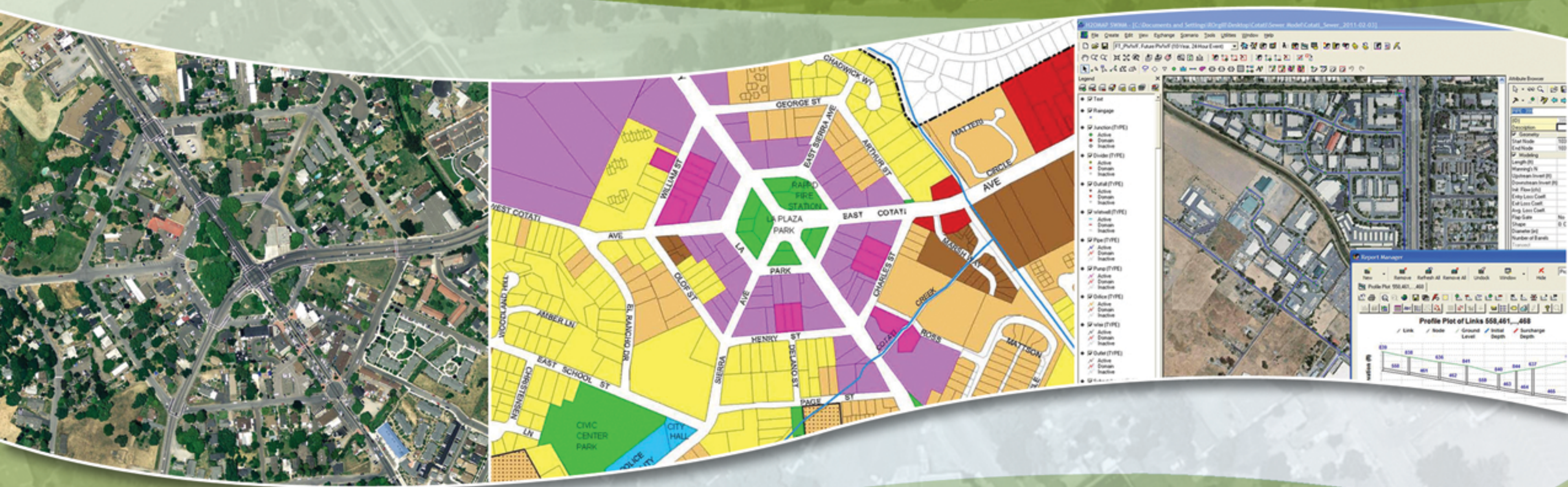
FINAL



CITY of COTATI

Sewer Collection System Master Plan

September 2011

carollo
Engineers...Working Wonders With Water®

cot911r2-8486.psd

Engineers...Working Wonders With Water™

September 6, 2011
8486A00

City of Cotati
201 West Sierra Avenue
City of Cotati, CA 94931

Attention: Mr. Damien O'Bid, P.E., City Engineer/Public Works Director

Subject: City of Cotati Final Sewer Collection System Master Plan

Dear Mr. O'Bid:

We are pleased to submit the final report for the City of Cotati (City) Sewer Collection System Master Plan (Master Plan). Enclosed are three copies of the final Master Plan report. This report summarizes work completed in Task 300 of the scope of work, including: flow monitoring data analysis, hydraulic model development, collection system capacity analysis, capital improvement plan (CIP) development, and master plan preparation.

We would like to extend our thanks to you, Mr. Kevin Fredrickson, Engineering Technician; Mr. Allan Martinoni, Field Maintenance Supervisor; Ms. Marsha Sue Lustig, Assistant to the City Manager/Acting Community Development Director; and other City staff whose courtesy and cooperation were valuable components in ensuring that this document will assist the City in planning infrastructure improvements to serve its customers.

Sincerely,

CAROLLO ENGINEERS, INC.

Thomas S Kalkman

Thomas S. Kalkman, P.E.
Vice President

Tim J. Loper, P.E.
Project Manager

TSK/TJL:asw

2700 Ygnacio Valley Road, Suite 300, Walnut Creek, California 94598
P. 925.932.1710 F. 925.930.0208

City of Cotati

SEWER COLLECTION SYSTEM MASTER PLAN

FINAL

September 2011

September 2, 2011 September 2, 2011

Prepared by

Carollo Engineers, Inc.
2700 Ygnacio Valley Road, Suite 300
Walnut Creek, CA 94598
925.932.1710

City of Cotati

SEWER COLLECTION SYSTEM MASTER PLAN

TABLE OF CONTENTS

Page No.

EXECUTIVE SUMMARY

CHAPTER 1 - BACKGROUND

CHAPTER 2 - STUDY AREA DESCRIPTION

CHAPTER 3 - PLANNING CRITERIA

CHAPTER 4 - WASTEWATER DESIGN FLOWS

CHAPTER 5 - COLLECTION SYSTEM FACILITIES AND HYDRAULIC MODEL

CHAPTER 6 - CAPACITY EVALUATION AND PROPOSED IMPROVEMENTS

LIST OF TABLES

LIST OF FIGURES

SEWER COLLECTION SYSTEM MASTER PLAN

ES.1 INTRODUCTION

The City of Cotati (City) is located in Sonoma County, about 45 miles north of San Francisco in the 101 corridor between Rohnert Park and Petaluma. Cotati has long been considered the "Hub" of Sonoma County by virtue of its central location and its distinct and historic hexagonal plaza. The City's residents enjoy the benefits of living in a small city, as well as the cultural advantages of being located near major urban centers[1].

The City owns, maintains, and operates gravity sewer pipelines, sanitary sewer force mains, and sewer lift stations within its service area. The City collects wastewater from residential and commercial customers.

ES.2 STUDY AREA

According to City staff, growth within the next 25 years is primarily expected to occur within the current City limits. Therefore, the study area boundary for this Sewer Collection System Master Plan (Master Plan) and the current City limits are coterminous and will be used interchangeably throughout the Master Plan report. Figure ES.1 shows the study area boundary, which is roughly bounded by the City of Rohnert Park to the north and east and unincorporated areas of Sonoma County to the south and west.

The City's current General Plan was adopted in 1998. The City is currently in the process of updating the General Plan. According to City staff, the land use assumptions that will be incorporated into the General Plan Update will be based on the City's current zoning map. For this reason, the land use assumptions used in this Master Plan are consistent with the City's current zoning designations.

The City is not anticipating that it will annex any additional land areas beyond the current City limits within the planning period of this Master Plan. For this reason, land use assumptions in this study do not extend beyond the current City limits.

ES.3 HISTORICAL AND FUTURE POPULATION

According to California Department of Finance (DOF) population estimates, between 1970 and 2005 the City's population grew by roughly 5,816 residents, from 1,368 in 1970 to 7,184 in 2005. Over these 35 years, that growth equated to an average annual rate of approximately 4.9 percent.

[1] http://www.ci.cotati.ca.us/

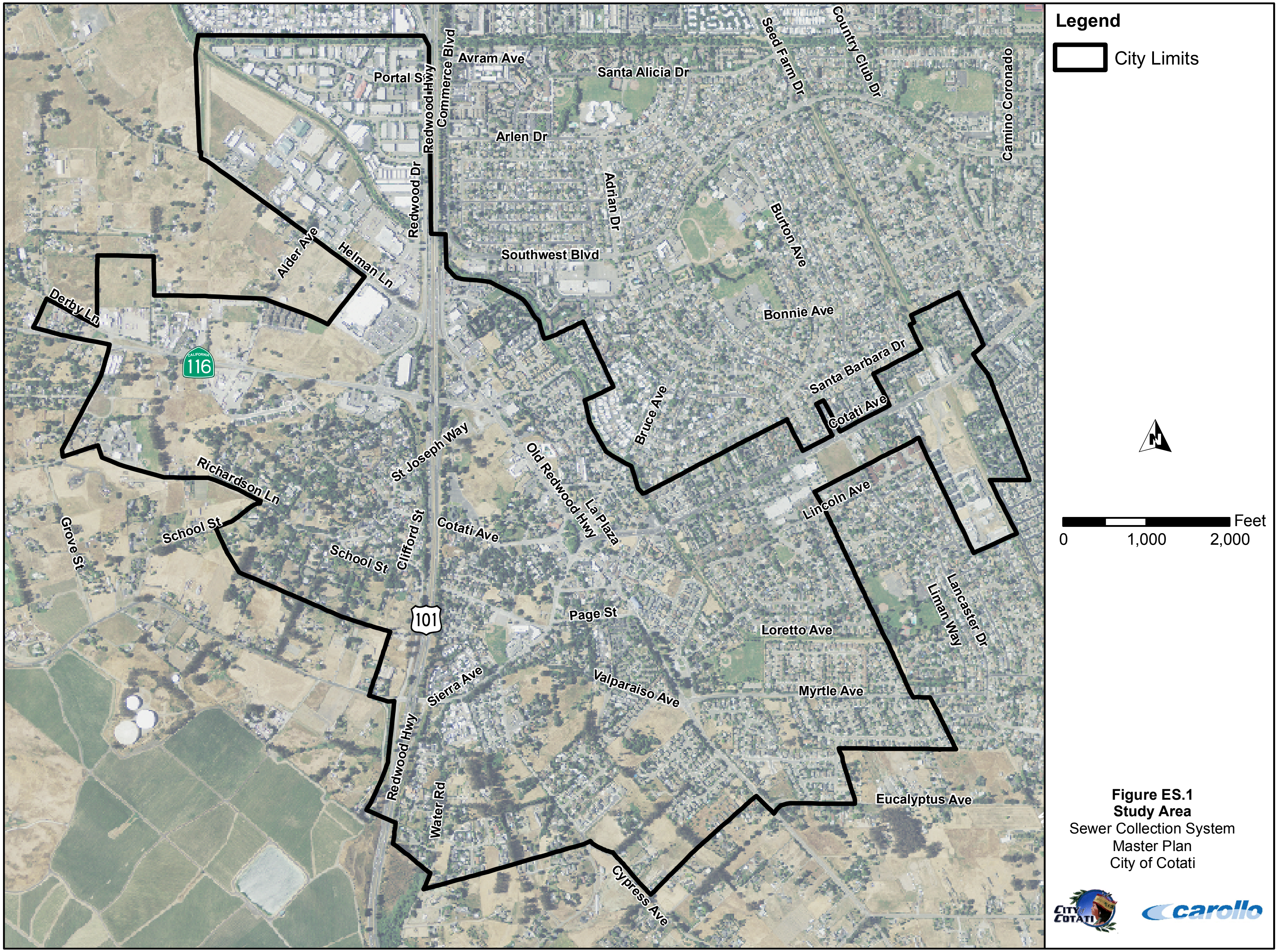


Figure ES.1
Study Area
Sewer Collection System
Master Plan
City of Cotati

Population projections used in this Master Plan are based on forecasts provided in the City's Urban Water Management Plan Water Demand Analysis and Water Conservation Measures Update, dated November 2010 (Maddaus Report). The population forecasts presented in the Maddaus Report project that the City will reach a population of approximately 9,889 people by 2035. Table ES.1 summarizes the City's historical and projected population to year 2035.

Table ES.1 Historical and Projected Population
Sewer Collection System Master Plan
City of Cotati

Year	Population (1),(2)	Year	Population (1),(2)
1970	1,368	2005	7,184
1975	2,870	2010	7,711
1980	3,346	2015	8,105
1985	4,030	2020	8,518
1990	5,625	2025	8,953
1995	6,332	2030	9,409
2000	6,480	2035	9,889

Notes:
1. Historical population based on California Department of Finance estimates for the City of Cotati.
2. Population projections provided in the City of Cotati Urban Water Management Plan Water Demand Analysis and Water Conservation Measures Update, November 2010.

ES.4 SEWER SERVICE AREA OVERVIEW

The City's sanitary sewer collection system consists of approximately 32 miles of active sewer pipelines ranging in size from 4-inches to 24-inches in diameter, with four sewer lift stations and the associated force mains. All wastewater generated within the City limits is ultimately conveyed through a 24-inch interceptor to the City of Santa Rosa's Laguna Wastewater Treatment Plant (WWTP). Figure ES.2 shows the existing sewer collection system, including sewer diameters and lift station locations.

ES.5 WASTEWATER FLOWS

The average dry weather flow (ADWF) is the average flow that occurs on a daily basis during the dry weather season. The ADWF includes the base wastewater flow (BWF) generated by the City's users, plus dry weather groundwater infiltration (GWI).

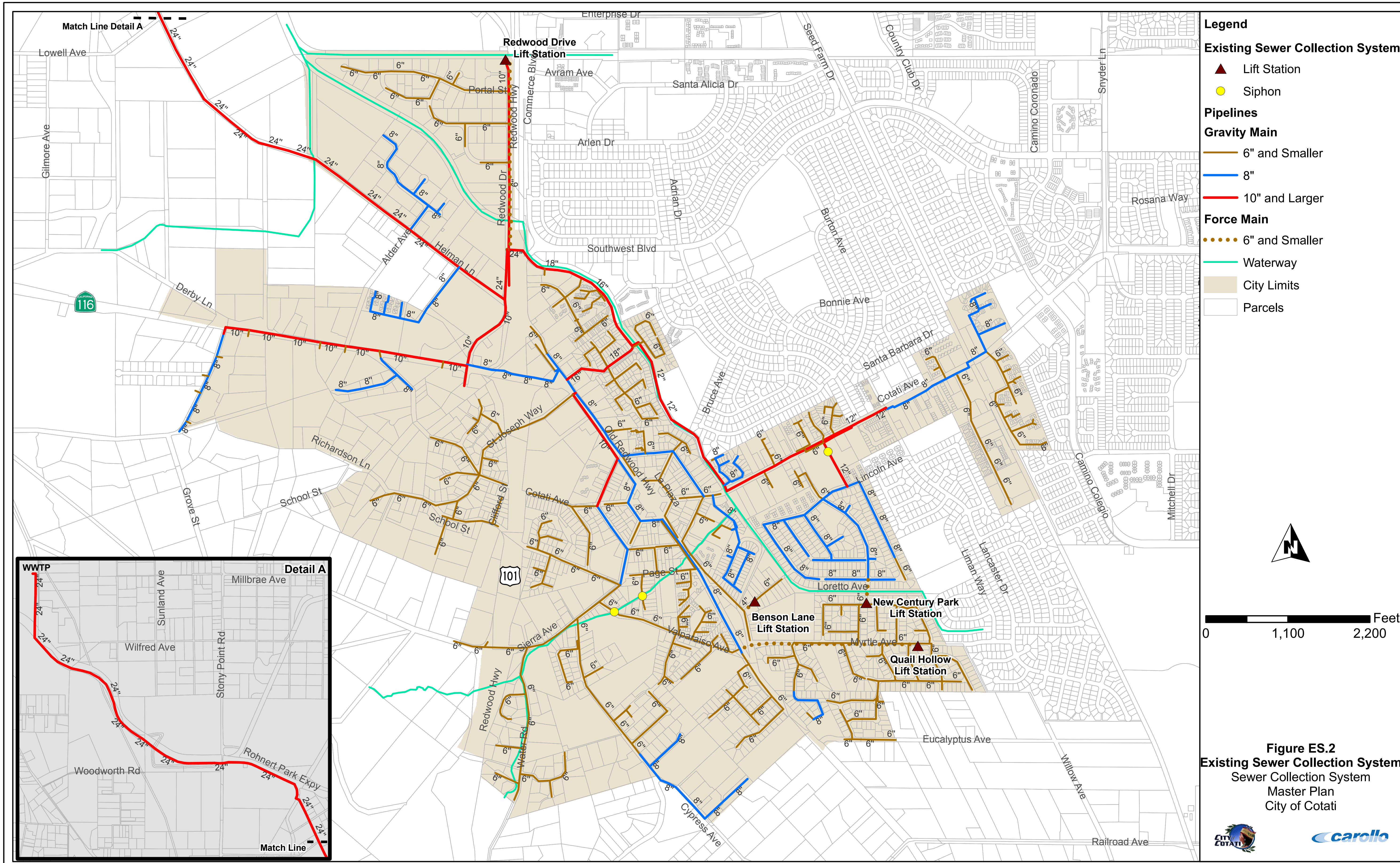


Figure ES.2
Existing Sewer Collection System
Sewer Collection System
Master Plan
City of Cotati

Peak wet weather flow (PWWF) is the highest observed hourly flow that occurs following the design storm event. The City's sewers and lift stations were evaluated based on their capacity to convey the "design flow ("design flow" is synonymous to PWWF in this study).

A summary of the existing and future ADWF and the Design Flow is presented in Table ES.2. It is anticipated that the City's 2035 ADWF, and design flow will approach 0.82 mgd and 4.60 mgd, respectively. As the City continues to develops, it is anticipated that the Design Flow to ADWF peaking factor will decrease from 8.5 to 7.0.

Table ES.2 Existing and Projected Wastewater Flow Summary
Sewer Collection System Master Plan
City of Cotati

Year	Average Dry Weather Flow (mgd)	Design Flow (mgd)	Peaking Factor
Existing (2010)	0.46	3.90	8.5
Build-Out (2035)	0.66	4.60	7.0

ES.6 CAPACITY EVALUATION AND PROPOSED IMPROVEMENTS

The capacity analysis identified areas in the sewer system where flow restrictions occur or where pipe capacity is insufficient to convey design flows. Sewers that lack sufficient capacity to convey design flows create bottlenecks in the collection system that can potentially cause sanitary sewer overflows (SSOs).

For the existing sewer collection system, the design flow was routed through the hydraulic model. In accordance with the established flow depth criteria for existing sewers, manholes where the hydraulic grade line (HGL) encroached within three feet of the manhole rim were identified.

Note that the pipelines with an HGL that encroached within three feet of the manhole rim are not necessarily capacity deficiencies. In many cases, a surcharged condition within a given pipeline segment is due to backwater effects created by a downstream bottleneck. For this reason, the hydraulic model was analyzed to identify the pipeline segments that are the cause of the surcharged conditions.

Following the completion of the existing system analysis, improvement projects were identified in order to mitigate existing system pipeline capacity deficiencies. The recommended improvement projects are discussed in Section ES.6.2.

Future system analysis was performed in a manner similar to the existing system analysis. The purpose of the future system evaluation was to verify that the existing system improvements were appropriately sized to convey build out design flows, and to identify the locations of sewers that are adequately sized to convey existing design flows, but cannot convey future design flows.

Figure ES.3 illustrates the improvements recommended to mitigate capacity deficiencies in the existing sewer collection system and improvements to accommodate future growth as identified by the hydraulic analysis.

ES.6.1 Project Categories

The proposed projects provide the City with a list of improvements that will correct capacity deficiencies in the collection system that occur during peak wet weather flow conditions. When fully implemented, the capital projects will correct flow restrictions within the collection system to accommodate existing and future users while meeting the planning criteria.

Each improvement project shown on Figure ES.3 was grouped into one of three different categories, based on the type of deficiency that is meant to be addressed by the improvement. The three categories are discussed below:

- **Category 1: Reducing the potential for Sanitary Sewer Overflows (SSOs) to Waters on the United States.** In 2006, the State Water Resources Control Board (SWRCB) adopted Statewide General Waste Discharge Requirements Order Number 2006-0003 (GWDRs). The focus of the GWDRs is to reduce the occurrence and extent of SSOs throughout the State of California, with particular emphasis given towards reducing SSOs that enter receiving waters of the United States. For this reason, the proposed improvements were analyzed to establish which improvements are required to reduce surcharged conditions (and therefore the SSO potential) for sewers in the vicinity of major waterways.
- **Category 2: Other Improvements to Meet the Maximum Flow Depth Criteria.** System improvements that are required to reduce surcharged conditions in areas with lower risk of contributing to SSOs to receiving waters were grouped into Category 2.
- **Category 3: Future Development.** System improvements exclusively required to accommodate future development within the City limits are identified as Category 3 improvements.

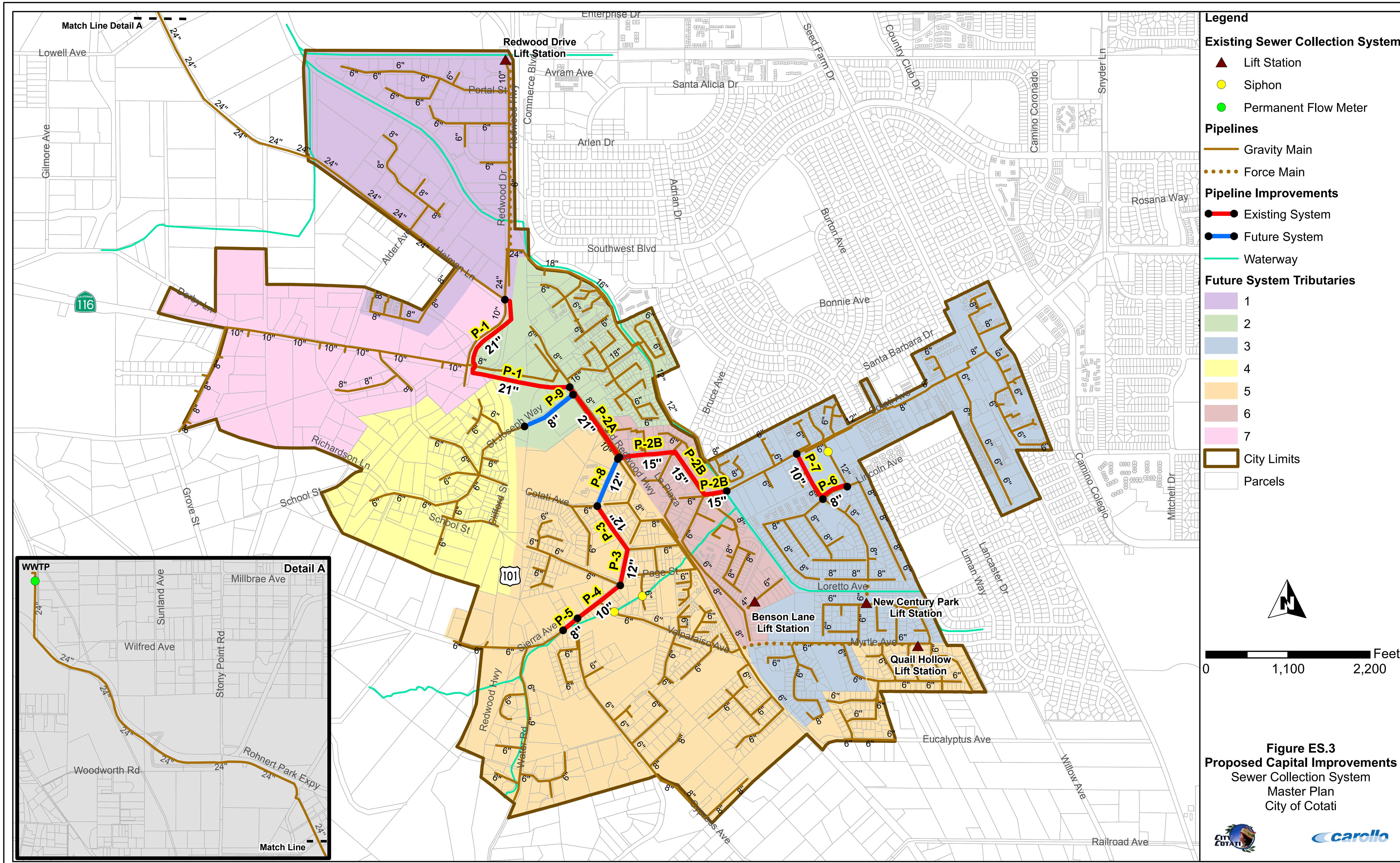


Figure ES.3
Proposed Capital Improvements
Sewer Collection System
Master Plan
City of Cotati

ES.6.2 Existing Versus Future Improvement

An existing deficiency is one where the existing facility's capacity is insufficient to meet the planning criteria (e.g., pipeline upgrades required to prevent severe surcharging during the design wet weather event) for existing users. If a project was proposed to exclusively correct an existing deficiency, then existing users were assigned 100 percent of the project's benefit, and therefore, 100 percent of the costs.

Future growth may trigger the construction of new facilities to support this growth (e.g., new trunk sewers to serve vacant areas within the City service area). If a specific project is needed to serve future growth exclusively, the future users were assigned 100 percent of the future project's benefit and 100 percent of the costs.

In many cases, such as a proposed relief sewer, projects are needed to mitigate existing deficiencies and to accommodate future growth. Where a project is needed to mitigate existing deficiencies and serve future growth, the future user benefit was determined based on the additional capacity necessary to serve future growth. More information on the breakdown in cost split between existing and future users and whether a proposed improvement is intended to correct an existing deficiency, to serve a future user, or both, is provided in Chapter 7.

ES.6.3 Lift Station Improvements

The City's lift stations are capable of adequately conveying the existing and future (year 2035) design flow with the largest pump out of service. An exception to this is the Quail Hollow Lift Station. However, since the existing and future modeled capacity deficiency for this lift station was very minor, no lift station improvement projects are recommended.

ES.6.4 Pipeline Improvements

Based on the results of the existing and future system analysis, the following projects are recommended:

- **Existing System Improvements**
  - <u>Improvement Number P-1 and P-2</u>: In order to mitigate existing capacity deficiencies in the 12-inch, 16-inch, and 18-inch diameter sewer along the Laguna/Gravenstein Way from Highway 101 to East Cotati Avenue, and the existing 10-inch diameter sewer in Old Redwood Highway from Williams Street to Saint Joseph Way, it is recommended that the City construct a new 15-inch and 21-inch diameter relief trunk sewer that extends from the intersection of East Cotati Avenue and Gravenstein Way to the 24-inch diameter interceptor on Helman Lane at Redwood Drive. This Category 1 improvement not only mitigates these deficiencies, but it also provides an added layer of redundancy by constructing a second major sewer crossing under Highway 101.

- Improvement Number P-3 through P-5: In order to mitigate surcharged conditions on Sierra Avenue, it is recommended that the City replace the existing 6-inch and 8-inch diameter sewers on West Sierra Avenue and Olof Street from west of Cypress Avenue to West Cotati Avenue. The proposed pipeline diameters are sized for future conditions, and include 12-inch, 10-inch, and 8-inch diameter sewers. This is a Category 1 improvement.
- Improvement Number P-6 and P-7: To address surcharged conditions on La Salle Avenue from Lincoln Avenue to Loretto Avenue, it is recommended that the City install a new 10-inch diameter sewer on La Salle Avenue from Lincoln Avenue to East Cotati Avenue. In addition, it is recommended that the City construct a new 8-inch diameter sewer main on Lincoln Avenue. The purpose of this sewer main is to redirect flows away from the existing 12-inch diameter main that extends under the Rancho Cotati Shopping Center. This will allow the 12-inch diameter sewer in the parking lot of the Rancho Cotati Shopping Center to be abandoned in place, and relocated to an alignment in the public right-of-way (ROW). This is a Category 2 improvement.

- **Future System Improvements**
  - Improvement Number P-8: To prevent future surcharged conditions within the recommended P-3 through P-5 improvement projects, it is recommended that the City replace the existing 10-inch diameter sewer on William Street from West Cotati Avenue to the Old Redwood Highway with a new 12-inch diameter sewer. This is a Category 3 improvement.
  - Improvement Number P-9: Replace the existing 6-inch diameter sewer on Saint Joseph Way from the Old Redwood Highway to Highway 101 with a new 8-inch diameter sewer. This Category 3 improvement is required as a result of the future development related to the Downtown Specific Plan.

ES.7 CAPITAL IMPROVEMENT PLAN

A summary of the capital project costs is presented in Chapter 7 of the Master Plan. Chapter 7 provides detailed information related to the projects, a description of the project, identifies facility size, the capital improvement cost, and the probable phase in which the project would be implemented. The implementation timeframe was based on the priority of each project to correct existing deficiencies or to serve future users.

The implementation phases are separated into 5-year increments. Each project is itemized by phase in Chapter 7 and a summary by improvement category and phase is provided in Table ES.3.

Table ES.3 Summary of Capital Costs by Improvement Category Sewer Collection System Master Plan City of Cotati						
	Implementation Phase					
Improvement Category	**2011-16 ($, mill.)**	**2017-21 ($, mill.)**	**2022-26 ($, mill.)**	**2027 - 31 ($, mill.)**	**2032 - 35 ($, mill.)**	**Total ($, mill.)**
Category 1(1)	1.39	0.79	0.19	0.00	0.00	2.36
Category 2(2)	0.00	0.20	0.00	0.00	0.00	0.20
Category 3 (3)	0.00	0.17	0.00	0.13	0.00	0.29
Total	**1.39**	**1.15**	**0.19**	**0.13**	**0.00**	**2.86**

Notes:
1. Category 1 projects are focused on reducing the potential for sanitary sewer overflows (SSOs) to waters on the United States.
2. Category 2 projects include other existing improvements to meet the maximum flow depth criteria.
3. Category 3 projects serve future development.
4. Costs are based on ENR CCI 20 City average of 8,998 (February 2011).

