City of San José

San José/Santa Clara Water Pollution Control Plant Master Plan

TASK NO. 4
PROJECT MEMORANDUM NO. 9
CONCEPTUAL STORMWATER DIVERSION ASSESSMENT

FINAL DRAFT

September 2010

carollo

in association with

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CITY OF SAN JOSÉ

SAN JOSÉ/SANTA CLARA WATER POLLUTION CONTROL PLANT MASTER PLAN

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CONCEPTUAL STORMWATER DIVERSION ASSESSMENT

1.0 PURPOSE

The purpose of this Project Memorandum (PM) is to provide a planning level fatal flaw assessment of the feasibility of diverting "dry weather" and "first flush" stormwater flows to the San José/Santa Clara Water Pollution Control Plant (WPCP) as part of the San José/Santa Clara WPCP Master Plan (Master Plan). In addition, the purpose of this PM is to briefly address the concerns associated with stormwater diversions, the regulatory, treatability, and operational issues, and to provide suggested recommendations. As noted, this is a planning level analysis rather than a detailed feasibility analysis. Future studies/work are described in Section 8.

The assessment addresses ten existing stormwater pump stations and their respective flows in the City of San José and City of Santa Clara service areas that were identified by the San Francisco Bay Area Regional Water Quality Control Board (RWQCB) in the San Francisco Bay Region Municipal Regional Stormwater National Pollution Discharge Elimination System (NPDES) Permit (MRP) Tentative Order R2-2008-XXXX NPDES Permit No. CAS612008. The reference to these pump stations was removed in the final, adopted version of the MRP R2-2009-0074 (October 4, 2009). However, Provision C.11.f of the final, adopted MRP requires the permittees, including the City of San José and the City of Santa Clara, to conduct a feasibility study and construct a diversion pilot project in each of the permitted counties and evaluate the reduction in mercury and polychlorinated biphenyls (PCBs) that is achieved by the projects. Based on case studies developed from interviews with other agencies diverting dry weather flows to their wastewater treatment plants (WWTPs), a technical solution was developed. A planning level project cost estimate for a dry weather flow diversion was developed at two of the existing stormwater pump stations, and the project costs were extrapolated to the remaining eight stormwater pump stations for the purpose of determining the feasibility of diverting dry weather flows to the WPCP. Operations and maintenance (O&M) costs for the WPCP to treat the flows were also developed.

2.0 BACKGROUND

2.1 Wet Weather, First Flush, and Dry Weather Flows

Wet weather flow is "generated when precipitation from rain and snowmelt events flows over land or impervious surfaces and does not percolate into the ground", and is collected by storm drains and catchments in a stormwater collection system (http://cfpub.epa.gov/npdes/home.cfm?program_id=6). In the case of a "separate system", where stormwater is not combined with sanitary sewer flows, stormwater flows are typically discharged to receiving waters. A "combined system" is one where stormwater and sanitary sewer flows are combined and sent to a WWTP for treatment. The City of San José and the City of Santa Clara both have separate stormwater collection and conveyance systems, and the WPCP and its sanitary sewer collection system is a "separate system" and does not currently intentionally accept stormwater flows. The wet weather induced flow in a stormwater collection system is the flow that is typically thought of as "stormwater". "First flush" refers to the wet weather or stormwater event "when rainfall after a dry period entrains a greater pollutant load from catchment surfaces than that of subsequent rainfall" (Soller et al., 2003).

"Dry weather" flow in a stormwater collection system occurs when there is no rain or snowmelt event but there are flows generated by activities such as irrigation excess, groundwater pumping, hard surface washing, pool draining, and other activities. These flows also move "over land or impervious surfaces and do not percolate into the ground", and are collected by storm drains and catchments in a stormwater collection system (http://cfpub.epa.gov/npdes/home.cfm?program_id=6). Figure 1 shows the various sources of dry weather flow in stormwater collection systems.

The Environmental Protection Agency (EPA) states that "as the runoff flows over the land or impervious surfaces (paved streets, parking lots, and building rooftops), it accumulates debris, chemicals, sediment or other pollutants that could adversely affect water quality" (http://cfpub.epa.gov/npdes/home.cfm?program_id=6). There are pollutants found in both dry and wet weather flows. Pollutants that are typically found include suspended solids and sediments, nutrients (nitrogen and phosphorus), metals (copper, zinc, lead, cadmium), oils and greases, bacteria, pesticides, and herbicides (http://www.stormwatercenter.net/Slideshows/impacts%20for%20smrc/sld034.htm). In the San Francisco Bay area, surface waters are impacted by pollutants conveyed by stormwater such as mercury, PCBs, dioxin and pesticides. Figure 2 shows the sources and types of pollutants in dry and wet weather flows.

2.2 Regulatory and Legal Considerations

Because of the pollutants found in dry weather and wet weather/first flush flows and their potential to adversely affect water quality, the EPA manages these flows through the NPDES Stormwater Program, and regulates discharges from municipal separate stormwater collection systems (MS4s). Regulated MS4s are required to develop and implement management programs to reduce the contamination of dry weather and wet weather flows and prohibit illicit discharges. These management programs include best management practices (BMPs) that are designed to address the following:

- Peak runoff flows and volumes
- Pollutant transport
- Treatment

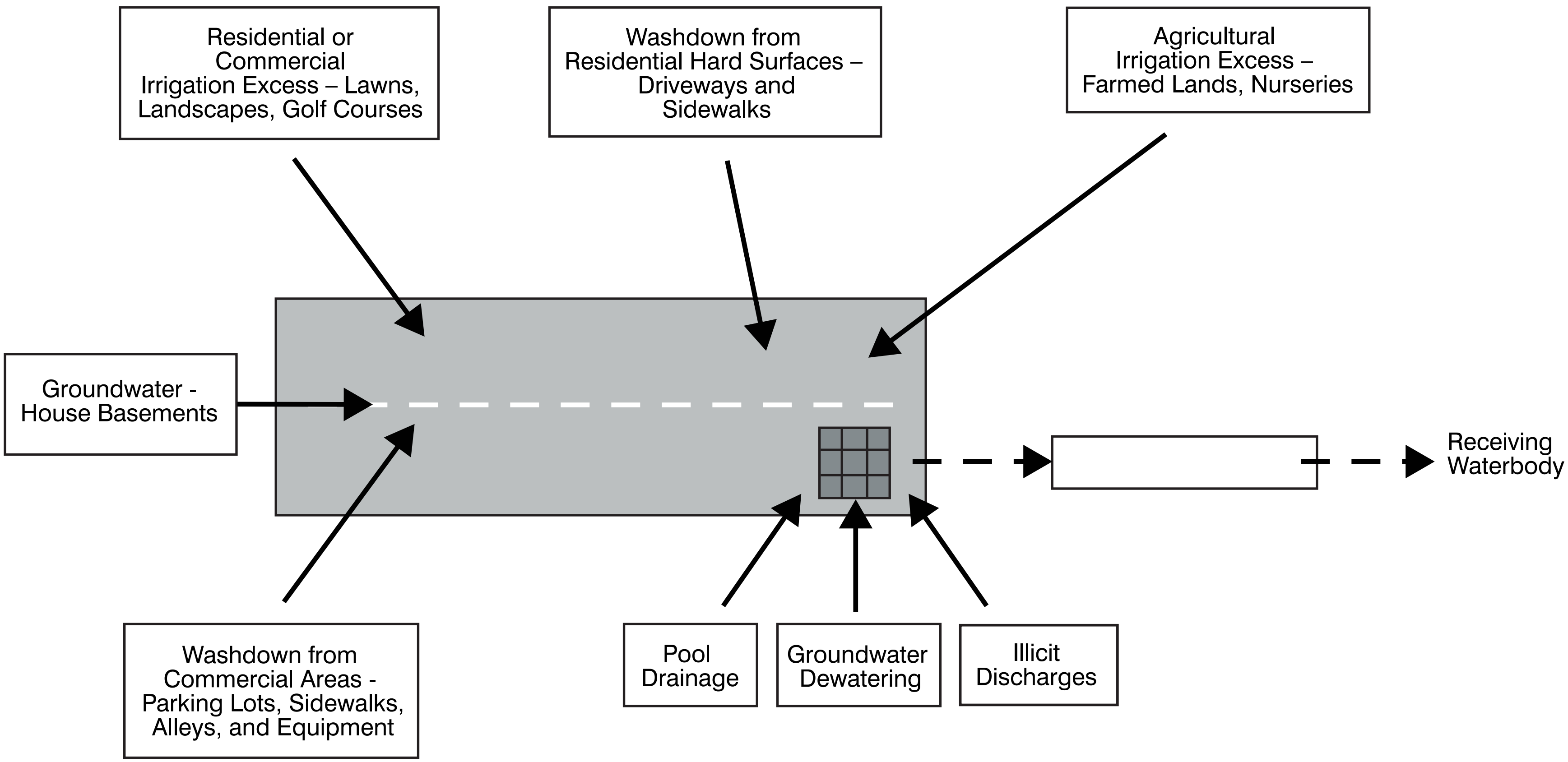

Figure 1
SOURCES OF DRY WEATHER FLOWS
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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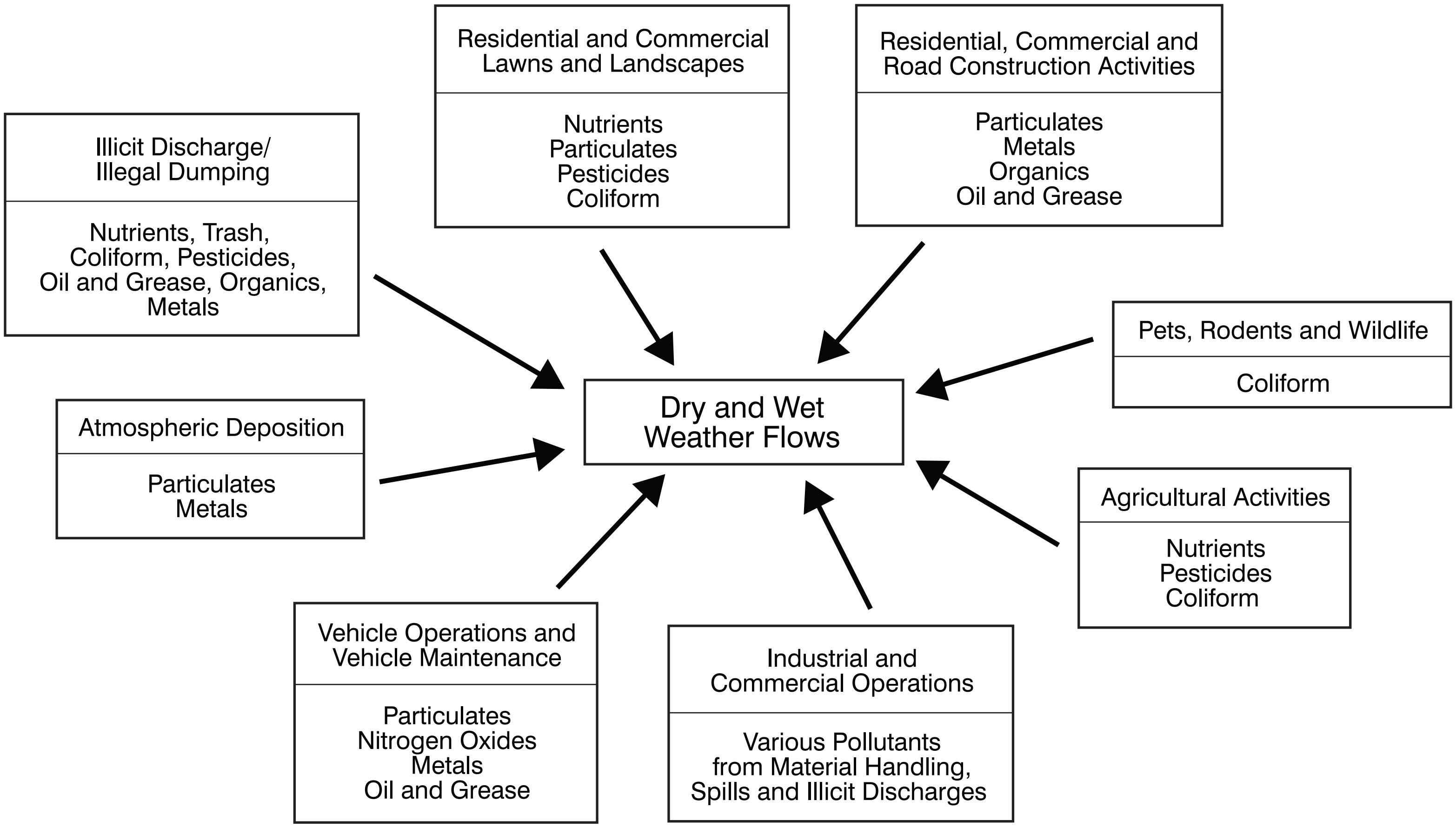

Figure 2
SOURCES OF POLLUTANTS IN
WET AND DRY WEATHER FLOWS
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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The effectiveness of BMPs at controlling flow, controlling pollutant transport and providing treatment is highly variable and depends on BMP selection, hydrodynamic and water quality conditions, and other site-specific parameters.

The EPA does not include stormwater diversions in the list of “stormwater BMPs.” There are challenges and opportunities associated with implementing diversions. Because the practice of diverting dry weather or wet weather/first flush flows to a sanitary sewer collection system is relatively new, the potential challenges and opportunities are not as well understood as compared to those associated with stormwater BMPs. Influencing the decision to divert dry weather and wet weather/first flush flows to the WPCP are other regulatory issues. These issues are discussed below.

2.2.1 San Francisco Bay Area Regional Water Quality Control Board

2.2.1.1 San Francisco Bay Region Municipal Regional Stormwater National Pollution Discharge Elimination System Permit

The RWQCB regulates municipal stormwater for the City of San José and City of Santa Clara, as well as the rest of the San Francisco Bay area, through MRP Permit No. CAS612008. In Tentative Order R2-2008-XXXX (December 4, 2007) section C.8.e iii Dry Weather Discharges & First Flush Investigations Table 8.4, the RWQCB identified five pump stations in San José and five pump stations in Santa Clara for which investigations on dry weather discharges and first flush investigations were to be conducted. This table was removed in subsequent versions and the final, adopted version of the MRP R2-2009-0074 (October 4, 2009). However, Provision C.11.f of the final, adopted MRP requires the San Francisco Bay area permittees, among which include the City of San José and the City of Santa Clara, to conduct a feasibility study and construct a diversion pilot project in each of the permitted counties and evaluate the reduction in mercury and PCBs that is achieved by the diversion projects. The reduced PCB and mercury loads to the San Francisco Bay that result from the diversions must be documented. The 2014 Integrated Monitoring Report must include an evaluation of pilot program effectiveness, estimates of the reduced PCB and mercury loads, and updated feasibility evaluation procedures to guide future diversion project selection.

The State Water Resources Control Board (SWRCB) has concerns over the effects of freshwater discharges on saltwater marsh habitat, and pollutant loading to the South San Francisco Bay. In Order WQ 90-5 (Order), the SWRCB found that the freshwater effluent from the WPCP contributed to the loss and degradation of habitat for two endangered species (California clapper rail and salt marsh harvest mouse). In 1990, the SWRCB adopted the Order and directed the RWQCB to set a cap on the average dry weather effluent flow (ADWEF) (defined as the average daily flow occurring over the three consecutive lowest flow months in the dry weather season for May through October) from the WPCP of 120 million gallons per day (mgd) average, or to flows that would not further adversely impact rare and endangered species. The RWQCB imposed the cap as a condition for approval of the WPCP's NPDES permit. To meet this limit, the WPCP submitted a South Bay Action Plan in 1991(Resolution 91-152), which included proposals for a salt marsh conversion and habitat protection project, a water conservation initiative, and a non-potable water reclamation and recycling project. The RWQCB approved the plan. Implementation of this plan by the WPCP resulted in the issuance of a WPCP permit by the RWQCB that did not contain a flow cap. Instead the permit contained a flow trigger that would result in conservation measures to be taken by the WPCP in phased steps if future San Francisco Bay discharge flows were found to be higher than 120 mgd. The NPDES permit (Order No. R2-2003-0085) requires the WPCP to prepare a contingency plan with measures to be implemented if the ADWEF exceeds 120 mgd during the life of the permit. The same provision is included in the current permit, (Order No. R2-2009-0038**)**. If the WPCP were to accept dry weather or first flush/wet weather diverted flows, there may be the potential for the WPCP to work with the RWQCB to obtain relief from the flow trigger.

