for sediment transport analysis. Data collection is expected to begin in the fall of 2006. A draft report of the historical ecology study is expected to be available in February 2006.

Beneficial Use Designation

The 1995 Basin Plan (SFRWQCB 1995) designated the following beneficial uses for Coyote Creek Watershed:

	Beneficial Uses	Coyote Creek	San Felipe Creek	Anderson Reservoir	Coyote Reservoir	Cherry Flat Creek Reservoir
AGR	Agricultural Supply				E	E
COLD	Cold Freshwater Habitat	E	P	E	E	
GWR	Groundwater Recharge			E		
MIGR	Fish Migration	E				
MUN	Municipal and Domestic Supply			E	E	E
RARE	Preservation of Rare & Endangered Species	E				
REC-1	Water Contact Recreation	P	P	L	E	L
REC-2	Non-contact Water Recreation	E	P	E	E	E
SPWN	Fish Spawning	P	P	E	E	E
WARM	Warm Freshwater Habitat	E	E	E	E	E
WILD	Wildlife Habitat	E	E	E	E	E

E=Existing P=Potential L= Limited

Coyote Creek mainstem is the only waterbody listed in the 1995 Basin Plan that occurs within the urban portion of the watershed.

Coyote Creek Watershed Characterization

The following information characterizing the Coyote Creek watershed originates from the Coyote Creek Watershed Integrated Pilot Assessment Final Report (EOA 2003) and the Aquatic Resource Characterization of Western Mt. Hamilton Stream Fisheries (EOA 1999).

Hydrology and Geomorphology

The hydrology and geomorphology of Coyote Creek along the valley floor has been highly modified. At the base of the Diablo Range, the Creek is impounded by two dams, which form Coyote and Anderson Reservoirs. Coyote Dam was built in 1936 and its reservoir has a capacity of 22,925 acre-feet. Two miles downstream the creek empties into Anderson Reservoir, which was built in 1950 and has a capacity of 89,073 acre-feet. Streamflow from both dams is regulated between April and October and runoff above Coyote Dam accounts for about 75 percent of the total runoff for the entire Anderson/Coyote watershed (SCVURPPP 2003). Nine tributaries drain to the two reservoirs and transport large amounts of sediment; however the dams effectively reduce the amount of sediment transported downstream. Management of flows released from the dams have also reduced peak flows and increased summer flows for groundwater recharge.

Water has been historically diverted about 0.5 miles below Anderson Dam by the Coyote Creek Diversion Dam (April – October) and into a concrete channel (Coyote Canal), which bypasses the natural channel. Water is reintroduced to the natural channel approximately six miles downstream at the Coyote Narrows, just upstream of the Coyote Percolation Ponds. In the past, water diversion has caused dryback zones in the natural channel during the summer months. A fish screen was installed in 1999 to prevent downstream passage of fish into the Coyote Canal (SCVURPPP 2003). Water diversions have not occurred since 2001.

Two major pond systems are located within the Coyote Creek mainstem between Anderson Dam and the Creek-mouth. The Ogier Road Quarry Pond Complex, located two miles below Anderson Dam in Santa Clara County Park property, was historic gravel quarry pits (SCVURPPP 2003). These ponds were isolated from the natural channel, but connected to the creek in 1997 when the levee was breached. The SCVWD does not manage these ponds for groundwater recharge. The Coyote Percolation Ponds, located approximately 10 miles downstream of the dam, are pits originally created by gravel mining in the natural channel and are now managed by the SCVWD as a ground water recharge system. A permanent concrete dam was built in the 1930's to increase the size of these ponds. In 1999, a fish ladder was constructed to allow passage over the dam.

The boundary between the Diablo Range and the alluvial plain that forms the valley floor is sharply defined. At least four major tributaries flow from the mountains across this alluvial plain to Coyote Creek. In addition, there are at least eighty-four storm drain outfalls (> 18 inches in diameter) along the Coyote Creek mainstem contribute flow to reaches of Coyote Creek below Anderson Dam (Master Outfalls GIS shapefile developed by William Lettis and Associates, August 2003).

As Coyote Creek nears the South Bay a transition occurs from a freshwater environment to an estuarine environment where the channel and adjacent baylands contain many acres of brackish marsh, salt marsh and mudflats. Originally, an earthen dam was constructed to prevent saltwater intrusion into agricultural lands. In 1995, the SCVWD installed a replacement steel dam several hundred feet downstream of the original dam site. The reach of Coyote Creek downstream of Standish Dam receives fresh water discharged from the San Jose-Santa Clara Water Pollution Control Plant.

Land Use and Land Cover

Much of the riparian corridor below Anderson Dam is intact. Orchards, farmlands and urban development have replaced the original riparian vegetation that occurred in the high terraces of the channel. The middle terrace remains mostly intact. Riparian cover is dominated by cottonwoods, oaks, and sycamores are interspersed. Much of this riparian corridor is managed by the Santa Clara County Parks and receives some recreational use. The lower Coyote Creek is considered to be one of the highest quality riparian corridors remaining in the southern San Francisco Bay region (SCVURPPP 2003).