A breakdown in existing and future user cost share of the proposed projects by phase is summarized in Table ES.4. All of the proposed improvements are pipeline improvements (i.e., no lift station improvements).

Table ES.4 Existing Versus Future User Cost Share Sewer Collection System Master Plan City of Cotati						
	Implementation Phase					
Reimbursement Category	**2011-16 ($, mill.)**	**2017-21 ($, mill.)**	**2022-26 ($, mill.)**	**2027 - 31 ($, mill.)**	**2032 - 36 ($, mill.)**	**Total ($, mill.)**
Existing User (2)	0.94	0.70	0.12	0.00	0.00	**1.76**
Future User (3)	0.45	0.45	0.06	0.13	0.00	**1.10**
Total	**1.39**	**1.15**	**0.19**	**0.13**	**0.00**	**2.86**

Notes:
1. Costs are based on ENR CCI 20 City average of 8,998 (February 2011)
2. Projects are funded through user rates.
3. Projects are expected to be funded through sewer development impact fees collected through new connections.

BACKGROUND

1.1 INTRODUCTION

This chapter presents a brief summary of the sewer collection system service area, the need for this Sewer Collection System Master Plan (Master Plan) and the objectives of the study. A list of abbreviations is also provided to assist the reader in understanding the information presented.

1.2 BACKGROUND

The City of Cotati (City) is located in Sonoma County, about 45 miles north of San Francisco in the 101 corridor between Rohnert Park and Petaluma. Figure 1.1 presents a location map of the City. Cotati has long been considered the "Hub" of Sonoma County by virtue of its central location and its distinct and historic hexagonal plaza. The City's residents enjoy the benefits of living in a small city, as well as the cultural advantages of being located near major urban centers[1].

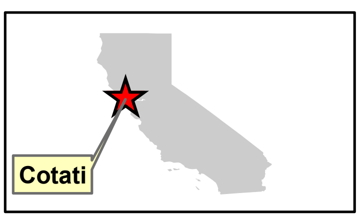
The City owns, maintains, and operates gravity sewer pipelines, sanitary sewer force mains, and sewer lift stations within its service area. The City collects wastewater from residential, commercial, institutional, and industrial customers.

1.3 SEWER SERVICE AREA

Figure 1.2 illustrates the City's current sewer service area. The City manages and maintains approximately 32 miles of sewer lines spanning 4 to 24-inches in diameter, with four lift stations and the associated force mains. All wastewater generated within the City limits is ultimately conveyed through the 24-inch Helman Lane interceptor to the City of Santa Rosa's Laguna Wastewater Treatment Plant (WWTP) for treatment.

The City's zoning designations set the foundation for the land use assumptions in this Master Plan. Should future planning conditions change from the assumptions stated in this Master Plan (i.e., accelerated growth, more intense developments, etc.), revisions and adjustments to the Master Plan recommendations may be necessary.

[1] http://www.ci.cotati.ca.us/



Legend

City of Cotati

Major Roads

Urban Areas

Hydrography

State of California

Miles

0 7.5 15

Figure 1.1
Location Map
Sewer Collection System Master Plan
City of Cotati

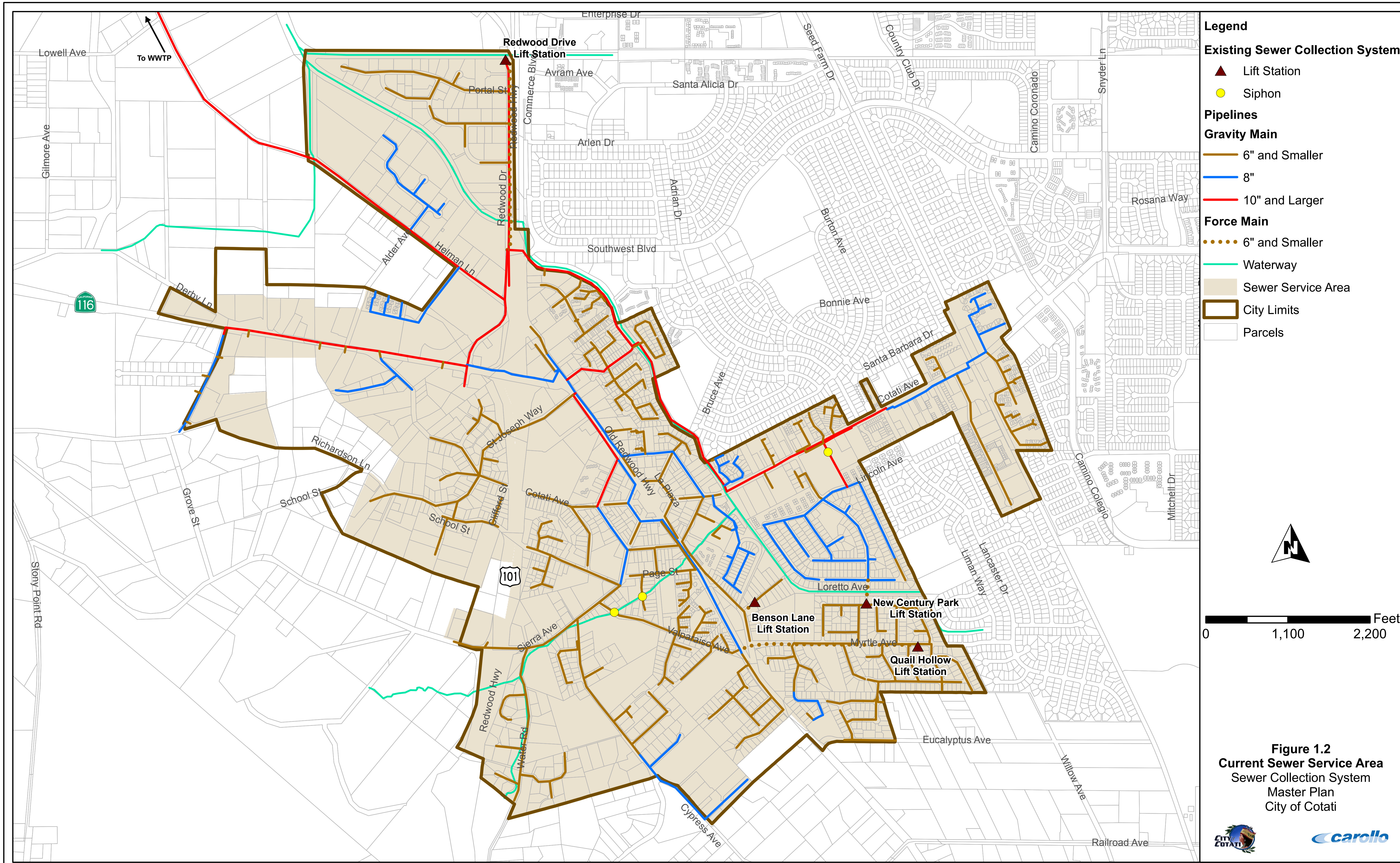


Figure 1.2
Current Sewer Service Area
Sewer Collection System
Master Plan
City of Cotati

1.4 SCOPE AND AUTHORIZATION

The purpose of this Master Plan is to identify capacity deficiencies in the wastewater collection system, develop feasible alternatives to correct these deficiencies, and plan the infrastructure that will serve future development. In May 2010, the City approved a professional service agreement with Carollo Engineers, Inc. (Carollo), formerly Carollo Engineers, P.C., to prepare this Master Plan for the sewer collection system, which included the following main tasks:

- Flow monitoring data analysis
- Hydraulic model development
- Collection system capacity analysis
- Capital Improvement Plan (CIP) development
- Master Plan preparation

1.5 REPORT ORGANIZATION

The Master Plan report contains seven chapters, followed by appendices that provide supporting documentation for the information presented in the report. The chapters are briefly described below:

Chapter 1 - Background. This chapter presents the need for this Master Plan and the objectives of the study. Lists of abbreviations and reference materials are also provided to assist the reader in understanding the information presented.

Chapter 2 - Study Area Description. This chapter presents a description of the study area, defines the land use classifications, and summarizes the historical population trends.

Chapter 3 - Planning Criteria. This chapter presents the planning criteria for evaluating the sewer collection system. The planning criteria address the collection system capacity, gravity sewer slopes, maximum depth of flow within a sewer, average sewer flow coefficients, and sewer peaking factors.

Chapter 4 - Wastewater Design Flows. This chapter summarizes the flow monitoring program and presents the calculation of the design flows used to model the existing and future sewer system.

Chapter 5 - Collection System Facilities and Hydraulic Model. This chapter describes the development and calibration of the City's sewer collection system hydraulic model.

Chapter 6 - Capacity Evaluation and Proposed Improvements. This chapter discusses the hydraulic evaluation of the collection system and the proposed projects that correct capacity deficiencies and serve future users.

Chapter 7 - Capital Improvement Plan. This chapter presents the capital improvement plan, a summary of the capital costs, and assessment of the costs that the City will need to recover from existing and future users. This chapter is organized to assist the City in making finance decisions.

1.6 ACKNOWLEDGMENTS

Carollo Engineers wishes to acknowledge and thank Mr. Damien O'Bid, City Engineer/Director of Public Works; Kevin Fredrickson, Engineering Technician; Allan Martinoni, Field Maintenance Supervisor; and Marsha Sue Lustig, Assistant to the City Manager/Acting Community Development Director. Their cooperation and courtesy in obtaining a variety of necessary information were valuable components in completing and producing this report.

1.7 ABBREVIATIONS AND DEFINITIONS

To conserve space and to improve readability, the following abbreviations are used in this report.

AACE	Association for the Advancement of Cost Engineering
ASCE	American Society of Civil Engineers
ADWF	Average Dry Weather Flow
BWF	Base Wastewater Flow
Carollo	Carollo Engineers, Inc.
CCTV	Closed-Circuit Television
CEQA	California Environmental Quality Act
CIP	Capital Improvement Plan
City	City of Cotati
d/D	Flow Depth to Pipe Diameter Ratio
DOF	California Department of Finance
DWF	Dry Weather Flow

ENR CCI	Engineering News Record Construction Cost Index
EPA	Environmental Protection Agency
fps	Feet Per Second
GIS	Geographic Information System
gpd	Gallons Per Day
gpd/ac	Gallons Per Day Per Acre
gpm	Gallons Per Minute
GUI	Graphical User Interface
GWDRs	General Waste Discharge Requirements Order Number 2006-0003
GWI	Groundwater Infiltration
HGL	Hydraulic Grade Line
I/I	Infiltration/Inflow
Laguna	Laguna de Santa Rosa
Master Plan	Sewer Collection System Master Plan
mgd	Million Gallons Per Day
msl	Mean Sea Level
n	Manning Friction Coefficient
NOAA	National Oceanic and Atmospheric Association
NRCS	Natural Resources Conservation Service
PWWF	Peak Wet Weather Flow
RDII	Rainfall Derived Infiltration and Inflow
ROW	Right-of-Way
SCS	Soil Conservation Service
SSO	Sanitary Sewer Overflow
SWMM	Stormwater Management Model
SWRCB	State Water Resources Control Board

TDH	Total Dynamic Head
WEF	Water Environment Federation
WRCC	Western Regional Climate Center
WWF	Wet Weather Flow
WWTP	Wastewater Treatment Plant

1.8 REFERENCE MATERIAL

The following documents were referenced in the preparation of this Master Plan:

- *City of Cotati 2010 Urban Water Management Plan Water Demand Analysis and Water Conservation Measures Update*, Final, Maddaus Water Management, November 2010.
- *City of Cotati Sewer System Master Plan*, Final, Winzler & Kelly Consulting Engineers, April 2002.
- *City of Cotati Standard Details and Specifications*, Final, September 2007.
- *City of Cotati Temporary Flow Study Data and Graphs*, Final, Utility Systems, Science, and Software, May 2010.

STUDY AREA DESCRIPTION

This chapter presents a description of the study area, defines the land use classifications, and summarizes the historical population trends.

2.1 STUDY AREA

According to City staff, growth within the next 25 years is primarily expected to occur within the current City limits. Therefore, the study area boundary for this Sewer Collection System Master Plan (Master Plan) and the current City limits are coterminous and will be used interchangeably throughout this report. Figure 2.1 shows the study area boundary, which is roughly bounded by the City of Rohnert Park to the north and east and unincorporated areas of Sonoma County to the south and west.

2.2 PLANNING PERIOD

The Master Plan study area is intended to include the existing City limits and development that could occur through the year 2035. Existing and projected populations and land uses within the study area are discussed in this chapter.

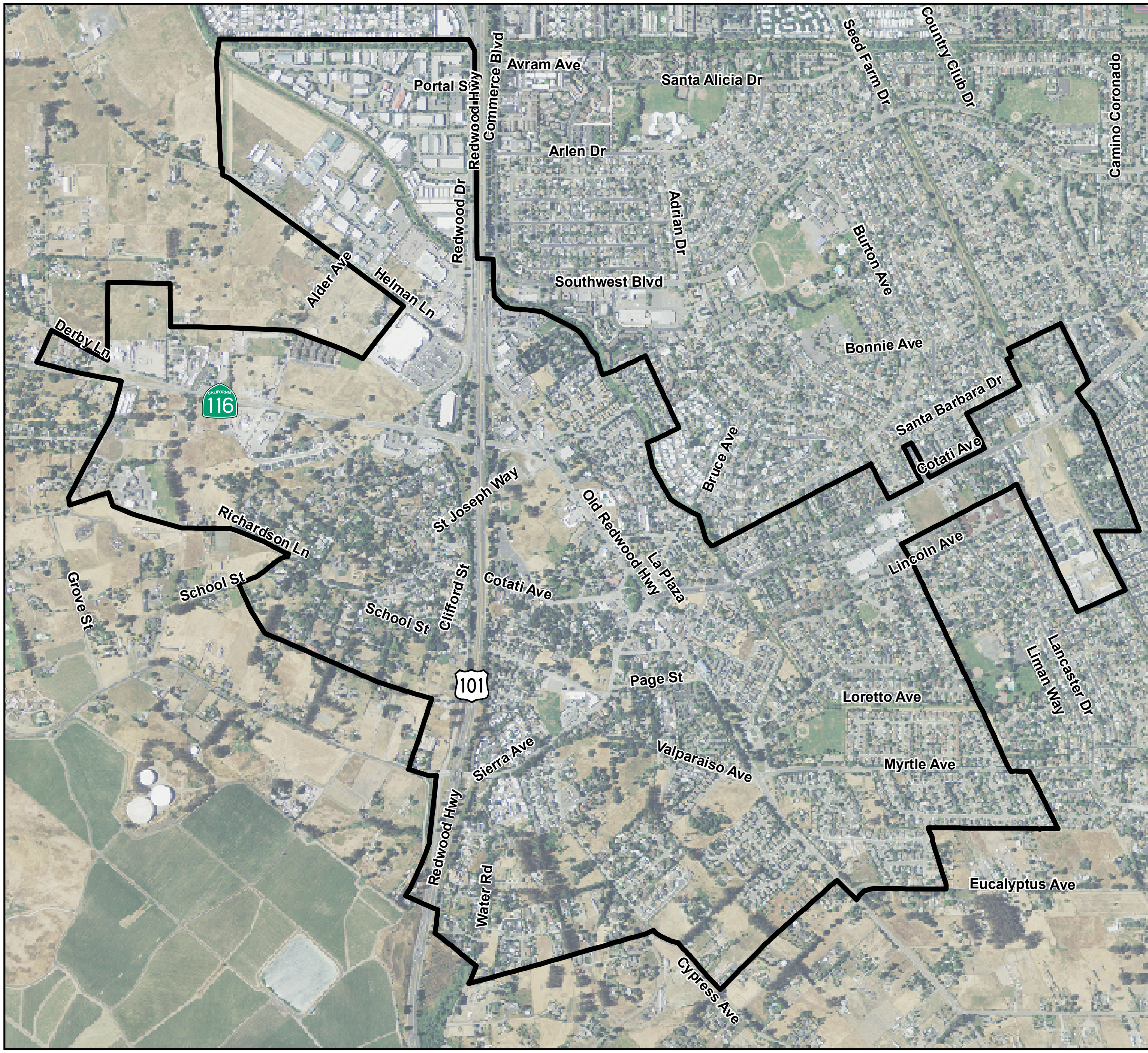
2.3 CLIMATE

The City's study area is characterized by a Mediterranean-type climate with wet, cold winters, and warm, dry summers. Approximately 95 percent of the annual rainfall occurs between November and April, with an average annual rainfall of 24.9 inches[1]. The study area elevation ranges from about 93 feet above mean sea level (msl) on the northwest side of the City, to 272 feet msl on the southwest side of the City.

2.4 LAND USE

Land use and population information are integral components in determining the amount of wastewater generation within a City. The type of land use in an area will affect the volume and character of the wastewater generation. Adequately estimating the generation of wastewater from various land use types is important in sizing and maintaining effective sewer system facilities.

[1] Source: Historical data from Western Regional Climate Center, Petaluma Fire Station 3.



Legend

City Limits

Feet
0 1,000 2,000

Figure 2.1
Study Area
Sewer Collection System
Master Plan
City of Cotati

The City's current General Plan was adopted in 1998. The City is currently in the process of updating the General Plan. According to City staff, the land use assumptions that will be incorporated into the General Plan Update will be based on the City's current zoning map. For this reason, the land use assumptions used in this Master Plan are consistent with the City's current zoning designations (Figure 2.2).

The City provides sewer collection service to residents, businesses, and other institutions within the study area. Table 2.1 provides the acreage totals by zoning classification within the City limits, and a breakdown between developed land and undeveloped lands.

Table 2.1 Study Area Zoning Designations
Sewer Collection System Master Plan
City of Cotati

	Area within the Current City Limits[1]		
Zoning Designation	**Total (acres)**	**Developed (acres)**	**Undeveloped (acres)**
CD - Downtown Commercial	3.31	1.23	2.08
CE - Commercial, East Cotati Corridor	27.90	26.14	1.76
CG - Commercial, Gravenstein Corridor	85.17	25.41	59.76
CI - Commercial/Industrial District	64.02	19.06	44.96
IG - General Industrial District	53.56	52.23	1.33
NL - Neighborhood, Low Density	231.41	193.51	37.9
NM - Neighborhood, Medium Density	99.98	89.01	10.97
NU - Neighborhood, Urban	34.79	27.80	6.99
OSR - Open Space - Recreation	26.48	25.16	1.32
PF - Public Facility District	15.45	10.71	4.74
RR - Rural Residential	98.63	78.00	20.63
RVL - Residential Very Low Density	117.38	69.86	47.52
SPD - Specific Plan, Downtown	62.30	28.04	34.26
SPSW - Specific Plan, Santero Way	20.55	6.29	14.26
Total	**940.94**	**652.44**	**288.5**

Notes:
1. Area totals exclude roads, highways, waterways, etc.

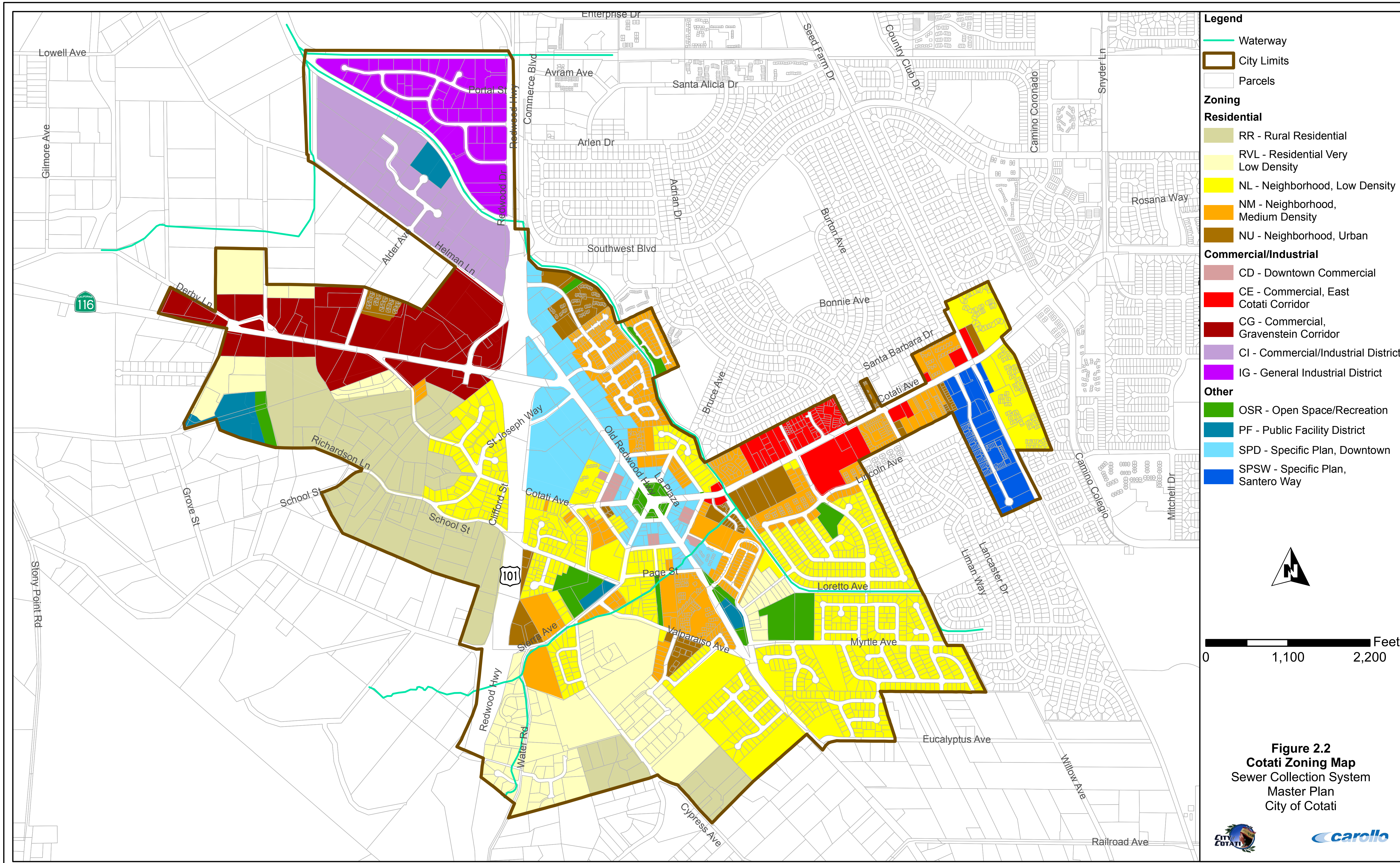


Figure 2.2
Cotati Zoning Map
Sewer Collection System
Master Plan
City of Cotati

The largest zoning category is residential (neighborhood, low density; neighborhood, medium density; neighborhood, urban; rural residential; and residential very low density), which accounts for approximately 1,758 acres, or approximately 62 percent of the City limit acreage, excluding streets, highways, waterways, etc. Commercial and industrial zoning (downtown commercial; commercial, east Cotati corridor; commercial Gravenstein corridor; commercial/industrial district; and general industrial district) make up approximately 25 percent of the total. Other land uses such as open space - recreation, public facility district, and specific plans (specific plan, downtown and specific plan, Santero Way) account for the remaining 13 percent of the City limits, excluding streets, highways, and waterways.

As previously noted, the City is not anticipating that it will annex any additional land areas beyond the current City limits within the planning period of this Master Plan. For this reason, land use assumptions in this study do not extend beyond the current City limits. As shown in Table 2.1, there is roughly 290 acres of developable land within the current City limits. Future wastewater flows in this Master Plan assume that the 290 acres of developable land within City limits will develop by year 2035.

2.5 HISTORICAL AND FUTURE POPULATION

In order to retain its distinct character, preserve its name, and guide its future growth, Cotati incorporated in 1963[2]. The City's roots are steeped in agriculture and music, and its citizens are proud of the diverse and charming community that has been shaped through its history.

According to California Department of Finance (DOF) population estimates, Between 1970 and 2005, the City's population grew by roughly 5,816 residents, from 1,368 in 1970, to 7,184 residents in 2005. Over these 35 years, that growth equated to an average annual rate of approximately 4.9 percent.

Population projections used in this Master Plan are based on forecasts provided in the City's Urban Water Management Plan Water Demand Analysis and Water Conservation Measures Update, dated November 2010 (Maddaus Report). The population forecasts presented in the Maddaus Report project that the City will reach a population of approximately 9,889 people by 2035. Table 2.2 and Figure 2.3 summarize the City's historical and projected population to year 2035.

[2] http://www.ci.cotati.ca.us/

Table 2.2 Historical and Projected Population Sewer Collection System Master Plan City of Cotati			
Year	**Population [1],[2]**	**Year**	**Population [1],[2]**
1970	1,368	2005	7,184
1975	2,870	2010	7,711
1980	3,346	2015	8,105
1985	4,030	2020	8,518
1990	5,625	2025	8,953
1995	6,332	2030	9,409
2000	6,480	2035	9,889

Notes:
1. Historical population based on California Department of Finance estimates for the City of Cotati.
2. Population projections provided in the City of Cotati Urban Water Management Plan Water Demand Analysis and Water Conservation Measures Update, November 2010.

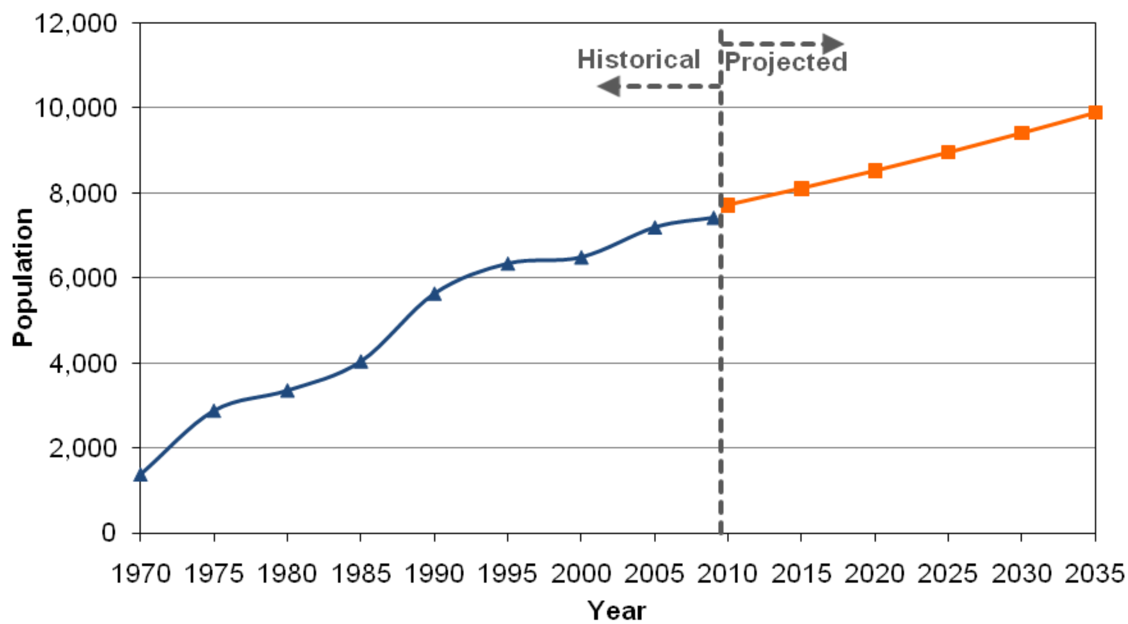


Figure 2.3
Historical and Projected Population
Sewer Collection System Master Plan
City of Cotati

PLANNING CRITERIA

The capacity of the City of Cotati's (City) sewer collection system was evaluated based on the planning criteria defined in this chapter. The criteria include standards from the City's Standard Details and Specifications and other planning criteria developed by Carollo based on engineering judgment and past experience. The planning criteria address the collection system capacity, gravity sewer slopes, maximum depth of flow within a sewer, average wastewater flow coefficients, and wastewater peaking factors.

3.1 GRAVITY SEWERS

Capacity analysis of the sewer collection system was performed in accordance with the criteria established in this chapter. The City's Standard Details and Specifications stipulate general policies of the City and outline sewer design criteria. Some of these criteria are discussed below. If not discussed in this Sewer Collection System Master Plan (Master Plan), the reader should assume that the design criteria conform to the City's Standard Details and Specifications.

Gravity sewer pipe capacities are dependent on many factors, including roughness of the pipe, the maximum allowable depth of flow, minimum velocity, and slope of pipe.

3.1.1 Manning Coefficient (n)

The Manning coefficient 'n' is a friction coefficient and varies with respect to pipe material, size of pipe, depth of flow, smoothness of pipe and joints, and extent of root intrusion. For sewer pipes, the Manning coefficient typically ranges between 0.011 and 0.017, with 0.013 being a representative value used for sewer system master planning.

3.1.2 Flow Depth Criteria (d/D)

The primary criterion used to identify capacity deficient trunk sewers or to size new improvements is the maximum flow depth to pipe diameter ratio (d/D). The d/D value is defined as the depth (d) of flow in a pipe during peak flow conditions divided by the pipe's diameter (D). The City's Standard Details and Specifications do not specifically define the acceptable d/D values for various pipe diameters. Based on Carollo's experience and industry standards, the following d/D criteria were established.