2.2.1.2 13267 Letter

On March 19, 2009, the RWQCB, pursuant to section 13267 of the California Water Code, sent a letter (13267 Letter) to the City of San José and the City of Santa Clara requiring that "at least five times, twice during the 2009 dry season and three times during the 2009-2010 wet season, including the first rain event of the season, the cities of San José and Santa Clara monitor discharges from their respective stormwater pump stations for biochemical oxygen demand (BOD), total suspended solids (TSS), total coliform organisms, pH, salinity, dissolved oxygen, and temperature" (RWQCB, 2009). The letter also requires an observation of the discharge at each pump station prior to discharge into the Guadalupe River and the development of a technical report by June 30, 2010. This letter was written subsequent to a fish kill of hundreds of striped bass and other fish in the Guadalupe River suspected to be caused by a heavy rain on the night of October 3, 2008.

2.2.1.3 RWQCB Authority

It does not appear that the RWQCB would have authority under the Porter-Cologne Water Quality Act or the Clean Water Act (CWA) to require the WPCP to accept and treat flows from a separate stormwater agency or flows subject to a separate MS4 permit. The RWQCB's authority to regulate the WPCP is based on permitting discharges from the WPCP. If the WPCP is not accepting and treating dry weather or wet weather/first flush flows, it has no related discharge, and the RWQCB cannot impose conditions in the WPCP's permit with respect to such flows.

The National Pretreatment Program provisions should be applicable to diversions of dry weather or wet weather/first flush flows to the WPCP, which is not required to accept discharges from non-domestic sources into the sanitary sewer collection system. The Pretreatment Program explicitly prohibits discharges to a sanitary sewer collection system that would cause pass-through or interference at the WWTP. (40 C.F.R. § 403.5(a)(1).). It also requires that a wastewater agency deny or condition discharges to a sanitary sewer collection system and thus a WWTP from non-domestic sources, (40 C.F.R. § 403.8(f)(1)(i)) and authorizes wastewater agencies to adopt local requirements that are more stringent than the Pretreatment Program requirements. (40 C.F.R. § 403.4.).

The RWQCB may not be able to require the WPCP to accept and treat dry weather or wet weather/first flush flows if the WPCP does not have the statutory authority to address stormwater issues. Local entities can only exercise the authority that is granted to them in their respective enabling acts or by the state Constitution

The RWQCB is further limited by service designations and other actions of the Local Agency Formation Commission (LAFCO). If the WPCP's enabling act does not authorize it to accept and treat dry weather or wet weather/first flush stormwater, then existing LAFCO designations may need to be addressed if the WPCP is planning on providing these services. LAFCO also determines the jurisdictional boundaries of a public service provider, authorizes the provision of particular services within the provider's jurisdictional boundaries, and requires authorization from LAFCO for the provision of services outside of a wastewater agency's jurisdictional boundaries. If the MS4 discharges are from entities that are not within the jurisdictional boundaries of the WPCP, additional LAFCO approval may be required.

2.2.1.4 Total Maximum Daily Load Program

The San Francisco Bay and certain tributary waters are identified as impaired due to the presence of a number of pollutants. These pollutants are included on the 303(d) List of Impaired Waters and require that a Total Maximum Daily Load (TMDL) be developed for each pollutant. A TMDL is equivalent to the assimilative capacity of a water body for a pollutant. Based on the TMDL, a waste load allocations may be given to point sources and/or a load allocation to non-point sources to attain the allowable loadings into the water body of the pollutant.

Stormwater agencies, who are responsible for dry weather or wet weather/first flush flows, in the San Francisco Bay area must comply with TMDLs for the following pollutants:

- Mercury loading to San Francisco Bay
- PCB loading to San Francisco Bay
- Diazinon and pesticide-related toxicity in urban creeks

TMDLs are planned or in development for, dichlorodiphenyltrichloroethane (DDT), dieldrin, chlordane, selenium, furan compounds and trash for the San Francisco Bay.

2.2.1.5 Treatment of Flows Combined with Sanitary Sewer Flows

The CWA, Section 402, prohibits wastewater dischargers from "bypassing" untreated or partially treated sanitary sewage prior to treatment at a WWTP. Historically, this has been a common practice at WWTPs whose wet weather/first flush flows exceed their capacity. The EPA has been enforcing the bypass prohibition for approximately 10 years, therefore NPDES-permitted WWTPs have had to look for other ways to manage their wet weather/first flush flows. For example, the East Bay Municipal Utility District is being required to close down their wet weather treatment facilities, which were constructed to provide only primary treatment to wet weather/first flush flows, and implement an extensive inflow and infiltration (I/I) rehabilitation program. In order to remain in compliance with the CWA, diversions must not cause wet weather/first flush flows to exceed the capacity of the WPCP. It should be noted that diverting wet weather/first flush flows to a WWTP and reducing sanitary sewer overflows (SSOs)/blending are related issues.

2.2.1.6 Combined Versus Separate Sewers

A potential issue is whether a stormwater collection system that is temporarily connected to a sanitary sewer collection system to divert dry weather flows becomes a “temporary” combined sewer collection system potentially impacted by the EPA’s Combined Sewer Overflow (CSO) Policy. The CSO Control Policy is intended to achieve cost effective CSO controls for wet weather/first flush events that ultimately meet the goals of the CWA. The CSO Policy states, “Discharges from CSSs (combined sanitary systems) during dry weather are prohibited by the CWA. Accordingly, the permitting provisions of this Policy do not apply to CSOs during dry weather” (http://www.epa.gov/OW-OWM.html/mab/owm0319.pdf). Therefore, it is unlikely that the acceptance of dry weather flows by the WPCP would require compliance with the CSO Policy.

2.2.1.7 Water Rights

Diverting dry weather or wet weather/first flush flows has the potential to reduce flows in San José’s and Santa Clara’s rivers and creeks. In general, these rivers discharge to the San Francisco Bay and are not diverted by downstream users, and therefore the diversion of these flows into the sanitary sewer collection system may be in compliance with water rights laws. However, various water rights issues would have to be addressed prior to the WPCP accepting any dry weather or wet weather/first flush flows.

In addition, the diversion would likely undergo environmental review under the California Environmental Quality Act, which would require analysis of the total environmental impact of the diversion. The impact of the diversion on “in -stream” uses would be considered since these flows are critical to habitat in the streams, and a reduction in flows could be detrimental. It would have to be determined whether in-stream uses below the point of diversion should be compromised to protect other aquatic or wildlife resources in the San Francisco Bay that will benefit from the improved water quality provided by the treatment of the diverted flow. Beneficial stream flows would have to be considered prior to implementing a diversion.

2.2.2 Cities of San José and Santa Clara, Tributary Agencies, and Capacity Allocation

Table 1 lists the contributory communities and the allocated WPCP permitted capacity for each. The allocated capacity is for average dry weather influent flow (ADWIF). ADWIF is the maximum average daily flow of the five weekday period between the months of June and October, per the NPDES permit. If the WPCP accepts diverted dry weather or first flush/wet weather flows, the allocated capacity among the Cities of San José and Santa Clara and the tributary agencies in relation to the capacity that will be used by the diverted flows will need to be addressed. If the diversions are categorized as temporary, then the capacity used by the diverted flows could be considered as “borrowed” rather than “purchased”. Decisions regarding the use of capacity for diversions and allocated capacities among the agencies are policy considerations that should be discussed if the WPCP accepts diverted flows. The discussion should address any credits from removal of pollutants in the diverted flows with respect to regulations, such as mercury or PCBs.

Table 1 Tributary Agencies’ Allocated ADWIF Capacity - 2007
San José/Santa Clara Water Pollution Control Plant Master Plan
City of San José

Agency	2007 Allocated ADWIF Capacity (mgd)
City of San José	109.60
City of Santa Clara	20.98
City of Milpitas	13.50
West Valley Sanitation District	12.05
Cupertino Sanitary District	8.60
County Sanitation District 2-3	1.52
Burbank Sanitary District	0.40
Sunol Sanitary District	0.35
Total	**167.0**

Source: San José/Santa Clara Water Pollution Control Plant Master Plan PM 2.1 – Description of Existing Facilities

2.3 Potential Benefits of Diversions

If the WPCP accepts a diversion that results in an improvement in receiving water quality, then the entire watershed benefits. However, from a regulatory perspective, it is the stormwater agency that directly benefits. Specifically, the stormwater agency may be able realize the following benefits:

- Reduced pollutant loading into San Francisco Bay, including an enhanced ability to meet a TMDL because a portion of the contaminant load is potentially being reduced by the WPCP

- Credit for the stormwater diversion under the MRP.

While the WPCP would not see any of these direct regulatory benefits, there are potential trade offs that could be negotiated with the RWQCB that would provide incentives for the WPCP to accept dry weather or wet weather/first flush flow diversions, including allowances for removal of pollutants:

- Pass-through credit for any dry weather or wet weather/first flush pollutant that is not removed during wastewater treatment. This would require monitoring dry weather or wet weather/first flush water quality at the diversions to determine the impact of diversion flows on effluent quality.
- Increased waste load allocations for pollutants that have TMDLs and are present in dry weather or wet weather/first flush flows.
- Increased allowance for effluent toxicity variability.

In addition to direct regulatory benefits, the WPCP would potentially be viewed as being “good neighbors” by helping with a water quality issue that is beyond its primary function and responsibility. In general, this sort of cooperation has the potential to result in economic and noneconomic benefits within the watersheds due to maximizing the use of the existing wastewater collection facilities and the WPCP.

2.4 Potential Regulatory Impacts

Accepting diversions opens the WPCP to increased potential of violating its NPDES discharge requirements, since dry weather or wet weather/first flush flow diversions further decreases the WPCP’s control over influent quality. Regulatory responsibilities and liability concerns are summarized below:

- **Increased effluent loading for some constituents** - Pollutants such as nitrogen cannot be removed below a given concentration due to the function of the biological processes involved, regardless of influent concentrations. Therefore, increased total effluent flow due to dry weather or wet weather/first flush diversion flows, even where concentrations of a pollutant are negligible in the dry weather or wet weather/first flush flows, will increase the discharge loading of some pollutants.
- **Violation of permit limits -** A slug of a pollutant such as mercury in the dry weather or wet weather/first flush flows could overwhelm the ability of the WPCP to remove that pollutant and cause an exceedance of the permitted effluent limit. Depending on pollutant concentrations and dry weather or wet weather/first flush flow, a large pollutant slug may also cause a treatment process upset.
- **Triggering reasonable potential for a pollutant that is not currently in the NPDES permit -** A one-time detection of a pollutant from dry weather or wet weather/first flush flows could trigger reasonable potential and cause the pollutant to be assigned a water quality based effluent limit in the subsequent permit. This would lead to increased monitoring and reporting burdens even if detection of the pollutant was a one-time event.

- **Triggering the antibacksliding provision of the Clean Water Act** - The antibacksliding provision is intended to prevent the issuance of permit requirements that are less restrictive than prior permit requirements that have been attained by the permittee. Reversing a dry weather or wet weather/first flush flow diversion when the WPCP needs to use its unused capacity to accommodate growth in its service area could be interpreted as backsliding if it results in a negative impact on receiving water quality.

Based on the case studies that were developed, diverted flows are generally small compared to the sanitary sewer flows, and the pollutants are greatly diluted prior to effluent discharge. Requiring stormwater agencies to monitor dry weather or wet weather/first flush quality and to implement BMPs to improve that quality would be an additional level of protection for the WPCP. Additionally, the WPCP could retain the authority to shut down a diversion if necessary.

Antibacksliding is a potentially significant issue in that it cannot be addressed with a technical solution. Antibacksliding is a significant regulatory concern that would need to be negotiated with the RWQCB before the WPCP agrees to accept a dry weather or wet weather/first flush flow diversion.

Stormwater agencies have significantly less liability concerns with respect to federal and state regulations when implementing a dry weather or wet weather/first flush flow diversion, since they are transferring responsibility for their water quality to the WPCP. However, the WPCP can require the stormwater agency to contractually accept shared responsibilities, or under the WPCP’s pretreatment requirements.

2.5 Related Existing Agreements

There are few existing agreements and local laws that relate to dry weather or wet weather/first flush flow diversions, including the WPCP’s ability to accept, deny or condition the acceptance of dry weather or wet weather/first flush flow diversions. Most wastewater agencies operating separate stormwater collection systems and sanitary sewer collection systems do not allow the discharge of dry weather or wet weather/first flush flows into the sanitary sewer collection system. However, many wastewater agencies have a stipulation in their rules that allow discharges to the sanitary sewer collection system with the permission of the wastewater agency.

2.6 Interagency Challenges

Implementing a dry weather or wet weather/first flush flow diversion project would require agreements between stormwater and wastewater collection agencies, i.e., the City of San José and the City of Santa Clara, and the WPCP. Clear agreements between the agencies would need to be adopted with respect to the following:

- **Ownership -** Who owns the diversion structure(s)?
- **Funding -** Who pays capital and O&M costs?
- **Duration of commitment/reversibility -** Can the WPCP refuse future flows?
- **Operational concerns, regulatory concerns, liability -** Who is responsible for a failure or an exceedance of a regulatory limit?

One concern about accepting dry weather or wet weather/first flush flow diversions is that they will lead to overflows from the sanitary sewer collection system, or that they could overwhelm the capacity of the WPCP during wet weather. The WPCP has the ability to protect itself from liabilities “outside of the fence” by making sure that agreements with the stormwater agencies make the stormwater agency responsible for proper functioning of the dry weather or wet weather/first flush flow diversion.

2.7 Bay Area Clean Water Agencies Stormwater Diversion White Paper

The Bay Area Clean Water Agencies (BACWA) commissioned Carollo Engineers in March 2009 to develop a Stormwater Diversion White Paper identify and describe the institutional, technical, and economic challenges and opportunities concerning stormwater diversions. The City of San José is a member of BACWA. A draft White Paper was completed in November 2009, in coordination with the development of this PM. A revised draft White Paper was prepared in August 2010 and is currently under review by BACWA. In addition, the Bay Area Stormwater Management Agencies Association (BASMAA) recently commissioned a study to determine feasibility criteria for stormwater diversions in the San Francisco Bay area.

3.0 TECHNICAL CONSIDERATIONS

Developing and implementing a diversion to convey dry weather or wet weather/first flush flows to a sanitary sewer collection system for treatment at the WPCP raises some potential technical considerations. Many of these considerations can be addressed by appropriate design of the diversion and are discussed below.

3.1 Using Existing WPCP Facilities

Under dry weather conditions, the WPCP typically has some excess capacity that could potentially be used for treatment of the dry weather flows. The availability of excess capacity depends on the dry weather sanitary sewer flows to the WPCP, the 120 mgd effluent flow trigger in the WPCP’s NPDES permit, and the amount of recycled water that is used. The available capacity is determined by the 120 mgd trigger less the dry weather sanitary sewer flows (average of 2003 to 2007 average day annual flow (ADAF) is 116 mgd per PM 3.1) plus the recycled water use (average of 2003 to 2007 total delivered volume is 9.64 mgd, per PM 3.7), which based on these values would be 13.64 mgd. While the 120 mgd trigger is an average dry weather effluent flow (ADWEF), it was used to approximate a daily flow (in dry weather) for the purposes of estimating available capacity. The challenge is that both the dry weather sanitary sewer flows and the recycled water use vary on an hourly and daily basis, making the available capacity to treat dry weather flows variable and unpredictable. At present, the WPCP could not treat all of the dry weather flows as presented in Tables 3 and 4, which equal approximately 14.7 mgd, if they all were to occur on the same day with an average available capacity of 13.44 mgd. The likelihood of all the events occurring at the described volumes (the flows could either be more or less, at present there is not data available to statistically quantify the accuracy of the flows) on the same day would require further analysis. However, there are challenges associated with growth that may “trump” available capacity for dry weather flow diversions.

In addition to available treatment plant capacity, sewer system capacity needs to be evaluated in the process of assessing the feasibility of a diversion project. San José designs sewer mains to flow at 2/3 full during dry weather for a number of reasons, including:

- Capacity to accommodate planned and future development
- Decrease the generation of foul odors and corrosive actions
- Address the capacity needs of peak wet weather flows
- Address background and seasonal I/I

It is important to note that currently, the flows in sewer mains that can be estimated by flow monitoring devices may not be a true indicator of the actual committed dry weather flows for a given drainage basin. Due to the large number of vacant or underutilized campuses and parcels in North San José, the current dry weather flows may be lower than expected, and when the vacancy rate returns to normal the demand for this capacity may return. In addition, there are plans for growth for the North San José area. These are important considerations in estimating the sewer system capacity in certain areas of San José’s sewer system.