The urbanized area of Coyote Creek watershed has dramatically increased since the 1960's. During this time, population has increased greatly, and agricultural and grazing land have been converted to residential communities in the southern region of the Santa Clara Valley, and along the base of the Western Diablo range.

The lower reaches of Coyote Creek have been partially modified for flood protection. Setback levees and a high bypass channel have been constructed in the section of lower Coyote Creek between Montague Expressway and Dixon Landing Road. In addition, several miles of tributary stream channels have been similarly modified, including the lower portions of Upper and Lower Penitencia, Berryessa, Lower and Upper Silver Creeks.

Fish Community Assemblages

The Coyote Creek mainstem downstream the Coyote Percolation Ponds supports 10 to 11 native fish species out of the original 18 (EOA 1999). Species known to occur currently include Pacific lamprey, steelhead/resident rainbow trout, chinook salmon, California roach, hitch, Sacramento blackfish, Sacramento pikeminnow, Sacramento sucker, threespine stickleback, prickly sculpin, riffle sculpin, and staghorn sculpin (EOA 1999). Three species, the thicktail chub, splittail, and Sacramento perch have been extirpated from the drainage; the thicktail chub is extinct.

The Coyote Creek mainstem upstream of the Coyote Percolation Ponds supports at least eight native fish species out of the original 14. Species include Pacific lamprey, steelhead/resident rainbow trout, hitch, California roach, hitch x California roach hybrid, Sacramento sucker, threespine stickleback, prickly sculpin, and tule perch (EOA 1999). Two additional cyprinids, the Sacramento pikeminnow and Sacramento blackfish were last collected in 1981, but these species may persist in low numbers within this Reach. A third cyprinid, the speckled dace, was last recorded in 1978 near the Riverside Golf Course (EOA 1999). Additional sampling is necessary to confirm its status. Of particular interest is the recent confirmation of reproducing populations of tule perch, as evidenced by the presence of juvenile and adult specimens. The tule perch was last recorded within Coyote Creek in 1925.

Sampling Design Rationale

Several key issues relevant to the development of a sampling design for the Program's FY 06-07 Monitoring Plan were identified based on the information sources described above. These include:

- Pilot testing of the Sediment Quality Triad (SQT) as screening-level monitoring tool in the FY 06-07 (Chapman 1990; Winger et al. 2005). The SQT consists of sampling and analyzing bedded creek sediment for pollutant concentrations (i.e., metals and organics) synoptically with BMI bioassessments and sediment toxicity testing (i.e., 10 day growth and survival of *Hyella azteca*).

- The SEIDP monitoring data collected in the Coyote Creek mainstem (16 sites below Anderson Reservoir) during 1999 provides baseline data to potentially study status and trends over a seven year time period. In particular, metal concentrations in sediment and BMI bioassessments (screening-level indicators of interest to the Program) were conducted at nine sites on the mainstem of Coyote Creek.

- Address recommendation in SEIDP report to conduct sampling of bedded sediment for contaminant analysis at more stream locations in urban portion of Coyote Creek. In addition, conduct bioassessments at sites in urban reaches using low gradient protocol as described in the California Stream Bioassessment Protocol (CSBP) (i.e., urban reaches of Coyote Creek were not sampled in other studies due to limited riffle habitat).

- Previous benthic macroinvertebrate bioassessment conducted in Coyote Creek utilized methods different than the CSBP. Bioassessments will be conducted in FY 06-07 using a combination of low and high gradient protocols established in the CSBP. These BMI bioassessments will provide a baseline data set using a standardized approach being implemented region-wide.

- Coordinate monitoring activities with SCVWD Mid-Coyote project. The SCVWD is planning to measure water quality, sample fish community assemblages and assess physical habitat at many of the locations that will be monitored by Program for bedded sediment contaminants, toxicity and BMI bioassessments (personnel communication, SCVWD staff). The SCVWD is also planning to conduct a geomorphic stability and sediment transport analysis, which will assist Program staff in the interpretation of its data.

- The data collected in the Coyote Creek mainstem as part of the Stream Augmentation Study during 1999-2001 provides baseline data to potentially study status and trends over a 5-7 year time period. In particular, metal concentrations and bacterial indicators (screening-level indicators of interest to Program) were conducted at ten sites across the urban gradient.

- Monitoring locations in the upper reaches of Coyote Creek mainstem will provide useful baseline data to measure potential creek impacts from new development planned in the Coyote Valley.

- Potential water contact recreation areas were identified at several city and county parks with public access. These areas include Watson Park, William Park, Kelley Park and

Hellyer Park. Water samples will be measured for microbial indicators at these locations.

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