3.1.2.1 <u>Flow Depth for Existing Sewers</u>

Maximum flow depth criteria for existing sanitary sewers are established based on a number of factors, including the acceptable risk tolerance of the utility, funding availability, local standards and codes, and other factors. Using a conservative d/D ratio when evaluating existing sewers may lead to unnecessary replacement of existing pipelines. Conversely, lenient flow depth criteria could increase the risk of sanitary sewer overflows (SSOs). Ultimately, the maximum allowable flow depth criteria should be established to be as cost effective as possible while at the same time reducing the risk of SSOs to the extent possible.

For Cotati, it was ultimately decided that during peak wet weather flow (PWWF) (this is typically the maximum hourly flow in the collection system) water levels would be allowed to rise to within three feet of the manhole rim (i.e., sewers were allowed to surcharge under these maximum flow conditions). If the flow depth was greater than the maximum allowed, then the sewer was deemed deficient and a capital project was proposed to provide greater flow capacity.

3.1.2.2 Flow Depth for New Sewers

When designing new sewers, it is common practice to adopt variable flow depth criteria for different pipe sizes. Design d/D ratios typically range from 0.5 to 0.92, with the lower values used for smaller pipes, which may experience flow peaks greater than design flow or may experience blockages from debris, paper or rags.

Sewers less than 12-inches in diameter should be designed to flow half full at peak wet weather flow rates. Sewers 12 to 18-inches in diameter should be designed to flow at two-thirds depth at peak wet weather flow rate. Sewers larger than 18 inches diameter should be designed to flow at a d/D of 0.75 at peak flow rate. The maximum allowable d/D ratios for design flow conditions are summarized in Table 3.1.

Table 3.1 Maximum Flow Depth Criteria
Sewer Collection System Master Plan
City of Cotati

Maximum Flow Depth Criteria for Existing Sewers	
Peak Wet Weather Flow:	Surcharge to 3' Below Manhole Rim
Maximum d/D for New Sewers	
Pipe Diameter (inches)	Maximum d/D Ratio (during Peak Flows)
Less than 12	0.50
12 to 18	0.67
Larger than 18	0.75

3.1.3 Design Velocities and Minimum Slopes

In order to minimize the settlement of sewage solids, sewer velocity should be equal to or greater than 2 feet per second (fps), based on roughness coefficient of 0.013. At this velocity, the sewer flow will typically provide self-cleaning of the pipe. Table 3.2 lists the recommended minimum slopes and their corresponding maximum flows when the pipe is flowing at its maximum d/D ratio. The recommended minimum slopes presented in Table 3.2 are consistent with those presented in the City's Standard Details and Specifications.

Table 3.2 Minimum Slope for New Sewer Pipes Sewer Collection System Master Plan City of Cotati			
Pipe Diameter (inches)	Minimum Slope(1),(2) (feet/feet)	Calculated Flow at Maximum d/D(2),(3)	
		d/D	Maximum Flow (mgd)
8	0.005(4)	0.50	0.276
10	0.0025	0.50	0.353
12	0.0019	0.67	0.796
15	0.0014	0.67	1.243
18	0.0011	0.67	1.791
21	0.0009	0.75	2.835
24	0.0008	0.75	3.703
27	0.0007	0.75	4.687
30	0.0006	0.75	5.786

Notes:
1. Recommended minimum slope for flows at a velocity greater than or equal to 2 feet/second.
2. Manning's n = 0.013
3. Calculated flow is determined using the minimum slope and the maximum allowable d/D presented in Table 3.1.
4. The City's Standard Details and Specifications specify a minimum slope for 8-inch sewer mains of 0.5%, which is slightly greater than required to maintain a minimum velocity of 2 fps with a d/D of 0.5.

3.1.4 Changes in Pipe Size

In accordance with the City's Standard Details and Specifications, when a smaller sewer joins a large one, the inlet crown should be at least as high as the outlet crown.

3.2 LIFT STATIONS AND FORCE MAINS

Standard industry practice is to require that sewage lift stations have sufficient firm capacity (capacity with the largest pump out of service) to pump the design flow.

Force main piping should be sized to provide a minimum velocity of 3 fps at the design flow rate of the lift station and no more than 8 fps. For the determination of head loss, the Hazen Williams Equation was used with a C factor of 120. These factors are typical for sewer system master planning purposes.

WASTEWATER DESIGN FLOWS

This chapter summarizes the flow monitoring program and presents the calculation of the design flows used to evaluate the capacity of the existing and future sewer system.

4.1 FLOW MONITORING PROGRAM

The City of Cotati (City) contracted with Utility Systems, Science, and Software (US3) to conduct a two-month temporary flow monitoring program at seven (7) sewer metering sites along with two rain gauge locations within the City. The flow monitoring was conducted between March 10, 2010 and May 14, 2010. As part of this Sewer Collection System Master Plan, the City asked Carollo to complete a flow monitoring report that summarizes the data collected by US3. A copy of the flow monitoring report, as well as the data collected as part of the US3 work is included in Appendix A of this Master Plan.

The sewer flow monitoring locations are illustrated on Figure 4.1. The seven locations were selected to collect flow data from the entire City and isolate flow from smaller sewer basins within the City's collection system. Table 4.1 lists the flow monitoring locations and the diameters for the sewers where the meters were installed. Figure 4.2 provides a schematic illustration of the flow monitoring locations.

**Table 4.1 Flow Monitoring Locations and Pipeline Diameters
Sewer Collection System Master Plan
City of Cotati**

Site	Diameter (in.)	Location
1	24	Helman Lane approximately 1 mile west of Highway 101
2	18	Manhole east of the intersection of Commerce Boulevard and the Laguna
3	12	West of Falleti park near intersection of Gravenstein Way and Village Court
4	6	Saint Josephs Way between the Park and Ride and the Baseball Field
5	10	West side of Old Redwood Highway in front of the Hub Cyclery at 7885 Old Redwood Highway
6	8	East side of Old Redwood Highway across the Hub Cyclery at 7885 Old Redwood Highway
7	10	Redwood Drive in front of Lowe's Home Improvement Store

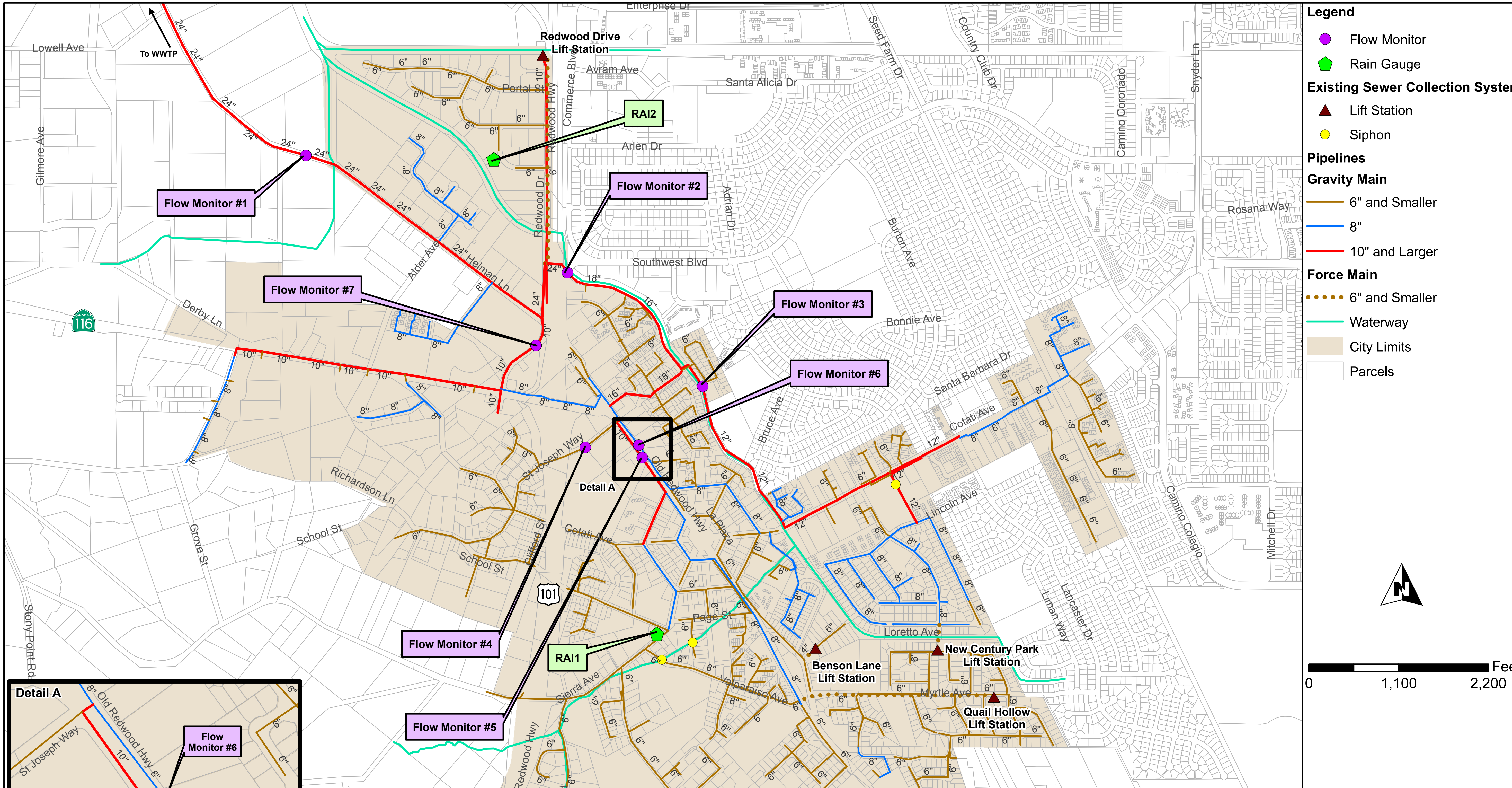


Figure 4.1
Flow Meter Locations
Sewer Collection System
Master Plan
City of Cotati

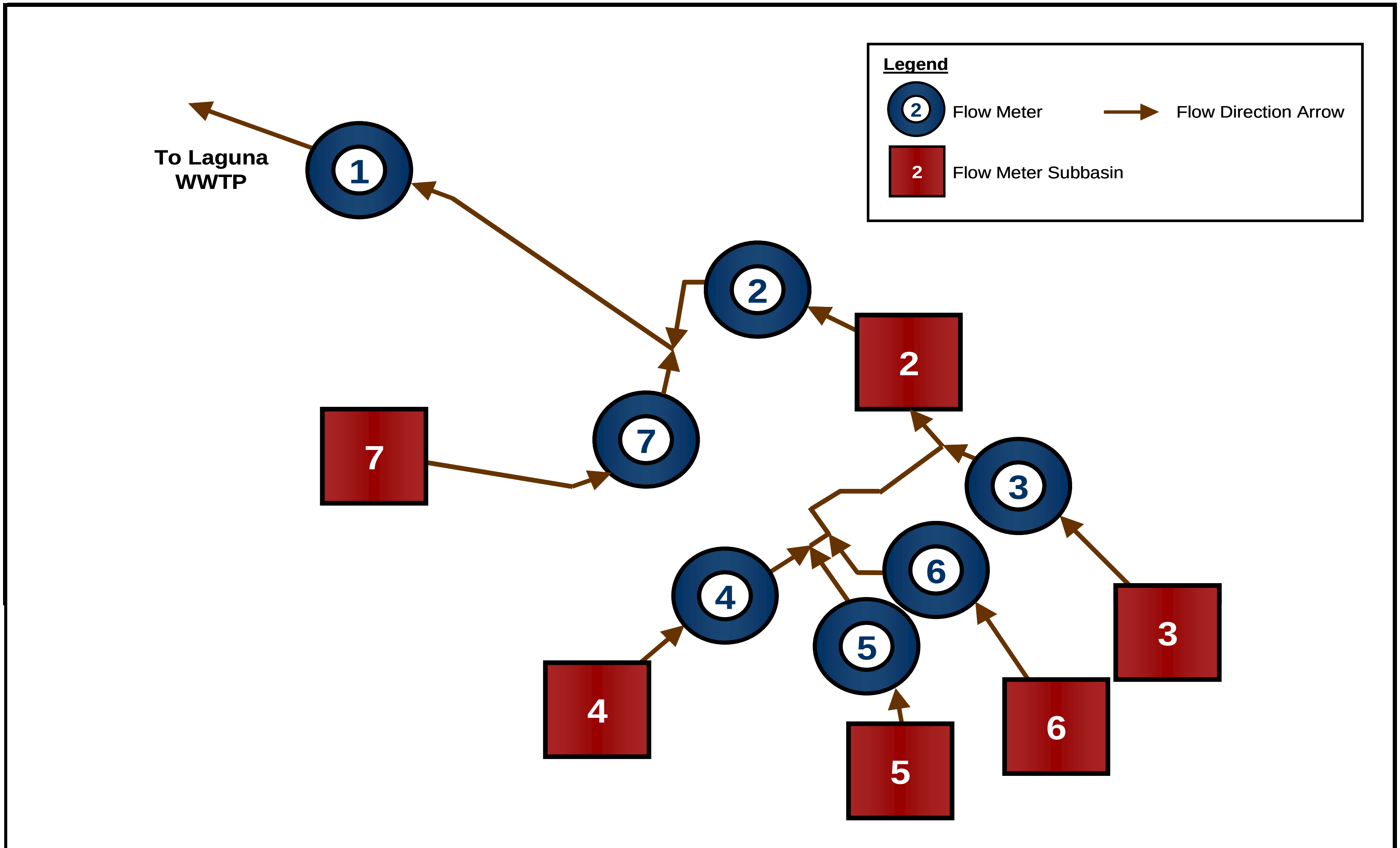


Figure 4.2
Flow Monitoring Locations Schematic
Sewer Collection System Master Plan
City of Cotati

4.2 FLOW MONITORING RESULTS

4.2.1 Dry Weather Flow

During the flow monitoring period, depth and velocity data were collected at each meter at 15 minute intervals. The 15 minute data was then aggregated to hourly data for the dry weather flow calibration effort. Characteristic dry weather 24 hour diurnal flow patterns for each site were developed based on the hourly data. This hourly flow data was then used to calibrate the hydraulic model for the observed dry weather flows during the flow monitoring period.

Hourly patterns for weekday and weekend flows vary and are separated to better understand dry weather flow. For the flow monitoring period, the following days were least affected by storm events and were used to determine dry weather flow.

- March 15 – 24, 2010
- April 6 – 10, 2010
- April 15 – 19, 2010
- April 29 – May 9, 2010

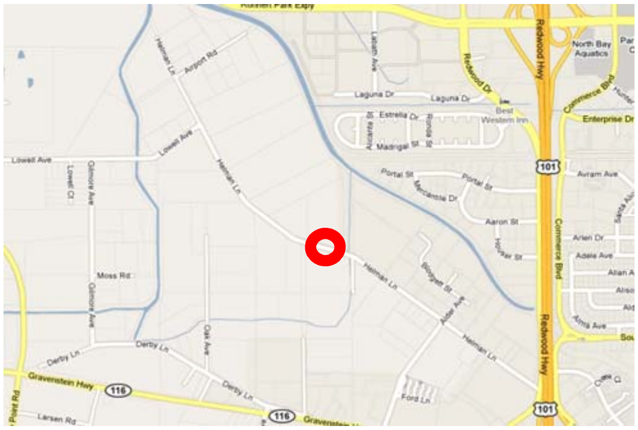
Figure 4.3 shows a summary of the dry weather flow analysis for Meter 1, including the average weekend and weekday flow variations during the flow monitoring period. For a summary of the dry weather flow analysis for Meter Sites 2 to 7, refer to Appendix A. Table 4.2 provides the dry weather flow for weekends and weekdays.

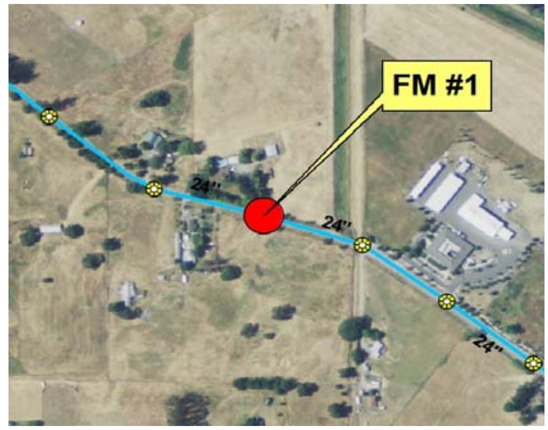
4.2.2 Rainfall Data

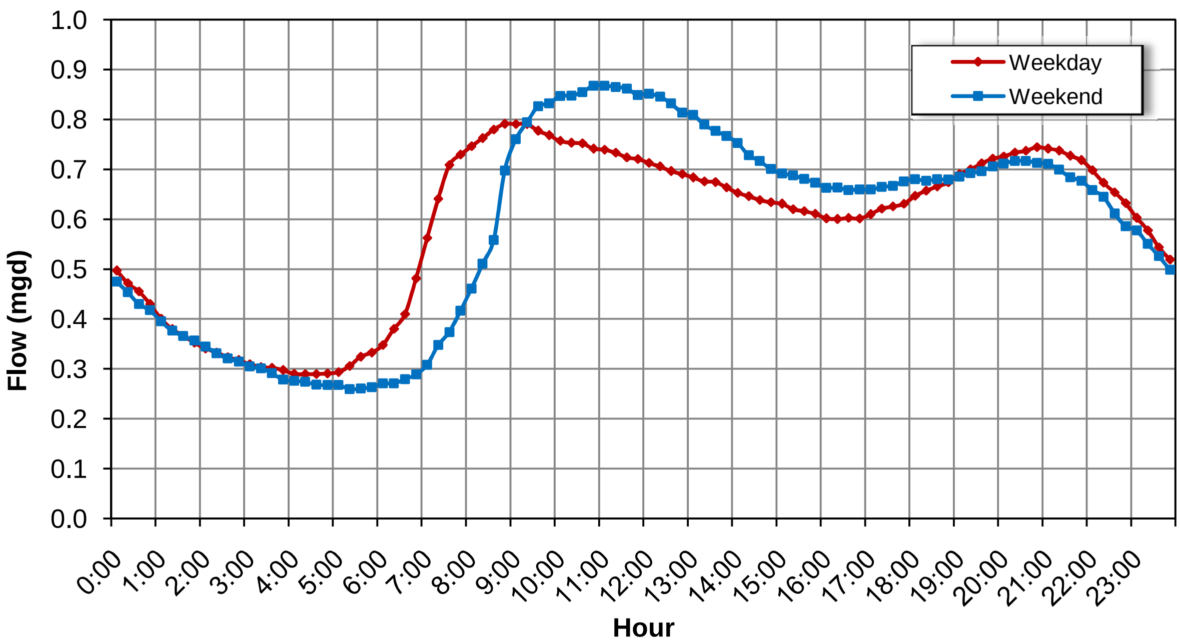
US3 installed two rain gauges in the City to capture rainfall data during the flow monitoring period in order to quantify the system's response to infiltration and inflow (I/I). In order to establish a benchmark of system response to varying storm depths and intensities, it is important to classify the relative size of the major storm events that occur over the course of the flow monitoring period. Based on historical data, the National Oceanic and Atmospheric Administration (NOAA) developed frequency contour maps for given intensity and duration storm events for all areas within the Continental United States. The NOAA Rainfall Atlas Maps classify a 10-year, 24-hour storm event in Cotati as 4.5 inches in a 24-hour period. This means that in any given year, there is a 10 percent chance that 4.5 inches of rain will fall in any 24-hour period.

Four significant rainfall events occurred during the flow monitoring period. Table 4.3 summarizes the rainfall depths and peak rainfall intensity for each storm. The highest rainfall total in any 1-hour period was 0.26 inches per hour and occurred during the April 11, 2010 rainfall event. The highest 24-hour total rainfall depth that occurred during the flow monitoring period was 1.67 inches on April 11, 2010. All of the events experienced during the flow monitoring program were classified as less than two-year storm events.

Flow Monitoring Site: Site 1
Pipe Diameter: 24-inches
Location: Helman Lane approximately 1 mile west of Highway 101







Dry Weather Flow Days: March 15-24, April 6-10, April 15-19, and April 29-May 9, 2010.

Flow Condition	Weekday	Weekend	Avg.
DWF (mgd)(1)	0.587	0.583	0.586
PDWF (mgd)(2)	0.929	0.951	0.951
PDWF/DWF	1.58	1.63	1.62

(1) Dry Weather Flow (DWF) represents the average flow during the dry weather days

(2) Peak Dry Weather Flow (PDWF) is the 15-minute peak measured during the dry weather days.

Figure 4.3
Flow Meter Site 1 Dry Weather Flow Summary
Sewer Collection System Master Plan
City of Cotati

carollo

CITY of COTATI

Table 4.2	Dry Weather Flow Summary Sewer Collection System Master Plan City of Cotati		
	Dry Weather Flow[1] (mgd)		
Site	Weekday	Weekend	Weekend/ Weekday Ratio
1	0.587	0.583	1.01
2	0.563	0.552	1.02
3	0.168	0.181	0.93
4	0.031	0.029	1.04
5	0.160	0.162	0.99
6	0.051	0.052	0.98
7	0.037	0.034	1.10

Note:

1. Dry Weather Flow represents the average of the 15-minute flow data during the established dry weather days (March 15-24, April 6-10, April 15-19, and April 29-May 9, 2010) during the flow monitoring period.

Table 4.3	Significant Storm Event Summary (Greater than 0.5-inches) Sewer Collection System Master Plan City of Cotati			
Event	Date	Total Rainfall (inches)	Peak Intensity (inches/hour)	Storm Duration (hours)
1	March 12, 2010	0.54	0.12	9
2	March 31, 2010	0.63	0.22	5
3	April 11, 2010	1.67	0.26	30
4	April 19, 2010	0.51	0.19	7

While the individual rainfall events were not large relative to a 10-year, 24-hour event, the total rainfall over the course of the flow-monitoring period was significant. The total rainfall depth over the course of the flow-monitoring period was 6.07-inches, while the historical average rainfall depth during the flow-monitoring period was 3.84-inches, based on data available from the Western Regional Climate Center (WRCC)[1]. The measured rainfall totals were approximately 158 percent (158 percent) above the average during this time period.

4.2.3 Wet Weather Flow Data

The flow monitoring data were also evaluated to determine how the collection system responds to wet weather events. Analysis of the I/I response was performed so that the

[1] Source: www.wrcc.dri.edu, data presented is from Station 046826 (Petaluma Fire Station 3)

peak I/I rates and I/I volumes could be clearly differentiated from the dry weather flow. The April 11, 2010 rainfall event yielded the greatest rainfall total (1.67 inches) and peak rainfall intensity (0.26 inches/hour) of the four storms indentified in Table 4.3. The I/I analysis was conducted using data from the April 11, 2010 event.

The parameters from the I/I analysis used for the master plan are the peak I/I rate and the R-Value. The R-Value is used to rate the basins in terms of combined I/I, and represents the percentage of rainfall that enters into the collection system after a rainfall event. Systems with R-Values less than five percent are often considered to be performing well in terms of combined I/I. Table 4.4 summarizes the results from the I/I analysis. As can be seen in Table 4.4, basin 6 showed the highest I/I response with an R-Value of 4.64 percent.

Figure 4.4 shows a summary of the wet weather flow analysis for Meter 1. For a summary of the wet weather flow analysis for Meter Sites 2 to 7, refer to Appendix A.

Table 4.4 I/I Results Summary
Sewer Collection System Master Plan
City of Cotati

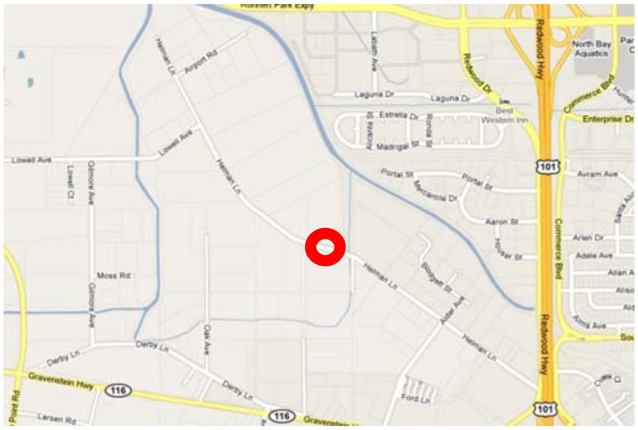
Flow Meter	DWF(1) (mgd)	Estimated Total I/I(2) (gallons)	R-Value(2) (%)	Peak I/I Rate(2) (mgd)	Peak I/I to DWF Ratio
1	0.59	824,000	1.59%	0.71	1.20
2	0.56	569,000	2.00%	0.60	1.07
3	0.17	155,000	1.44%	0.20	1.18
4	0.03	101,000	2.23%	0.07	2.33
5	0.16	301,000	1.83%	0.36	2.25
6	0.05	139,000	4.64%	0.18	3.60
7	0.04	67,000	1.33%	0.12	3.00

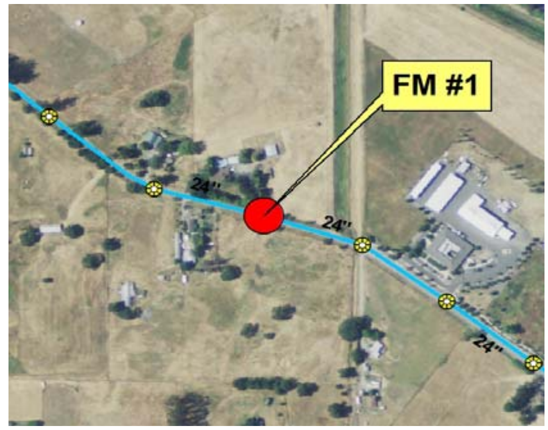
Notes:
1. Dry Weather Flow represents the average of the 15-minute flow data during the established dry weather days (March 15-24, April 6-10, April 15-19, and April 29-May 9, 2010) during the flow monitoring period.
2. Results are taken from the April 11, 2010 storm event.

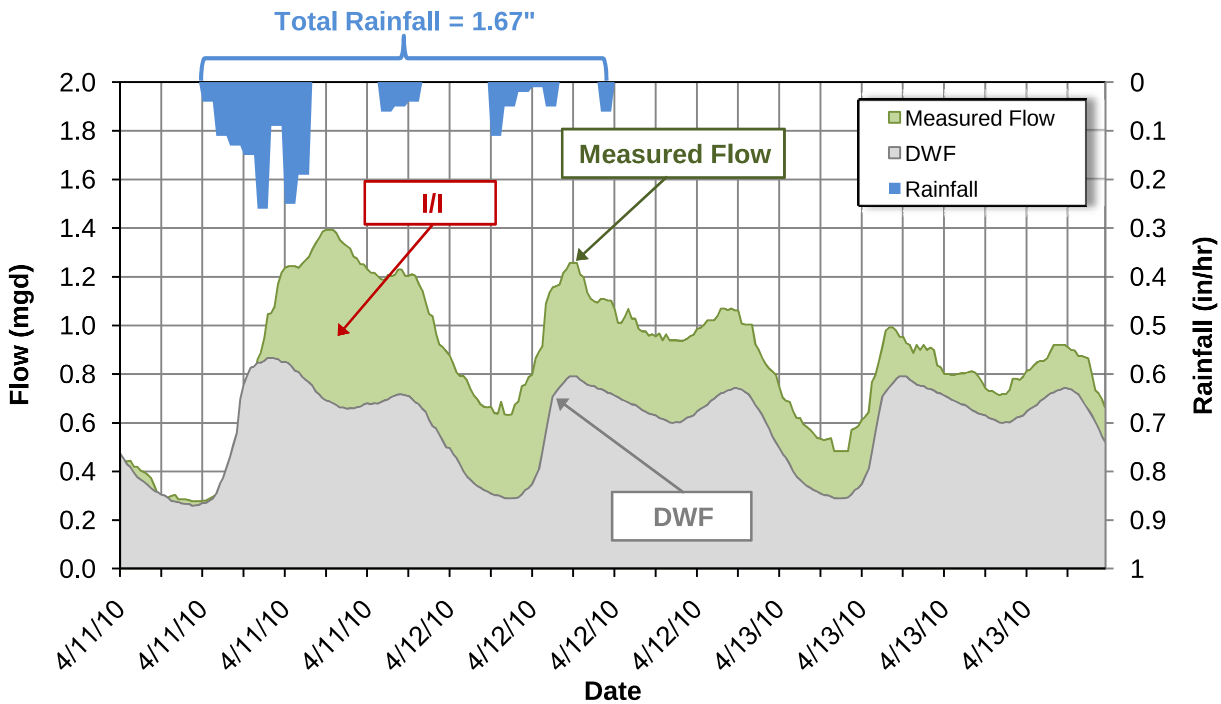
4.2.4 Design Storm Data

Design storms are rainfall events used to the I/I response of a collection system during wet weather events. Developing a design storm can be accomplished two ways. If hourly rainfall data is not available for a historical design storm event, a synthetic design storm can be used. The NOAA Atlas 2 isopluvial (rainfall total contours) map of California is used to approximate the total depth for the 10-year, 24-hour design storm.