There are several approaches to address the issue of dry weather flow diversions using capacity that is available to accommodate growth and peak wet weather/first flush flows, including:

- In assessing feasibility of a particular dry weather flow diversion, studies should be conducted to determine the potential flow volume that could be diverted. To minimize impacts on available capacity, the diverted flows should be small relative to the sanitary sewer flows in the pipe that will receive the diverted flow. A hydraulic capacity analysis of the sanitary sewer collection system should be completed prior to implementing any dry weather flow diversions.

- An agreement would need to be made between the WPCP and the stormwater agencies on the relative importance of using available capacity for dry weather flows versus accommodating growth. Interagency agreements can be used to establish the conditions and terms for both accepting and terminating dry weather flow diversions.

- It is recommended that the diverted dry weather flows are small relative to sanitary sewer flows and that the diversions only occur in dry weather conditions when the respective sanitary sewers have the most available capacity. Analysis of data from the case study agencies showed that the maximum percentage of daily diversion flow to treatment plant average day annual flow was 6%.

3.2 Semi-Permanent or Permanent Diversions

One consideration is the permanency of a diversion. Depending on the situation, either semi-permanent or permanent diversions can be implemented. Permanent diversions could entail the permanent installation of pumps, instrumentation and controls, and a connection to the sanitary sewer collection system. Installation of a permanent diversion would require a capital investment as well as an increase in O&M costs.

A semi-permanent diversion could be implemented by mobile operational staff with little permanent infrastructure. During the dry season, dry weather flows can collect in stormwater pump stations, and over time, can become septic. This accumulated flow could be pumped with a portable pump to a truck for disposal at the WPCP, prior to storm events that would convey this accumulated water to the receiving water. This strategy could be useful at some of the larger stormwater pump stations that collect dry weather flows, but where the flows are too small to trigger the pumps for months at a time.

After the first storm in the fall of 2008, a fish kill was observed in the Guadalupe River downstream of several stormwater pump stations. It is hypothesized that a light rain after a dry period can trigger stormwater pumps to discharge even when the flow is insufficient to dilute the pollutants in the stormwater wet wells. This may cause a slug of stormwater that is potentially toxic or has a high organic load to be discharged. A program where dry weather flows are “diverted” by maintenance staff on a semi-regular basis could help alleviate this problem with little capital investment. The effectiveness of this approach would require that the material accumulating in the stormwater system is captured (pumped out) prior to stormflows that would convey it to the receiving water.

This type of program would increase O&M costs. Prior to implementing an “operational diversion program”, a more detailed evaluation of the necessary equipment, labor demands and O&M costs should be conducted.

3.3 Flow Control

Implementing a diversion requires that the separate stormwater collection system and sanitary sewer collection system operate as a combined system, at least on a temporary basis, within some portion of the stormwater and sanitary sewer service areas. It is important that in creating a “temporary combined system”, the dry weather or wet weather/first flush flows are monitored and controlled, because unrestricted diversions from a stormwater collection system under wet weather conditions could overwhelm sanitary sewer collection systems and the WPCP.

Controlling the flow from the stormwater collection system to the sanitary sewer collection system can be accomplished through passive, manual, automated and remote control mechanisms. Many of these controls are used by the agencies in the case studies. The cost and complexity of these controls increases from the passive approach to the remote control approach. In general, the simplest approach that meets the flow control objectives is the most desirable and most cost effective.

In general, the risk of exceeding and overwhelming the flow capacity of the sanitary sewer collection system and WPCP can be mitigated by providing redundancy in the diversion design and control systems.

3.4 Monitoring

There are several reasons to collect flow and water quality monitoring data for the diverted dry weather or wet weather/first flush flows. Site-specific conditions and interagency agreements would dictate the specific needs for flow and water quality data. Benefits of monitoring include:

- Understanding the sanitary sewer collection system and WPCP capacity used by diversions
- Determining allowance for additional treatment and pollutant removals achieved
- Demonstrating compliance with permit limits
- Tracking costs for treatment and conveyance

3.4.1 <u>Flow Monitoring</u>

Selection of a particular type of flow meter is generally based on a number of factors such as accuracy, calibration and reporting requirements, as well as cost, ease of installation and maintenance, and other site specific considerations. Examples of the major classes of flow measurement devices include differential pressure meters, positive displacement meters, ultrasonic meters, magnetic meters, open channel meters etc.

3.4.2 Water Quality Monitoring

It would likely be important to understand the pollutant loads in the dry weather or wet weather/first flush flows. Determining loads is challenging because both volume and concentration can be highly variable. Water quality monitoring can range significantly in complexity and cost. Collecting water quality data on dry weather or wet weather/first flush flow diversions is complicated because pollutant concentrations are variable and unpredictable. A water quality program needs to be focused around the intended use of the data and should include identification of the parameters to be measured, the frequency of data collection, conditions for data collection (event or time based), type of sample collection (grab or composite), monitoring budget, and availability of field and lab staff. Standard QA/QC measures should be included, because it can be important to understand the variability of pollutant concentrations in dry weather or wet weather/first flush flows.

Some pollutants can be measured in-situ with online meters, such as conductivity, dissolved oxygen, and gaseous phase pollutants. These types of meters are typically programmed to take measurements at specified intervals and require field calibration. Pollutants, including metals and coliform, are most effectively measured in a laboratory and therefore require field collection of samples and subsequent laboratory analysis. Samples can be manually collected or collected by automated samples at regular intervals or based on the occurrence of an event (i.e. flow trigger).

3.5 Pollutants and Treatability

Dry weather or wet weather/first flush flow diversions potentially provide a mechanism for improving water quality if the pollutants in the diverted flows can be reduced by treatment at the WPCP. To assess the potential treatability of dry weather or wet weather/first flush flow diversions, the dry weather or wet weather/first flush water quality should be analyzed. In addition, process performance data for the WPCP should be used to estimate treatability of specific pollutants.

Characterizing the pollutants in dry weather flows is complicated by two factors: (1) there is limited water quality data in published or grey literature, (2) the water quality of diversions varies with space and time and is dependent on catchment characteristics and various activities occurring within these catchments at a given time. Studies have shown that concentrations are highly variable in both space and time, and the pollutants that are generally found include coliform, metals, nutrients, and, in a few observations, organics. To understand the water quality in a specific area, sampling should be conducted, and there should be a good understanding of treatment performance.

3.6 Potential Process Impacts to the WPCP

Dry weather or wet weather/first flush flow diversions have the potential to impact biological treatment processes at the WPCP as a result of slug loadings of pollutants and increased pollutant concentrations in biosolids.

The approaches for mitigating the potential impacts at the WPCP due to a slug pollutant load include shutting down a dry weather or wet weather/first flush flow diversion if a high pollutant concentration in the diverted flow is suspected, or by limiting (through diversion design and location) the amount of flow that is diverted to the sanitary sewer collection system. Additional detail on these approaches is included below:

- **Real time monitoring data -** Real time monitoring systems can be configured to measure specific pollutants or surrogate pollutants in dry weather or wet weather/first flush flows. If a concentration threshold is exceeded, a signal can be sent to a valve or pump that would result in stopping the diversion. This approach relies on operation of the monitoring instrumentation and that the pollutant or suite of pollutants measured capture the types of pollutants that could impact treatment processes.

- **Dilution -** Diversions can be designed to limit the diverted flow to a small percentage of the sanitary sewer flow. This approach relies on the mechanism of dilution to minimize the potential for the pollutants in the diverted flow from having a significant impact on the WPCP processes and biosolids quality.

- **Analysis of pollutant transport potential -** Analysis of the watershed area contributing to a diversion site can be used to help understand the potential for a specific pollutant slugs that may impact WPCP processes. If an upset occurred, this information may help determine the source of the process upset.

4.0 APPROACH TO ASSESSMENT

4.1 Overall Approach

This assessment was to determine the feasibility of diverting dry weather and wet weather/first flush flows to the sanitary sewer collection system for treatment at the WPCP. The approach included meeting with City of San José and City of Santa Clara staff, identifying ten existing stormwater pump stations to assess, gathering applicable data, developing appropriate dry weather and wet weather/first flush flows, selecting the appropriate sanitary sewer pipe to connect to, determining a conceptual solution for diverting the flows, and developing planning level project and O&M cost estimates to implement the conceptual solution for two of the ten stormwater pump stations. Case studies of other agencies in California implementing diversions were also developed.

The approach for the assessment began with a meeting with City of San José and City of Santa Clara staff on June 10, 2009. Meeting minutes are shown in Appendix A. The purpose of the meeting was to involve the stakeholders, discuss the intent of the PM and the approach to its development.

Following the meeting, data was gathered from the City of San José and City of Santa Clara with respect to the following:

- San Francisco Bay Region Municipal Regional Stormwater National Pollution Discharge Elimination System Permit No. CAS612008 Tentative Order R2-2008-XXXX
- San Francisco Bay Region Municipal Regional Stormwater National Pollution Discharge Elimination System Permit No. CAS612008 Order R2-2009-0074
- The 13267 Letter
- Evaluation of First Flush Pollutant Loading and Implications for Water Resources and Urban Runoff Management by Eisenberg, Olivieri and Associates (2003)
- San José Connection Fee Study by FCS Group (2009)
- City of Santa Clara Water Quality Evaluation of Pump Station Discharges Draft Final Monitoring Plan
- San José Pump Station Sampling Plan
- City of San José Urban Runoff Management Plan Annual Report 2008-2009
- GIS layers and maps for the sanitary sewer collection systems and stormwater collection systems for the City of San José and City of Santa Clara
- Pump station data, including name, number of pumps, total flow capacity, dry weather flows (City of San José only), catchment area, land use (City of San José only), and receiving waters for the City of San José and the City of Santa Clara
- O&M cost data for the WPCP from 2002 to 2008
- Record drawings for the City of Santa Clara stormwater pump stations

Once the data had been collected and reviewed, the ten existing stormwater pump stations that were listed in Table 8.4 of the MRP Tentative Order R2-2008-XXXX were selected for the assessment. Data for these existing stormwater pump stations was then compiled, and a determination of the dry weather and wet weather/first flush flows to be used for the assessment was developed. The GIS layers and maps were used to identify the nearest sanitary sewer pipes to each existing stormwater pump station that were capable of handling the dry weather and wet weather/first flush flows.

Two existing stormwater pump stations were chosen to further develop planning level project and O&M costs for a proposed conceptual solution. Based on the technical solutions other agencies are using, a conceptual solution was developed for implementation at the existing stormwater pump stations identified in the City of San José and the City of Santa

Clara. The costs developed for the two selected stormwater pump stations were then extrapolated to the remaining eight stormwater pump stations.

Other agencies utilizing diversions in California were visited, interviewed, and toured to understand the problems the diversions were intended to solve, the regulatory and institutional steps taken, the diversion designs and costs, implementation, operations, benefits, and lessons learned. Case studies were developed for each agency.

4.2 Assumptions

The assessment required simplifying assumptions in estimating the following: 1) the volume of dry weather flows to be diverted and treated at the WPCP, 2) the volume of wet weather/first flush flows to be diverted and treated at the WPCP, 3) the details on the cross connects between the sanitary sewer collection system and stormwater collection system in the proximity of the existing stormwater pump stations, and 4) the accuracy of the estimated costs. The simplifying assumptions were as follows:

- The flows to be considered for diversion will not be in excess of the design conveyance capacity of the existing sanitary sewer collection system, and the existing WPCP capacity.
- Dry weather flows will be assumed to be one-fifth the reliable capacity (largest pump out of service) of the existing stormwater pump stations. This assumption is based on a presumed base irrigation runoff flow, and is somewhat arbitrary as it is not anticipated to significantly impact the estimated cost to treat dry weather flows on a $/gallon basis.
- Wet weather/first flush flows to be conveyed are assumed to be one-half the reliable capacity of the existing stormwater pump stations. This assumption is based on the typically observed peak ratio between the mean annual storm (2-year return frequency), and the 10-year storm return event, which is usually the basis for sizing stormwater pump stations. It assumes that there is a high probability that the first flush will be from a mean annual event, and not an extreme event.
- Engineering details on the cross connects between the sanitary sewer collection system and stormwater collection system in the proximity of the existing stormwater pump stations will not be developed. The estimated costs for the cross connections at each existing stormwater pump station will be assumed to consist of a new force main and junction box connection to the nearest sanitary trunk sewer.
- Order-of-magnitude planning-level project and O&M costs. Estimated conceptual planning-level project costs ($/gallon) for diverting, conveying and treating dry weather and wet weather/first flush flows at the WPCP. O&M costs for treating the diverted flows at the WPCP.

4.3 Case Studies

A summary of the case studies that were developed for the City of Los Angeles, Orange County Sanitation District (OCSD), the City of Ventura, and the City of Santa Cruz are shown in Table 2. Full case studies are provided in Appendix B.

In addition to the case studies, there is a stormwater treatment facility in the City of Santa Monica, CA that illustrates a different approach to treating stormwater. The Santa Monica Urban Runoff Recycling Facility (SMURRF) is a facility designed and operated specifically for stormwater treatment. Under certain conditions, SMURRF may treat both dry weather and wet weather/first flush flows. SMURRF treats all flow up to its capacity, which is up to 500,000 gallons per day (gpd) on a regular basis and up to 750,000 gpd for short periods.

Because the normal daily dry weather flow is between 300,000 and 400,000 gpd, there is additional capacity for some wet weather/first flush flows to be treated. The maximum pump capacity is no greater than the capacity that SMURRF can treat. However, if a storm with the potential to exceed the pump flow capacity is predicted, SMURRF staff can manually shut down the pumps to avoid any problems. This is their current operating procedure when a storm is predicted to arrive overnight when staff is unavailable to monitor flows.

While the treatment of some wet weather flows at SMURRF addresses an approach to capture first flush flows, this system is significantly different from the WPCP in the respect that SMURRF was not permitted, designed and constructed for the purpose of treating municipal wastewater.

