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DRAFT Memorandum

*To: San Bernardino County Flood Control District,
Risk Sciences*

From: CDM

Date: November 23, 2009

*Subject: Dry weather Bacterial Indicator TMDL Compliance Cost for San
Bernardino County Portion of the Santa Ana River Watershed – Draft*

This technical memorandum evaluates the potential use of urban dry weather runoff diversions to eliminate bacteria loads during dry weather conditions for the San Bernardino County portion of the Santa Ana River watershed. This is the most effective means of achieving compliance with dry weather TMDL targets by 2016. The extent of implementation and associated costs will be highly variable, therefore the analysis results are presented as a range.

Identification of Diversion Locations

The Santa Ana Region Water Quality Control Plan (Basin Plan) was used to identify a set of open channel waterbodies in the San Bernardino County portion of the Santa Ana River watershed that are currently listed for unrestricted water contact recreational use (REC-1). San Bernardino County recently completed a survey of drainage facilities and developed a GIS database, which includes underground stormwater collection features¹. These data were supplemented by city-specific data, where available; however, collection system data was not available from all cities, in particular Colton, Yucaipa, Rialto, Upland, Highland, San Antonio Heights, Grand Terrace, Muscoy, and Bloomington. The locations of outfalls from the underground stormwater collection system to surface waterbodies were approximated by comparing these data sources with the location of surface waterbodies (Figure 1).

This spatial analysis identified approximately 100 locations (within Cities with available GIS data) where diversion of urban dry weather could be implemented within the San Bernardino County portion of the Santa Ana River watershed. For each of the dry weather runoff diversion candidate locations, the jurisdiction and downstream receiving waterbody were documented. Because data was not available from all cities, this number is likely an underestimate.