Flow Monitoring Site: Site 1
Pipe Diameter: 24-inches
Location: Helman Lane approximately 1 mile west of Highway 101







Wet Weather Analysis Period: April 11-13, 2010

I/I Analysis

Rainfall:	1.67	inches
Peak I/I Rate:	0.71	mgd
Peak I/I:DWF Ratio:	1.20	
Combined I/I Volume:	824,000	gallons
R-Value:	1.59%	

Figure 4.4
Flow Meter Site 1 Wet Weather Flow Summary
Sewer Collection System Master Plan
City of Cotati

carollo

CITY of COTATI

NOAA Atlas 2, published in 1973, serves as the industry standard for determining total rainfall depth at specified frequencies and durations in Central and Northern California. The isopluvial maps published in NOAA Atlas 2 were developed using historical rainfall data from approximately 3,300 weather stations in the western United States (roughly 1,200 located in California) with a period of record that ranged from 10 to 94 years.

Based on the NOAA data, a 10-year, 24-hour design storm for Cotati is 4.5 inches of rainfall. This design storm has a ten percent chance (1/10) that 4.5 inches of rain will fall in any 24-hour period in a given year. A 10 year, 24-hour design storm is typically used when modeling peak wet weather flow (PWWF) in collection systems.

The Natural Resources Conservation Service (NRCS), formally known as the Soil Conservation Service (SCS), developed normalized rainfall hyetograph distribution curves based on the storm's geographical location. The distribution curves are applied to total storm event volumes in order to develop hourly storm event hyetographs. There are four types of rainfall distributions used to represent various regions throughout the United States (Type I, IA, II, and III). Types I and IA represent the Pacific maritime climate with wet winters and dry summers. Type III represents Gulf of Mexico and Atlantic coastal areas where tropical storms bring large 24-hour rainfall amounts. Type II represents the rest of the country. The City lies geographically within the Type 1A boundary. Therefore, the Type IA distribution was used. The design storm developed using the NRCS method is shown in Figure 4.5. The NRCS method will be used to develop synthetic rainfall hyetographs in order to simulate the PWWF in the collection system during a design storm event.

4.3 WASTEWATER FLOW COMPONENTS

Wastewater consists of dry weather flow (DWF) and wet weather flow (WWF). DWF (or base flow) is flow generated by routine water usage in the residential, commercial, business and industrial sectors of the sewer system. The other component of DWF is the contribution of dry weather groundwater infiltration (GWI) into the sewer system. Dry weather GWI will enter the sewer system when the relative depth of the groundwater table is higher than the depth of the pipeline and when the susceptibility of the sanitary sewer pipe allows infiltration through defects such as cracks, misaligned joints and broken pipelines.

WWF includes storm water inflow, trench infiltration, and GWI. The storm water inflow and trench infiltration comprise the WWF component termed I/I. The response in the sewer system to rainfall is seen immediately (as with inflow) or within hours after the storm (as with infiltration).

The third element of WWF is GWI, which is not specific to a single rainfall event, but rather to the effects on the sewer system over the entire wet weather season. The depth of the groundwater table rising above the pipe invert elevation causes GWI.

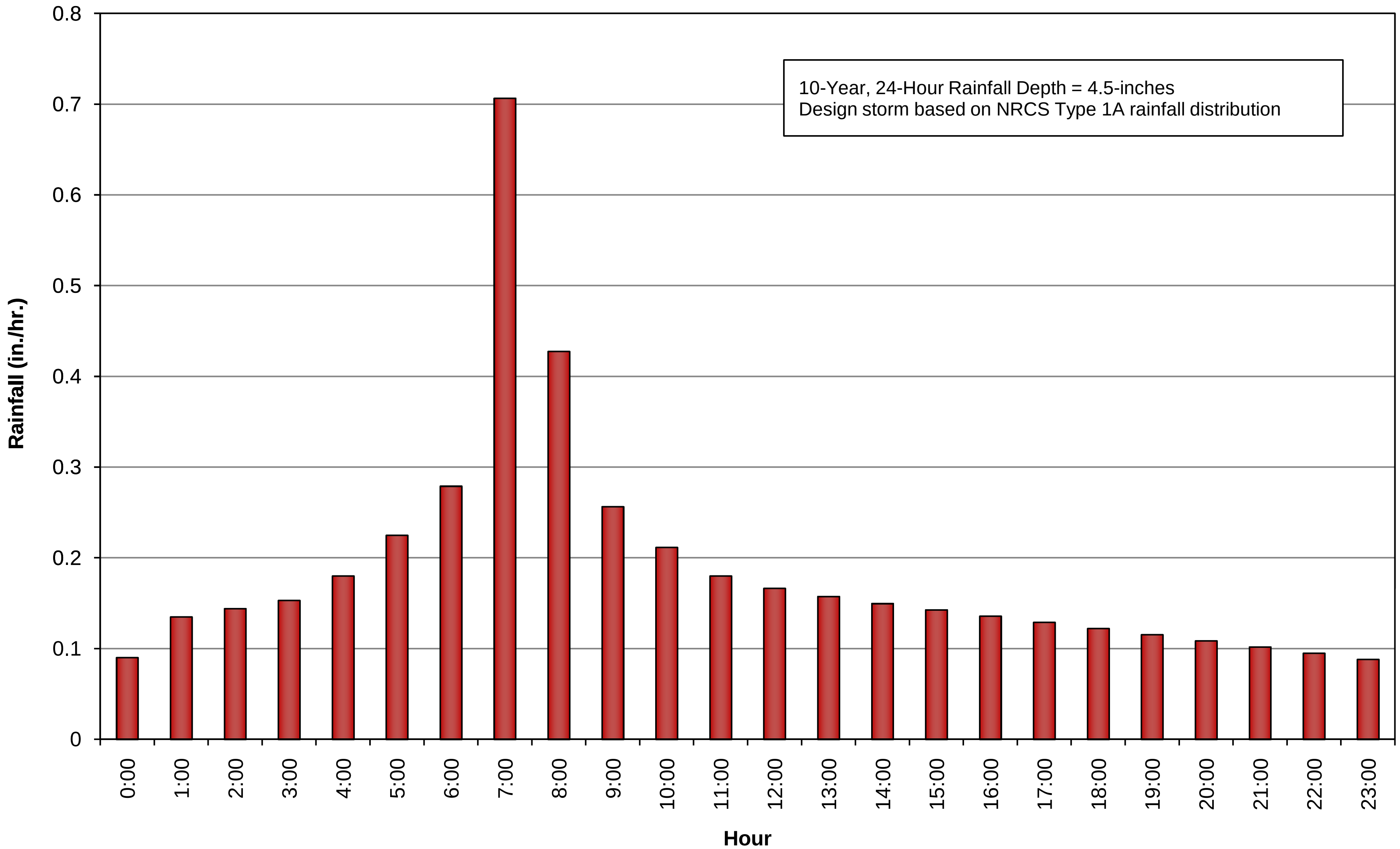


Figure 4.5
10-Year, 24-Hour Design Storm
Sewer Collection System Master Plan
City of Cotati

Sewer pipes within close proximity to a body of water can be greatly influenced by groundwater effects. As the groundwater table fluctuates over the wet weather season, this fluctuation is seen as a mounding effect in flow monitoring data. This may be considerable in the City's service area, particularly in sewers located near the Laguna de Santa Rosa (Laguna), or Cotati Creek.

A description of each flow component is detailed in the following sections.

4.3.1 Base Wastewater Flow

The base wastewater flow (BWF) is the flow generated by the City's customers. The flow has a diurnal pattern that varies depending on the type of use. Commercial and industrial patterns, though they vary depending on the type of use, typically have more consistent higher flows during business hours, and lower flows at night. Furthermore, the diurnal flow pattern experienced during a weekend may vary from the diurnal flow experienced during a weekday.

4.3.2 Groundwater Infiltration

GWI, one of the components of I/I, is associated with extraneous water entering the sewer system through defects in pipes and manholes. GWI is related to the condition of the sewer pipes, manholes, and groundwater levels. GWI may occur throughout the year, although rates are typically higher in the late winter and early spring. Dry weather GWI (or base infiltration) cannot easily be separated from BWF by flow measurement techniques. Therefore, dry weather GWI is typically grouped with BWF.

4.3.3 Average Dry Weather Flow

The average dry weather flow (ADWF) is the average flow that occurs on a daily basis during the dry weather season. The ADWF includes the BWF generated by the City's residential, commercial, and industrial users, plus the dry weather GWI component. Based on historical flow data from the City's permanent flow meter at the City of Santa Rosa Laguna Wastewater Treatment Plant for the dry weather season in 2008 and 2010, the City's existing ADWF is estimated to be roughly 0.46 mgd.

4.3.4 Infiltration and Inflow

Infiltration is defined as storm water flows that enter the sewer system by percolating through the soil and then through defects in pipelines, manholes, and joints. Examples of infiltration entry points are cracks in pipelines, misaligned joints, and root penetration. Inflow is defined as storm water that enters the sewer system via a storm drain cross connections, leaky manhole covers, or cleanouts. Examples of inflow entry points are roof drain and downspout connections, leaky manhole covers, and illegal storm drain connections.

The adverse effects of I/I entering the sewer system is that it increases both the flow volume and peak flows such that the sewer system is operating at or above its capacity. If too much I/I enters the sewer system, SSOs could occur.

4.3.5 Peak Wet Weather Flow (Design Flow)

Peak wet weather flow is the highest observed hourly flow that occurs following the design storm event. Wet weather I/I causes flows in the collection system to increase. PWWF is typically used for designing sewers and lift stations. Therefore, PWWF will be referred to as the design flow in this study. The City's sewers and lift stations were evaluated based on their capacity to convey the design flow (PWWF). If the sewers violated the flow depth criterion, then they were considered capacity deficient for which improvements were proposed.

The WEF Manual of Practice FD-6 and ASCE Manual No. 62 recommends maintaining design flow to ADWF ratios below 3 to 4, with higher values indicative of pronounced I/I. Based on the hydraulic modeling results, we were able to derive peak flows throughout the system. This was accomplished by routing the 10-year, 24-hour design storm through the hydraulic model, which was calibrated to both dry weather and wet weather conditions (see Chapter 5).

4.4 EXISTING AND PROJECTED WASTEWATER FLOW

In order to develop wastewater flow projections and allocate future flows to the collection system, relationships between land use and wastewater generation were developed. These relationships, called wastewater generation coefficients are established based on the average wastewater flow generated for each existing land use type. The land use flow coefficients were established to project the estimate average day flow for build out of the study area.

4.4.1 Existing Wastewater Flow Coefficients

Average wastewater flow coefficients are rates, usually expressed in gallons per day per acre (gpd/ac), applied to land use acreage to calculate the ADWF generated from a particular land use. A flow coefficient was developed for each zoning classification. The flow coefficient provides a means to transform a zoning category from acreage into wastewater flow. The resulting flow is then input into the appropriate sewer area in the sewer system model. Wastewater flow coefficients for residential areas can range between 200 to 4,000 gpd/ac, and commercial and industrial areas might range from 500 to 2,500 gpd/ac, with typical values averaging approximately 800 to 1,000 gpd/ac. Land uses designated as open space and agriculture are assumed to generate negligible amounts of sewage flow, and as a result have a flow coefficient of zero.

The coefficients are developed using the following procedure:

- Average flows for each flow metering tributary area were derived from the flow monitoring data.
- Using GIS, the acres for each land use type contained in each flow monitoring tributary area were calculated.
- Preliminary coefficients for each land use type are estimated based on the approximate number of dwelling units per acre, the assumed per capita wastewater generation rates, and the typical number of people per dwelling unit for each land use type.
- The coefficients for each flow metering tributary are then adjusted up or down (balanced) so that the calculated average flows from each tributary match what was measured during the flow monitoring period.
- Once the coefficients for the six flow meter tributary areas were balanced, the weighted average of the coefficients for each land use type is calculated based on the acreage contribution from each metering tributary area.
- The weighted average wastewater generation coefficients were then adjusted for the entire developed sewer service area to the match the ADWF of 0.46 mgd. The adjusted weighted average coefficients are considered representative of the wastewater generation by land use for the City as a whole, and are used to project future average wastewater flows.
- The coefficients are then compared to the water use billing records to confirm that the return-to-sewer ratio (i.e., the percentage of water demand that enters the sewer system) for each land use type is reasonable before they are used to project future wastewater flows (see Appendix E for a summary of the return-to-sewer ratio for each land use type).

The calibrated wastewater flow coefficients developed for this Master Plan range from 200 gpd/ac to 1,600 gpd/ac, and are summarized in Table 4.5.

Table 4.5 Wastewater Flow Coefficients and Projected ADWF
Sewer Collection System Master Plan
City of Cotati

	Land Use Totals		Sewer Flow Estimates (ADWF)		
Zoning Designation	**Developed (acres)**	**Total (acres)**	**Wastewater Flow Coefficient (gpd/ac)**	**Existing (2010) ADWF[1] (mgd)**	**Future (2035) ADWF[1] (mgd)**
CD - Downtown Commercial	1.23	3.31	1,400	1,728	4,632
CE - Commercial, East Cotati Corridor	26.14	27.90	1,000	26,137	27,905
CG - Commercial, Gravenstein Corridor	25.41	85.17	600	15,244	51,105
CI - Commercial/Industrial District	19.06	64.02	400	7,626	25,607
IG - General Industrial District	52.23	53.56	400	20,894	21,425
NL - Neighborhood, Low Density	193.51	231.41	900	174,158	208,268
NM - Neighborhood, Medium Density	89.01	99.98	1,100	97,908	109,980
NU - Neighborhood, Urban	27.80	34.79	1,600	44,473	55,669
OSR - Open Space - Recreation	25.16	26.48	0	0	0
PF - Public Facility District	10.71	15.45	600	6,425	9,270
RR - Rural Residential	78.00	98.63	200	15,600	19,726
RVL - Residential Very Low Density	69.86	117.38	400	27,942	46,954
SPD - Specific Plan, Downtown	28.04	62.30	800	22,431	49,839
SPSW - Specific Plan, Santero Way	6.29	20.55	1,300	8,183	26,709
Total	**652.44**	**940.94**	**--**	**468,749**	**657,088**

Notes:
1. ADWF = Average Dry Weather Flow

4.4.2 Existing and Projected Average Dry Weather Flow

Developing an accurate estimate of the future quantity of wastewater generated at build out of the collections system is an important step in maintaining and sizing sewer system facilities, for both existing conditions and future developments. The future ADWF for build out of the study area was determined by multiplying the wastewater generation coefficients by the build out land use acreage. Using this method, the build out ADWF is approximately 0.66 mgd. The existing and future wastewater generation is summarized in Table 4.5.

4.5 DESIGN FLOWS

The design flow is the maximum hourly flow rate under selected design storm and growth conditions. The design flow includes the ADWF and the peak I/I rate. Typically, a design storm is routed through a hydraulic model to estimate the PWWF in a sewer system and to quantify the system's capacity. This Master Plan utilized the 10 year, 24-hour design storm rainfall pattern for generating the design flow in the sewer system ("design flow" is synonymous to peak wet weather flow).

The existing PWWF was generated by routing the 10-year, 24-hour synthetic design storm through the hydraulic model, which was calibrated under both dry weather and wet weather conditions. Detailed information regarding the calibration of the City's hydraulic model is provided in Chapter 5.

Similar to the existing PWWF, the 2035 PWWF was derived by routing a synthetic 10-Year, 24-Hour Design Storm through the hydraulic model. Peak I/I rates for future growth areas (i.e., vacant land within the current City service area) were developed based on peak I/I rate of 1,000 gpd/ac[2].

Using the hydraulic model Cotati's PWWF (or model derived design flow) at the Laguna Wastewater Treatment Plant (WWTP) for build out is estimated to be 4.6 mgd for year 2035 conditions. This equates to a PWWF to ADWF peaking factor of 7.0, which exceeds the peaking factor of 3 to 4 recommended in the WEF Manual of Practice FD-6 and ASCE Manual No. 62. The City could potentially reduce the peak I/I rate in the collection system through I/I identification and reduction projects. In the master planning phase, however, it is difficult to quantify the I/I reduction that could be achieved through such projects. In addition, for evaluating the capacity of the sewer collection system, it is prudent to assume the peaking factor of 7.0 for year 2035.

A summary of the existing and future ADWF is presented in Table 4.6. In addition to the projected ADWF, Table 4.6 includes estimates for existing and projected 2035 design flow.

---

[2] *Recommended Standards for Wastewater Facilities*, "10 State Standards," Great Lakes-Upper Mississippi Board of State and Provincial Public Health and Environmental Managers, 2004.

Table 4.6	Existing and Projected Wastewater Flow Summary Sewer Collection System Master Plan City of Cotati		
Year	**Average Dry Weather Flow (mgd)**	**Design Flow (mgd)**	**Peaking Factor**
Existing (2010)	0.46	3.90	8.5
Build-Out (2035)	0.66	4.60	7.0

4.6 PLANNING CRITERIA SUMMARY

The planning criteria for this Master Plan are summarized in Table 4.7.

Table 4.7 Planning Criteria Summary
Sewer Collection System Master Plan
City of Cotati

Minimum Slopes for New Sewers

Pipe Size (inches)	Minimum Slope[(1)] (ft/ft)	Calculated Flow at Maximum d/D	
		d/D	Maximum Flow (mgd)
8	0.005[(2)]	0.50	0.276
10	0.0025	0.50	0.353
12	0.0019	0.67	0.796
15	0.0014	0.67	1.243
18	0.0011	0.67	1.791
21	0.0009	0.75	2.835
24	0.0008	0.75	3.703
27	0.0007	0.75	4.687
30	0.0006	0.75	5.786

Notes:
1. Recommended minimum slope for flows at a velocity greater than or equal to 2 feet/second. Manning's n =0.013
2. The City's Standard Details and Specifications specify a minimum slope for 8-inch sewer mains of 0.5%, which is slightly greater than required to maintain a minimum velocity of 2 fps with a d/D of 0.5

Maximum Flow Depth, d/D

The following flow depth criteria was used in the analysis:

Maximum d/D for Existing Sewers

Peak Wet Weather Flow: Pipes will be allowed to surcharge 3 feet below manhole rim

Maximum d/D for Planning New Sewers

Pipe Diameter (inches)	Maximum d/D Ratio (during Peak Flows)
Less than 12	0.50
12 to 18	0.67
Larger than 18	0.75

Headloss in Existing Pipes

Headloss in existing sewer pipes shall be calculated based on the following:

Gravity Pipes	Manning's n = 0.013
Pressure Pipes	Hazen Willam's C = 120

Changes in Pipe Size

When a smaller sewer joins a larger one, sewer crowns were matched.

Average Sewer Flow Coefficients

Zoning Designation	ADWF Coefficient (gpd/acre)
CD - Downtown Commercial	1,400
CE - Commercial, East Cotati Corridor	1,000
CG - Commercial, Gravenstein Corridor	600
CI - Commercial/Industrial District	400
IG - General Industrial District	400
NL - Neighborhood, Low Density	900
NM - Neighborhood, Medium Density	1,100
NU - Neighborhood, Urban	1,600
OSR - Open Space - Recreation	0
PF - Public Facility District	600
RR - Rural Residential	200
RVL - Residential Very Low Density	400
SPD - Specific Plan, Downtown	800
SPSW - Specific Plan, Santero Way	1,300

COLLECTION SYSTEM FACILITIES AND HYDRAULIC MODEL

This chapter describes the development and calibration of the City of Cotati (City) sewer collection system hydraulic model.

5.1 SEWER SERVICE AREA OVERVIEW

The City's sanitary sewer collection system consists of approximately 32 miles of active sewer pipelines ranging in size from 4-inches to 24-inches in diameter, with four sewer lift stations and the associated force mains. All wastewater generated within the City limits is ultimately conveyed through a 24-inch interceptor to the City of Santa Rosa's Laguna Wastewater Treatment Plant (WWTP). Figure 5.1 shows the existing sewer collection system, including sewer diameters and lift station locations. More detail on the City's trunk sewers is provided below. Table 5.1 presents a summary by diameter of the known sewers in the collection system.

Table 5.1 Sewer Collection System Pipeline Summary
Sewer Collection System Master Plan
City of Cotati

Diameter (inch)	Length (feet)	Diameter (inch)	Length (feet)
4	196	12	6,013
6	92,979	16	1,790
8	35,519	18	1,247
10	9,558	24	22,539
		Total	**169,888**

5.2 MODELED SEWER COLLECTION SYSTEM

It is common practice in sewer system master planning to exclude small diameter sewers (typically 8-inches in diameter and smaller) when developing a hydraulic computer model of a particular sewer collection system. This process, referred to as "skeletonizing," reduces the complexity of the hydraulic model, data input requirements, file size, and model run times. Due to the relatively small size of the City's sewer collection system, however, it was possible to include all sewer mains in the City's sewer collection system in the model. Therefore, the modeled sewer system consists of the entire 32 miles of active sewer pipelines, as well as each of the City's four sewer lift stations. Sewer laterals are not included in the hydraulic model.

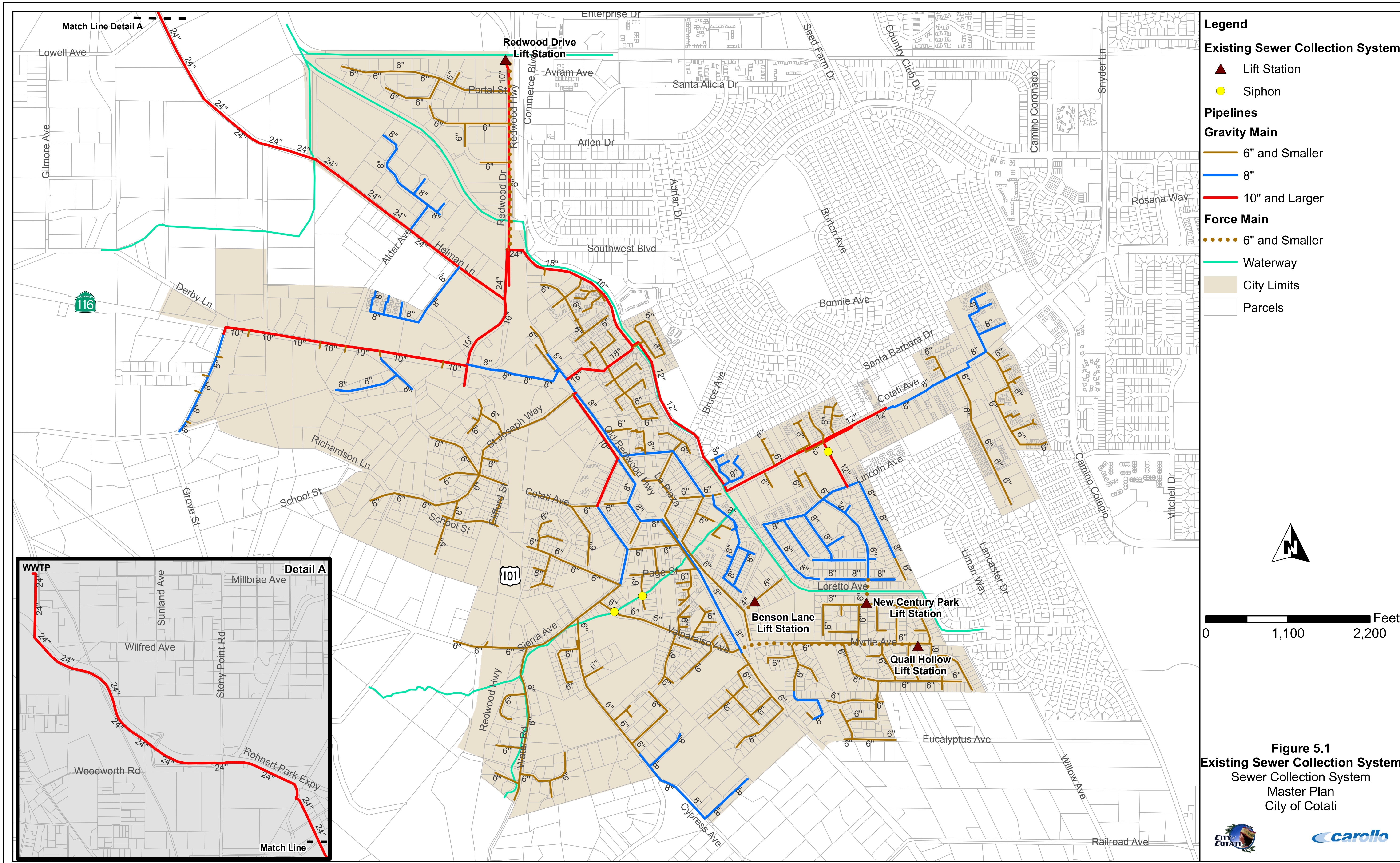


Figure 5.1
Existing Sewer Collection System
Sewer Collection System
Master Plan
City of Cotati

5.2.1 Major Interceptors and Sewer Basins

For the purposes of this Sewer Collection System Master Plan (Master Plan), the City's sewer collection system has been divided into seven distinct tributary areas, referred to "sewer basins" in this Master Plan, corresponding to the flow monitoring locations discussed in Chapter 3. The existing sewer basins are delineated on Figure 5.2. The major sanitary sewer system facilities are highlighted in Figure 5.3.

5.2.1.1 Helman Lane Sanitary Sewer Interceptor

The Helman Lane Sanitary Sewer Interceptor is the main artery of the City's sewer collection system. All wastewater flow generated within the City is ultimately conveyed through this 24-inch diameter interceptor, which flows in a northwesterly direction from Highway 101 along Helman Lane and Laguna de Santa Rosa (Laguna) to the Laguna WWTP.

5.2.1.2 Basin 1

Basin 1 services primarily commercial/industrial land use areas north of Helman Lane and west of Highway 101, as well as a small pocket of residential land use southwest of Helman Lane. The major facilities within Basin 1 include a portion of the Helman Lane Sanitary Sewer Interceptor, a 10-inch diameter trunk sewer that extends from the City limits south to Helman Lane, and the Redwood Drive Lift Station and its associated 6-inch diameter force main. The Redwood Drive Lift Station was constructed to redirect flows from the 10-inch diameter trunk sewer to the Helman Lane Sanitary Sewer Interceptor. Previously, flows from the 10-inch diameter trunk were conveyed through the City of Rohnert Park's sewer collection system.

5.2.1.3 Basin 2

Basin 2 services a mixture of commercial and residential land use areas east of Highway 101 in the north-central area of the City. The major facilities within Basin 2 include a 16- and 18-inch diameter trunk sewer that extends from Highway 101 southeast along the Laguna to Gravenstein Way, where it extends southwest to the Old Redwood Highway.

5.2.1.4 Basin 3

Basin 3 services a large area consisting of residential, commercial, and open space land use areas in the southeast area of the City. The major facilities within Basin 3 include a 12-inch diameter trunk sewer that extends from Gravenstein Way southeast along the Laguna to East Cotati Avenue and then northeast to Lancaster Drive, and a 12-inch diameter trunk sewer that extends southeast from East Cotati Avenue through a shopping center to Lincoln Avenue. In addition, Basin 3 includes the New Century Park Lift Station and force main.

