

*APPENDIX*

*City of San Rafael – Initial Study/Mitigated Negative Declaration  
Marin Sanitary Services Facility Project – 1050 Andersen Drive/535-565 Jacoby Street, San  
Rafael, CA*

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## **Source Reference 10**

Drainage Analysis Marin Sanitary Services  
Property, San Rafael Ca, prepared by  
Oberkamper & Associates, Civil Engineers, Inc.  
July 2010 (aka, MUPA Appendix E)

# Marin Sanitary Service

Master Use Permit

December 2013

Appendix E: Drainage Analysis

**DRAINAGE ANALYSIS  
MARIN SANITARY SERVICES PROPERTY  
SAN RAFAEL, CALIFORNIA**

**PREPARED BY  
OBERKAMPER & ASSOCIATES, CIVIL ENGINEERS, INC.**

**JULY 2010**

## INDEX

Summary	page 1
Watershed Areas	page 2
Runoff Coefficients	page 3
Overall System Flows	page 5
Jacoby Street System	page 6
System Between Transfer Station and Recovery Building	page 19
System Through PG&E Property	page 42
Watershed Map	Appendix
Drainage Study Maps	Appendix

## SUMMARY

This analysis has been prepared pursuant to a request by the City of San Rafael that it be shown that the city's drainage system has adequate capacity to handle the 1% probability runoff from the site for four conditions.

- a) With all developments in place by March of 2003.
- b) With all development in place at the present time.
- c) Same as a) with no development on Parcel E.
- d) Same as b) with no development on Parcel E.

A watershed map was prepared for the entire property showing the subwatershed areas located within and outside of Parcel E. These areas were measured and tabulated and broken down into pervious and impervious areas for each subwatershed within and outside of Parcel E. The watershed map also shows the points of concentration for the flow from the various areas and the sizes and slopes for the existing storm drain piping within the property.

Drainage Study maps were also prepared showing the existing storm drain piping within the property and in Jacoby Street to the point of discharge into the drainage channel at Andersen Drive. The sizes, elevations and slopes of the storm drain piping were established through the use of topographic mapping in the area, city and project records and physical measurement of the depths of drainage structures and physical confirmation of pipe sizes. As shown by the Drainage Study maps there are three locations where drainage leaves the property. One is through Jacoby Street to Andersen Drive, the second is between the Transfer Station and the Resource Recovery Building out to Andersen Drive and the third is through the PG&E property out to Andersen Drive.

System calculations were done for the four required conditions using the Hydraflow Storm Sewers program formerly by Intelisolve but now a part of Autocad programming. The calculations reveal that the quantity of drainage flowing to the city's Jacoby Street system is beyond the system's capacity, but that there is excess capacity in the other two systems. We are recommending that a portion of the drainage now entering the Jacoby Street system be rerouted to the system which goes between the Transfer Station and the Resource Recovery Building through construction of a new 24 inch storm drain as shown on Sheet C1 of the Drainage Study maps. This rerouting will provide adequate capacity for the 1% storm runoff to be discharged from the property.

### WATERSHED AREAS

Area Number	Total Areas (Acres)			Impervious Areas (Acres)		
	Non-E Area	E- Area	Total Area	Non-E Area	E-Area	Total Area
1	0.87	7.11	7.98	0.46	0.66	1.12
2	0.26	8.78	9.04	0.16	0.72	0.88
3	2.33	1.16	3.48	2.33	0.12	2.45
4	1.16	0.66	1.82	1.16	0.11	1.27
5	2.79	4.88	7.67	2.38	0.19	2.57
6	0.00	5.25	5.25	0.00	2.59	2.59
7	0.00	8.22	8.22	0.00	1.52	1.52
8	0.33	1.12	1.45	0.04	0.84	0.88
9	4.57	0.52	5.09	3.43	0.01	3.44
10	2.32	0.00	2.32	2.21	0.00	2.21
11	1.37	1.53	2.90	0.35	0.00	0.35
12	3.89	7.70	11.59	3.16	0.85	4.01
13	4.12	0.00	4.12	3.73	0.00	3.73
14	3.23	0.00	3.23	1.51	0.00	1.51
15	4.06	0.00	4.06	3.84	0.00	3.84

**RUNOFF COEFFICIENTS  
CURRENT**

Area	c=.90	c=.40	Total	c composite
	Acres	Acres	Acres	
1	1.22	6.86	7.98	0.47
2	0.88	8.15	9.03	0.45
3	2.45	1.03	3.48	0.75
4	1.27	0.54	1.81	0.75
5	2.57	5.10	7.67	0.57
6	2.59	2.67	5.26	0.64
7	1.52	6.70	8.22	0.49
8	0.89	0.57	1.46	0.70
9	3.45	1.64	5.09	0.74
10	2.21	0.11	2.32	0.88
11	0.35	2.55	2.90	0.46
12	4.00	7.59	11.59	0.57
13	3.73	0.39	4.12	0.85
14	1.51	1.72	3.23	0.63
15	3.84	0.22	4.06	0.87

**RUNOFF COEFFICIENTS  
WITHOUT AREA E IMPERVIOUS**

Area	c=.90 Acres	c=.40 Acres	Total Acres	c composite
1	0.46	7.52	7.98	0.43
2	0.16	8.88	9.04	0.41
3	2.33	1.15	3.48	0.73
4	1.16	0.66	1.82	0.72
5	2.38	5.29	7.67	0.56
6	0.00	5.25	5.25	0.40
7	0.00	8.22	8.22	0.40
8	0.04	1.42	1.46	0.41
9	3.43	1.66	5.09	0.73
10	2.21	0.11	2.32	0.88
11	0.35	2.55	2.90	0.46
12	3.15	8.44	11.59	0.54
13	3.73	0.39	4.12	0.85
14	1.51	1.72	3.23	0.63
15	3.84	0.22	4.06	0.87



### OVERALL SYSTEM FLOWS

The flows for the four conditions for each of the systems will be as follows:

Condition	Jacoby Street	Between Transfer & Recovery	Through PG&E	Total
a)	15.10 cfs	32.93 cfs	32.33 cfs	80.36 cfs
b)	15.10 cfs	34.08 cfs	33.38 cfs	82.56 cfs
c)	14.40 cfs	28.30 cfs	30.70 cfs	73.40 cfs
d)	14.40 cfs	29.44 cfs	31.62 cfs	75.46 cfs

The following sections provide analysis and calculations for each of the three systems for each of the four conditions listed above.

## **JACOBY STREET SYSTEM**

The Jacoby Street system presently receives flow from subwatersheds 6, 7, 11 and 12. Analysis of the system reveals that the system does not have capacity to accommodate the flow from this drainage area for any of the four conditions. The system was then analyzed for the flow from subwatershed 12 and it was determined that the system has the capacity to accommodate the flow for each of the four conditions. The following pages contain the system data and the hydrologic and hydraulic calculations. In this instance conditions a) and b) have the same flow and conditions c) and d) have the same flow so there are two calculations rather than four.