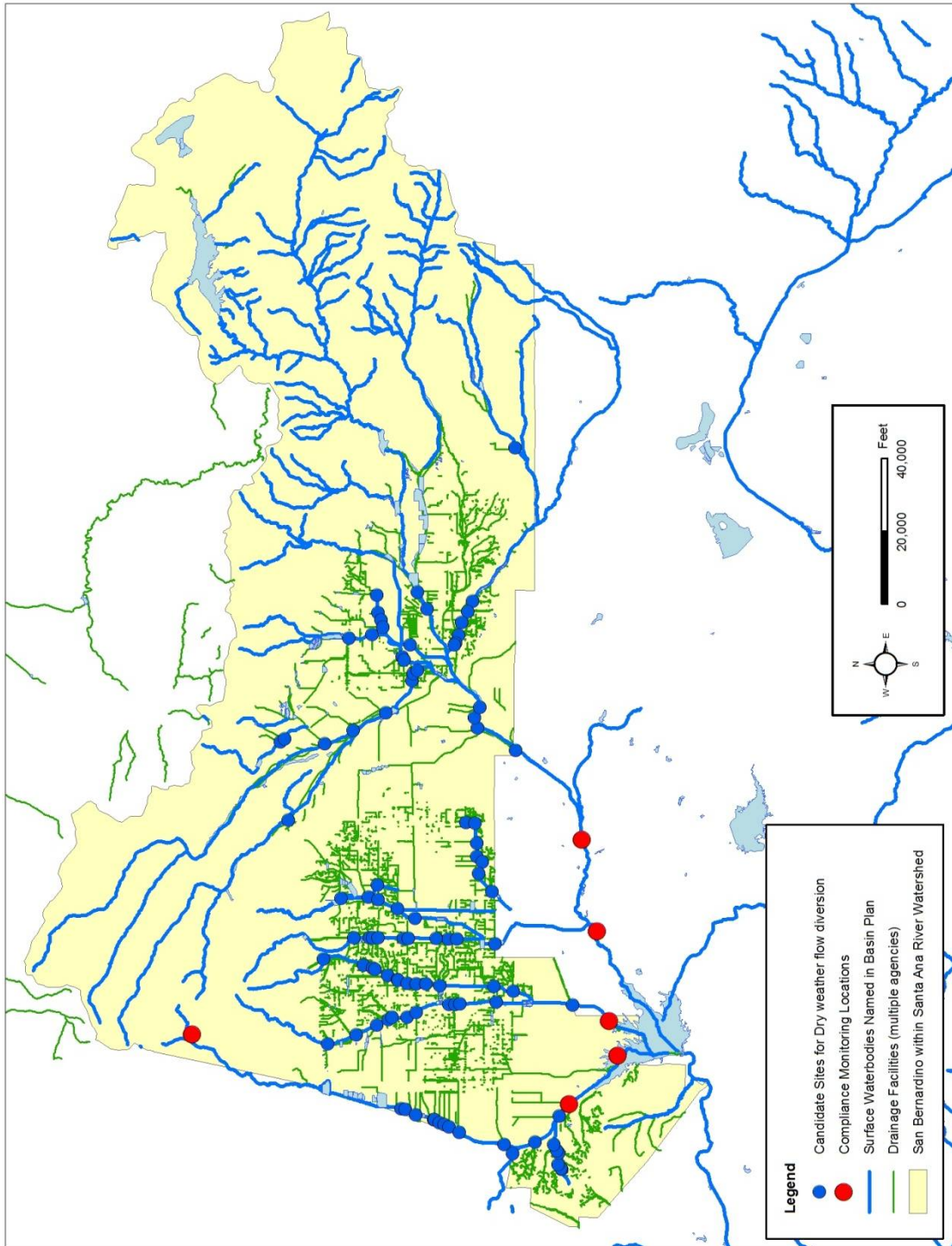


Figure 1
Map of Candidate Dry Weather Runoff Diversion Locations in San Bernardino County
within the Santa Ana River Watershed

Planning Level Cost Estimate

Engineered facilities associated with urban dry weather diversions from the stormwater to sanitary collection system do not vary significantly between sites due to the relatively low flowrates addressed; therefore, a unit cost per diversion is appropriate for this analysis. Generally for any diversion project, new facilities include two additional manholes/structures, one equipped with a gross solids removal device to protect pumping equipment and wet weather bypass and the other used as a wet well for pumping dry weather flows into a new force main to the nearest sanitary sewer with sufficient capacity to accept the flow. Capital costs for this type of a diversion facility are estimated at approximately \$1.7 million². Due to the coincidence of stormwater and sanitary collection systems throughout most of the area of investigation, 1,000 feet of small diameter (6 -inch) force main was assumed for an average project. At a rate of \$100 per linear foot, the cost of conveyance pipeline would be approximately \$100,000 per project. Specific projects would need to revise this value based on a survey of existing sewer interceptors. Therefore, the total capital cost of a typical diversion is \$1.8million.

The cost of diversion of dry weather runoff also includes capital and O&M for use of conveyance and treatment capacity in the municipal sanitary sewer system and wastewater treatment facilities. For this analysis, these costs were not determined specifically for all wastewater service agencies within the area of investigation, which include Inland Empire Utilities Agency, and Cities of Colton, Rialto, San Bernardino, and Redlands. Agreements with these local sewerage agencies would need to be developed to establish the ability and willingness of the wastewater programs to accept a certain amount of flow and develop costs of diversion specific to San Bernardino County and the discharge of urban runoff. These agencies may be willing to consider a reduced rate for urban runoff considering it has very low TSS and BOD compared to typical wastewater and if necessary it could be temporarily held and delivered during off-peak hours.

Capital cost for capacity and O&M fees (for flow, TSS, and BOD of influent) have been estimated for the City of Los Angeles, which currently providing conveyance and treatment of urban dry weather runoff. The City of Los Angeles operates a relatively larger system than local agencies and therefore may underestimate capital improvements required at smaller treatment plants to take additional flow. Several key assumptions were made to estimate the cost of conveyance and treatment:

- Flow at each diversion is 0.5 cfs. This estimate is based on an assumed urban dry weather runoff generation rate³ of 190 gallons/acre/day routed to 143 outfalls over the urbanized portion of the area of investigation (383 mi²)
- BOD of urban dry weather runoff is 11 mg/L⁴
- TSS of urban dry weather runoff is 19 mg/L (from USEP monitoring)

- Conveyance from diversion to sewer interceptor is 1000 feet

The cost of a typical diversion differs when comparing rates specific to urban runoff discharge for the City of Los Angeles and general sewer service rates for the City of Colton (Table 1). This cost is extrapolated over the entire MS4 drainage area for dry weather runoff diversion in San Bernardino County (Table 2).

Costs per Diversion	City of Los Angeles¹	City of Colton²
Capital Costs (\$/tributary acre)		
LFD Facilities Cost	\$1,005	\$1,005
Sewer Capacity	\$323	\$1,140
BOD	\$7	\$0
TSS	\$6	\$0
Total Capital Cost	\$1,341	\$2,145
O&M Unit Costs (\$/tributary acre/yr)		
Admin/Maintenance	\$27.91	\$21.10
Conveyance	\$18.47	\$0
Treatment Flow	\$5.43	\$81.59
BOD	\$1.75	\$0
TSS	\$2.79	\$0
Total O&M Cost	\$56	\$103

1) Los Angeles Bureau of Sanitation

2) <http://www.ci.colton.ca.us/Documents/Community%20Development/Building/fees-www.pdf>

Limits of Analysis

The costs presented in this technical memorandum are order-of-magnitude planning level estimates based on broad assumptions about the required level of implementation to achieve compliance with dry weather bacteria indicator water quality objectives. Limited data from some cities within the area of study suggest that the number of outfalls requiring treatment could increase significantly in certain reaches. Additionally, the cost and feasibility for local sewerage agencies to collect and treat urban dry weather runoff is not yet determined.