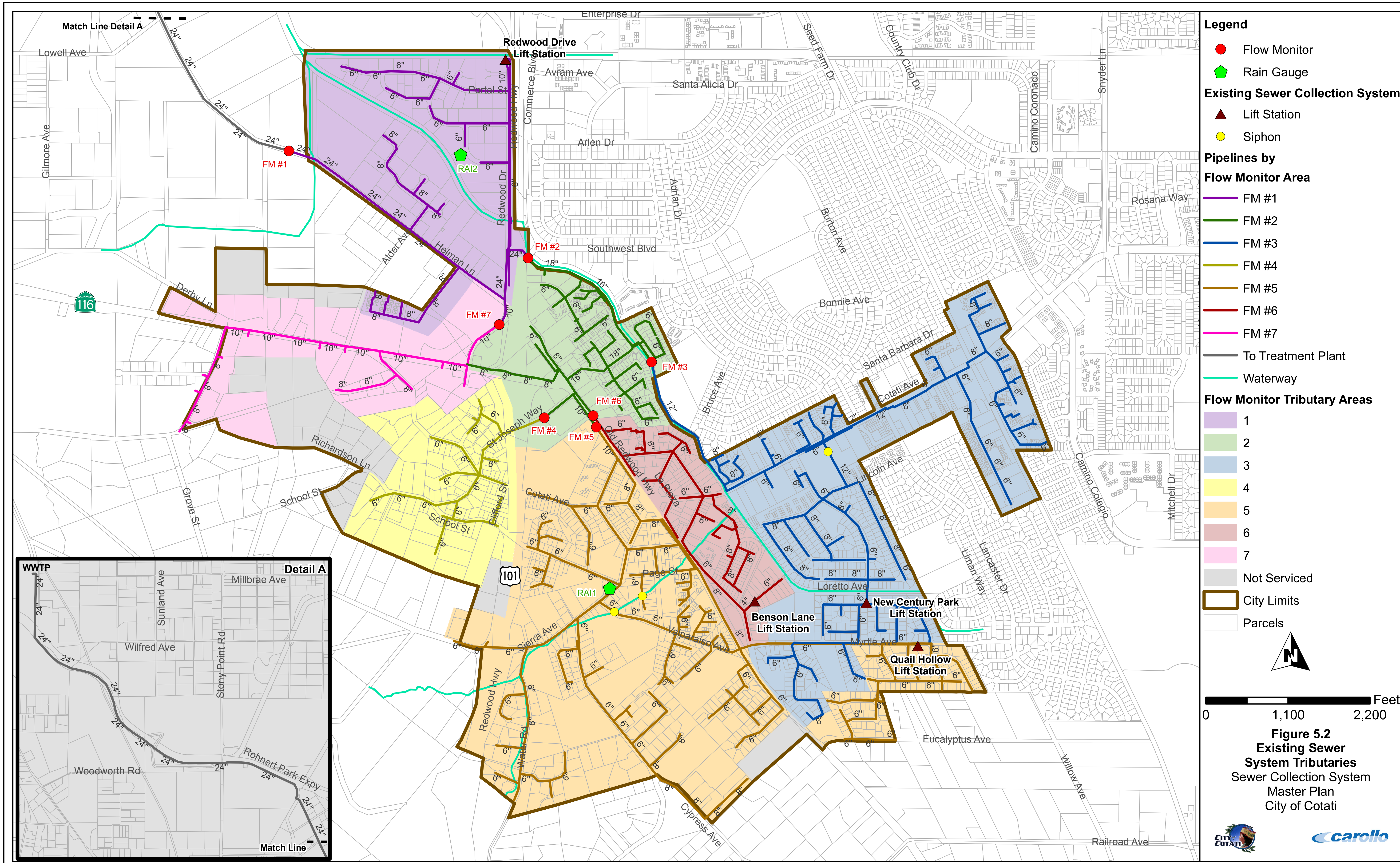


Figure 5.2
Existing Sewer System Tributaries
Sewer Collection System Master Plan
City of Cotati

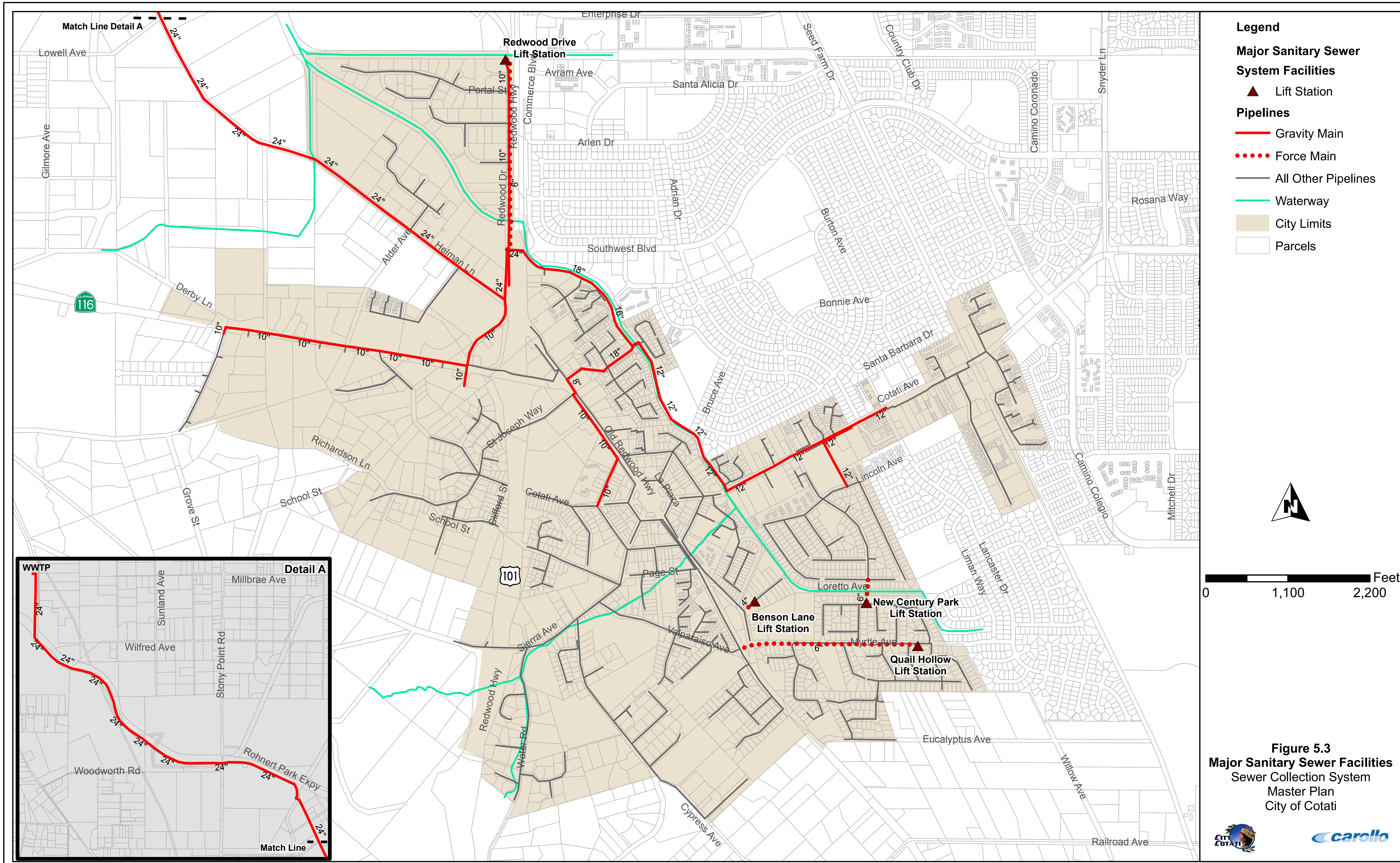


Figure 5.3
Major Sanitary Sewer Facilities
Sewer Collection System
Master Plan
City of Cotati

5.2.1.5 Basin 4

Basin 4 services a residential land use located west of Highway 101 and south of Highway 116. There are no major trunk sewers (10-inches or larger) in Basin 4.

5.2.1.6 Basin 5

Basin 5 services a large area generally bounded by the Old Redwood Highway to the east, Highway 101 to the west, and the City limits to the south. Land use designations within Basin 5 include residential, commercial, public, and open space areas. The major facilities within Basin 5 include a 10-inch diameter trunk sewer that extends from the 8-inch diameter sewer main along the Old Redwood Highway to William Street and then southwest to West Cotati Avenue. In addition, the Quail Hollow Lift Station and force main are located within Basin 5.

5.2.1.7 Basin 6

Basin 6 services commercial, residential, open space, and public land use areas located in the central portion of the City. While there are no major trunk sewers (10-inches or larger) located within Basin 6, the Benson Lane Lift Station and force main are located within Basin 6.

5.2.1.8 Basin 7

Basin 7 services primarily commercial and residential land use areas located in the western area of the City in the vicinity of Highway 116. The major facilities within Basin 7 include a 10-inch diameter trunk sewer that extends from Highway 101 west along Highway 116 to the City limits.

5.2.2 Lift Stations

There are four lift/pump stations in the collection system, all of which were included in the hydraulic model. The locations of each lift station are shown on Figure 5.1. A schematic representation of the City's lift stations is provided in Figure 5.4 for reference. Table 5.2 summarizes the available data for lift stations[1].

5.3 SEWER SYSTEM HYDRAULIC MODEL

A sewer collection system model is a simplified representation of the real sewer system. Sewer system models can assess the conveyance capacity for a collection system. Also, sewer system models can perform "what if" scenarios to assess the impacts of future developments and land use changes.

[1] Source: City of Cotati 2002 Sanitary Sewer System Master Plan (Winzler & Kelly Consulting Engineers)

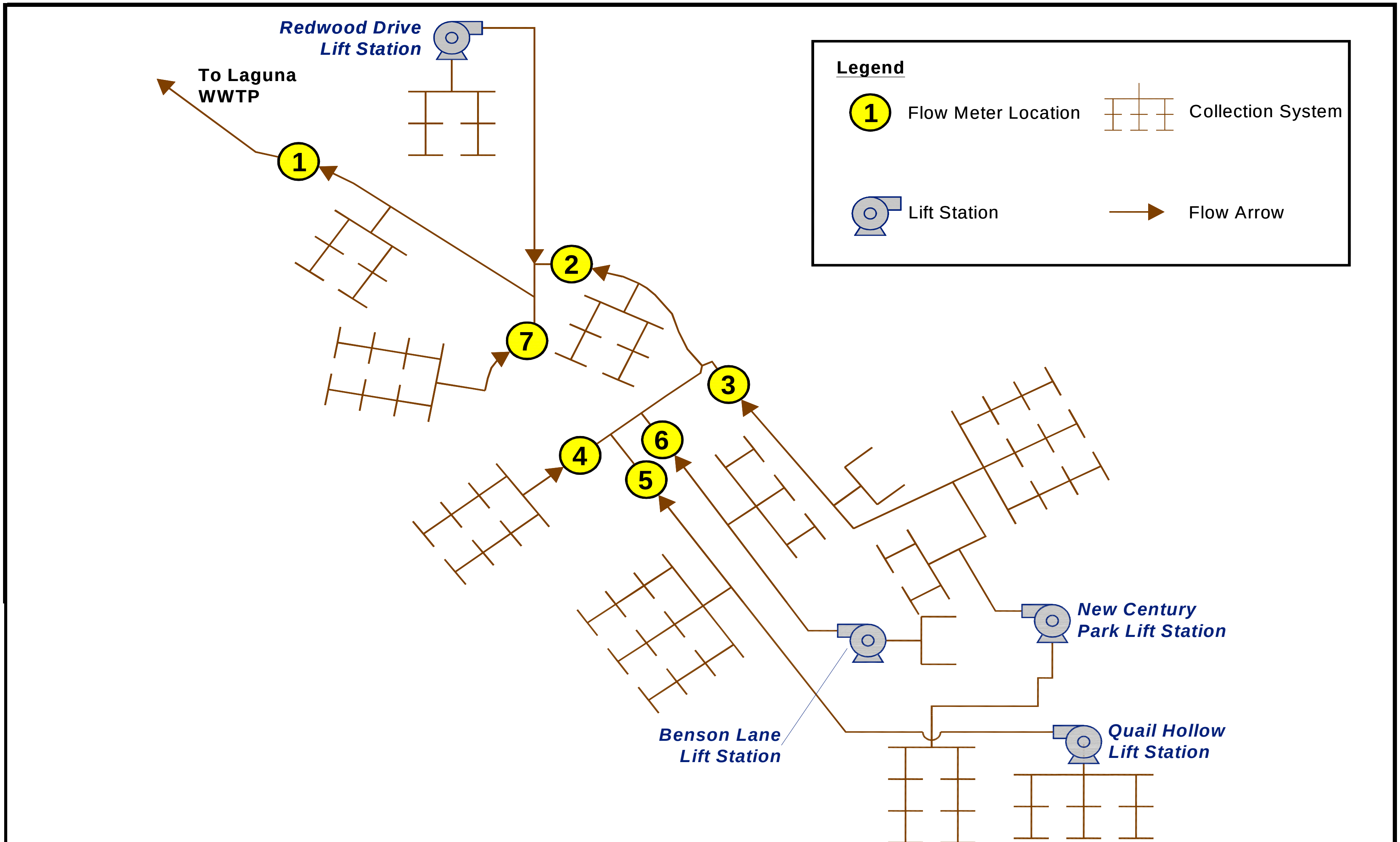


Figure 5.4
Lift Station Schematic
Sewer Collection System Master Plan
City of Cotati

Table 5.2	**Lift Station Summary Sewer Collection System Master Plan City of Cotati**				
				Pump Capacity(1)	
Lift Station Name	**Location**	**Pump Details(1)**	**Pump No.**	**Capacity (gpm)**	**TDH (ft)**
Benson Lane Lift Station	Benson Lane, west of the Laguna	Two Flygt 3102, 3.2 hp submersible, 1750 rpm	1	130	21
			2	130	21
New Century Park Lift Station	Eagle Dr between Lark Dr & Flamingo	Two Flygt 3085, 3.2 hp submersible, 1750 rpm	1	280	24
			2	280	24
Quail Hollow Lift Station	Myrtle Ave between Keppel & Hahn Way	Two Flygt 3085, 3.2 hp submersible, 1750 rpm	1	120	27
			2	120	27
Redwood Drive Lift Station	Redwood Dr, south of Copeland Creek	Two Flygt 3102, 5 hp submersible, 1715 rpm	1	250	34
			2	250	34

Notes:
1. Source: Table 2-1 of the City of Cotati 2002 Sanitary Sewer System Master Plan (Winzler & Kelly Consulting Engineers)

This section summarizes the process used to develop the City's hydraulic computer model of the sewer system, including a summary of the previous model, modeling software selection, the hydraulic model elements, and the model creation process.

5.3.1 Previous Hydraulic Computer Model

The City's previous sewer system hydraulic model was developed using the HYDRA® Version 6 hydraulic modeling software package, developed by Pizer Incorporated. The hydraulic model contained the physical attributes of the collection system facilities (e.g., pipe size, inverts, manhole rim elevations, etc.), base wastewater flows, and infiltration and inflow (I/I) flows. It should be noted that while the physical attributes of the City's previous hydraulic model were used in the development of the updated hydraulic model for this project, the base wastewater and I/I flows are outdated. For this reason, base wastewater and I/I flows were reallocated during the development and calibration of the updated hydraulic model.

5.3.2 Selected Hydraulic Model

There is an abundance of sewer analysis software in the marketplace today, with a variety of features and capabilities. The selection of a particular model generally depends on user preferences, software costs, and the complexity of the sewer system.

It was agreed that H_2OMAP SWMM®, by MWH Soft®, would be used to assemble the City's hydraulic model. H_2OMAP SWMM® is a fully dynamic, stand alone, wastewater and storm water modeling software application. The hydraulic modeling engine for the H_2OMAP SWMM® software package uses the Environmental Protection Agency's (EPA) Storm Water Management Model (SWMM), which is widely used throughout the world for planning, analysis, and design related to stormwater runoff, combined sewers, sanitary sewers, and other drainage systems. The advantage of the H_2OMAP SWMM® package over the SWMM software is that it offers an enhanced graphical user interface (GUI) and a variety of additional features and functionality.

Version 9.0 of H_2OMAP SWMM® was used to assemble the hydraulic model.

5.3.3 Elements of the Hydraulic Model

The following provides a brief overview of the various elements of the hydraulic model and the required input parameters associated with each:

- **Junctions.** Sewer manholes, cleanouts, as well as other locations where pipe sizes change or where pipelines intersect are represented by junctions in the hydraulic model. Required inputs for junctions include rim elevation, invert elevation, and surcharge depth (used to represent pressurized systems).

- **Pipes.** Gravity sewers and force mains are represented as pipes in the hydraulic model. Input parameters for pipes include length, friction factor (e.g., Manning's n for gravity mains, Hazen Williams C for force mains), invert elevations, diameter, and whether or not the pipe is a force main.

- **Storage Nodes.** For sewer system modeling, storage nodes typically are used to represent lift station wet wells (although other storage basins, etc. can be modeled as storage nodes). Input parameters for storage nodes include invert elevation, wet well depth, and wet well cross section.

- **Pumps.** Pumps are included in the hydraulic model as links. Input parameters for pumps include pump curves and operational controls.

- **Outfalls.** Outfalls represent areas where flow leaves the system. For sewer system modeling, an outfall typically represents the connection to the influent pump station at a WWTP.

- **Rain Gauges.** Rain gauges are input into the hydraulic model to simulate historical or theoretical hourly rainfall events.

- **Inflows.** The following are the three types of inflow sources that can be injected into individual model junctions (and storage nodes):
  - External: External inflows can represent any number of flows into the collection system, such as metered flow data or groundwater inflow. External inflows are applied to a specific model junction by applying a baseline flow value and a pattern that varies the flow by hour, day, or month of the year.

- Dry Weather: Dry weather inflows simulate base sanitary wastewater flows and represent the average flow. The dry weather flows can be multiplied by up to four patterns that vary the flow by month, day, hour, and day of the week (e.g., weekday or weekend). The dry weather diurnal patterns are adjusted during the dry weather calibration process.
- RDII: Rainfall Derived Infiltration and Inflows (RDII) are applied in the model by assigning a unit hydrograph and a corresponding tributary area to a given junction. The unit hydrographs consists of several parameters that are used to adjust the volume of RDII that enters the system at a given location. These parameters are adjusted during the wet weather calibration process.

5.3.4 Quantifying Wastewater Flow

Determining the quantity of wastewater flow generated by a City and loaded into a hydraulic model is typically based on land use designations, flow coefficients, and land use area. The land use type will affect the volume and diurnal flow pattern of wastewater being generated from the study area. Adequately estimating this volume of wastewater is an important process in maintaining and sizing sewer system facilities, both for present and future conditions.

The City's zoning map, wastewater flow coefficients discussed in Chapter 4, and customer billing records were the basis for estimating wastewater loads input into the hydraulic model. The water billing records were used to allocated wastewater flows into the existing system model, while the wastewater generation coefficients were used to generate wastewater flows for future developments. The flow coefficients and billing records provided a means to transform a specific land use category into an average dry weather flow. The loads were calculated in the geographic information systems (GIS) software program by multiplying the flow coefficient by the land use acreage. The model's load allocation assigned the calculated average dry weather flow to an appropriate sewer basin and corresponding node in the sewer system model.

5.3.5 Sewer Tributary Areas (Existing and Future)

The City's sewer service area was divided into sewer basins. Each of these sewer basins was further broken down into sewer "sub-basins" to facilitate the assignment of wastewater flow to appropriate sewers. A sub-basin is a geographic area within the sewer system where wastewater generated in the area will be injected into a single node in the model. Usually a sub-basin will encompass a particular subdivision or grouping of lots.

Figure 5.2 shows the sewer basins for the existing collection system. The tributaries represent the assembly of smaller sub-basins into larger sewer basins. As vacant lands within the City limits develop, they will be connected to the wastewater collection system. Figure 5.5 shows the anticipated future sewer basin boundaries at full build out of the City limits.

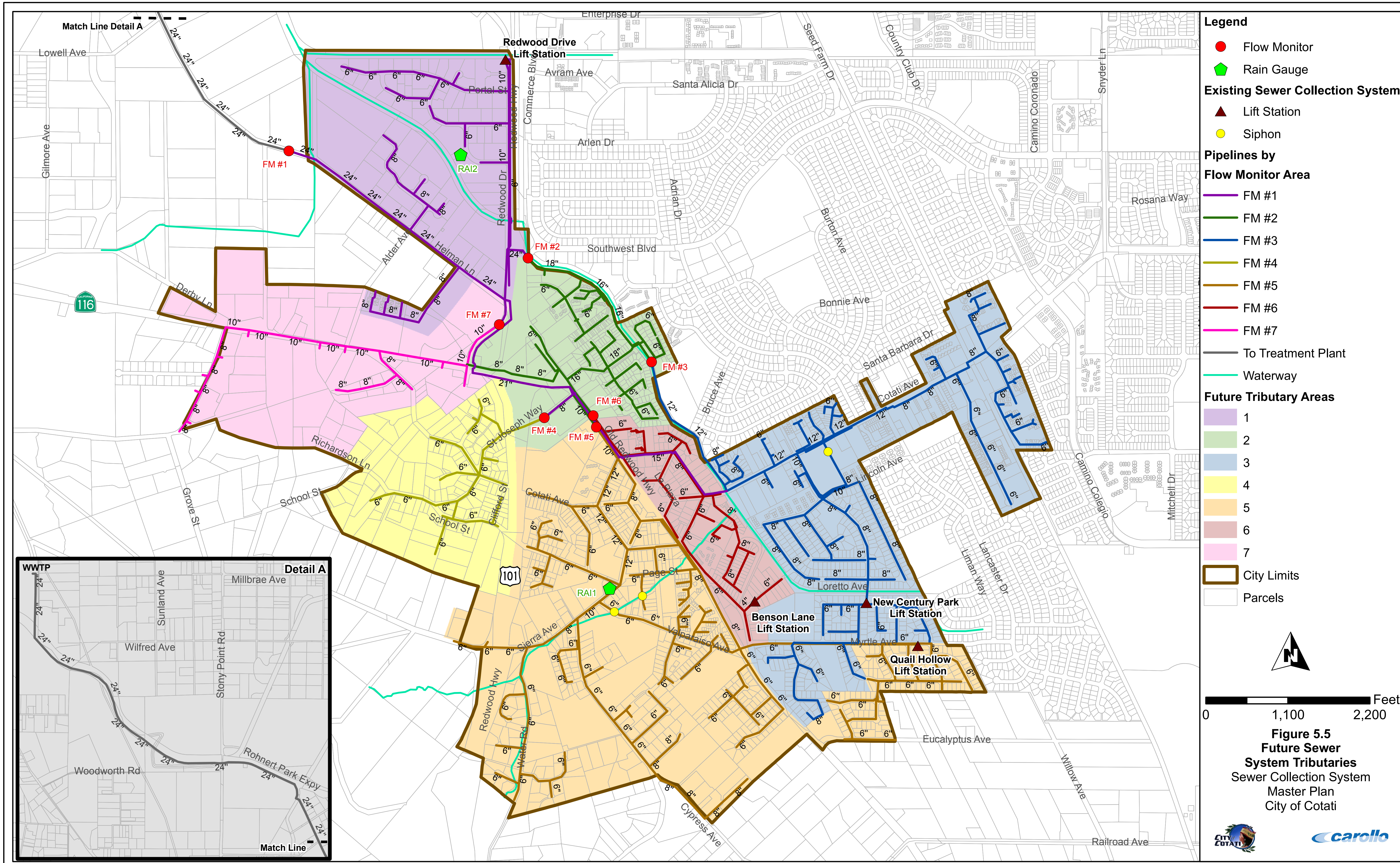


Figure 5.5
Future Sewer
System Tributaries
Sewer Collection System
Master Plan
City of Cotati

5.3.6 Hydraulic Model Construction

The City's hydraulic model combines information on the physical and operational characteristics of the wastewater collection system, and performs calculations to solve a series of mathematical equations to simulate flows in pipes.

The model creation process consisted of five steps, as described below:

- Step 1 - The hydraulic model elements from the City's previous hydraulic model (developed in HYDRA®) were exported into GIS format. In addition, the Helman Lane Sanitary Sewer Interceptor was digitized into the GIS database[2];

- Step 2 - The GIS data was reviewed and formatted to allow easy import into the H_2OMAP SWMM modeling platform;

- Step 3 - The collection system pipeline and facility data were imported into the modeling software and verified. Certain physical and operational data for the City's wastewater collection facilities was not available from the GIS data. This type of data, such as wet well dimensions, pump controls, and pump curves, were input manually into the model based on information provided in the City's 2002 Sanitary Sewer System Master Plan and as-built drawings provided by City staff.

  Once all the relevant data was input into the hydraulic model, the model was reviewed to verify that the model data was input correctly and that the flow direction and size of the modeled pipelines were logical. Additionally, the modeled lift stations were also checked to verify that they operated correctly.

- Step 4 - The existing dry weather wastewater flows were allocated to the model junctions using the City's water billing records. These flows were scaled up or down to match the dry weather flows recorded during the flow monitoring period (see Chapter 4).

- Step 5 - The hydraulic model contains certain run parameters that need to be set by the user at the beginning of the project. These include run dates, time steps, reporting parameters, output units, and flow routing method. Once the run parameters were established, the model was debugged to ensure that it ran without errors or warnings.

5.4 HYDRAULIC MODEL CALIBRATION

Model calibration is a crucial component of the hydraulic modeling effort. Calibrating the model to match data collected during the flow monitoring program ensures the most accurate results possible. The calibration process consists of calibrating to both dry and wet weather conditions.

---

[2] The City's previous model did not include the Helman Lane Sanitary Sewer Interceptor.

For this project, both dry and wet weather flow monitoring were conducted. Dry weather flow (DWF) calibration ensures an accurate depiction of base wastewater flow generated within the study area. The wet weather flow (WWF) calibration consists of calibrating the hydraulic model to a specific storm event or events to accurately simulate the peak and volume of infiltration/inflow (I/I) into the sewer system. The amount of I/I is essentially the difference between the WWF and DWF components.

5.4.1 Dry Weather Flow Calibration

The DWF calibration consists of several elements: 1) dividing the sewer system into areas tributary to each of the flow meter stations; 2) defining the flow volumes within each area; and 3) creating diurnal patterns to match the temporal distribution of flow. The diurnal curve is a pattern of hourly multipliers that are applied to the baseflow to simulate the variation in flow that occurs throughout the day.

The first step in the calibration process was to divide the City service area into flow meter tributary areas. Seven tributary areas (sewer basins) were created, one for each flow meter. The next step was to define the flow volumes within each area, which was accomplished in the flow-loading step discussed in Section 5.3.6. Two diurnal curves based on the flow monitoring data were created for nodes tributary to a specific flow meter, one representing weekday flows and the other representing weekend flows. Figure 5.6 displays the weekday and weekend diurnal curves for the area tributary to Meter 4. Similar diurnal curves were developed for each of the meters and its tributary area. These additional curves are available in Appendix B.

The calibration process compared the meter data with the model output. Comparisons were made for minimum, maximum, and average flows as well as the temporal distribution of flow. Table 5.3 summarizes the DWF calibration using minimum, maximum, and average flow results.

It is industry standard practice to consider a hydraulic model to be satisfactorily calibrated when the model simulated values are within ±10-percent of the field measured data. All of the meter sites were within 10-percent of the field measured data for the daily average, minimum, and maximum flows, except for meter 5, which was 14-percent off the daily minimum flow. However, the difference in flow between the minimum simulated and field measured flow was insignificant (0.008 mgd). Therefore, the flow calibration for Meter 5 was considered acceptable.

A sample of the DWF calibration for Meter 4 is presented in Figure 5.7. This figure shows the measured flow at the meter versus the model predicted flows for both weekday and weekend periods. The remaining DWF calibration plots are provided in Appendix B. As shown in Appendix B and Figure 5.7, the model showed good correlation between the measured flow and simulated flow for all sites.