5.0 PUMP STATION ASSESSMENT

5.1 Pump Stations Selected for Assessment

In MRP Tentative Order R2-2008-XXXX (December 4, 2007) section C.8.e iii Dry Weather Discharges & First Flush Investigations Table 8.4, the RWQCB identified five stormwater pump stations in the City of San José and five stormwater pump stations in the City of Santa Clara for which investigations on dry weather and first flush discharges were to be conducted. These ten existing stormwater pump stations were selected for this diversion assessment. The existing stormwater pump stations are the following:

- City of San José
  - Golden Wheel
  - Oakmead
  - Rincon
  - Rincon 2
  - River Oaks

Table 2 Case Study Descriptions
San José/Santa Clara Water Pollution Control Plant Master Plan
City of San José

Agency	Flows		Driver	Water Quality Benefits Realized	Flow Control Measures	Flow Monitoring	Water Quality Monitoring
City of Los Angeles	Annual Average Diversion Flow (mgd)	17	Reduce coliform-related beach closures and improved water quality at the beaches. Bacteria TMDL for Santa Monica Bay.	Heal the Bay (2009) reports that the diversions have improved water quality and reduced beach closures. Part of the success is also due to reduced sanitary sewer overflows (SSOs).	Passive Control - Pipe diameter/weir from the screening wet well to pumping wet well limits flow. Pump size limits flow. Manual Control - Pumps can be manually turned off via control panel at street Automated Control - Pumps turn off when water level sensor is triggered. Pumps will also turn off if lower explosive limit (LEL) sensors detect hydrocarbons in the air in the pump wet well. Remote Control - Pumps can be turned off via remote telemetry/ SCADA system.	Magnetic flow meters located at the diversion pumps. Purpose: To quantify diversion flow	Some manual grab samples for bacteriological parameters. There are LEL sensors in each diversion pump wet well to detect the presence of hydrocarbons, which causes the pump station to be shut down automatically if a set level is exceeded.
	WWTP Average Annual Flow (mgd)	280					
	Percent Diversion Flow (%)	6.1					
Orange County Sanitation District (OCSD)	Annual Average Diversion Flow (mgd)	1 to 3	Reduce coliform-related beach closures and improved water quality at the beaches. Protection of biologically sensitive areas.	Orange County Health Care Annual Beach Water Quality Report states improved water quality due to the diversions (and reduced SSOs). Anecdotal evidence that the Crystal Cove ecosystem has improved as a result of the diversion.	Passive Control - Pipe and pump size limit flow. Manual Control - Manual valve on diversion can be opened/closed. Automated Control - Pumps turn off when water level sensor is triggered. Remote Control - Rain gauges are located within the catchment watersheds. When a gauge registers precipitation, the pump are shut down by the SCADA system. Pumps are programmed to turn back on after a specified period after the rain event. (Note: Not all OCSD diversion use all of the above controls.)	Monitored by contributing cities and counties. Almost all diversions are monitored with flow meters. Purpose: to quantify diversion flow. Basis for fees if total flow is >4 mgd	The OCSD permit includes a list of pollutants to monitor and the contributing cities and counties to collect the data.
	WWTP Average Annual Flow (mgd)	88 (Plant 1)(1) 156 (Plant 2)(1)					
	Percent Diversion Flow (%)	1.2(2)					

Table 2 Case Study Descriptions
San José/Santa Clara Water Pollution Control Plant Master Plan
City of San José

Agency	Flows		Driver	Water Quality Benefits Realized	Flow Control Measures	Flow Monitoring	Water Quality Monitoring
City of Ventura	Annual Average Diversion Flow (mgd)	0.006	Aesthetics on popular beach.	Beach aesthetics have improved No decrease in coliform-related beach closures.	Automated Control - Pumps are limited to 5 gpm. When 5 gpm is reached, the pumps shut down automatically. Remote Control - Rain gauges are located within the catchment watersheds. When a gauge registers precipitation, the pumps are automatically shut down. Pumps are programmed to turn back on after a specified period after the rain event. Telemetry system allows staff to remotely turn pumps on and off and override the automated controls.	Type of meter not known Purpose: to quantify diversion flow.	Manual grab samples from bottom of sump.
	WWTP Average Annual Flow (mgd)	9.3					
	Percent Diversion Flow (%)	0.1					
City of Santa Cruz	Annual Average Diversion Flow (mgd)	0.5(3)	Reduce bacteria loadings. Aesthetics.	Anecdotal evidence that one of the diversions has improved beach water quality.	Manual Control - In one case, a valve is manually opened during the summer months. This valve may also be opened during winter months when rainfall is infrequent. Other diversions in the system are located at stormwater pump stations. During dry weather, the water that collects in the sumps is manually pumped into the sewer on a weekly basis.	Type of meter not known Purpose: to quantify diversion flow.	Visual inspection for oil sheen on the water surface in the catchments that are manually pumped to the sewer.
	WWTP Average Annual Flow (mgd)	10					
	Percent Diversion Flow (%)	5					

Notes:
mgd= million gallons per day
WWTP = wastewater treatment plant
SCADA = Supervisory Control and Data Acquisition
(1) 2005 Data
(2) Percentage based on combined treatment plant flows of 244 mgd and diversion flow of 3 mgd.
(3) Agency staff indicated that the flow diversion was several hundred thousand gallons per day. Conservatively assumed a diversion flow of 500,000 gal/day.

- City of Santa Clara
  - Eastside Retention Basin
  - Fairway Glen
  - Laurelwood
  - Lick Mill
  - Nelo/Victor

Data was compiled for each existing stormwater pump station. Data for the San José stormwater pump stations is shown in Table 3, and data for the Santa Clara stormwater pump stations is shown in Table 4.

5.2 Dry Weather Flows

The assumption that had been made as part of the scope for this PM to estimate dry weather flows is as follows:

- The volume of the dry weather stormwater flows will be assumed to be one-fifth the reliable capacity (largest pump out of service) of the existing stormwater pump stations. This assumption is based on a presumed base irrigation runoff flow, and is somewhat arbitrary as it is not anticipated to significantly impact the estimated cost to treat dry weather flows on a $/gallon basis.

However, once the existing stormwater pump station data was gathered and the capacity for each existing stormwater pump station was compiled, two key items were realized. The first item is that the capacity of the existing stormwater pump stations was much greater than originally anticipated. For example, the City of San José's Oakmead Pump Station has a maximum pump capacity at the station of 475 mgd, as shown in Table 3. Reliable capacity assumes that the largest pump is out of service, per the Ten States Standards. One-fifth of the reliable capacity of this stormwater pump station is about 80 mgd, and therefore according to the assumption, the estimated dry weather flow to be diverted to the WPCP. The average of the ADAF for the WPCP from 2003 to 2007 was 116 mgd. The RWQCB established a flow trigger in the permit for the WPCP limiting discharge of the ADWEF to 120 mgd. Given both the ADAF of 116 mgd and the flow trigger of 120 mgd, it does not make sense to assume that one (out of ten for this assessment) existing stormwater pump station's dry weather flow estimate to be diverted to the WPCP to be approximately two thirds of the WPCP's ADAF and permitted discharge. Therefore, the assumption that was developed is not appropriate for this analysis. The alternative approach used to estimate dry weather flows is described later in this section.

Table 3 City of San José Pump Station Descriptions
San José/Santa Clara Water Pollution Control Plant Master Plan
City of San José

No.	Pump Station	Number of Pumps[1]	Max Pump Capacity at Station[2] (mgd)	Range of Dry Weather Discharge Rates[2][3] (mgd)	Average Wet Weather/First Flush Discharge Rate[4] (mgd)	Catchment Area[2] (acres)	Land Use[2]	Receiving Water[2]
1	Golden Wheel	2	60	0.0001 to 0.001	1.2	36.5	Residential/Heavy Industrial	Coyote Creek
2	Oakmead	6	475	0.4 to 1.83	47.1	1,446	Planned Development/ Industrial Park	Lower Guadalupe
3	Rincon	3	232	0.1 to 0.5[5]	18.8	577	Industrial Park	Lower Guadalupe
4	Rincon 2	5	388	0.02 to 0.1	26.4	810	Heavy Industrial	Lower Guadalupe
5	River Oaks	3	43	0.05 to 0.25	10.4	318	Industrial Park	Lower Guadalupe

Notes:

All flows shown in mgd = million gallons per day, rounded.

(1) Per personal communication (telephone call) with Mike O'Connell, 2/10/10.

(2) Source: City of San José, James Downing.

(3) The discharge rates at the high end of the range were provided by the City of San José and are estimates. Discharge rates were calculated using pump hours for each pump station. Water is not necessarily discharging when the pumps are running (water can be recirculated within the wet well). Pump capacities used in the calculations were design capacities - since many of the pumps are older, the capacity is probably lower. Pumps are not always run at full revolutions per minute (rpm) capacity. Flow data is from May 2006 - April 2007 and was averaged to gallons per day (gpd); however, a single day flow could be extremely large or small compared to the averaged gpd number. Best professional judgment used to establish the low end of the range.

(4) Based on 0.05 inches/hour, which is the 50th percentile in rainfall intensity for San José per California Stormwater BMP Handbook, Appendix D. (http://www.cabmphandbooks.org/Documents/Development/Appendix_D.pdf)

(5) No value reported by the City of San José. Value calculated by dividing the average of San José pump stations' (Golden Wheel, Oakmead, Rincon 2 and River Oaks) dry weather discharge rate by average of those pump stations respective maximum pump capacity at the station and then multiplying that value by the maximum pump capacity at the station for Rincon.

Table 4 City of Santa Clara Pump Station Descriptions
San José/Santa Clara Water Pollution Control Plant Master Plan
City of San José

No.	Pump Station	Number of Pumps[1]	Flow[1] (mgd)	Estimated Range of Dry Weather Discharge Rates[2] (mgd)	Estimated Average Wet Weather Discharge Rate[3] (mgd)	Catchment Area (acres)	Land Use[4]	Receiving Water[4]
6	Eastside Retention Basin	3	72	0.03 to 0.16	6.5	Unknown	Industrial/ Residential	Guadalupe
7	Fairway Glen	5	161	0.07 to 0.4	10.7	327[5]	Residential	Guadalupe
8	Laurelwood	4	85	0.04 to 0.19	19.9	610[5]	Industrial	Guadalupe
9	Lick Mill	4	152	0.07 to 0.3	13.6	Unknown	Residential	Guadalupe
10	Nelo/ Victor	4	113	0.05 to 0.25	5.4	165[5]	Industrial	Guadalupe

Notes:

All flows shown in mgd = million gallons per day, rounded.

(1) Source: City of Santa Clara.

(2) Dry weather stormwater flow data was not available for the Santa Clara pump stations. Estimates were made using best professional judgment and average San José dry weather flows per average pump station capacity multiplied by the specific flow of each Santa Clara pump station.

(3) Wet weather stormwater flow data was not available for the Santa Clara pump stations. Estimates were made based on 0.05 in/hour, which is the 50th percentile in rainfall intensity for San José per California Stormwater BMP Handbook, Appendix D for those pump stations with a catchment area value. For the pump stations without a catchment value, average San José wet weather flows per average pump station capacity were multiplied by the specific flow of each Santa Clara pump station to develop an Estimated Average Wet Weather Discharge Rate. (http://www.cabmphandbooks.org/Documents/Development/Appendix_D.pdf)

(4) Source: City of San José.

(5) Per the City of Santa Clara Water Quality Evaluation of Pump Station Discharges Draft Final Monitoring Plan.

The second key item was with the data that was reported and provided by the City of San José. According to the City of San José, “these discharge rates are estimates. Discharge rates were calculated using pump hours for each pump station. Water was not necessarily discharging when the pumps were running, since water can be recirculated within the wet well. Pump capacities used in the calculations were design capacities - since many of the pumps are older, the capacity is probably lower. Pumps are not always run at full RPM [revolutions per minute] capacity. Flow data is from May 2006 - April 2007 and was averaged; however, a single day flow could be extremely large or small compared to the averaged number” (Note for the dry weather discharge rate, Table 3). In addition, “the data in the study began in the spring. That spring happened to be a very wet one, and likely helped to recharge ground water supplies. With the expected infiltration rates of our storm lines, it’s possible that the drainage numbers would have been elevated that season” (Personal communication (email) with Raymond Ho (City of San José, Department of Transportation), February 5, 2010).

While there are potential data issues with these dry weather discharge rates, these rates are more appropriate than the dry weather flows developed based on the assumption as discussed above. Using best professional judgment, a range of dry weather rates was developed and is presented in Table 3. Best professional judgment was used to develop the low end of the range. The high end of the range is data that was reported by the City of José. A dry weather discharge rate of zero was reported for the Rincon pump station. Instead, a dry weather discharge rate was calculated by dividing the average of San José pump stations’ (Golden Wheel, Oakmead, Rincon 2 and River Oaks) dry weather discharge rate by average of those pump stations respective maximum pump capacity at the station and then multiplying that value by the maximum pump capacity at the station for Rincon. For the Oakmead Pump Station, the City of San José’s data shows a dry weather discharge rate of 1.9 mgd. A dry weather discharge rate of 1.9 mgd is far more reasonable that a rate of 80 mgd for this analysis. The high end of the dry weather discharge rates, as reported by the City of San José for their five existing stormwater pump stations, was used for this assessment.

Similar dry weather discharge rates/flows were not provided by the City of Santa Clara for their five existing stormwater pump stations. Given that the assumption as discussed above is not appropriate for developing an estimate of dry weather flows, an alternative approach was used. An average of the maximum pump capacity at each station (mgd) was calculated for the City of San José’s four stormwater pump stations for which data was reported. In addition, an average dry weather discharge rate (mgd) (high end) was calculated for the City of San José’s four respective stormwater pump stations. Then the average dry weather discharge rate was divided by the average of the maximum pump capacity at each station to calculate an average dry weather discharge rate per maximum pump capacity at each station. This average rate per capacity value was then multiplied by the flow provided by the City of Santa Clara for each of its five stormwater pump stations to develop the high end of the range of estimated dry weather discharge rate for each of the pump stations as shown in Table 4. Best professional judgment was uses to develop the low end of the range. The high end of the dry weather discharge rates was used for this assessment.

5.3 Wet Weather/First Flush Flows

The assumption that had been made as part of the scope for this PM to estimate wet weather/first flush flows is as follows:

- The volume of the wet weather/first flush flows to be conveyed is one-half the reliable capacity of the existing stormwater pump stations. This assumption is based on the typically observed peak ratio between the mean annual storm (2-year return frequency), and the 10-year storm return event, which is usually the basis for sizing stormwater pump stations. It assumes that there is a high probability that the first flush will be from a mean annual event, and not an extreme event.

However, as discussed in Section 5.2, once the existing stormwater pump station data was gathered and the capacity for each existing stormwater pump station was compiled, two key items were realized. The first item is that the capacity of the stormwater pump stations was much greater than originally anticipated. For example, the City of San José's Oakmead Pump Station has a maximum pump capacity at the station of 475 mgd as shown in Table 3. Reliable capacity assumes that the largest pump is out of service, per the Ten States Standards. One-half of the reliable capacity of this stormwater pump station is about 200 mgd, and therefore according to the assumption, the estimated wet weather/first flush flow to be diverted to the WPCP. The average of the maximum daily wet weather flow (MDWWF) for the WPCP from 2003 to 2007 was 148.6 mgd. Given the MDWWF of 148.6 mgd, it does not make sense to assume that one (out of ten for this assessment) existing stormwater pump station's wet weather/first flush flow estimate to be diverted to the WPCP to be more than thirty percent more than the WPCP's MDWWF. Therefore, the assumption that was developed is not appropriate for this analysis. The alternative approach used to estimate wet weather flows is described later in this section.

To develop more reasonable wet weather/first flush flows, estimated wet weather/first flush discharge rates were calculated using the median (50th percentile) rainfall intensity for San José per California Stormwater BMP Handbook, Appendix D, which is 0.05 inches/hour (http://www.cabmphandbooks.org/Documents/Development/Appendix_D.pdf). This rainfall intensity was multiplied by the catchment area and appropriate conversion factors to develop the wet weather/first flush discharge rates. For the two City of Santa Clara stormwater pump stations that did not have catchment area data, an alternate method to calculate wet weather/first flush discharge rates was used. An average of the eight maximum pump capacity or flow at each existing stormwater pump station with a catchment area value was calculated. In addition, an average of the average/estimated average wet weather/first flush discharge rates for each of the eight stormwater pump station with a catchment area value was calculated. Then the average of the average/estimated average wet weather/first flush discharge rates was divided by the average of the maximum pump capacity/flow to calculate an average of the average/estimated average wet weather/first flush discharge rate per maximum pump capacity/flow. This average wet weather/first flush discharge rate per capacity/flow value was then multiplied by the flow provided by the City of Santa Clara for each of its two stormwater pump stations without a catchment area value to develop an estimated average wet weather/first flush discharge rate as shown in Table 4.

These flows are more appropriate than the wet weather/first flush flows developed based on the assumption as discussed above. For example, as shown in Table 3, the Oakmead Pump Station wet weather/first flush discharge rate is 47.1 mgd. A wet weather/first flush discharge rate of 47.1 mgd is far more reasonable that a rate of 200 mgd for this analysis. However, given the MDWWF of 148.6 mgd, it does not make sense to assume that one (out of ten for this assessment) existing stormwater pump station's wet weather/first flush discharge rate estimate to be diverted to the WPCP to be thirty percent of the WPCP's MDWWF.

In addition to the two key items discussed above, several other factors were taken into account in addressing wet weather/first flush discharge rates in this assessment. The first factor is that in all four case studies that were developed where non-sanitary flows were being diverted to the sanitary sewer collection system for treatment at the WWTP, none of the diversions sent wet weather/first flush flows to the plants for treatment. The diversions were implemented to address dry weather flows only. In fact, numerous controls were in place to ensure that the diversions went offline at the start of a wet weather event.

The second factor is that the wet weather/first flush discharge rates developed based on the assumption are also not reasonable. Treating flows of that size at the WPCP is not realistic from either a capacity standpoint, since the flows are much larger than the current wet weather flows being treated at the WPCP, or a process standpoint, since wet weather/first flush flows would have a substantially different composition than wastewater and this difference in composition could upset the treatment processes. Not only is treating these flows at the WPCP unrealistic, but diverting these flows through the existing sanitary sewer collection system without significant storage is hydraulically impossible, even with the use of force mains.