Many factors could influence the cost and feasibility of implementing dry weather runoff diversion at given location, including constraints on local sewer collection and treatment system, presence of continuous flow, flowrate, and the potential change of recreational use designations in certain types of open channels that is being proposed through the Stormwater Quality Standards Study. These factors are site specific and would be investigated during

preliminary design. One alternative to diversion from the stormwater to sanitary collection system is to construct on-site treatment or infiltration, in the form of an urban runoff plant (URP) or natural treatment system. These types of facilities can provide integrated resource benefits, but are typically less cost effective and are potentially more land intensive than diversion to the sanitary sewer system. In the case of URPs, treatment and discharge provides a low bacteria source of water to receiving waterbodies, which can dilute uncontrolled sources of bacteria, or the URP can be designed for reuse to be used for irrigation demands near the project site. Similarly, natural treatment systems can provide “clean” runoff to impaired waterbodies or recharge underlying groundwater basins through infiltration.

¹ URL: <http://sbcounty.permitrack.com/HCOC2/>

² Take-off estimate completed by CDM Constructors Inc. for similar facilities for City of Los Angeles Bureau of Sanitation

³ City of Los Angeles. Integrated Resources Plan, Department of Public Works Bureau of Sanitation and Department of Water and Power, 2006.

⁴ McPherson, Timothy N., Steven J. Burion, Michael K. Stenstrom, H.J. Turin, Michael J. Brown, and I.H. Suffet, 2005. Dry and Wet Weather Flow Nutrient Loads From a Los Angeles Watershed. *Journal of the American Water Resources Association*, 41(4): 959-969.

Table 2							
Planning Level Costs for Diversion of Dry Weather Urban Runoff from Stormwater Collection System within San Bernardino County							
Portion of Santa Ana River Watershed							
Jurisdiction	Number of Diversions	Drainage Area (mi²)	LFD Facilities Cost	Sewer Capacity Cost (Low - High)			Annual O&M (\$/yr)
Bloomington ¹	3	6	\$5,400,000	\$1,230,000	-	\$4,160,000	\$290,000
Chino ¹	7	17	\$12,600,000	\$3,690,000	-	\$12,500,000	\$870,000
Chino Hills	8	16	\$14,400,000	\$3,360,000	-	\$11,390,000	\$790,000
Colton ¹	6	15	\$10,800,000	\$3,180,000	-	\$10,780,000	\$750,000
Fontana	11	36	\$19,800,000	\$7,710,000	-	\$26,140,000	\$1,820,000
Grand Terrace ¹	2	4	\$3,600,000	\$750,000	-	\$2,550,000	\$180,000
Highland ¹	5	14	\$9,000,000	\$2,980,000	-	\$10,090,000	\$700,000
Loma Linda	5	7	\$9,000,000	\$1,510,000	-	\$5,130,000	\$360,000
Los Serranos	1	2	\$1,800,000	\$370,000	-	\$1,250,000	\$90,000
Montclair	7	5	\$12,600,000	\$1,090,000	-	\$3,690,000	\$260,000
Muscoy ¹	2	3	\$3,600,000	\$650,000	-	\$2,190,000	\$150,000
Ontario	8	37	\$14,400,000	\$7,960,000	-	\$27,000,000	\$1,880,000
Rancho Cucamonga	26	38	\$46,800,000	\$8,180,000	-	\$27,740,000	\$1,930,000
Redlands	3	25	\$5,400,000	\$5,320,000	-	\$18,030,000	\$1,260,000
Rialto ¹	8	21	\$14,400,000	\$4,580,000	-	\$15,540,000	\$1,080,000
San Antonio Heights ¹	1	1	\$1,800,000	\$310,000	-	\$1,040,000	\$70,000
San Bernardino	15	56	\$27,000,000	\$12,010,000	-	\$40,710,000	\$2,840,000
Unincorporated	9	40	\$16,200,000	\$8,500,000	-	\$28,820,000	\$2,010,000
Upland ¹	6	15	\$10,800,000	\$3,250,000	-	\$11,020,000	\$770,000
Yucaipa ¹	10	27	\$18,000,000	\$5,740,000	-	\$19,470,000	\$1,360,000
Total	143	383	\$257,400,000	\$82,370,000	-	\$279,240,000	\$19,170,000

1) Approximated value due to unavailable data; Number of diversions based on assumption of 1,800 acres of drainage area per diversion