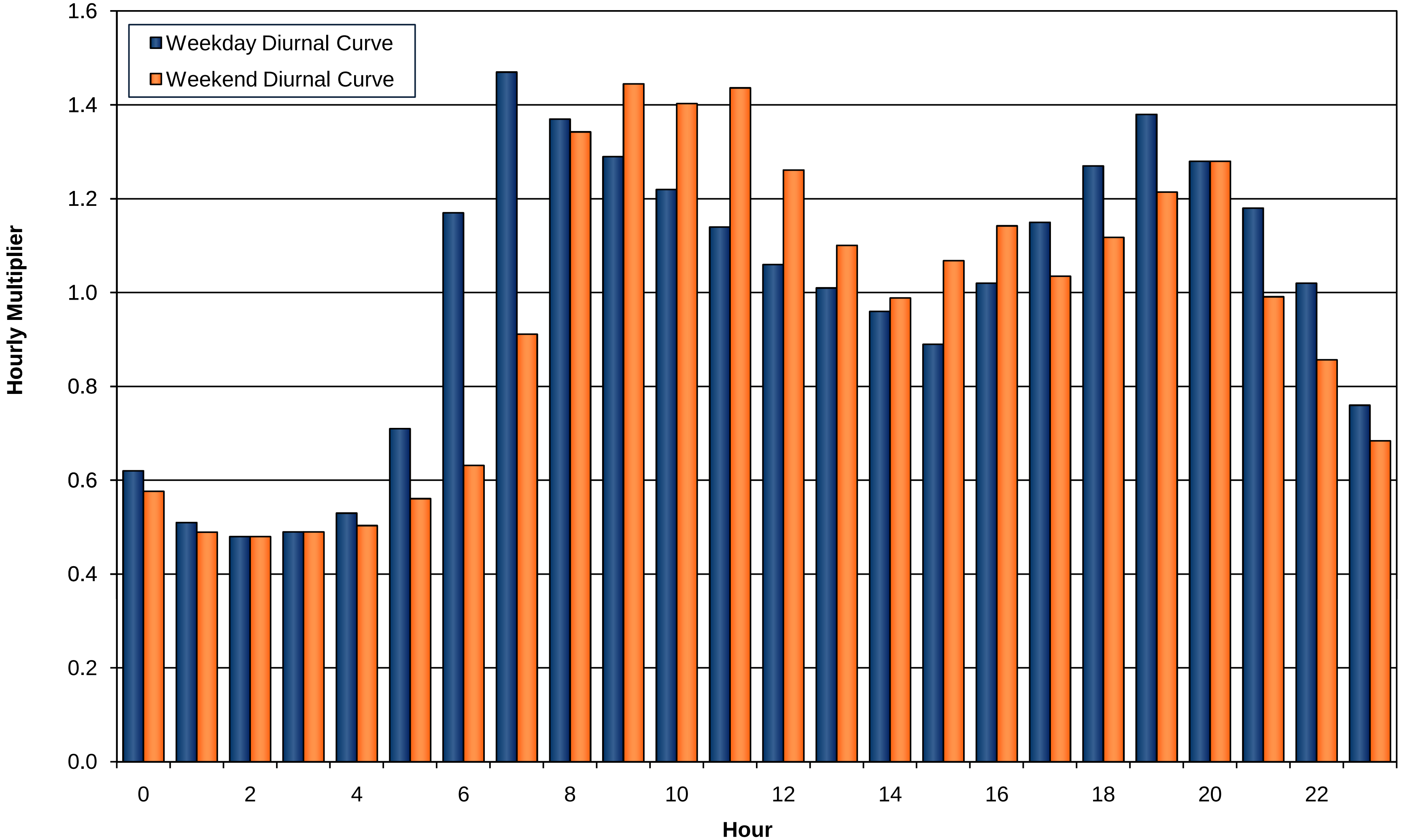


Figure 5.6
Flow Meter 4 Diurnal Patterns
Sewer Collection System Master Plan
City of Cotati

Table 5.3 Dry Weather Flow Calibration Summary
Sewer Collection System Master Plan
City of Cotati

	Metered DWF[1],[2]			Modeled Simulated DWF			Percent Difference[3]		
Meter Site	**Average (mgd)**	**Maximum (mgd)**	**Minimum (mgd)**	**Average (mgd)**	**Maximum (mgd)**	**Minimum (mgd)**	**Average (%)**	**Maximum (%)**	**Minimum (%)**
1	0.585	0.861	0.263	0.599	0.938	0.265	2.4%	8.9%	1.0%
2	0.558	0.799	0.247	0.538	0.848	0.236	-3.5%	6.1%	-4.7%
3	0.174	0.302	0.066	0.169	0.306	0.064	-2.9%	1.2%	-3.4%
4	0.030	0.045	0.015	0.030	0.044	0.015	0.0%	-3.1%	0.9%
5	0.161	0.252	0.062	0.161	0.247	0.054	0.4%	-2.2%	-14.3%
6	0.051	0.117	0.020	0.050	0.116	0.020	-1.4%	-0.8%	1.0%
7	0.036	0.043	0.029	0.036	0.042	0.030	-0.1%	-2.9%	3.8%

Notes:
1. Source: City of Cotati Flow Monitoring Report
2. Average flow calculated from weekday/weekend dry weather flow monitoring data. Maximum and minimum values are hourly averages, and correspond to either weekday or weekend flows, depending on the meter site.
3. Percent difference between meter collected and model derived results.

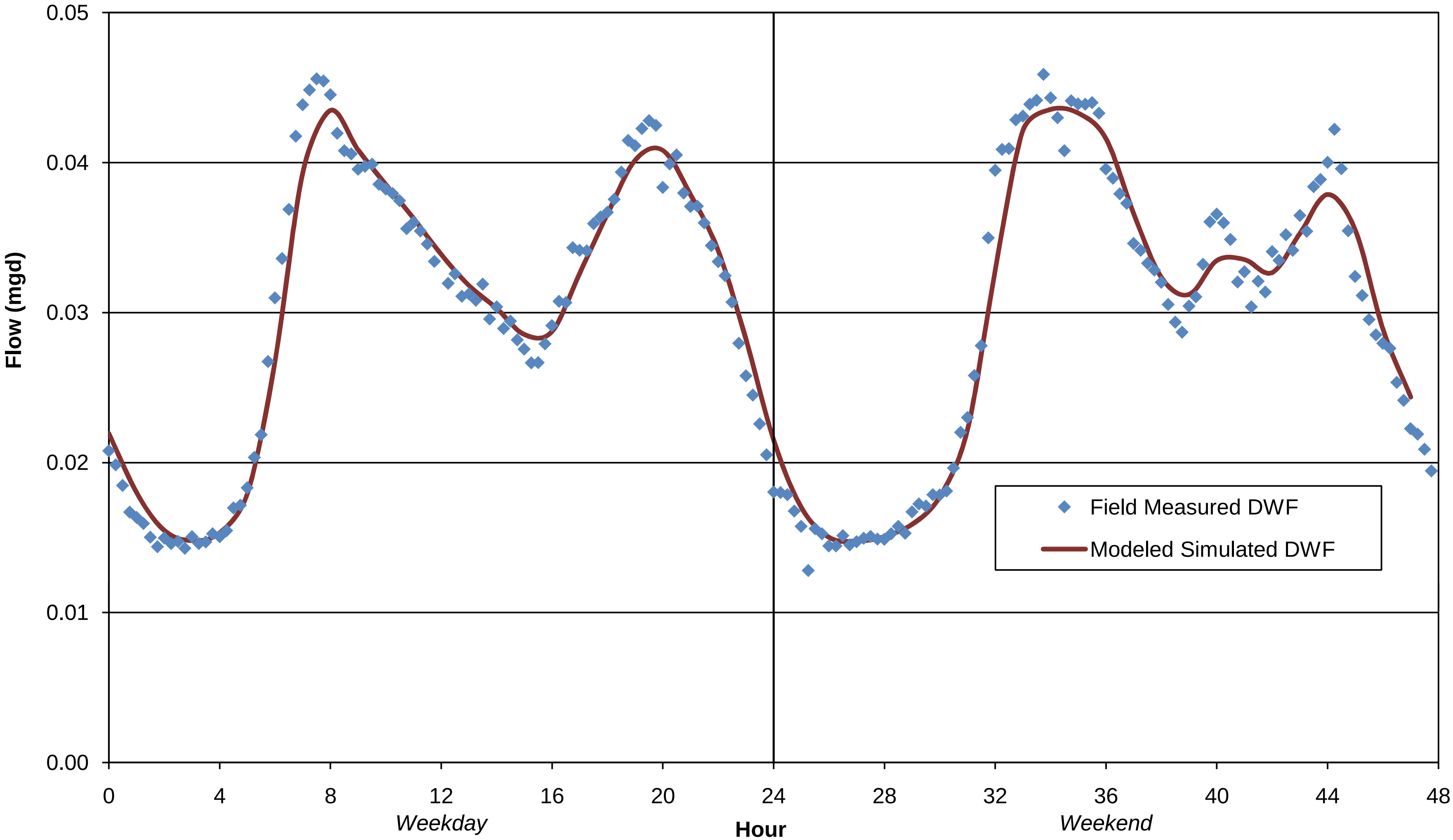


Figure 5.7
Flow Meter 4 Dry Weather Calibration
Sewer Collection System Master Plan
City of Cotati

5.4.2 Wet Weather Flow Calibration

The WWF calibration enables the hydraulic model to accurately simulate I/I entering a sewer system during a large storm. WWF calibration consists of two steps: 1) determining a rainfall event that characterizes the most significant impact on the sewer system facilities, preferably during wet antecedent soil moisture conditions; and 2) creating a database of I/I parameters for this rainfall event.

For the WWF calibration, two storm events were used, as should be used for any WWF calibration effort. For example, model parameters for I/I are adjusted for one event so that projected flows align with measured flows. These same parameters are then used to project flows for a second measured event. If both events provide an accurate and precise estimate of the independent measured flow events, the model is calibrated.

The March 31 - April 1, and the April 11 - 13, 2010 rainfall events were used to characterize the system's response to wet weather events. The hydraulic model was calibrated to the rainfall events that occurred during these time periods. These two events were chosen as they had the highest total rainfall volume of the four rainfall events that were captured during the flow monitoring program. In addition, the model was checked against rainfall events that occurred in the City in January 2010.

The wet weather calibration process involves creating custom unit hydrographs for each flow meter tributary using the "RTK Method." The RDII unit hydrograph is the summation of three separate triangular hydrographs (short-term, medium-term, and long-term), which are each defined by three parameters: R, T, and K. R represents the fraction of the rainfall over the watershed that enters the sanitary sewer system; T represents the time to peak; and K represents the ratio of the time to recession to the time to peak. Therefore, there are a total of nine variables for each RDII unit hydrograph. Figure 5.8 shows an example RDII hydrograph.

The hydrographs utilize the R-Values (percent of rainfall that enters collection system) calculated for each basin to simulate I/I. The R-Values are input into the model and the parameters are adjusted until the peak I/I rate measured during the flow monitoring program are simulated for each of the series of rainfall events. Figure 5.9 illustrates the results for the wet weather calibration for Meter 6 for the April 11 - 13, 2010 event. The remaining WWF calibration plots are provided in Appendix C. As shown in Appendix C and Figure 5.9, the model showed good correlation between the measured flow and simulated flow for all sites.

Similar to the DWF calibration plots, the hydraulic model is considered to be calibrated when the model simulated results are within 10 percent of the field measured results. Comparisons were made for maximum and average flows as well as the temporal distribution of flow. Table 5.4 summarizes the WWF calibration using maximum and average flow results. As shown in Table 5.4, all of the meter sites were within 10-percent of the field measured data for the daily average and maximum flows.

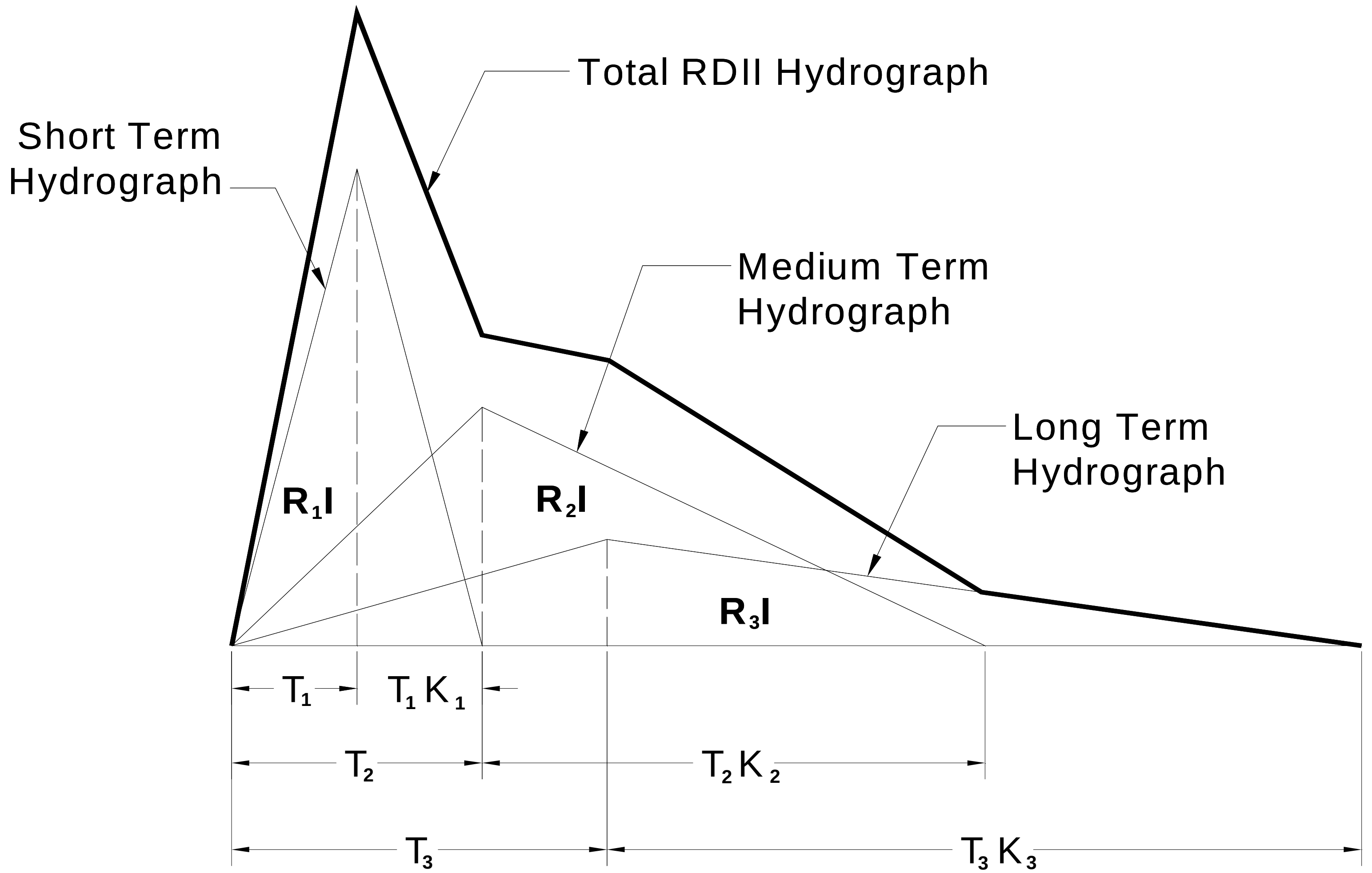


Figure 5.8
Example RDII Hydrograph
Using the RTK Method
Sewer Collection System Master Plan
City of Cotati

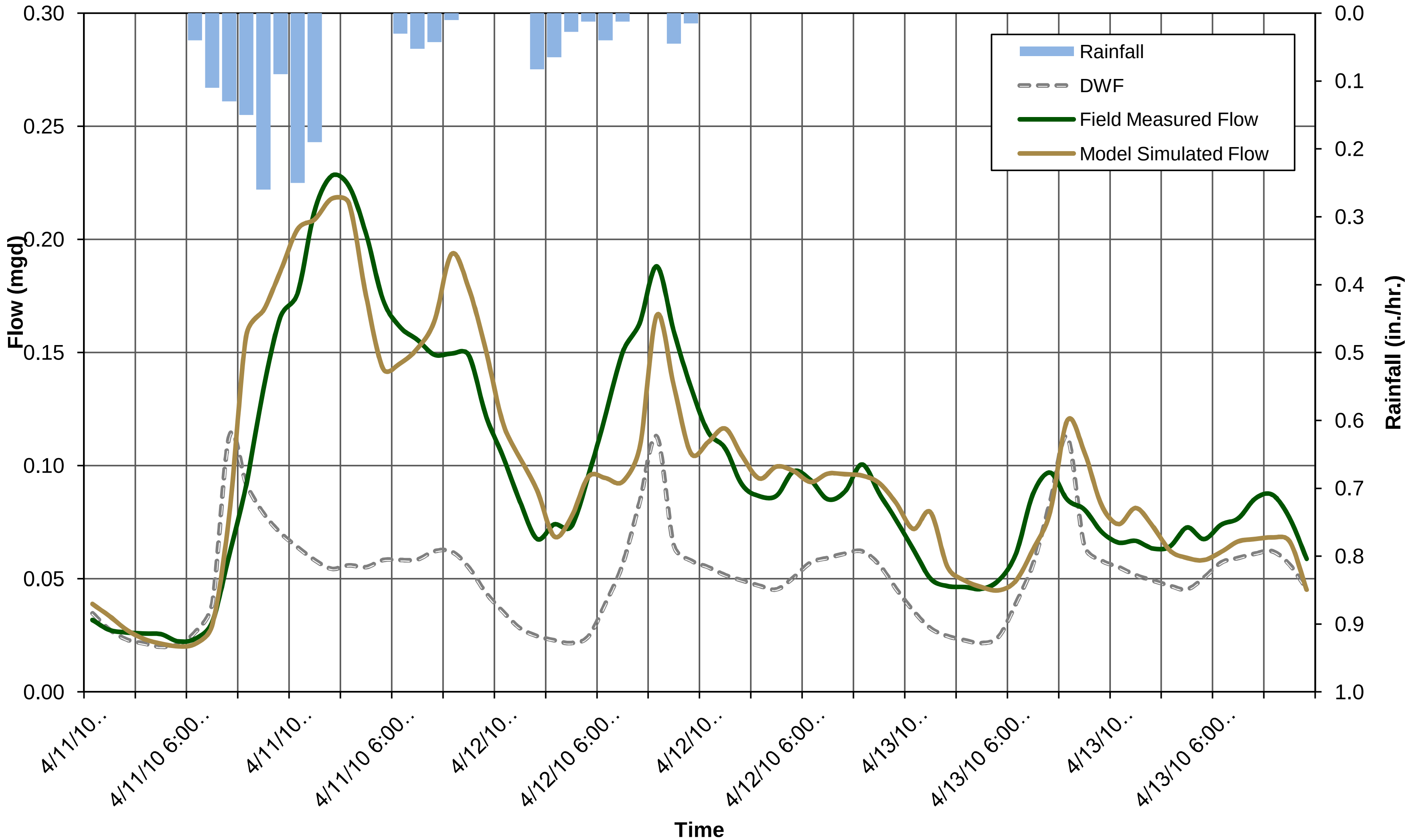


Figure 5.9
Flow Meter 6 Wet Weather Calibration
(April 11 - 13, 2010)
Sewer Collection System Master Plan
City of Cotati

Table 5.4 Wet Weather Flow Calibration Summary
Sewer Collection System Master Plan
City of Cotati

Meter Site	Wet Weather Event	Field Measured Flow[1],[2]		Model Simulated Flow[2]		Percent Difference[3]	
		Average (mgd)	Peak (mgd)	Average (mgd)	Peak (mgd)	Average (%)	Peak (%)
1	April 11 - 13, 2010	0.858	1.390	0.859	1.478	0%	6%
	March 31 - April 1, 2010	0.683	1.034	0.697	1.090	2%	5%
2	April 11 - 13, 2010	0.747	1.265	0.772	1.315	3%	4%
	March 31 - April 1, 2010	0.632	0.913	0.624	0.978	-1%	7%
3	April 11 - 13, 2010	0.223	0.382	0.225	0.358	1%	-6%
	March 31 - April 1, 2010	0.183	0.309	0.187	0.337	2%	9%
4	April 11 - 13, 2010	0.064	0.102	0.062	0.098	-3%	-4%
	March 31 - April 1, 2010	0.047	0.079	0.046	0.074	-3%	-7%
5	April 11 - 13, 2010	0.261	0.514	0.251	0.466	-4%	-9%
	March 31 - April 1, 2010	0.194	0.300	0.181	0.320	-6%	7%
6	April 11 - 13, 2010	0.096	0.228	0.097	0.218	1%	-4%
	March 31 - April 1, 2010	0.070	0.152	0.070	0.147	0%	-4%
7	April 11 - 13, 2010	0.059	0.129	0.056	0.116	-4%	-10%
	March 31 - April 1, 2010	0.047	0.089	0.048	0.091	1%	3%

Notes:
1. Source: City of Cotati Flow Monitoring Report
2. Average flows are measured over the duration of the storm event. Peak flows represent hourly average peak flows.
3. Percent difference between meter collected and model derived results.

The City conducted the temporary flow monitoring period during the months of March, April, and May 2010. These months are not ideal for conducting wet weather flow monitoring, because the ground tends to be less saturated in the spring than in the winter months of December, January, and February. However, the City does have hourly flow data during these months at the City's permanent flow meter near the Laguna WWTP. Examination of the 2010 flow data at the permanent flow meter indicated that during the period of January 19 - 24, 2010, the City experienced a significant increase in wastewater flow that is attributable to I/I. During that period, roughly 4.1 inches of rain fell in the City, with 1.9 inches falling on January 20, 2010.

As a check of the RDII parameters generated during the wet weather calibration, the model was run for the January 19 - 24, 2010 wet weather event. By performing the model runs, it was found that using the RDII parameters generated for the spring time storms (March and April, 2010) underestimated the long term infiltration response in the collection system during the winter months when ground saturation is high. In addition, it is suspected that flows in the waterways throughout Cotati may have a significant impact on the amount of RDII that enters the collection system, and that flows in the waterways throughout Cotati were likely significantly higher in January than in March or April. To account for this difference, the RDII parameters for sewer trunks within a close proximity (roughly 300 feet) to the waterways in the City were adjusted to account for groundwater flows. The resulting simulated flows at the Laguna WWTP flow meter are shown on Figure 5.10. The model was then run a second time for the March and April storm events to confirm that it simulates an accurate RDII response for both spring and winter events. The results summarized in Table 5.3 were generated after the RDII parameters were adjusted for the January rainfall events to account for both spring and winter events, and the correlation between the field measured and model simulated flows is good.

To simulate the peak wet weather flow (PWWF) condition in the hydraulic model, a 10-year, 24-hour design storm was routed through the hydraulic model using the adjusted RDII parameters to simulate peak flows during the design storm event.

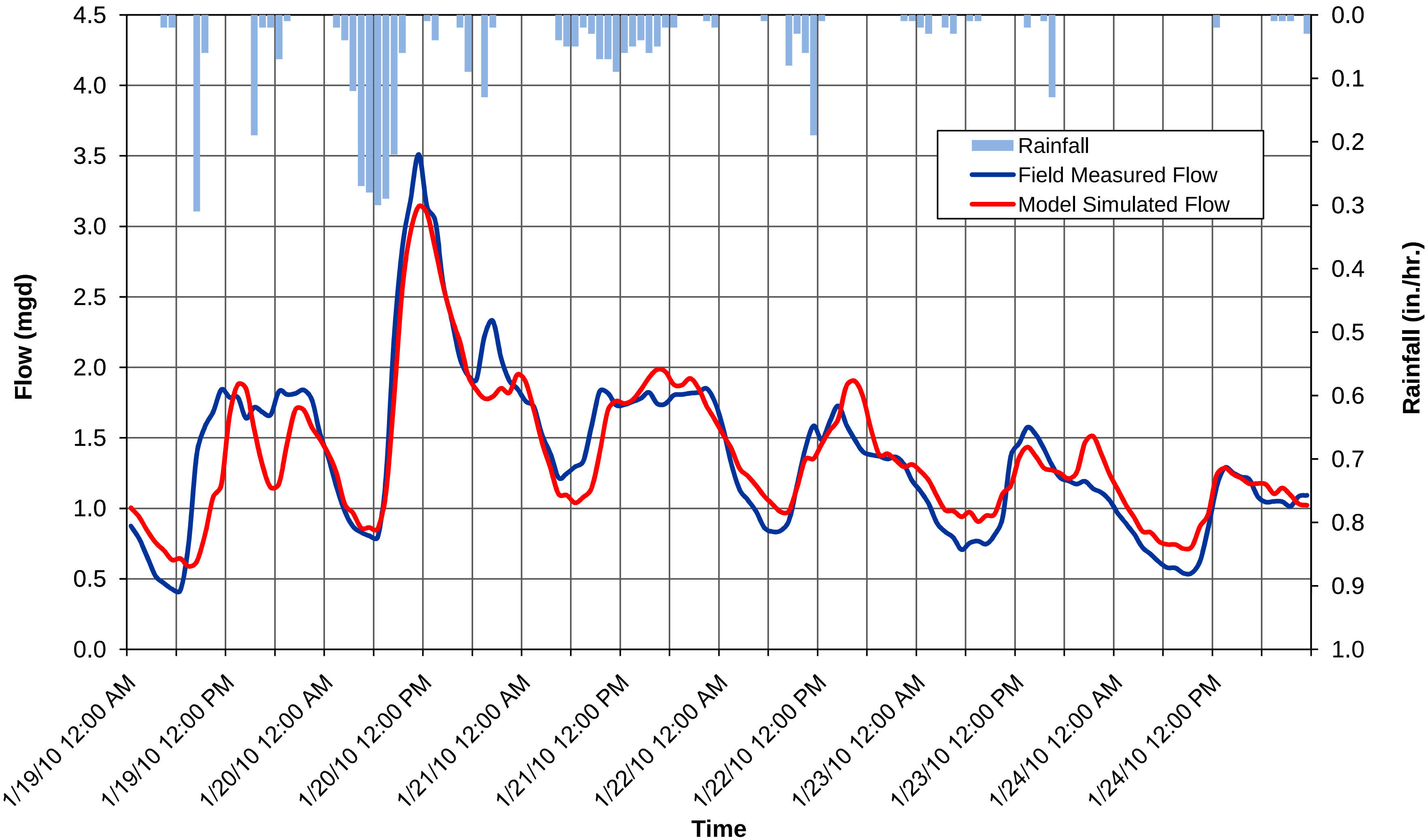


Figure 5.10
Jan.19 - 24, 2010 Wet Weather
Calibration Plot (Permanent Flow Meter)
Sewer Collection System Master Plan
City of Cotati

CAPACITY EVALUATION AND PROPOSED IMPROVEMENTS

This chapter discusses the hydraulic evaluation of the sewer collection system and the proposed projects that correct capacity deficiencies and serve future users.

6.1 CAPACITY ANALYSIS

Following the dry and wet weather flow calibration (Chapter 5), a capacity analysis of the existing and future collection system was performed. The capacity analysis entailed identifying areas in the sewer system where flow restrictions occur or where pipe capacity is insufficient to convey design flows. Sewers that lack sufficient capacity to convey design flows create bottlenecks in the collection system that can potentially cause sanitary sewer overflows (SSOs). The sewer system was evaluated based on planning criteria presented in Chapter 3.

This section discusses the locations of existing and future hydraulic deficiencies resulting from flows exceeding the maximum flow depth criteria.

6.1.1 Existing System

For the existing sewer collection system, the design flow was routed through the hydraulic model. In accordance with the established flow depth criteria for existing sewers, manholes where the hydraulic grade line (HGL) encroached within three feet of the manhole rim were identified. Pipelines where the maximum HGL encroached within three feet of the manhole rim are identified in blue on Figure 6.1.

Note that the pipelines with an HGL that encroached within three feet of the manhole rim are not necessarily capacity deficiencies. In many cases, a surcharged condition within a given pipeline segment is due to backwater effects created by a downstream bottleneck. For this reason, the hydraulic model was analyzed to identify the pipeline segments that are the cause of the surcharged conditions. The location of the capacity deficient pipelines under existing design flow conditions are shown on Figure 6.1 in red. Hydraulic profiles from the hydraulic model of the deficient pipeline segments are provided in Appendix D.

6.1.2 Future System

Following the completion of the existing system analysis, improvement projects were identified in order to mitigate existing system pipeline capacity deficiencies. The recommended improvement projects are discussed in Section 6.3. In accordance with the established planning criteria, new sewer pipelines were sized such that the maximum flow depth to pipe diameter ratio (d/D) did not exceed the values summarized in Chapter 3. In other words, flows in recommended improvements were not allowed to surcharge.

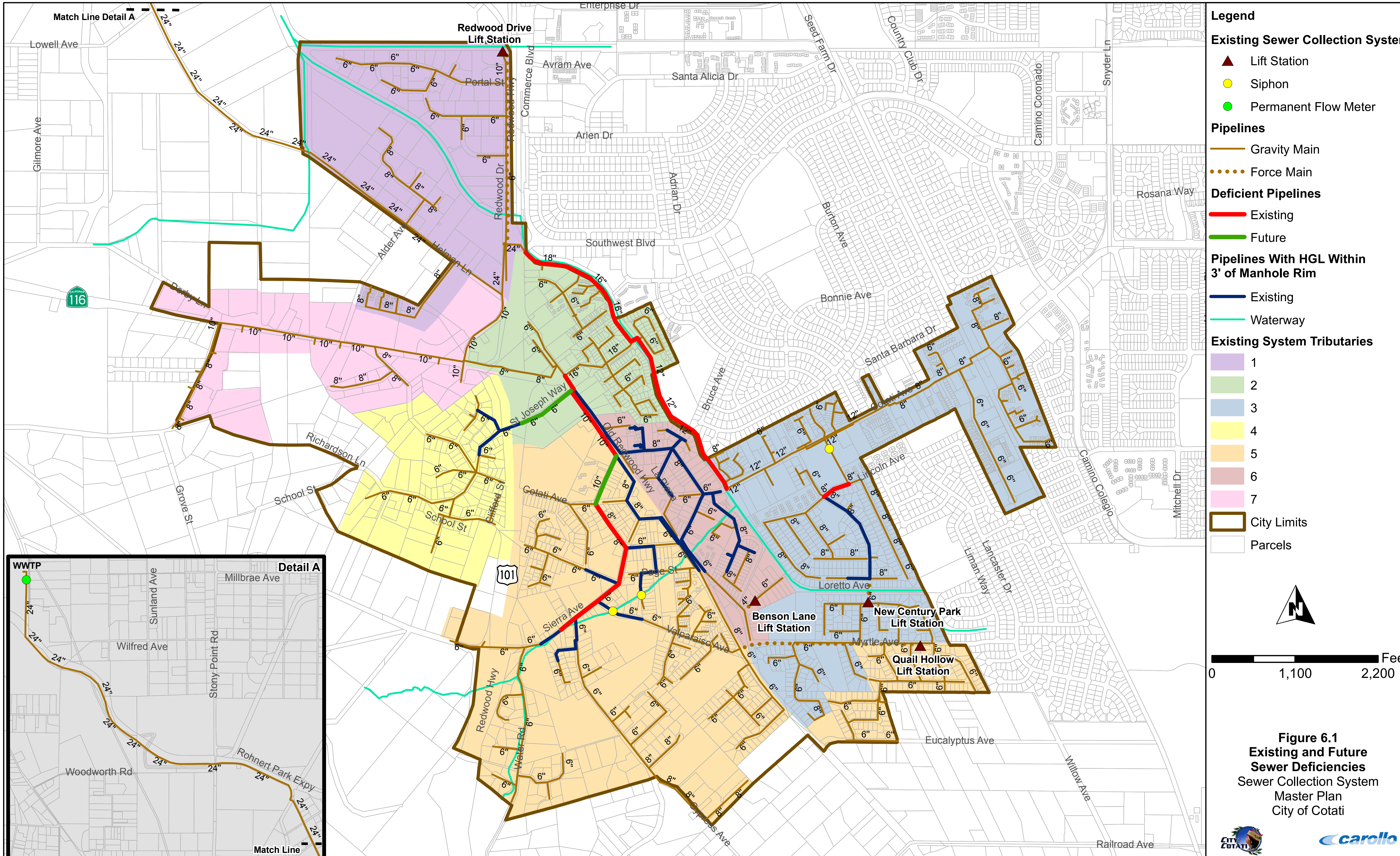


Figure 6.1
Existing and Future Sewer Deficiencies
Sewer Collection System Master Plan
City of Cotati

The future system analysis was performed in a manner similar to the existing system analysis. The purpose of the future system evaluation is to verify that the existing system improvements were appropriately sized to convey build out design flows, and to identify the locations of sewers that are adequately sized to convey existing design flows, but cannot convey future design flows. These pipelines are identified as future system deficiencies (in green) on Figure 6.1.