The third factor is that the wet weather/first flush discharge rates developed based on the rainfall intensity calculation are also not reasonable. Treating flows of that size at the WPCP is also not realistic from either a capacity standpoint, since the flows add to approximately 160 mgd, which would double the current wet weather flows being treated at the WPCP, or a process standpoint, since wet weather/first flush flows would have a substantially different composition than wastewater, and this difference in composition could upset the treatment processes. Again, diverting these flows through the existing sanitary sewer collection system without significant storage is hydraulically impossible, even with the use of force mains.

The fourth factor is that the City of San José commissioned a study that looked at first flush water quality between May 1997 and April 2000 (Soller et al., 2003). The intent of the study was “(1) to determine if concentrations of specific constituents in stormwater runoff are elevated during storms preceded by an extended dry period and (2) if so, to identify the environmental conditions surrounding such events (first flush events)” (Soller et al., 2003). Data was collected at more than twenty five sites in the Guadalupe River and Coyote Creek watersheds (Soller et al., 2003). Collected data included total and dissolved metals, pesticides, polycyclic aromatic hydrocarbons (PAHs), anions, TSS, total organic carbon (TOC), conductivity, gasoline, diesel, and volatile and semi-volatile organics (Soller et al., 2003). However, the study focused on metals and anions because the other pollutants were found to be below detection limits. For the metals and anions, “first flush phenomena did not occur consistently throughout most of the stations investigated” (Soller et al., 2003). The study did, however, conclude that “there are specific combinations of site and storm circumstances that result in a first flush effect with respect to dissolved metals” (Soller et al., 2003).

Based on the four factors discussed above, it was determined that completing further analysis on wet weather/first flush flows was not reasonable, therefore, the remainder of this assessment will focus on dry weather flows only.

5.4 Nearest Sanitary Sewer Pipe

Once the dry weather flows to be diverted to the WPCP were determined, the sanitary sewer pipe to connect each diversion to was identified. One assumption that was made as part of the scope for this PM is as follows:

- The volume of the flows to be considered for diversion will not be in excess of the conveyance capacity of the existing sanitary collection system, and the existing WPCP capacity.

In order to determine an appropriate sanitary sewer pipe to connect the diversion to in order for the flows to not be in excess of the conveyance capacity, the sanitary sewer pipes near each existing stormwater pump station were identified. The nearest sanitary sewer pipes to the existing stormwater pump stations in the City of San José are shown in Table 5, and those in the City of Santa Clara are shown in Table 6. Once the sanitary sewer pipes had been identified, the estimated capacity of each sanitary sewer pipe was calculated. The Full Pipe Capacity shown in Table 5 was calculated based on the pipe diameter, length, slope, invert data (except for Rincon 2), and Manning’s equation. Due to the fact that pipe length, invert data, and slope was not available for the City of Santa Clara sanitary sewer collection system, the Full Pipe Capacity shown in Table 6 was calculated based on pipe diameter, topographical data, and Manning’s equation.

Once the nearest sanitary sewer pipe capacities were calculated, the dry weather flows for diversion at each existing stormwater pump station were compared in order to select the

Table 5 City of San José Nearest Sanitary Sewer Pipes to the Existing Stormwater Pump Stations
San José/Santa Clara Water Pollution Control Plant Master Plan
City of San José

Description	Units	Golden Wheel[1]	Oakmead	Rincon[2]	Rincon 2[3][7]	River Oaks
Dry Weather Flow	mgd	0.001	1.83	0.5	0.1	0.25
Nearest Pipe 1						
Distance[4]	feet	100	800	900	100	1,700
Pipe Slope	feet/feet	0.004	0.006	0.004	0.003	0.001
Diameter	inches	8	8	8	12	30
Location		Golden Wheel Pump Station	Lisa Lane at Eucalyptus Dr	Orchard Dr	Rincon 2 Pump Station	1st Street at River Oaks Parkway
Full Pipe Capacity[5]	mgd	0.47	0.61	0.49	1.17	8.35
Capacity Allocated to Sanitary Sewer Flow[6]	mgd	0.32	0.41	0.33	0.78	5.6
Capacity Available for Diverted Dry Weather Flow	mgd	0.15	0.20	0.16	0.39	2.75
Nearest Pipe 2						
Distance[4]	feet	3,500	2,500	1,500	200	3,500
Pipe Slope	feet/feet	0.002	0.001	0.001	0.001	0.0004
Diameter	inches	21	30	30	48	60
Location		South side of Coyote Creek between I-880 and Ridder Park Drive	Southbay Drive at 1st Street	1st Street at Montague Expressway	Trimble Road at 1st Street	Zanker Road at River Oaks Parkway
Full Pipe Capacity[5]	mgd	4.54	5.65	8.36	35.17	33.16
Capacity Allocated to Sanitary Sewer Flow[6]	mgd	3.04	3.79	5.60	23.57	22.22
Capacity Available for Diverted Dry Weather Flow	mgd	1.50	1.86	2.76	11.60	10.94

mgd = million gallons per day
(1) The nearest 4 sanitary sewer pipes were evaluated for this pump station.
(2) The nearest 3 sanitary sewer pipes were evaluated for this pump station.
(3) Inverts are not available. Slope is from the downstream pipe. The nearest 3 sanitary sewer pipes were evaluated for this pump station.
(4) Distance based on following existing pipe alignments, streets, and right of way.
(5) Full Pipe Capacity calculated using Manning's Equation.
(6) Assumes 67% of the Average Capacity is allocated to the sanitary sewer flow.
(7) The Nearest Pipe 2" for Rincon 2 is a 48-inch pipe that is referred to as the Santa Clara Trimble Road Trunk Line. Capacity in this line is reserved to the City of Santa Clara. Note that this location was not a selected site. However, to use this line for diversion flows there would need to be agreement on its use for diversion flows.

Table 6 City of Santa Clara Nearest Sanitary Sewer Pipes to the Existing Stormwater Pump Stations
San José/Santa Clara Water Pollution Control Plant Master Plan
City of San José

Description	Units	Eastside Retention Basin	Fairway Glen[1]	Laurelwood	Lick Mill[1]	Nelo/Victor[1]
Dry Weather Flow	mgd	0.16	0.4	0.19	0.3	0.25
Nearest Pipe 1						
Distance[2]	feet	1,200	800	100	450	200
Diameter	inches	2 x 42[3]	21	12	8	8
Location		Rabello Pump Station	Lick Mill Road South of HH ROW	Laurelwood Road at Victor Street	Lick Mill Boulevard at Montague Expressway	Brasswood Court
Full Pipe Capacity[4]	mgd	62.18 [5]	5.09	1.56	0.29	0.45
Pipe Slope[6]	feet/feet	N/A	0.003	0.005	0.001	0.003
Capacity Allocated to Sanitary Sewer Flow[7]	mgd	41.66	3.41	1.05	0.20	0.30
Capacity Available for Diverted Dry Weather Flow	mgd	20.52	1.68	0.51	0.09	0.15
Nearest Pipe 2						
Distance[2]	feet	---	1,000[8]	1,600	1,900	1,800
Diameter	inches	---	24	12	12	15
Location		---	Lick Mill Road North of HH ROW	Dela Cruz Boulevard at Laurelwood Road	Agnew Road at Montague Expressway	Dela Cruz Boulevard at Greenwood Circle
Full Pipe Capacity[4]	mgd	---	5.07	1.30	1.76	0.84
Pipe Slope[6]	feet/feet	N/A	0.001	0.003	0.006	0.0004
Capacity Allocated to Sanitary Sewer Flow[7]	mgd	---	3.40	0.87	1.18	0.57
Capacity Available for Diverted Dry Weather Flow	mgd	---	1.67	0.43	0.58	0.27

Notes:
mgd = million gallons per day
N/A = Not Available
(1) The nearest 3 sanitary sewer pipes were evaluated for this pump station.
(2) Distance based on following existing pipe alignments, streets, and right of way.
(3) The connection from the existing stormwater pump station would be made to the Rabello Pump Station (sanitary sewer), which has two 42 inch diameter force mains.
(4) Full Pipe Capacity calculated using Manning's Equation.
(5) Velocity equals 5 fps.
(6) Slope calculated from topographical maps.
(7) Assumes 67% of the Average Capacity is allocated to the sanitary sewer flow.
(8) Crosses Hetch Hetchy right of way.

sanitary sewer pipe for which the volume of the dry weather flow would not be in excess of the conveyance capacity of the pipe. Because the sanitary sewer pipes' primary function is to convey sanitary sewer flows, and the conveyance of the diverted dry weather flows would be in addition, an estimate of the sanitary sewer pipe capacity in dry weather conveying the sanitary sewer flows of 67 percent was made. Sixty seven percent of the sanitary sewer pipe capacity was subtracted from the full capacity of the sanitary sewer pipe to calculate the remaining capacity available to convey diverted dry weather flows. The available 33% capacity was then compared to determine which sanitary sewer pipes had enough available capacity to handle the diverted dry weather flows. As discussed in Section 3.1, San José designs sewer mains to flow at 2/3 full (approximately 67% full) during dry weather for a number of reasons. Therefore, the City of San José may not necessarily want to allocate the remaining 33% capacity to accommodate diversion flows. Determining the capacity available for diversion flows would be a policy decision that would need to be determined in the future and would potentially be site specific based on the proposed diversion location within the collection system. For the purpose of this analysis it was assumed that 33% of the pipe capacity was available to accommodate diversion flows.

The distance from the existing stormwater pump station to the nearby sanitary sewer pipes was calculated based on following existing pipe alignments, streets, and rights of way. In the interest of cost, O&M, and minimal disturbance to the public, the nearest sanitary sewer pipe to the existing stormwater pump station with enough available capacity was selected as the sanitary sewer pipe to which the diversion would be connected. The sanitary sewer pipes that were selected are unshaded, and the sanitary sewer pipes that were not selected are shaded as shown in Tables 5 and 6.

This analysis did not consider the feasibility of implementing multiple diversions and the potential downstream effects on trunk line capacities. For example, the nearest sanitary sewer pipes selected for Oakmead, Rincon, Rincon 2 and River Oaks all drain to the North First Trunk Line. If these diversions were being considered for implementation than it would be important to assess potential impacts on the North First Trunk Line, the Lamplighter Sanitary Sewer Pump Station, the Lamplighter Force Main and the Nortech Injection Station. In general, the feasibility analysis for a diversion project should include evaluating potential impacts on downstream sewer system infrastructure including, trunk lines, force mains and pump stations.

5.5 Pump Stations Selected for Further Evaluation

From the ten existing stormwater pump stations identified, two were selected for further evaluation. Selection criteria included:

- Representative stormwater pump stations from both the City of San José and the City of Santa Clara,

- Stormwater pump stations listed in the 13267 Letter, since the stormwater pump stations named in this letter are of particular interest to the RWQCB,
- A range of stormwater pump station capacities, and
- Close proximity of stormwater pump station to the sampling locations indentified in the first flush water quality study (City of San José only).

It is important to note that the above criteria do not include water quality data, as analysis of water quality data was beyond the scope of this project memorandum. In general, selection of a diversion site may include many additional considerations, including estimated pollutant loads (in particular PCB and mercury) from these pump stations.

Based on the criteria, the Oakmead Pump Station and the Nelo/Victor Pump Station were selected. The Oakmead Pump Station is located in the City of San José, and the Nelo/Victor Pump Station is located in the City of Santa Clara. Both stormwater pump stations were named in the 13267 Letter. The Oakmead Pump Station has the largest capacity of the ten stormwater pump stations, and the Nelo/Victor Pump Station's capacity at 113 mgd is in the middle of the medium to small range, defined as 43 mgd to 161 mgd. The Oakmead Pump Station is one of only two stormwater pump stations (the other being the River Oaks Pump Station) in close proximity to the sampling locations identified in the first flush water quality study (Soller et al., 2003).

6.0 CONCEPTUAL SOLUTION

The conceptual solution that has been developed for the purpose of this assessment is based on the dry weather flow diversions implemented by the City of Los Angeles. The proposed dry weather diversion is composed of a pipe that starts in the existing stormwater pump station wet well and flows by gravity to a manhole that contains a trash screen. The dry weather flow would flow through the trash screen, through a weir and into another pipe that connects the screening manhole to a pumping manhole. The pumping manhole would contain two pumps that pump the dry weather flow up to another pipe that is pumped to the sanitary sewer pipe. Flow would be controlled by several mechanisms, including the pipe diameter and the pumping capacity, water level sensors, remote sensing, such as through a Supervisory Control and Data Acquisition (SCADA) system, and valves that could be operated manually. Rain gauges could also be installed to signal the pumps to shut down in the case of a precipitation event. This solution, based on the design of the flow diversions used in the City of Los Angeles, introduces infrastructure and equipment that would need to be operated and maintained. Figure 3 shows the schematic of the dry weather flow diversion.

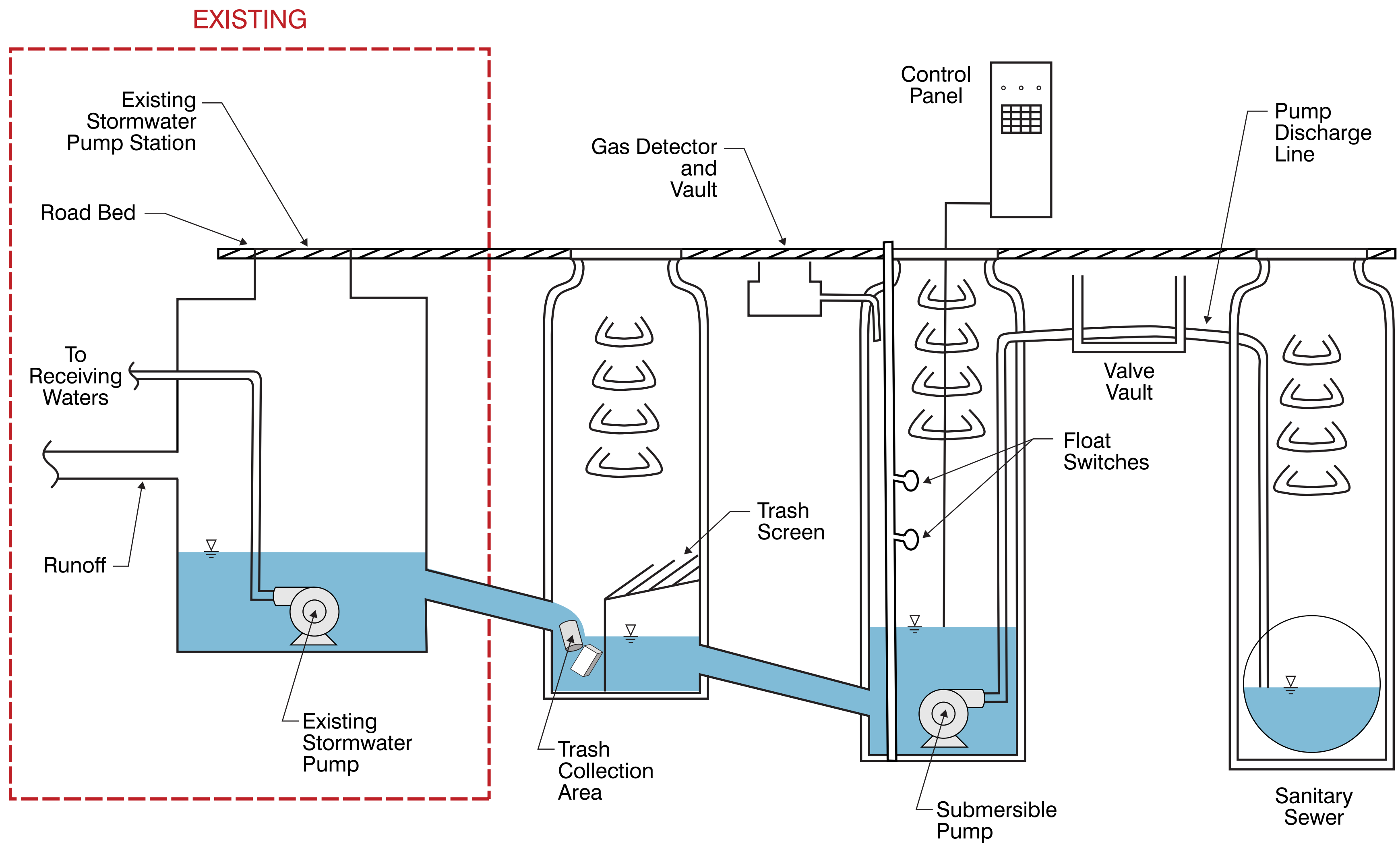

Figure 3
DRY WEATHER FLOW DIVERSION SCHEMATIC
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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The design of the dry weather flow diversion described above is reasonable for the existing stormwater pump stations that have been selected for this assessment because these existing pump stations have wet wells and some instrumentation, controls, and other infrastructure, such as electrical power, that already exist. The instrumentation and controls that exist can be added to for the purpose of serving the dry weather flow diversion. In addition, the existing stormwater pump stations already have O&M crews that perform activities onsite on a regular basis and are provided for by the City of San José and the City of Santa Clara. However, as noted previously, implementing a diversion will introduce additional equipment into the system and the resources and cost associated with operation and maintenance need to be considered and quantified.