6.2 LIFT STATION ANALYSIS

In accordance with the established planning criteria, the City's existing lift stations were evaluated to determine if each lift station has available capacity to convey existing and future design flow. Lift stations with a design flow above the existing firm capacity were flagged as deficient. Table 6.1 summarizes the results of the lift station evaluation.

6.2.1 Existing System

As shown in Table 6.1, the City's lift stations are adequately sized to convey the existing design flow. The Quail Hollow Lift Station has an existing capacity deficiency of 16 gallons per minute (gpm), but since the capacity deficiency is very minor (less than 25,000 gallons per day [gpd]), an improvement project for the Quail Hollow Lift Station is not recommended. However, if changes are proposed to the area served by the Quail Hollow Lift Station, it is recommended that an evaluation be conducted to determine if upgrades would be needed to serve future growth.

6.2.2 Future System

Similar to the existing system analysis, the City's lift stations are adequately sized to meet year 2035 design flow conditions. As noted in Table 6.1, the Quail Hollow Lift Station was found to have a future capacity deficiency of 18 gpm. Because the deficiency is minor, a capacity improvement is not recommended at this time.

6.3 COLLECTION SYSTEM IMPROVEMENTS

Figure 6.2 illustrates the improvements recommended to mitigate capacity deficiencies in the existing sewer collection system and improvements to accommodate future growth as identified by the hydraulic analysis. Detail maps for some of the proposed improvements are provided in Figure 6.3 for clarity. The improvements are summarized in Table 6.2 with a cross-referenced number system. The columns used in Table 6.2 refer to the following:

- Figure Number: Assigned number that corresponds to the Proposed Improvements Table. This is an alphanumeric number that starts with one letter indicating the type of improvement P= Pipe, LS = Lift Station and continues with a number.
- Type of improvement: Pipelines, lift stations, force mains, and jacked steel casings.

Table 6.1 Lift Station Evaluation
Sewer Collection System Master Plan
City of Cotati

Lift Station	Lift Station Information[1],[2]				Firm Capacity vs. Existing PWWF			Firm Capacity vs. Future PWWF[3]		
	Pump No.	Pump Capacity (gpm)	Total Capacity (gpm)	Firm Capacity (gpm)	Existing PWWF (gpm)	Capacity Deficiency (gpm)	Available Firm Capacity (gpm)	Build Out PWWF (gpm)	Capacity Deficiency (gpm)	Available Firm Capacity (gpm)
Benson Lane Lift Station	1	130	260	130	21	0	109	21	0	109
	2	130								
New Century Park Lift Station	1	280	560	280	248	0	32	265	0	15
	2	280								
Quail Hollow Lift Station	1	120	240	120	136	16	0	138	18	0
	2	120								
Redwood Drive Lift Station	1	250	500	250	112	0	138	122	0	128
	2	250								

Notes:
1. Source: Table 2-1 of the City of Cotati 2002 Sanitary Sewer System Master Plan (Winzer & Kelly Consulting Engineers).
2. Firm Capacity is the total lift station capacity with the largest pump out of service.
3. Build out is defined as year 2035 in this master plan.

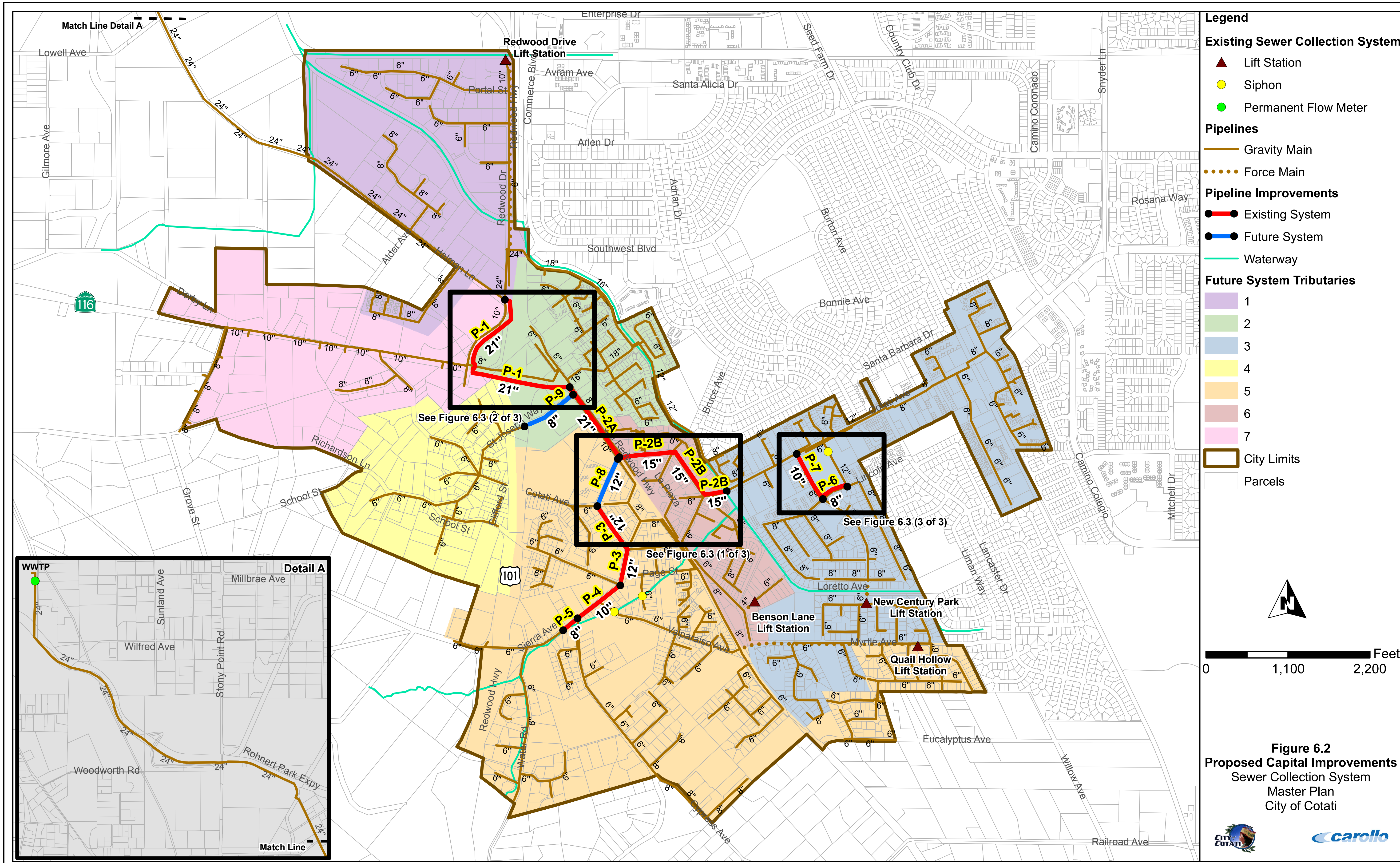


Figure 6.2
Proposed Capital Improvements
Sewer Collection System
Master Plan
City of Cotati

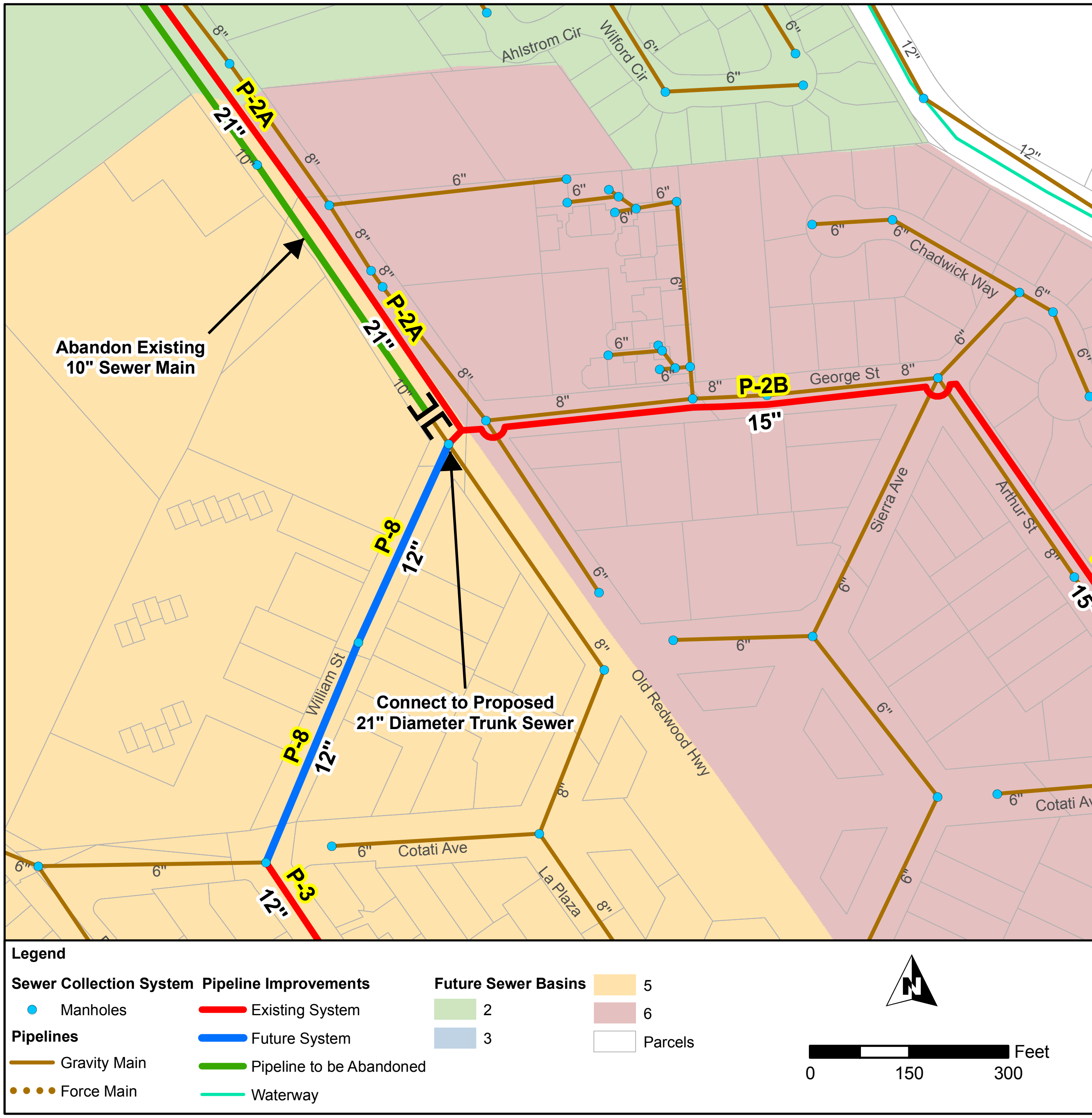


Figure 6.3
Proposed Relief Sewer Details (1 of 3)
Sewer Collection System Master Plan
City of Cotati

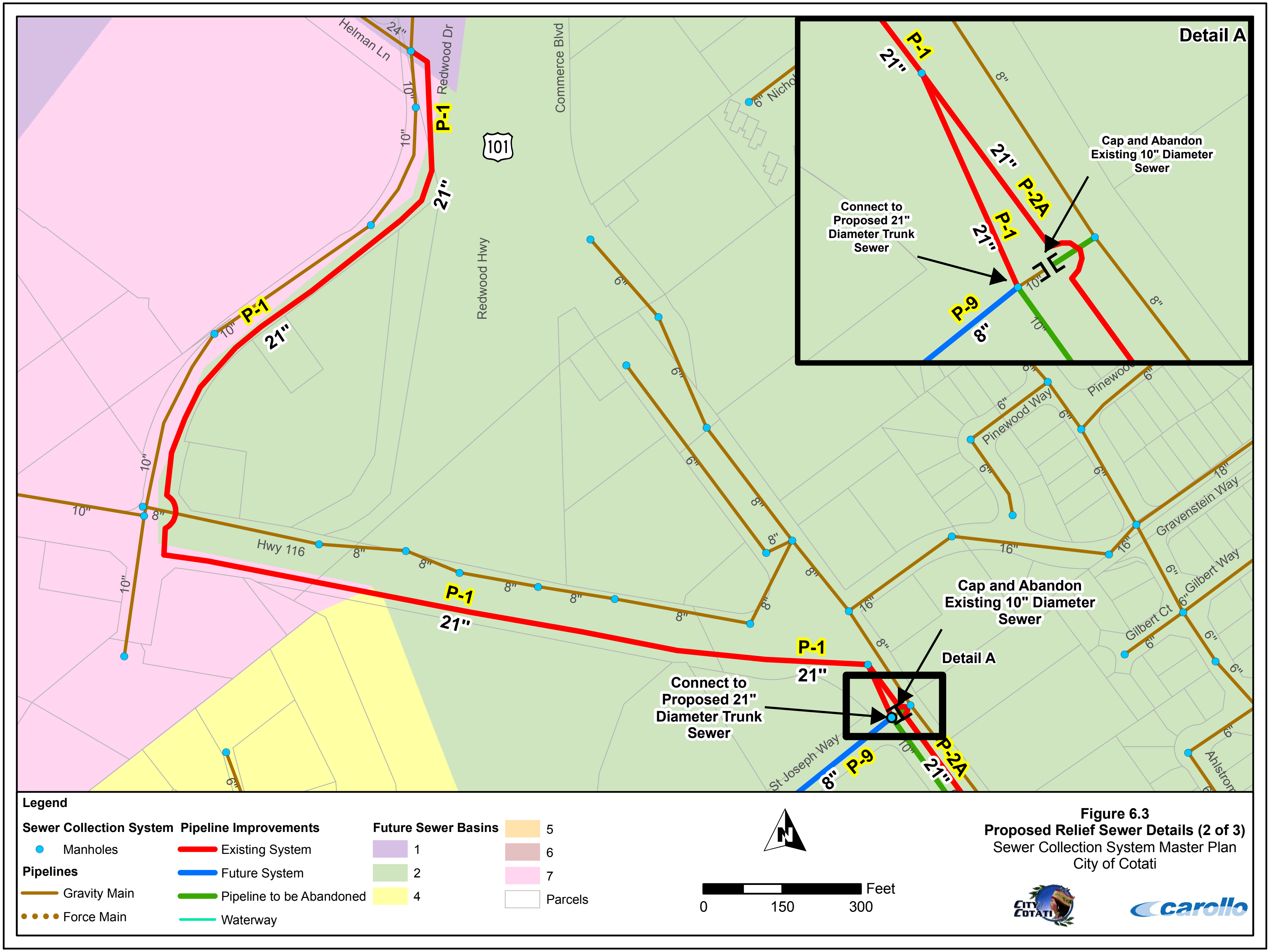


Figure 6.3
Proposed Relief Sewer Details (2 of 3)
Sewer Collection System Master Plan
City of Cotati

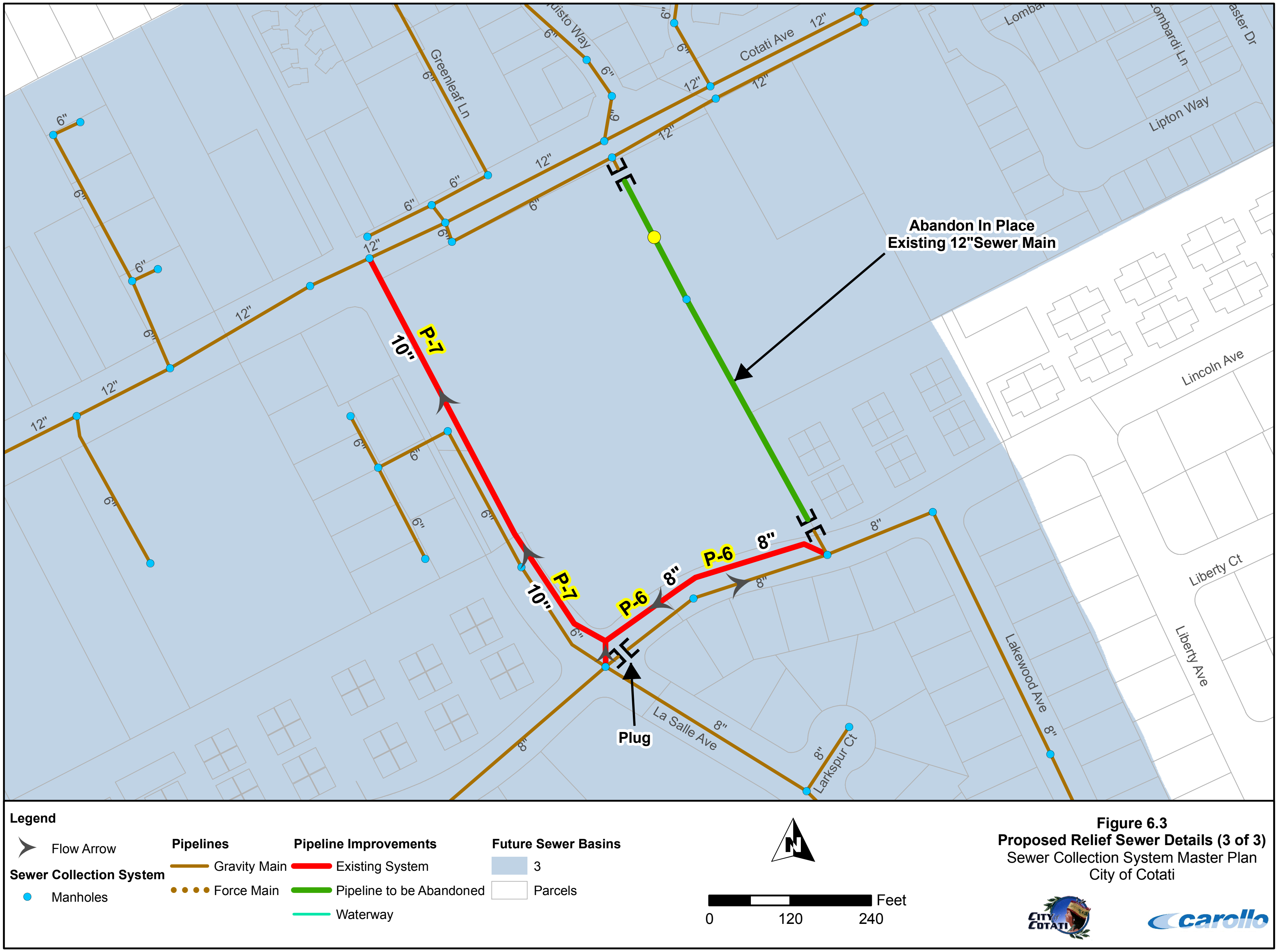


Figure 6.3
Proposed Relief Sewer Details (3 of 3)
Sewer Collection System Master Plan
City of Cotati

Table 6.2 Proposed Collection System Improvements
Sewer Collection System Master Plan
City of Cotati

Figure No.	Type of Improv.	Description/ Street	Description / Limits	Improv. Category	Project Length/Size: Ex. Size/ Diam. (in)	Project Length/Size: New Size/ Diam. (in)	Project Length/Size: Replace/ New	Project Length/Size: Length (ft)	Capital Improvement Phasing: Phase 1 2011-2015	Capital Improvement Phasing: Phase 2 2017-2021	Capital Improvement Phasing: Phase 3 2022-2026	Capital Improvement Phasing: Phase 4 2027-2031	Capital Improvement Phasing: Phase 5 2032-2036
Existing System Improvements													
Pipelines													
P-1	Pipe	Redwood Drive and Highway 116	From Helman Lane to Old Redwood Highway/Saint Joseph Way	Category 1	-	21	New	2,600	Phase 1				
P-2	Pipe	Old Redwood Highway	Saint Josephs to George Street	Category 1	-	21	New	1,100	Phase 1				
P-2B	Pipe	George Street, Arthur Street, East Cotati Avenue	From Old Redwood Highway/George Street to Laguna de Santa Rosa/East Cotati Avenue	Category 1	-	15	New	1,700		Phase 2			
P-3	Pipe	Olof Street, West Sierra Avenue	From East Cotati Avenue to East School Street	Category 1	8	12	Replace	1,200		Phase 2			
P-4	Pipe	West Sierra Avenue	From West School Street to Cypress Avenue	Category 1	6	10	Replace	700			Phase 3		
P-5	Pipe	West Sierra Avenue	From Cypress Avenue to Juniper Drive	Category 1	6	8	Replace	300			Phase 3		
P-6	Pipe	Lincoln Avenue	From LaSalle Avenue to near Lakewood Avenue	Category 2	8	8	Replace	400		Phase 2			
P-7	Pipe	LaSalle Avenue	East Cotati Avenue to Lincoln Avenue	Category 2	-	10	New	700		Phase 2			
Future System Improvements													
Pipelines													
P-8	Pipe	William Street	From Old Redwood Highway to West Cypress Avenue	Category 3	10	12	Replace	700		Phase 2			
P-9	Pipe	St Joseph Way	From Redwood Highway 101 to Old Redwood Highway	Category 3	6	8	Replace	800				Phase 4	

- Street Description: Street in which the improvement is proposed.
- Limits: Description of the beginning and end of a proposed pipeline project.
- Ex. Size/Diameter: This is the size of the existing pipeline/facility. It represents the diameter of the existing pipelines (in inches), and the total capacity of lift stations (in mgd).
- New Size/Diameter: This is the size of the proposed improvement. It represents the diameter of the proposed pipelines (in inches), and the total capacity of lift stations (in mgd).
- Additionally, for jacked steel casings, the size of the casing as well as the carrier pipe are indicated (in inches).
- Length: Estimated length of the proposed improvement (in feet). It should be noted that the length estimates do not account for re-routing the alignment to avoid unknown conditions.

6.3.1 Project Categories

The proposed projects provide the City with a list of improvements that will correct capacity deficiencies in the collection system that occur during peak wet weather flow conditions. When fully implemented, the capital projects will correct flow restrictions within the collection system to accommodate existing and future users while meeting the planning criteria.

Each improvement project listed in Table 6.2 was grouped into one of three different categories, based on the type of deficiency that is meant to be addressed by the improvement. The three categories are discussed below:

- **Category 1: Reducing the potential for Sanitary Sewer Overflows (SSOs) to Waters on the United States.** In 2006, the State Water Resources Control Board (SWRCB) adopted Statewide General Waste Discharge Requirements Order Number 2006-0003 (GWDRs). The focus of the GWDRs is to reduce the occurrence and extent of SSOs throughout the State of California, with particular emphasis given towards reducing SSOs that enter receiving waters of the United States. For this reason, the proposed improvements were analyzed to establish which improvements are required to reduce surcharged conditions (and therefore the SSO potential) for sewers in the vicinity of major waterways.
- **Category 2: Other Improvements to Meet the Maximum Flow Depth Criteria.** System improvements that are required to reduce surcharged conditions in areas with lower risk of contributing to SSOs to receiving waters were grouped into Category 2.
- **Category 3: Future Development.** System improvements exclusively required to accommodate future development within the City limits are identified in Table 6.2 as Category 3 improvements.

6.3.2 Existing Versus Future Improvement

An existing deficiency is one where the existing facility's capacity is insufficient to meet the planning criteria (e.g., pipeline upgrades required to prevent severe surcharging during the design wet weather event) for existing users. If a project was proposed to exclusively correct an existing deficiency, then existing users were assigned 100 percent of the project's benefit, and therefore, 100 percent of the costs.

Future growth may trigger the construction of new facilities to support this growth (e.g., new trunk sewers to serve vacant areas within the City service area). If a specific project is needed to serve future growth exclusively, the future users were assigned 100 percent of the future project's benefit and 100 percent of the costs.

In many cases, such as a proposed relief sewer, projects are needed to mitigate existing deficiencies and to accommodate future growth. Where a project is needed to mitigate existing deficiencies and serve future growth, the future user benefit was determined based on the additional capacity necessary to serve future growth. More information on the breakdown in cost split between existing and future users and whether a proposed improvement is intended to correct an existing deficiency, to serve a future user, or both is provided in Chapter 7.

6.3.3 Lift Station Improvements

As discussed in Section 6.2, the City's lift stations are capable of adequately conveying the existing and future (year 2035) design flow with the largest pump out of service. An exception to this is the Quail Hollow Lift Station. Since the existing and future modeled capacity deficiency for this lift station was very minor, no lift station improvement projects are recommended.

6.3.4 Pipeline Improvements

The proposed pipeline improvements that will serve future users are sized for build out conditions. As the City continues to grow, it is recommended that the capital projects proposed in this Master Plan be constructed so that the facilities have sufficient capacity for build out conditions.

When an increase to capacity is required, existing sewers can be upgraded or a parallel or relief sewer can be constructed. For the purposes of this Master Plan, unless otherwise stated, we assumed that a capacity deficient sewer would be upgraded to a larger diameter sewer. The upgraded pipeline generally followed the same slope as the existing pipeline, with the exception where data revealed negative or flat slopes in an existing alignment. In essence there are two alternatives for every trunk sewer project, but the decision to replace or construct a parallel sewer should be made during the preliminary design phase.

During the preliminary design phase, the existing sewer should be inspected by closed circuit television (CCTV) to determine its structural condition. If severely deteriorated, the existing sewer should be upgraded. If moderately deteriorated, slip lining or cured-in-place pipe lining can rehabilitate the existing sewer.

Based on the results of the existing and future system analysis, the following projects are recommended:

- **Existing System Improvements**
  - Improvement Number P-1 and P-2: In order to mitigate existing capacity deficiencies in the 12-inch, 16-inch, and 18-inch diameter sewer along the Laguna/Gravenstein Way from Highway 101 to East Cotati Avenue, and the existing 10-inch diameter sewer in Old Redwood Highway from Williams Street to Saint Joseph Way, it is recommended that the City construct a new 15-inch and 21-inch diameter relief trunk sewer that extends from the intersection of East Cotati Avenue and Gravenstein Way to the 24-inch diameter interceptor on Helman Lane at Redwood Drive. This Category 1 improvement not only mitigates these deficiencies, but it also provides an added layer of redundancy by constructing a second major sewer crossing under Highway 101.
  - Improvement Number P-3 through P-5: In order to mitigate surcharged conditions on Sierra Avenue, it is recommended that the City replace the existing 6-inch and 8-inch diameter sewers on West Sierra Avenue and Olof Street from west of Cypress Avenue to West Cotati Avenue. The proposed pipeline diameters are sized for future conditions, and include 12-inch, 10-inch, and 8-inch diameter sewers. This is a Category 1 improvement.
  - Improvement Number P-6 and P-7: To address surcharged conditions on La Salle Avenue from Lincoln Avenue to Loretto Avenue, it is recommended that the City install a new 10-inch diameter sewer on LeSalle Avenue from Lincoln Avenue to East Cotati Avenue. In addition, it is recommended that the City construct a new 8-inch diameter sewer main on Lincoln Avenue. The purpose of this sewer main is to redirect flows away from the existing 12-inch diameter main that extends under the Rancho Cotati shopping center. This will allow the 12-inch diameter sewer in the Rancho Cotati shopping center to be abandoned in place, and relocated to an alignment in the public right-of-way (ROW). This is a Category 2 improvement.