7.0 ESTIMATED PROJECT AND OPERATIONS AND MAINTENANCE COSTS

Estimated project and operation and maintenance (O&M) costs were developed for the dry weather flow diversions at the Oakmead Pump Station and the Nelo/Victor Pump Station. These costs were then extrapolated to the dry weather flow diversions at the remaining eight existing stormwater pump stations. These costs are discussed further in the following sections.

7.1 Project Costs

Project costs are Class 5 estimates as defined by the Association for the Advancement of Cost Engineering International (AACEI, formally known as the American Association of Cost Engineers). Estimate classes are presented in the AACEI Recommended Practice No. 18R-97.

Class 5 estimates are typically used for conceptual and screening purposes, and are based on a project definition of 0 to 2 percent. A contingency is often used to compensate for lack of detailed engineering data and oversights (–20 percent to -50 percent on the low side, and +30 percent to +100 percent on the high side) depending on the technological complexity of the project, availability and accuracy of appropriate reference information, and the availability of other appropriate contingency determination information.

Project costs were developed for each project element for a dry weather flow diversion at the Oakmead Pump Station as shown in Table 7 and the Nelo/Victor Pump Station as shown in Table 8.

A construction contingency cost of 50 percent was added, which includes the following:

- Contractor’s overhead and profit
- Construction costs associated with unknown field conditions
- Construction change orders
- Compensation for estimation oversights and other project changes

Table 7 Dry Weather Flow Diversion Elements and Costs - Oakmead Pump Station
San José/Santa Clara Water Pollution Control Plant Master Plan
City of San José

No.	Project Element	Requirements: Units	Requirements: Quantity, Rounded	Cost[1] ($000)	Comments
1.	Pipes (10 inch diameter) and valves[2][3]	LF	2,500	$190	To connect existing stormwater pump station to the sanitary sewer.
2.	Screening manhole - Manhole[4] - Trash screen - Level controls	Lot	1	$100	To screen trash prior to pump/flow control manhole.
3.	Pump/flow control manhole - Manhole[4] - Pumps (2 pumps at 900 gpm each) - Instrumentation and controls	Lot	1	$140	To pump flow to sanitary sewer system.
4.	Miscellaneous	Lot	1	$70	Modifications to Oakmead Pump Station and the valve vault and connection to sanitary sewer.
			Subtotal	$500	---
			Construction Contingency (50%)	$250	---
			Construction Cost Subtotal	$750	
			Engineering, Legal, Administrative, and Contingency (30%)	$220	---
			Total Project Cost[5]	$970	---

Notes:

ENRCCI = 8564 (August 2009 20 Cities Average), R.S Means Location Factor (2010) = 117.1

Sizing Basis: 1.83 mgd

mgd = million gallons per day

gpm = gallons per minute

(1) Costs are rounded.

(2) Distance based on following existing pipe alignments, streets, and right of way. LF = linear feet.

(3) Assumes a 10 inch diameter PVC pipe 6 feet below the surface elevation at $75/LF.

(4) Assumes a 60 inch precast concrete manhole to 16 feet below surface elevation, rounded.

(5) Project cost includes construction, construction contingency, and ELAC costs to make a complete project.

Table 8 Dry Weather Flow Diversion Elements and Costs - Nelo/Victor Pump Station
San José/Santa Clara Water Pollution Control Plant Master Plan
City of San José

		Requirements			
No.	**Project Element**	**Units**	**Quantity**	**Construction Cost[1] ($000)**	**Comments**
1.	Pipes (8 inch diameter) and valves[2][3]	LF	1800	$140	To connect existing stormwater pump station to the sanitary sewer.
2.	Screening manhole - Manhole[4] - Trash screen - Level controls	Lot	1	$100	To screen trash prior to pump/flow control manhole.
3.	Pump/flow control manhole - Manhole[4] - Pumps (2 pumps at 325 gpm each) - Instrumentation and controls	Lot	1	$110	To pump flow to sanitary sewer system.
4.	Miscellaneous	Lot	1	$70	Modifications to Nelo/Victor Pump Station and the valve vault and connection to sanitary sewer.
			Subtotal	$420	---
			Construction Contingency (50%)	$210	---
			Construction Cost Subtotal	$630	
			Engineering, Legal, Administrative, and Contingency (30%)	$180	---
			Total Project Cost[5]	$810	---

Notes:

ENRCCI = 8564 (August 2009 20 Cities Average), R.S Means Location Factor (2010) = 117.1

Sizing Basis: 0.25 mgd

Mgd = million gallons per day

Gpm = gallons per minute

(1) Costs are rounded.

(2) Distance based on following existing pipe alignments, streets, and right of way. LF = linear feet.

(3) Assumes an 8 inch diameter PVC pipe 6 feet below the surface elevation at $75/LF.

(4) Assumes a 60 inch precast concrete manhole to 16 feet below surface elevation, rounded.

(5) Project cost includes construction, construction contingency, and ELAC costs to make a complete project.

The costs presented are based on preliminary layouts, preliminary unit process sizes, and conceptual-level alternative configurations, and not on cost curve data due to lack of availability. Consequently, the construction contingency of 50 percent cannot be compared to the construction contingency discussed in PM 6.4, because PM 6.4 is based on using cost curves to develop project costs.

An engineering, legal, administrative, and contingency (ELAC) cost of 30 percent was also added, which includes the following:

- Engineering design fees
- Construction management fees
- Project management costs
- Environmental planning and review costs
- Other legal and administrative costs and fees

The construction, contingency, and ELAC costs for the dry weather flow diversion were added to produce a total project cost for the dry weather flow diversion. All costs are in Engineering News Record Construction Cost Index (ENRCCI) value of 8564 (August 2009 20 Cities Average) and adjusted to location based on a R.S Means Location Factor (2010) of 117.1.

An average of the total project costs for the dry weather flow diversion without connection to the selected sanitary sewer pipe for the Oakmead Pump Station and the Nelo/Victor Pump Station was calculated to be $570,000. This average was then applied to the dry weather flow diversions at the remaining eight stormwater pump stations as shown in Table 9. The cost for an 8 to 10 inch diameter PVC pipe at 6 feet below the surface elevation of $75/LF was then applied to the length of pipe to connect the dry weather flow diversion to the selected sanitary sewer pipe for each existing stormwater pump station. The total project cost for the dry weather diversion without connection to the sanitary sewer pipe was added to the project cost to connect the dry weather flow diversion to the selected sanitary sewer pipe to develop a total project cost for the dry weather flow diversion. All costs are in 2009 dollars for ENRCCI 8564 (August 2009 20 Cities Average) and R.S. Means Location Factor 117.1.

7.2 O&M Costs

O&M costs presented in this section are the costs to treat the flow at the WPCP, not O&M costs associated with the dry weather flow diversion at the existing stormwater pump station. Additional studies are needed to estimate any additional O&M costs that would result from the implementation of a diversion at a pump station, as a diversion may require additional equipment and infrastructure in the collection system that would need to be maintained and operated.

Table 9	Dry Weather Flow Diversion Costs[1] San José/Santa Clara Water Pollution Control Plant Master Plan City of San José			
Existing Stormwater Pump Station	**Project Cost without Connection to Sanitary Sewer Pipe[2] ($000)**	**Distance to Selected Sanitary Sewer Pipe[3] (LF)**	**Project Cost to Connect to Sanitary Sewer Pipe[2][4] ($000)**	**Total Project Cost[2] ($000)**
Golden Wheel	$570	100	$20	$590
Oakmead	$600	2,500	$370	$970
Rincon	$570	1500	$220	$790
Rincon 2	$570	3500	$510	$1080
River Oaks	$570	1,700	$250	$820
Eastside Retention Basin	$570	1,200	$180	$750
Fairway Glen	$570	800	$120	$690
Laurelwood	$570	100	$20	$590
Lick Mill	$570	1,900	$280	$850
Nelo/Victor	$540	1,800	$260	$800
Totals	$5,700		$1,980	$7,700

Notes:
ENRCCI = 8564 (August 2009 20 Cities Average), R.S. Means Location Factor = 117.1
(1) Costs are rounded.
(2) Project cost includes construction, construction contingency, and ELAC costs to make a complete project.
(3) Distance based on following existing pipe alignments, streets, and right of way. LF = linear feet.
(4) Assumes an 8 to 10 inch diameter PVC pipe approximately 6 feet below the surface elevation at $75/LF.

In order to develop the annual O&M costs per average dry weather season to treat the diverted dry weather flow at the WPCP, the billable parameter on which to base the costs had to be developed. Given relatively small solids loading in stormwater, the O&M costs were assumed to be a function of the costs associated with treating flow only. In order to develop the O&M cost of flow per mg, average day annual flow data from the WPCP from 2003 to 2007 was averaged. O&M cost data for the WPCP from 2003 to 2007 was also averaged. The cost allocation fraction for flow from Exhibit 5.9 of the San José Connection Fee Study (2009) by the FCS Group was applied to the average annual O&M cost to develop an average annual O&M cost to treat flow. The average annual O&M flow cost was then divided by the average flow and appropriate conversion factors to calculate the average unit cost as shown in Table 10. Costs have an ENRCCI equal to 8564 (August 2009 20-Cities Average).

Table 10	O&M Cost per Million Gallons to Treat Dry Weather Flows at the WPCP San José/Santa Clara Water Pollution Control Plant Master Plan City of San José			
Parameter	**Average ADAF[(1)] (mgd)**	**Cost Allocation Fraction for Flow[(2)]**	**Average Annual O&M Flow Cost[(3)] ($)**	**Average Unit Cost ($/mg)**
Flow	116	0.4161	$16,760,000	$400

Notes:
ENRCCI = 8564 (August 2009 20 Cities Average)
Mg = million gallons
ADAF = Average Day Annual Flow
(1) Average of the average day annual flows from 2003 through 2007 per PM 3.1.
(2) San José Connection Fee Study, 2009, FCS Group.
(3) Average annual O&M cost (2003 thru 2007) per data provided by the City of San José; = $40,270,000 x 0.4161.

The average unit cost for flow, equal to $400/million gallons (ENRCCI 8564, August 2009 20-Cities Average), was then multiplied by the dry weather flow at each of the ten existing stormwater pump stations diverted to the WPCP and the number of days in the dry season (April 15 to October 15) to calculate an annual average O&M cost per average dry weather flow season as shown in Table 11.

Table 11	O&M Cost per Average Dry Weather Flow Season San José/Santa Clara Water Pollution Control Plant Master Plan City of San José	
Existing Stormwater Pump Station	**Average Dry Weather Flow[(1)] (mgd)**	**Annual O&M [(2)(3)] ($000)**
Golden Wheel	0.001	$0.1
Oakmead	1.83	$130
Rincon	0.5	$40
Rincon 2	0.1	$10
River Oaks	0.25	$20
Eastside Retention Basin	0.16	$10
Fairway Glen	0.4	$30
Laurelwood	0.19	$10
Lick Mill	0.3	$20
Nelo/Victor	0.25	$20
Totals	4.0	$290

Notes:
ENRCCI = 8564 (August 2009 20 Cities Average)
(1) Assumed to be an average dry weather flow diversion.
(2) Based on $400/million gallon
(3) Based on an average dry weather flow season, which is April 15 through October 15.

7.3 Total Costs

The total project cost and the annual average O&M cost for the dry weather flow diversion at each existing stormwater pump station is shown in Table 12. All costs assume an ENRCCI equal to 8564 (August 2009, 20-Cities Average) and an R. S. Means Location Factor of 117.1.

Table 12 Total Costs for Dry Weather Flow Diversions
San José/Santa Clara Water Pollution Control Plant Master Plan
City of San José

Existing Stormwater Pump Station	Total Project Cost(1)(2) ($000)	Annual O&M Cost (1)(3)(4) ($000)
Golden Wheel	$590	$0.1
Oakmead	$970	$130
Rincon	$790	$40
Rincon 2	$1,080	$10
River Oaks	$820	$20
Eastside Retention Basin	$750	$10
Fairway Glen	$690	$30
Laurelwood	$590	$10
Lick Mill	$850	$20
Nelo/Victor	$800	$20

Notes:

ENRCCI = 8564 (August 2009, 20-Cities Average), R.S. Means Location Factor = 117.1

(1) Costs are rounded.

(2) Project costs includes construction, construction contingency, and engineering, legal and administrative costs to make a complete project.

(3) Based on an assumed $400/million gallon treated.

(4) Based on an average dry weather flow season, which is April 15 through October 15.

These costs are consistent with the estimated project costs for dry weather diversions in the City of Los Angeles, which range from approximately $200,000 to $2,800,000 (Wilson, 2003; County of Los Angeles Department of Public Works, 2003).

8.0 NEXT STEPS

This evaluation was the initial evaluation of the considerations and potential advantages of dry weather diversions to the SJ/SC System. There are a number of outstanding issues that are recommended for additional investigation beyond this initial evaluation if stormwater diversions are further considered for implementation. These outstanding issues include:

- Investigation of the O&M costs associated with an operational program to pump out pump station wet wells and a cost-benefit comparison of such an operational pumping program versus implementation of a diversion.

- Investigation of the O&M costs associated with maintaining and operating a diversion structure
- A capacity analysis of the connecting sewer line as well as downstream trunk lines and pump stations for any diversion location that is considered.
- A detailed analysis of alternative sewer connection locations for any diversion location that is considered.
- Investigation of the potential impacts of utilizing available dry weather capacity for dry weather diversions as it may relate to accommodation of planned growth.
- An evaluation of potential mercury and PCB loads to the wastewater plant, and the potential reductions that could be achieved through implementing a diversion.
- A detailed evaluation of the potential impacts that a diversion may have on treatment plant process performance and effluent quality.

9.0 CONCLUSIONS

Wet weather, first flush, and dry weather flows were defined, and a variety of regulatory considerations were addressed, as well as potential benefits and regulatory impacts from diverting these flows to the WPCP. Related existing agreements, interagency challenges, and the parallel development of the BACWA Stormwater Diversion White Paper were discussed. A variety of technical considerations in diverting flows to the WPCP were also included, such as using the existing WPCP facilities, the use of semi-permanent or permanent diversions, flow control, monitoring, pollutants and their treatability, and potential process impacts to the WPCP. The overall approach to the assessment was discussed, as well as the assumptions that were initially made as part of the scoping effort for this PM. Case studies of other agencies diverting flows to WWTPs were addressed as well. An assessment of the dry weather and wet weather/first flush flows was performed on the selected existing stormwater pump stations. The dry weather flows add to 4 mgd, which is about 4% of the flow to the WPCP. Also, the nearest appropriate sanitary sewer pipe to each existing stormwater pump station was identified, and two existing stormwater pump stations were selected for further analysis. A conceptual solution based on the dry weather flow diversions used by the City of Los Angeles was developed. Estimated project costs were developed for implementing dry weather flow diversions at the two selected existing stormwater pump stations and then extrapolated to the remaining eight existing stormwater pump stations. O&M costs to annually treat the average dry weather flow diversions at the WPCP during the dry weather season were developed.

In making future decisions regarding implementing diversions to the WPCP, additional data is needed. Suggested additional data includes flow, BOD, TSS, DO, bacteria, mercury, PCBs, diazinon, PBDEs, DDT, dieldrin, chlordane, selenium, and furan compounds for both dry and wet weather flows at the City of San José and the City of Santa Clara's existing stormwater pump stations. There is the potential for air deposition of mercury, PAHs, PCBs, and dioxin. These air deposition pollutants should be considered as part of the overall water quality picture with respect to implementing wet weather/first flush diversions to the WPCP. However, these pollutants are not issue with respect to dry weather flow diversions since, by definition, there are no deposition issues during dry weather.

The case study analysis indicated that there is not a precedent for diverting wet weather/first flush flows. The case study agency diversions were implemented to address dry weather flows only. In fact, numerous controls were put in place to ensure that the diversions went offline at the start of a wet weather event. If San José were considering implementing a diversion for the purpose of treating wet weather/first flush flows, then this would be setting a precedent, and would therefore require extensive and detailed analysis of potential impacts to the sewer system and treatment plant capacities, treatment process performance and effluent water quality.

There may be some appropriate opportunities to divert dry weather flows to the WPCP, but these decisions would need to be made on a case by case basis. In addition, while it is technically feasible to divert dry weather flows to the WPCP, the impacts to the water quality are unknown. The case study agencies all adopted a diversion strategy where the diverted dry weather flows are small relative to sanitary sewer flows and that the diversions only occur in dry weather conditions when the respective sanitary sewers have the most available capacity. For the case study agencies, diversion flows did not exceed 6% of the respective treatment plant dry weather flow. If San José were considering implementing a diversion that would generate a diverted flow percentage greater than 6% of the WPCP dry weather flow then additional studies should be conducted to assess feasibility and potential impacts to treatment performance and effluent quality.

In addition to addressing the technical challenges of implementing a diversion, institutional, legal, and policy considerations should also be taken into account before the implementation of a diversion.

REFERENCES

REFERENCES

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5. http://www.epa.gov/OW-OWM.html/mab/owm0319.pdf
6. http://www.cabmphandbooks.org/Documents/Development/Appendix_D.pd
7. FCS Group. 2009. San José Connection Fee Study.
8. Wilson, R. 2003. *The Use of Dry Weather Storm Drain Diversions in California – Diverted by Diversions?.* Surfrider Foundation.
9. County of Los Angeles Department of Public Works, November 6, 2003. Letter to the Board of Supervisors for the County of Los Angeles, subject: Resolutions to Negotiate, Accept, and Execute Two Proposition 40 Reimbursable Grants from the California State Water Resources Control Board for Project Nos. 501 and 5241 Low-Flow Diversions in the Santa Monica Bay. Noyes.

APPENDIX A - PM 4.9 STAKEHOLDER MEETING ON JUNE 10, 2009 MEETING MINUTES

San José/Santa Clara Water Pollution Control Plant Master Plan

CONFERENCE MEMORANDUM

Project:	San José/Santa Clara Water Pollution Control Plant Master Plan	**Conf. Date:**	June 10, 2009
Client:	City of San José	**Issue Date:**	July 8, 2009
Location:	San José City Hall		
Attendees:	San José: Kirsten Struve, Matt Krupp, Dale Ihrke, David Tucker, Thuy Nguyen, Alan Kam, Mike O'Connell, Joe Vafa, Mirabel Aguilar, Melody Tovar, James Downing, Raymond Ho	Santa Clara: Chris deGroot, Dave Staub	Carollo: Steve McDonald, Priscilla Bloomfield
Purpose:	Stormwater Diversion PM Meeting		
Distribution:	Attendees	**File:**	7897B.00

Discussion:
The following is our understanding of the subject matter covered in this conference. If this differs with your understanding, please notify us. Agenda is attached to the end of this file.

1. Purpose of Meeting

The purpose of this meeting was to meet with staff members from the Cities of San José and Santa Clara to discuss the development of PM 4.9 - Conceptual Stormwater Diversion Assessment, the scope, the assumptions, interaction with BACWA project, and data needs/availability.

2. Discussion

The items addressed during the discussion are provided in below:

- Ongoing BACWA work to develop a white paper to identify issues with stormwater diversions, including regulatory considerations, to be completed by end of the year.
- City of Los Angeles is doing similar stormwater diversion piloting work and will be looked at as a case study for the BACWA work.
- This PM does not address legal issues, only technical and tactical considerations and estimated costs. Will look at 2 stormwater pump stations and their characteristics (location to collection system, connection to system, capacity, etc) as a pilot and extrapolate for the remaining stormwater pump stations.
- Need to be aware of MRP and 13267 (stormwater) requirements. Will require monitoring and sampling for discharges to Guadalupe. Plan is in development, required to have first samples by Sept 30, 2009. MRP requires receiving water quality data.
- Santa Clara has 21 pump stations.
- Discussion on definition of first flush, volume of flows, physical considerations,

operations, maintenance, flow control, peaks, etc.

- There is some old stormwater data from 10-12 years ago.
- RWQCB is interested in the largest pump stations as candidates for diversion.
- Discussion on the timing of this PM, City has lot of other ongoing stormwater work. Schedules for Collection System Master Plan (completion targeted for end of 2010) and BACWA to be compared to determine whether to delay development of the PM. Consider a worst case estimate prior to the TAG meeting in September.
- Key assumptions:
  - Capacity requirements/issues in the collection system will not be addressed by the WPCP master plan. Volume of stormwater to be considered for diversion will not be in excess of the WPCP or collection system capacity.
  - Volume of dry weather flows will be one fifth the reliable capacity of the pump stations. Assumes 6 hours. Use same design storm as defined by Shin Roei (RWQCB). Discussion on if this is only the first storm of the season.
  - Volume of first flush flows will be one half the reliable capacity of the pump stations.
  - Engineering details for the cross connects between collection and storm systems will not be developed, but the estimated costs for cross connections at each pump station will be assumed to consist of a new force main and junction box connection to the collection system.
  - Order of magnitude planning level capital and O&M costs.

3. **Action Items**

The list of Action Items below is listed by SJ/SC WPCP staff responsible for delivering the item.

- Matt Krupp to coordinate collection data with Priscilla Bloomfield (Carollo).
- City to provide copy of 13267 and MRP requirements to Priscilla Bloomfield (Carollo).
- City to provide Collection System Master Plan schedule to Priscilla Bloomfield (Carollo). Schedule for development of the PM to be determined.
- Carollo to develop work plan/flow chart/logic diagram that includes intermediate conclusions and when items will be reviewed by City staff.

4. **Key Issues Tracking List**

5. **Decision Log**

6. **Calendar Updates**

7. **Attachments**

Prepared By:

____

Priscilla Bloomfield

PJB:hsm

APPENDIX B - CASE STUDY SUMMARIES

BACWA Stormwater Diversion White Paper
Case Studies Reporting Form

Agency: City of Los Angeles, CA

Name of Respondent: Adel Hagekhalil/Wing Tam

Job Title of Respondent: Assistant Director/Assistant Division Manager

Contact Information:
Phone: 213-485-2210/213-485-3985
Email: adel.hagekhalil@lacity.org/wing.tam@lacity.org

GENERAL

Are there any available documents on your stormwater diversion project?
Wing Tam to send presentation material, costs, contact information, stormwater master plan, permission letter from EPA

Number of diversions (first flush versus dry weather flows):
23 in total, 8 are owned by the City that go directly to Santa Monica Bay, the County (Public Works) and Santa Monica own the others. The 8th Street diversion was added to address high bacteria counts (7,000-8,000)coming from that area of the City due to homeless and produce that were directly discharged to the LA River. Cost was bout $100,000-$200,000. Dry weather only. Pump stations shut during a rain event. Diversions based on benefit to receiving water, proximity to a large trunk sewer, pump station. There are 4 phases of low flow diversions - they are upgrading the collection system and the 8 City owned diversions. 2000 storm drains discharge to LA River. 300 storm drains discharge to Balloa Creek.

Number of years diversions have been in place:
Since 1997 or 1998. Initially just dry summer flows, as of 2009/2010 (winter) they will take year round dry flows. Expecting winter flows to be much larger than summer flows - the groundwater table is up and people use more water. After a rain event the diversion is shut down for 3 days. They are looking at first flush, will be conducting a pilot study to take the “worst” of the flows (ie, worst in terms of loading). SCCWRP is doing a regional research project on first flush.

Size (area) of stormwater service area:
1500 miles of pipe

Capacity of stormwater system:
Not available.

Estimated annual flow sent to wastewater treatment plant by diversions:
17 mgd, dry weather only

Capacity of receiving wastewater treatment plant:
375 mgd at Hyperion, currently seeing flows of 280 mgd. No collection system capacity issues with dry summer flows, one concern with dry winter flows - City is upgrading that section of the collection system at Santa Monica Canyon Channel (capacity is 3.2 mgd, upgrade will be 7.75 mgd).

INSTITUTIONAL ISSUES

What was the regulatory impetus to implement the diversions?
Initially no regulatory driver, impetus was the water quality at the beaches forcing beach closures. Then a bacterial TMDL for Santa Monica Bay was put in to place which furthered the efforts to take dry weather flows - NPDES permit amended to include TMDL. Wing to send presentation.

If applicable, please describe the roles of the stormwater and wastewater agencies in planning and implementing the diversions (including description of existing agreements and local laws, and POTWs ability to accept/deny/condition diversions).
Low flow stormwater master plan was initially done (1996) to investigate taking the diversions. Expanded definition of low flow to include no rain.

Did the wastewater agency receive any regulatory concessions or protections (i.e. to prevent permit violations) from the Regional Board in exchange for accepting the stormwater flows?
No. However, they had to get permission from EPA to take the dry weather flows in order to not jeopardize the EPA grants that they were given to fund Hyperion WWTP.

Has there been a change in the POTW permit status as a result of accepting stormwater diversions (i.e. regulated as a CSO versus an SSO?)
No. However the RWQCB will change the stormwater NPDES permit to include the bacteria TMDL exceedences. The Basin Plan has not been amended, but the City is still liable for any exceedences. The City has seen a 10% in bacteria.

Is there an agreement between the stormwater and wastewater agencies to terminate the diversion program/system? If so, what are the conditions for terminating the stormwater diversion program/system?
City has 29 contract cities who don’t want to pay for stormwater

Describe interface issues (i.e. ownership of infrastructure, funding, liability, etc.)

What is the permitting vehicle for regulating the diversions?
RWQCB considers this a stormwater BMP for LA. LAstormwater.org has the permit online. City has a permit for the collection system and a permit for the stormwater system.

TECHNICAL ISSUES

What were the water quality benefits the diversions were designed to achieve?
Originally, reduced beach closures and improved water quality at the beaches. Then, in addition, to meet the bacteria TMDL for Santa Monica Bay. The TMDL is measured by geometric mean in “allowable days”. Went into effect in 2003 for dry weather, 2005 for wet weather. Dry weather from April 1 to Oct 31 is 0 days, from Nov 11 to March 31 is 3 days, in wet weather is 17 days. Also AB411 is a statewide bill.

What criteria were use to determine the diversion location and volume?
Diversions were discharges to Santa Monica Bay. The 8th Street diversion was added because of very high loadings in that catchment area due to fish markets, etc.

Have the diversions achieved those goals? If not, what are the main obstacles?
Yes. Heal the Bay (Mark Gold) reports that the diversions have improved water quality and reduced beach closures. Part of the success is also due to reduced SSOs.

How have the diversions affected wastewater treatment process operations (including physical, chemical and biological processes), effluent quality, or biosolids, if at all?
No, but 17 mgd out of 300 mgd is not significant. And only dry flows are taken (no wet flows).

How is stormwater quality monitored?
It is not. There is some monitoring for bacteria, but that is limited. Specific projects monitor more than bacteria. There are some concerns where there is not much dilution. There are LEL sensors in each diversion pump wet well to detect the presence of hydrocarbons (due to a gasoline spill), which causes the pump station to be shut down automatically if a set level is exceeded. It also sends a message to the WWTP to alert them. The screens are cleaned regularly of trash and leaves to prevent overflows at the wet well.

How is flow monitored?
Mag meters on the pumps. They also use some portable velocity meters and weird to temporarily monitor flows.

How is stormwater flow to the wastewater treatment plan controlled (manual, automatic, remote, passive)?
Flow is controlled by design - pipe size/weir from the screening wet well to the pump wet well, the pump capacity, and the flow level sensors in the pump wet well. The pump stations can be shut down manually, automatically (level sensors), and via SCADA. There is a mechanical screen prior to the pumps that collects trash. They are adding a new diversion (7th Street) that is gravity. There will be a valve and a trap to prevent gas transfer. They do all their designs in house. There is no treatment occurring in the system. A big issue is backup power - either permanent or a plug for temporary power is installed at each diversion.

ECONOMIC ISSUES

How are the costs for the diversions allocated between the stormwater and wastewater agencies (if applicable)?
Capital costs to design and construct the diversions were paid for by the stormwater fund. Paid for largely with Prop O funds.

Was the wastewater agency able to recoup any costs incurred by implementing the project? From whom?
They did not pay for the capital costs. O&M costs are paid based on flowfor by the stormwater fund to the wastewater fund via an annual service charge. A connection fee to hook up to the collection system was not charged as the connection is considered a "temporary connection". Not taking any capacity permanently.

Are costs available for either/both project costs or O&M costs for the diversions?
Yes, Wing to send. Estimated costs are \$300,000 - \$400,000 per year in O&M costs for the 8 pump stations.

OTHER

Are there other aspects of your diversion project that are important to note?

Are there other stormwater and/or wastewater agencies in California or other states, that you think could provide information for this study?
Los Angeles County Sanitation District (this might not be the technical name) - they have issues about when they discharge at certain times of the day and their detention ponds, different than the City. Wing to send contact info. Los Angeles County Public Works, OCSD, Ventura, and San Diego. Talk to Mark Gold at Heal the Bay. Look at SMURFF - half owned by City, half owned by Santa Monica. Provides treatment, has MF and UV. City of LA has control.

DATA PROVIDED

- Presentation
- LA Sanitation Year at a Glance

OTHER

- Santa Monica captures some first flush flows.
- LA is trying to raise additional funds for stormwater. They feel that planning/water quality issues will really start to come to the forefront.
- The City is doing a pilot to disconnect residential drains to the stormwater system and to use rain barrels or rain gardens instead. The pilot will lead to the development of standards. City does LID to address water quality and water supply issues.
- City is conducting pilot studies on new technology for maintenance - where a bacteria (good) is used to eat another bacteria (bad) or FOG.

BACWA Stormwater Diversion White Paper
Case Studies Reporting Form

Agency: OCSD

Name of Respondent: Tom Meregillano/Jim Colston/Mary Sue Thompson

Job Title of Respondent: Regulatory Specialist of Source Control/XXX

Contact Information:
Phone: x7457
Email: tmeregillano@ocsd.com/jcolston@ocsd.com/mthompson@ocsd.com

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GENERAL

Are there any available documents on your stormwater diversion project?
Yes, Tom to sent documents:
1. The initial CH2M Hill study on capacity to accept dry weather stormwater diversions.
2. The OCSD Board Policy (adopted in 1999?) on acceptance of dry weather stormwater diversions.
3. An example pretreatment program permit for one of the 4 cities that currently divert.
4. The follow up study (3-yr post study) by CH2M Hill assessing the program.
5. Data summary on stormwater quality and flow.
6. Any O&M cost data on the additional cost to treat these dry weather diversions at the plant (separate from the costs to divert).
7. Any capital, and O&M costs on the diversion facilities, if available.

Number of diversions (first flush versus dry weather flows):
19, dry weather only. Newport Beach (1), Huntington Beach (11), Irvine Ranch Water District (2), Orange County (4), and Irvine County (1). Dry weather, dry days only. Channels that are diverted are Santa Ana River (.2 to .5 mgd, used a v notch in the channel with a new dam, no flow meter but requires study every 2 years), Talbert, Huntington Beach/Adams, and Greenville. As soon as the rain gauge registers rain, the pump stations shut down. They prioritize the shutoff of the pump stations. Diversions are accepted on a case by case basis, based on priority and pipe capacity. Permitted as pretreatment.

Number of years diversions have been in place:
Since 1999 (emergency only)/2000 (full time).

Size (area) of stormwater service area:
Stormwater service area owned by individual cities and county. OCSD service area (all cities/county). Diversions provided to over half of the service area, but theoretically available to entire service area. Diversions granted based on priority, priority based on water quality impact

(beach, sensitive area). Decisions made by Stormwater Technical Advisory Committee (cities and county) using a standard work flow process. OCSD can decline.

Capacity of stormwater system:
Stormwater service area owned by individual cities and county. CH2M Hill did a capacity study to determine which pipes could take what flows for OCSD.

Estimated annual flow sent to wastewater treatment plant by diversions:
Between .4 and 3 mgd. Have capacity to take 10 mgd.

Capacity of receiving wastewater treatment plant:
18 diversions go to Plant 2, 1 diversion goes to Plant 1.

INSTITUTIONAL ISSUES

What was the regulatory impetus to implement the diversions?
The RWQCB was putting pressure on the cities to address the beach closures, wanted major flows to be diverted. OCSD did a study to determine if the high bacteria counts were due to the outfall - study showed that was not the case, due to the nonpoint source runoffs. Public has been pointing the finger at OCSD. While this was not OCSD's problem to solve, they stepped up (Blake Anderson) to provide a "band aid" - a temporary fix on an emergency basis. Now, it has turned in to more of a permanent solution. After the diversions had begun, a bacteria TMDL was placed on Huntington Beach, which further added to the efforts to diver runoff. There are 23 "hotspots" with approved discharges.

Please describe the roles of the stormwater and wastewater agencies in planning and implementing the diversions (if applicable).
The RWQCB was not involved in the process at all.

Did the wastewater agency receive any regulatory concessions or protections (i.e. to prevent permit violations) from the Regional Board in exchange for accepting the stormwater flows?
No.

Has there been a change in the POTW permit status as a result of accepting stormwater diversions (i.e. regulated as a CSO versus an SSO?)
No. However OCSD did have to change their original charter to be able to accept runoff flows. They also had to change their health and safety code to be able to accept runoff.

Is there an agreement between the stormwater and wastewater agencies to terminate the diversion program/system? If so, what are the conditions for terminating the stormwater diversion program/system?
OCSD does have the right to refuse diversions and to stop taking flows at their discretion. Tom to provide this policy language to us.

TECHNICAL ISSUES

What were the water quality benefits the diversions were designed to achieve?
Reduced bacteria loadings leading to beach closures. Later diversions also aimed at protecting biologically sensitive areas, like Cove Creek. Divert from Santa Ana, Greenville, and Talbert, as well as from 2 creeks in the Irvine Water District.

What criteria were use to determine the diversion location and volume?
Areas that would have the most water quality benefit, ie not stagnant areas, ones with a lot of flushing. Creeks, rivers, biologically sensitive areas. 4 mgd set based on the City of Huntington Beach's estimate of 1 mgd of flows and the County's estimate of 1 mgd and using a safety factor of 2 ((1 mgd+1 mgd)*2 = 4 mgd). This was a policy decision. Blake felt it was not up to OCSD to solve the urban stormwater runoff problem.

Have the diversions achieved those goals?
Yes. Orange County Health Care Annual Beach Water Quality Report states improved water quality due to the diversions (and reduced SSOs) from 1985 to 2006, recorded in beach mile days. There is about a 50% reduction in beach closures as a consequence. AB411 standard addresses bacteria in receiving water.

How have the diversions affected wastewater treatment operations or effluent quality, if at all?
No. The stormwater is cleaner than sewage. However, 4 mgd (stormwater flows) out of 220 mgd (wastewater flows) is pretty small. In addition, they have seen some "exotic" chemicals, mostly pesticides (likely from golf course and nursery runoff). Since they are recycling water and doing groundwater recharge, they are paying close attention to these chemicals and may potentially decide in the future to no longer take flows due to the impacts to the GWR (Plant 1) from these pollutants. They have been able to correlate open space with pesticide use

How is stormwater quality monitored?
OCSD provides a list of pollutants to monitor, and the cities do the monitoring. OCSD has some first flush data, and has provided water quality data to Carollo.

How is flow monitored?
Cities self monitor flows (how was not discussed) and send monthly flows to OCSD.OCSD compiles all the flows and sends them back out to the cities.

How is stormwater flow to the wastewater treatment plan controlled (manual, automatic, remote, passive)?
Telemetry. The flows are only accepted on dry days. When the rain gauge registers, the pump stations automatically turn off. Rubber dams are used to divert flows from channels to the pump stations. There are emergency and rain teams that are available to manual shut down the pump stations, were implemented prior to telemetry installation. All but 1 diversion is pumped. There are 9 retrofitted pump stations. The diversion that is gravity fed is controlled through a 2' pipe to

the collection system and is shut down from Nov to Apr. A flow study was done to ensure that this approach would work.

ECONOMIC ISSUES

How are the costs for the diversions allocated between the stormwater and wastewater agencies (if applicable)?
Accept flows up to 4 mgd at no cost to cities/county. Any flows over 4 mgd, the cities/county pay the industrial rate structure (level 1).

Was the wastewater agency able to recoup any costs incurred by implementing the project? From whom?
The cities paid for the costs to install the diversions. Rubber dams are being used to close off channels. Treatment costs are not shared, but this may change in the future.

Are costs available for either/both project costs or O&M costs for the diversions?
Yes, in CH2M Hill report. Tom to provide.

OTHER

Are there other aspects of your diversion project that are important to note?
It has been a very positive program but expensive.

Are there other stormwater and/or wastewater agencies in California or other states, that you think could provide information for this study?
San Diego and SOCWA. Suggest we look at Santa Monica's SMURFF facility. Larry Honeymore at the Orange County Health Care organization. Charlies McGee, the OCSD microbiologist.

DATA PROVIDED

- OCSD WDR
- Constituent Analysis Summary 2000-2009
- Dry Weather Diversion Study
- Urban Runoff Discharge Charges
- Dry Weather Urban Runoff Discharge Permit Example
- Urban Runoff Flows 2001-2007
- Dry Weather Urban Runoff Policy
- Urban Runoff Study
- Los Trancos diversion information

OTHER

- OCSD did “mini” watershed inspections for each pump station to identify what land uses were in the area (and perhaps able to get into the diversion), ie, gas stations, dry cleaners, industries, etc. Before issuing a permit, they do a GIS survey of the watershed and major potential sources of discharges and types. Nonpoint source is the major issue. OCSD works with the contract agency to prioritize which area to be developed.
- The manholes for the pump stations are dredged once a year , sediment is high in metals.

TOUR

Talbert Channel Low Flow Diversion

- County owned and operated. OCSD has the authority to shut down the diversion pump stations (for all) through an agreement with the contracting agencies, their board policy, the permit, and their WDR.
- 1999 initiated, 2002 permanent.
- The County is not charged any permit fees. They estimate it costs $1098/MG to treat the runoff (mainly the BOD and TSS).
- Use a rubber dam (42” dia?) to divert flows from channel to pump station. Deflates during rain events and reinflates in dry weather. Dam helped in a sewer spill, sending flow to collection system rather than into the receiving water.
- Have seen a drop in BOD since the diversion has been in place.
- The other side of the channel (downstream) experiences algae blooms that are treated once a year with an algaecide (upstream and downstream) and odor control agent for odor issues with diquat dibromide (high copper content). RWQCB ok’ed this.
- Diversion has a pipe from the channel to a wet well. Use 2 pumps in a rotating system (only 1 at a time), each pump can pump 500 gpm max - this is used to help control flow. There is a mag meter as well that is installed. A 6” pipe controls the flow to the collection system. There are screens in the channel and in the wet well before the pumps to protect the pumps from trash and debris.
- County paid to install the diversion with Prop 50 money.
- Average flows are .1 to .2 mgd with a high of .4 mgd.
- Carollo should speak to County if interested in obtaining the drawings for the diversion.
- The telemetry system sends the flow volume to the County, which reports them to OCSD.
- There are no hydrocarbon sensors.

Hamilton Pump Station Low Flow Diversion

- City owned and operated.
- Discharges to the Santa Ana River in wet weather.
- Located very close to the trunk sewer (in nearby road).
- Storm drain has a very slow flow, which lead to build up of sulfides. Sulfides where exceeding the limits at the plant. Use air to blow back up the pipe to control the sulfides.
- 1 pump at 300 gpm, a mag meter has been installed, and there is a 4” line to the trunk sewer, which is used to control flow in addition to the pump capacity.

Los Trancos (Crystal Cove) Low Flow Diversion

- Runoff from detention ponds, golf course, and possibly some natural springs from a subdivision that was required to keep all runoff on site.
- Dry runoff and stormwater are combined during wet weather and discharged to beach - Crystal Cove, which is a sensitive habitat.
- The rain gauge turns off the pump station automatically. There is also a telemetry system, manual shutoff, and email notification is sent to the operations staff to shut down the pump station in a rain event.
- There are 2 pumps with a screen and a wet well. The flow rate is also measured.
- Since diversion has been in place, the local kelp forest has been coming back.

BACWA Stormwater Diversion White Paper
Case Studies Reporting Form

Agency: City of Ventura

Name of Respondent: Richard Bradley

Job Title of Respondent: Environmental Services Supervisor (responsible for diversion project)

GENERAL

Are there any available documents on your stormwater diversion project? No time to retrieve.

Number of diversions (first flush versus dry weather flows): 2 diversions - each in a separate location. Both dry weather flows. Never heard of first flush diversions.

Number of years diversions have been in place: 2 years

Size (area) of stormwater service area: 66 acres and 20 acres

Capacity of stormwater system: Don't know - one is 4x6 ft underground channel, other is 48 inch CMP

Estimated annual flow sent to wastewater treatment plant by diversions: 3-4 gpm when operating, and they operate most of the time

Capacity of receiving wastewater treatment plant:
14 mgd design and permitted capacity. Current average annual flow is 9.3 mgd.

INSTITUTIONAL ISSUES

What was the regulatory impetus to implement the diversions? No, just serving community and economic interest of city because each of the storm drains discharge at popular beach.

Please describe the roles of the stormwater and wastewater agencies in planning and implementing the diversions (if applicable). Richard had to interact a lot with POTW, and had to take a lot of input so operators would feel comfortable with direct connection. There was a lot of opposition. Single hardest thing was working with operator. POTWs get a lot of pressure to help bail out general fund, and they need to be defensive so they're not pressured into doing something that will compromise their main priority. No formal agreement to reverse diversions if POTWs have future regulatory/capacity problems.

Did the wastewater agency receive any regulatory concessions or protections (i.e. to prevent permit violations) from the Regional Board in exchange for accepting the stormwater flows? No, but they probably didn't ask for any. They talked with Regional Board. Filed a Mitigated Negative Declaration because of archaeological considerations.

TECHNICAL ISSUES

What were the water quality benefits the diversions were designed to achieve?
Getting discharges off of popular beach. Ocean water quality testing for bacteria (AB 411 testing), but aesthetic considerations most important. One of stormdrains was 50-100 years old that stagnated and became malodorous. The other stormdrain discharged to the beach and would puddle in a prime tourist area. This site attracted rodents.

Have the diversions achieved those goals? No decrease in number of days of beach closures because it's mostly related to rainfall.

How have the diversions affected wastewater treatment operations or effluent quality, if at all? The operator has had concerns since they've gone in.

How is stormwater quality monitored? Difficult to do. Measure at bottom of sump, but water there is stagnant, so generally worse than is truly representative. Didn't get into much detail in testing individual compounds. County (Ventura County Watershed Protection District) website may have test result data.

How is flow monitored? Flow meter, don't know what kind.

How is stormwater flow to the wastewater treatment plan controlled (manual, automatic, remote, passive)?
Attached to SCADA. Have them year round, deactivated automatically by rain gauges, then need to be turned back on by staff. When triggered, the system turns off pump in catchment.

They're programmed to come back on after time after rainfall, but overridden by staff if I/I. They also have maximum volume - 40 gpm initially, reduced to 5 gpm, because POTW didn't want such high flows. When they get to 5gmp now, they shut off.

Do you know whether diverting flows had an affect on water quality or flows in neighboring streams or creeks? Not applicable - they were beach discharges.

ECONOMIC ISSUES

How are the costs for the diversions allocated between the stormwater and wastewater agencies (if applicable)? Most other cities don't pay POTWs, but Ventura payed $200K in connection fees and industrial charges per gallon for treatment costs - based on industrial rates. Connection fees money came from general fund. Stormwater paid for the physical connections.

Was the wastewater agency able to recoup any costs incurred by implementing the project? From whom?

Are costs available for either/both project costs or O&M costs for the diversions? For construction $200K for design (for both), and $400K to construct each. Approx $10-20K for both in O&M for maintenance and pump replacement.

OTHER

Are there other aspects of your diversion project that are important to note? The SW and sanitary collection system connection points were close together.

They looked at other coastal communities (10 to 15 other agencies). City of LA and Orange County to begin with.

UV/Ozone onsite treatment may be preferable if POTW is very difficult (Encinitas, Oceanside).

BACWA Stormwater Diversion White Paper
Case Studies Reporting Form

Agency:City of Santa Cruz

Name of Respondent: Steve Wolfman

Job Title of Respondent: Associate Engineer, Public Works Department

Contact Information:
Phone: 831-420-6050
Email:

GENERAL

Are there any available documents on your stormwater diversion project?
On the City website in the stormwater permit section there is a stormwater management plan (chap 1) that includes a chapter on the Neary Lagoon, which is the largest of the 4 diversions.

Number of diversions (first flush versus dry weather flows):
4, all dry weather.

Number of years diversions have been in place:
Near Lagoon for 10 years. Other three for 2 years.

Size (area) of stormwater service area:
Nearly Lagoon - several hundred acres
Other three - several acres

Capacity of stormwater system:
Unknown

Estimated annual flow sent to wastewater treatment plant by diversions:
Nearly Lagoon - several hundred thousand gallons per day
Other three - very low flow that is manually discharged from pump station approximately once per week.

Capacity of receiving wastewater treatment plant:
17 mgd

INSTITUTIONAL ISSUES

What was the regulatory impetus to implement the diversions?
Neary Lagoon - The lagoon detains storm water, urban runoff, and groundwater from the watershed prior to its discharge into Monterey Bay. A fixed weir controls the water level. The City used to keep the lagoon backed up during the summer when there was a lot of beach use. This led to water quality issues from stagnant water that was then released all at once. Current operation is to use the diversion to drain the lagoon and send the water to the WWTP. There was not a specific regulatory driver, but the City had some general concern about the old approach with respect to water quality bacteria and others) when the lagoon was released.

Other three - These catchments drain to waters impaired for bacteria. Driver was to improve water quality condition.

If applicable, please describe the roles of the stormwater and wastewater agencies in planning and implementing the diversions (including description of existing agreements and local laws, and POTWs ability to accept/deny/condition diversions).
Not applicable since the city is responsible for stormwater and wastewater.

Did the wastewater agency receive any regulatory concessions or protections (i.e. to prevent permit violations) from the Regional Board in exchange for accepting the stormwater flows?
No

Has there been a change in the POTW permit status as a result of accepting stormwater diversions (i.e. regulated as a CSO versus an SSO?)
No, but in the preamble of the permit there is reference to having permission for the POTW to accept stormwater.

Is there an agreement between the stormwater and wastewater agencies to terminate the diversion program/system? If so, what are the conditions for terminating the stormwater diversion program/system?
No

Describe interface issues (i.e. ownership of infrastructure, funding, liability, etc.)
Not applicable

TECHNICAL ISSUES

What were the water quality benefits the diversions were designed to achieve?
Neary Lagoon - bacteria loadings, aesthetics
Other three - bacteria

What criteria were use to determine the diversion location and volume?
Unknown

Have the diversions achieved those goals? If not, what are the main obstacles?
Neary Lagoon - yes
Other three - no specific information on effects on receiving waters

How have the diversions affected wastewater treatment process operations (including physical, chemical and biological processes), effluent quality, or biosolids, if at all?
Not a concern since diversion flow is low relative to treatment capacity.

How is stormwater quality monitored?
The MS4 permit may have information on monitoring,

How is flow monitored?
Unknown

How is stormwater flow to the wastewater treatment plan controlled (manual, automatic, remote, passive)?
Neary Lagoon - Upstream of the weir there is a valve that the City manually opens. Typically this valve is open during the summer months as well as other times of the year when rainfall happens to be infrequent. Use of the beach (nice weather) can be the driver for draining the lagoon to the WWTP.

Other three - These diversions are at stormwater pump stations. It is very low flow. Approximately once per week in the dry season, and operator manually turns on the pump that feeds a small (2 inch) line going to the WWTP.

ECONOMIC ISSUES

How are the costs for the diversions allocated between the stormwater and wastewater agencies (if applicable)?
Not applicable

Was the wastewater agency able to recoup any costs incurred by implementing the project? From whom?
Not applicable

Are costs available for either/both project costs or O&M costs for the diversions?
Neary Lagoon - Capital cost about 10K, O&M not well known
Other diversions - About 50K or less each. However, these were constructed with grant money and other related projects were completed, including local projects that minimized infiltration in the areas upstream of these diversions.

OTHER

Are there other aspects of your diversion project that are important to note?

Are there other stormwater and/or wastewater agencies in California or other states, that you think could provide information for this study?