- **Future System Improvements**
  - Improvement Number P-8: To prevent future surcharged conditions within the recommended P-3 through P-5 improvement projects, it is recommended that the City replace the existing 10-inch diameter sewer on William Street from West Cotati Avenue to the Old Redwood Highway with a new 12-inch diameter sewer. This is a Category 3 improvement.
  - Improvement Number P-9: Replace the existing 6-inch diameter sewer on Saint Joseph Way from the Old Redwood Highway to Highway 101 with a new 8-inch

diameter sewer. This Category 3 improvement is required as a result of the future development related to the Downtown Specific Plan.

CAPITAL IMPROVEMENT PLAN

This section presents the recommended capital improvement plan (CIP) for the City of Cotati (City) sewer collection system and a summary of the capital costs. This chapter is organized to assist the City in making financial decisions. The CIP is based on the evaluation of the City's sewer system, planning area, and zoning designations.

7.1 CAPITAL IMPROVEMENT PROJECT COSTS

The capacity upgrades set the foundation for the City's sewer system CIP. The cost estimates presented in this study are opinions developed from bid tabulations, cost curves, information obtained from previous studies, and Carollo Engineers, Inc. (Carollo) experience on other projects. The costs are based on an Engineering News Record Construction Cost Index (ENR CCI) 20-City Average of 8,998 (February 2011).

7.2 COST ESTIMATING ACCURACY

The cost estimates presented in the CIP have been prepared for general master planning purposes and for guidance in project evaluation and implementation. Final costs of a project will depend on actual labor and material costs, competitive market conditions, final project scope, implementation schedule, and other variable factors such as preliminary alignment generation, investigation of alternative routings, and detailed utility and topography surveys.

The Association for the Advancement of Cost Engineering (AACE) defines an Order of Magnitude Estimate, deemed appropriate for master plan studies, as an approximate estimate made without detailed engineering data. It is normally expected that an estimate of this type would be accurate within plus 50 percent to minus 30 percent. This section presents the assumptions used in developing order of magnitude cost estimates for recommended facilities.

7.3 CONSTRUCTION UNIT COSTS

The construction costs are representative of sewer system facilities under normal construction conditions and schedules. Costs have been estimated for public works construction.

7.3.1 Pipeline Unit Costs

Sewer pipeline improvements range in size from 8-inches to 21-inches in diameter in this master plan. Pipe casings up to 48-inches in diameter are included for major crossings (e.g. creeks, canals, highways, and railroad) of the trunk sewers. Unit costs for the construction of pipelines and appurtenances (i.e., manholes) are shown in Table 7.1.

The construction cost estimates are based upon these unit costs. The unit costs are for "typical" field conditions with construction in stable soil at a depth ranging between 10 to 15 feet.

**Table 7.1 Pipeline Construction Unit Costs
Sewer Collection System Master Plan
City of Cotati**

Pipe Size (inches)	Pipeline Unit Cost ($/Linear Foot)
8	97
10	121
12	146
15	182
18	199
21	232
24	265
27	298
30	331
Pipeline Casing for Major Crossings	
12/24	926
15/30	1,158
18/30	1,158
24/42	1,621
27/48	1,853

Note:
1. ENR CCI 20 City average used for estimating (February 2011) = 8,998

7.4 PROJECT COSTS AND CONTINGENCIES

Project cost estimates are calculated based on elements, such as the project location, size, length, land acquisition needs, and other factors. Allowances for project contingencies consistent with an "Order of Magnitude" estimate are also included in the project costs prepared as part of this study, as outlined in this section.

7.4.1 Baseline Construction Cost

This is the total estimated construction cost, in dollars, of the proposed improvement for pipelines and lift stations. Baseline Construction Costs were developed using the following criteria:

- Pipeline: Calculated by multiplying the estimated length by the unit cost.

7.4.2 Estimated Construction Cost

Contingency costs must be reviewed on a case-by-case basis because they will vary considerably with each project. Consequently, it is appropriate to allow for uncertainties associated with the preliminary layout of a project. Such factors as unexpected construction conditions, the need for unforeseen mechanical items, and variations in final quantities are a few of the items that can increase project costs for which it is wise to make allowances in preliminary estimates. To assist the City in making financial decisions for these future construction projects, contingency costs will be added to the planning budget as percentages of the total construction cost, divided into two categories: Estimated Construction Cost and Capital Improvement Cost.

Since knowledge about site-specific conditions of each proposed project is limited at the master planning stage, a 25 percent contingency was applied to the Baseline Construction Cost to account for unforeseen events and unknown conditions. A 25 percent contingency to account for unknown site conditions such as poor soils, unforeseen conditions, environmental mitigations and other unknowns are typical for master planning projects. The Estimated Construction Cost for the proposed sewer system improvement consists of the Baseline Construction Cost plus the 25 percent construction contingency.

7.4.3 Capital Improvement Cost

Other project construction contingency costs are divided into three subcategories, totaling 30 percent: The 30 percent contingency is divided accordingly; 10 percent for project engineering, 10 percent for construction phase professional services, and 10 percent for project administration. Engineering services associated with new facilities include preliminary investigations and reports, ROW acquisition, foundation explorations, preparation of drawings and specifications during construction, surveying and staking, sampling of testing material, and start-up services. For this study, engineering costs are assumed to equal 10 percent of the Estimated Construction Cost.

Construction phase professional services cover such items as construction management, engineering services, materials testing, and inspection during construction. The cost of these items can also vary, but for the purpose of this study, it is assumed that construction phase professional services expenses will equal approximately 10 percent of the Estimated Construction Cost.

Finally, there are project administration costs, which cover such items as legal fees, environmental/CEQA compliance requirements, financing expenses, administrative costs, and interest during construction. The cost of these items can also vary, but for the purpose of this Master Plan, it is assumed that project administration costs will equal 10 percent of the Estimated Construction Cost.

The Capital Improvement Cost is the total of the Estimated Construction Cost (including contingency) plus the other costs discussed in the previous paragraphs.

As shown in the following sample calculation of the Capital Improvement Cost, the total cost of all project construction contingencies (construction, engineering services, construction management, and project administration) is 62.5 percent of the Baseline Construction Cost. Note that contingencies were not applied to land acquisition costs. Calculation of the 62.5 percent is the overall mark-up on the baseline construction cost to arrive at the capital improvement cost. It is not an additional contingency.

Example:

Baseline Construction Cost	$1,000,000
Construction Contingency (25%)	250,000
Estimated Construction Cost	1,250,000
Engineering Cost (10%)	125,000
Construction Management (10%)	125,000
Project Administration (10%)	125,000
Capital Improvement Cost	$1,625,000

A summary of the capital project costs is presented in Table 7.2. This table identifies the projects, provides a brief description of the project, identifies facility size (e.g., pipe diameter and length), and the capital improvement cost. The table also shows the probable phase in which the project would be implemented. The implementation timeframe was based on the priority of each project to correct existing deficiencies or to serve future users.

Table 7.2 Capital Improvement Plan
Sewer Collection System Master Plan
City of Cotati

Figure No.	Type of Improv.	Description/ Street	Description / Limits	Improv. Category	Project Length/Size and Cost: Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Replace/ New	Length (ft)	Capital Improvement Cost(1),(2),(3) ($)	Capital Improvement Phasing: Phase 1 2011-2015 ($)	Phase 2 2017-2021 ($)	Phase 3 2022-2026 ($)	Phase 4 2027-2031 ($)	Phase 5 2032-2036 ($)	ADWF Split: Existing (mgd)	Future (mgd)	Future Users Benefit (%)	Reimbursement Category: Existing Improvements ($)	Future Improvements ($)
Existing System Improvements																			
Pipelines																			
P-1	Pipe	Redwood Drive and Highway 116	From Helman Lane to Old Redwood Highway/Saint Joseph Way	Category 1	-	21	New	2,600	$ 978,000	$ 978,000					0.318	0.480	34%	$ 648,000	$ 330,000
P-2A	Pipe	Old Redwood Highway	Saint Josephs to George Street	Category 1	-	21	New	1,100	$ 414,000	$ 414,000					0.300	0.426	30%	$ 292,000	$ 122,000
P-2B	Pipe	George Street, Arthur Street, East Cotati Avenue	From Old Redwood Highway/George Street to Laguna de Santa Rosa/East Cotati Avenue	Category 1	-	15	New	1,700	$ 502,000		$ 502,000				0.147	0.205	29%	$ 359,000	$ 143,000
P-3	Pipe	Olof Street, West Sierra Avenue	From East Cotati Avenue to East School Street	Category 1	8	12	Replace	1,200	$ 284,000		$ 284,000				0.078	0.118	34%	$ 188,000	$ 96,000
P-4	Pipe	West Sierra Avenue	From West School Street to Cypress Avenue	Category 1	6	10	Replace	700	$ 138,000			$ 138,000			0.058	0.095	40%	$ 83,000	$ 55,000
P-5	Pipe	West Sierra Avenue	From Cypress Avenue to Juniper Drive	Category 1	6	8	Replace	300	$ 47,000			$ 47,000			0.028	0.033	16%	$ 39,000	$ 8,000
P-6	Pipe	Lincoln Avenue	From LaSalle Avenue to near Lakewood Avenue	Category 2	8	8	Replace	400	$ 63,000		$ 63,000				0.061	0.078	23%	$ 49,000	$ 14,000
P-7	Pipe	LaSalle Avenue	East Cotati Avenue to Lincoln Avenue	Category 2	-	10	New	700	$ 138,000		$ 138,000				0.060	0.080	25%	$ 104,000	$ 35,000
								Existing Improvements Subtotal	**$ 2,564,000**	**$ 1,392,000**	**$ 987,000**	**$ 185,000**	**$ -**	**$ -**				**$ 1,762,000**	**$ 803,000**
Future System Improvements																			
Pipelines																			
P-8	Pipe	William Street	From Old Redwood Highway to West Cotati Avenue	Category 3	10	12	Replace	700	$ 166,000		$ 166,000						100%	$ -	$ 166,000
P-9	Pipe	St Joseph Way	From US Highway 101 to Old Redwood Highway	Category 3	6	8	Replace	800	$ 127,000				$ 127,000				100%	$ -	$ 127,000
								Future Improvements Subtotal	**$ 293,000**	**$ -**	**$ 166,000**	**$ -**	**$ 127,000**	**$ -**				**$ -**	**$ 293,000**
								CIP Total (Existing and Future)	**$ 2,857,000**	**$ 1,392,000**	**$ 1,153,000**	**$ 185,000**	**$ 127,000**	**$ -**				**$ 1,762,000**	**$ 1,096,000**

Notes:
1. Baseline Construction Cost plus 25% to account for unforeseen events and unknown conditions.
2. Estimated Construction Cost plus 30% to cover other costs including Engineering, Construction Management, and Project Administration.
3. Costs are based on the Engineering News Record Construction Cost Index 20-city average of 8998 (February 2011).

7.5 CAPITAL IMPROVEMENT IMPLEMENTATION

The CIP projects are prioritized based on their urgency to mitigate existing deficiencies and for servicing anticipated growth. In addition, each improvement project has been assigned a “project category” as summarized in Chapter 6. It is recommended that improvements to mitigate existing deficiencies be constructed as soon as possible.

The implementation phases are separated into 5-year increments. Each project is itemized by phase in Table 7.2 and a summary by improvement category and phase is provided in Table 7.3.

Table 7.3 Summary of Capital Costs by Improvement Category
Sewer Collection System Master Plan
City of Cotati

	Implementation Phase					
Improvement Category	**2011-16 ($, mill.)**	**2017-21 ($, mill.)**	**2022-26 ($, mill.)**	**2027 - 31 ($, mill.)**	**2032- 36 ($, mill.)**	**Total ($, mill.)**
Category 1(1)	1.39	0.79	0.19	0.00	0.00	2.36
Category 2(2)	0.00	0.20	0.00	0.00	0.00	0.20
Category 3 (3)	0.00	0.17	0.00	0.13	0.00	0.29
Total	**1.39**	**1.15**	**0.19**	**0.13**	**0.00**	**2.86**

Notes:
1. Category 1 projects are focused on reducing the potential for sanitary sewer overflows (SSOs) to waters on the United States.
2. Category 2 projects include other existing improvements to meet the maximum flow depth criteria.
3. Category 3 projects serve future development.
4. Costs are based on ENR CCI 20 City average of 8,998 (February 2011).

7.6 EXISTING VERSUS FUTURE USERS COST SHARE

The improvements proposed in this Master Plan either benefit existing users, or are required to service new development and future users. Some of the projects provide benefit to both existing and future users. An opinion of benefit to future users, based on preliminary project information, was included in Table 7.2.

A breakdown in existing and future user cost share of the proposed projects by phase is summarized in Table 7.4. All of the proposed improvements are pipeline improvements (i.e., no lift station improvements).

Table 7.4 Existing Versus Future User Cost Share Sewer Collection System Master Plan City of Cotati						
	Implementation Phase					
Reimbursement Category	**2011-16 ($, mill.)**	**2017-21 ($, mill.)**	**2022-26 ($, mill.)**	**2027 - 31 ($, mill.)**	**2032- 36 ($, mill.)**	**Total ($, mill.)**
Existing User [(2)]	0.94	0.70	0.12	0.00	0.00	**1.76**
Future User [(3)]	0.45	0.45	0.06	0.13	0.00	**1.10**
Total	**1.39**	**1.15**	**0.19**	**0.13**	**0.00**	**2.86**

Notes:

1. Costs are based on ENR CCI 20 City average of 8,998 (February 2011).
2. Projects are funded through user rates.
3. Projects are expected to be funded through sewer development impact fees collected by the City through future connections.

APPENDIX A – CITY OF COTATI FLOW MONITORING REPORT

carollo

Engineers...Working Wonders With Water™

REGISTERED PROFESSIONAL ENGINEER
TIMOTHY JOHN LOPER
No. 70847
Exp. 06/30/11
CIVIL
STATE OF CALIFORNIA

08/12/10

CITY OF COTATI

FLOW MONITORING REPORT

FINAL

August 2010

REGISTERED PROFESSIONAL ENGINEER
BRIAN FRANCIS ORCUTT
No. 75802
Exp. 06/30/12
CIVIL
STATE OF CALIFORNIA

08/12/10

2700 YGNACIO VALLEY ROAD • SUITE 300 • WALNUT CREEK, CALIFORNIA 94598 • 925.932.1710 • FAX 925.930.0208

August 12, 2010
8486A.00

City of Cotati
201 West Sierra Avenue
City of Cotati, CA 94931

Attention: Mr. Damien O'Bid, P.E., City Engineer/Public Works Director

Subject: City of Cotati Flow Monitoring Report

Dear Mr. O'Bid:

We are pleased to submit the final Flow Monitoring Report for the City of Cotati (City). The purpose of the flow monitoring report is to summarize the wastewater collection system flow and precipitation monitoring data collected by Utility Systems, Science, and Software (US3) for the City between March 10, 2010 and May 14, 2010.

The flow monitoring report summarizes the selected monitoring sites, documents the meter installation process, and provides an analysis of the dry weather flow, wet weather flow, and rainfall data collected by US3.

The information presented in the flow monitoring report is an integral part of the City's Sewer System Master Plan project, and provides a basis for the dry weather and wet weather hydraulic model calibration.

If you have any questions, please feel free to contact us.

Sincerely,

CAROLLO ENGINEERS, INC.

Thomas S Kalkman

Thomas S. Kalkman, P.E.
Partner

Tim J. Loper, P.E.
Project Manager

TSK/TJL:cjp

Enclosures: City of Cotati Flow Monitoring Report (3)

CITY OF COTATI

FLOW MONITORING REPORT

TABLE OF CONTENTS

Page No.

LIST OF TABLES

LIST OF FIGURES

1.0 EXECUTIVE SUMMARY

The City of Cotati (City) contracted with Utility Systems, Science, and Software (US3) to conduct a two-month temporary flow monitoring program at seven (7) sewer metering sites along with two rain gauge locations within the City. The flow monitoring was conducted between March 10, 2010 and May 14, 2010. Carollo Engineers, Inc. (Carollo) was contracted by the City to complete a Sewer System Master Plan. As part of the Sewer System Master Plan, the City asked Carollo to complete a flow monitoring report that summarizes the data collected by US3.

1.1 Flow Monitoring and I/I Results

Table 1 summarizes the flow monitoring results and infiltration and inflow (I/I) results for each flow-monitoring site. The I/I results shown in this table are taken from the April 11 – April 13, 2010 wet weather event.

Table 1 Flow Monitoring and I/I Results Summary
Flow Monitoring Report
City of Cotati

Site	ADWF (mgd)	Estimated Total I/I (gallons)	R-Value (%)	Peak I/I Flow (mgd)	Peak I/I to ADWF Ratio	Inflow Rank	Combined I/I Rank
1	0.59	824,000	1.59%	0.71	1.20	5	5
2	0.56	569,000	2.00%	0.60	1.07	7	3
3	0.17	155,000	1.44%	0.20	1.18	6	6
4	0.03	101,000	2.23%	0.07	2.33	3	2
5	0.16	301,000	1.83%	0.36	2.25	4	4
6	0.05	139,000	4.64%	0.18	3.60	1	1
7	0.04	67,000	1.33%	0.12	3.00	2	7

The following major results are noted:

- **Inflow:** Meter Sites 6 and 7 exhibited the highest rates of inflow as compared to their average dry weather flows (ADWFs);

- **Combined I/I:** Meter Site 6 exhibited the highest R-Value, and was the only meter site with an R-Value approaching 5 percent;

- **Capacity (peaking factor):** Flow Meter Sites 4, 5, 6, and 7 exceeded the typical peaking factor threshold of 3; and

- **Capacity (d/D ratio):** The maximum depth of flow to pipe diameter ratio (d/D) for the flow-monitoring period was measured at Meter 6 (0.6).

2.0 INTRODUCTION

The City of Cotati (City) contracted with Utility Systems, Science, and Software (US3) to conduct a two-month temporary flow monitoring program at seven (7) sewer metering sites along with two rain gauge locations within the City. The flow monitoring was conducted between March 10, 2010 and May 14, 2010. Carollo Engineers, Inc. (Carollo) was contracted by the City to complete a Sewer System Master Plan. As part of the Sewer System Master Plan, the City asked Carollo to complete a flow monitoring report that summarizes the data collected by US3. The data collected as part of the US3 work is included in Appendix A of this report.

The sewer flow monitoring locations are illustrated on Figure 1. The seven locations were selected to collect flow data from the entire City and isolate flow from smaller portions of the City.

Table 2 lists the flow monitoring locations and the diameters for the sewers where the meters were installed. Figure 2 provides a schematic illustration of the flow monitoring locations.

Table 2 Flow Monitoring Locations and Pipeline Diameters
Flow Monitoring Report
City of Cotati

Site	Diameter (in.)	Location
1	24	Helman Lane approximately 1 mile west of Highway 101
2	18	Manhole east of the intersection of Commerce Boulevard and the Laguna
3	12	West of Falleti park near intersection of Gravenstein Way and Village Court
4	6	Saint Josephs Way between the Park and Ride and the Baseball Field
5	10	West side of Old Redwood Highway near Grapevine Shopping Center
6	8	East side of Old Redwood Highway across from Grapevine Shopping Center
7	10	Redwood Drive in front of Lowe’s Home Improvement Store

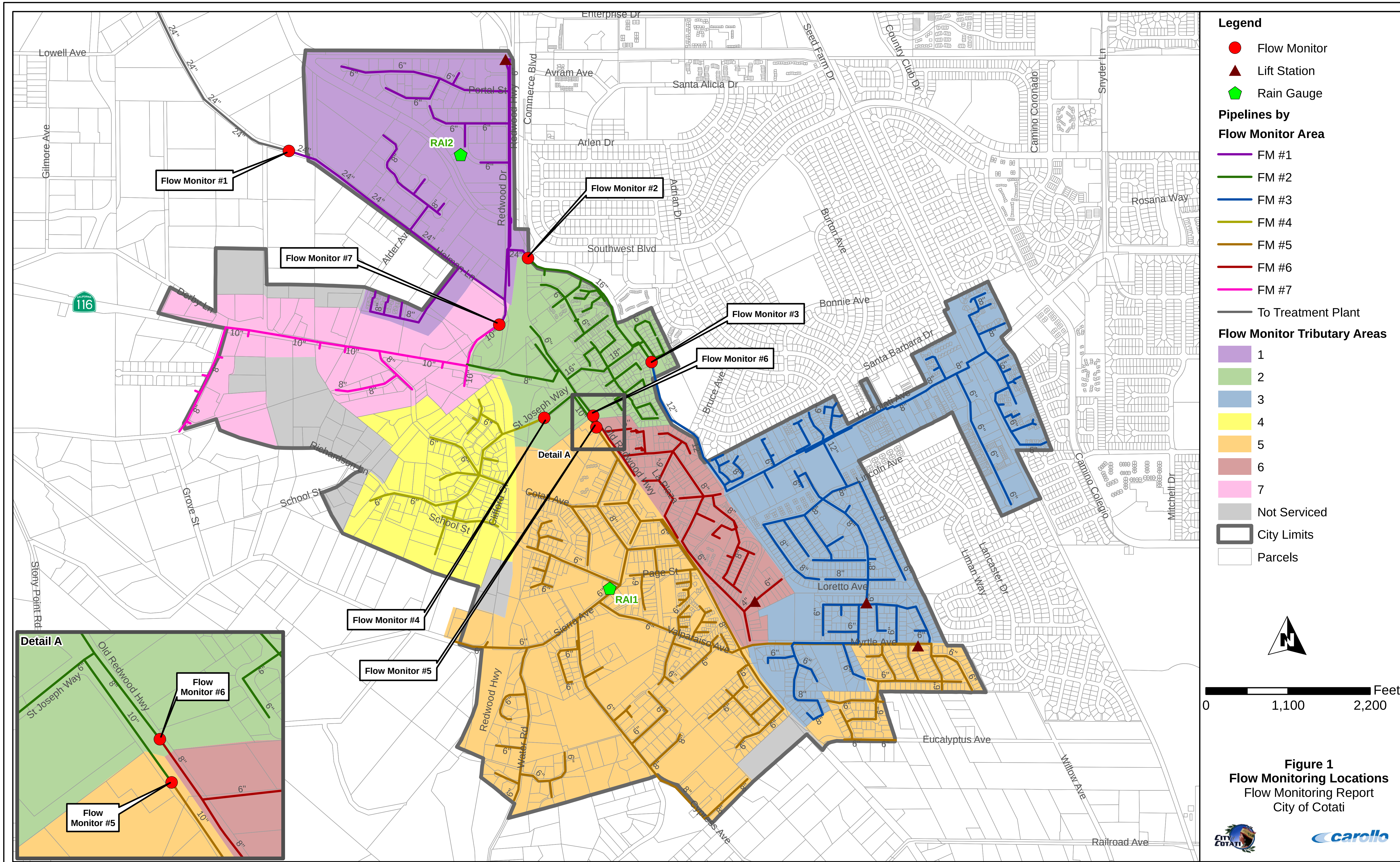


Figure 1
Flow Monitoring Locations
Flow Monitoring Report
City of Cotati

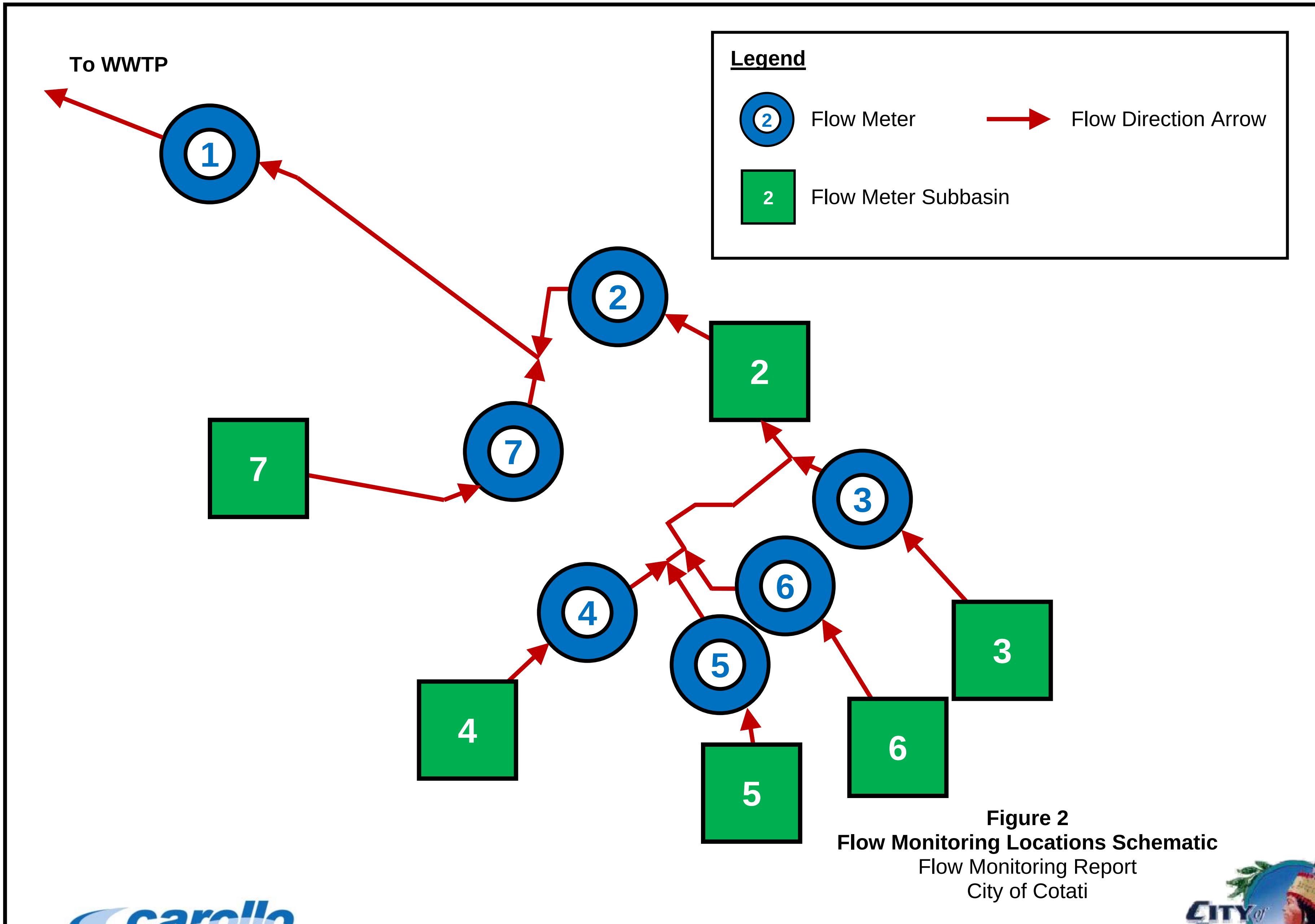


Figure 2
Flow Monitoring Locations Schematic
Flow Monitoring Report
City of Cotati

3.0 METER INSTALATION

US3 installed seven Flo-Dar flow meters. The meters are installed in sewer manholes to measure flow depth and velocity to calculate wastewater flow rates in the collection system sewers. Flo-Dar uses a Doppler Radar Velocity Sensor and an Ultrasonic Depth Transducer to measure continuous 15-minute depth and velocity readings. Details of the Flo-Dar meter and the associated data management software are included in Appendix A of this report.

4.0 RAINFALL DATA AND RESULTS

US3 installed two rain gauges in the City to capture rainfall data during the flow-monitoring period in order to quantify the system's response to infiltration and inflow (I/I). It is important to classify the relative size of the major storm events that occur over the course of the flow-monitoring period. Based on historical data, the National Oceanic and Atmospheric Administration (NOAA) developed frequency contour maps for given intensity and duration storm events for all areas within the Continental United States. The NOAA Rainfall Atlas Maps (Figure 3) classify a 10-year, 24-hour storm event in Cotati as 4.5 inches. This means that in any given year, there is a 10 percent chance that 4.5 inches of rain will fall in any 24-hour period.

Four significant rainfall events were captured during the flow-monitoring period. Table 3 summarizes the significant rainfall events data for each storm. The highest rainfall total in any 1-hour period was 0.26 inches per hour and occurred during the April 11, 2010 rainfall event. The highest rainfall total during the flow-monitoring period was 1.67 inches during the April 11, 2010 event. The cumulative rainfall depths were calculated and plotted against a storm event classification chart, show in Figure 4. The events experienced during the flow-monitoring program were all classified as being less than two-year storm events.

While the individual rainfall events were not large relative to a 10-year, 24-hour event, the total rainfall over the course of the flow-monitoring period was significant. Figure 5 shows a plot of each rainfall event and a plot of the cumulative rainfall totals versus the average rainfall over the course of the flow-monitoring period. The total rainfall depth over the course of the flow-monitoring period was 6.07-inches, while the historical average rainfall depth during the flow-monitoring period was 3.84-inches, based on data available from the Western Regional Climate Center (WRCC)[1]. The measured rainfall totals were approximately 158 percent (158%) above the average during this time period. This has a bearing on the identification of I/I as it means the ground was adequately saturated during the flow-monitoring period.

[1] Source: www.wrcc.dri.edu, data presented is from Station 046826 (Petaluma Fire Station 3)

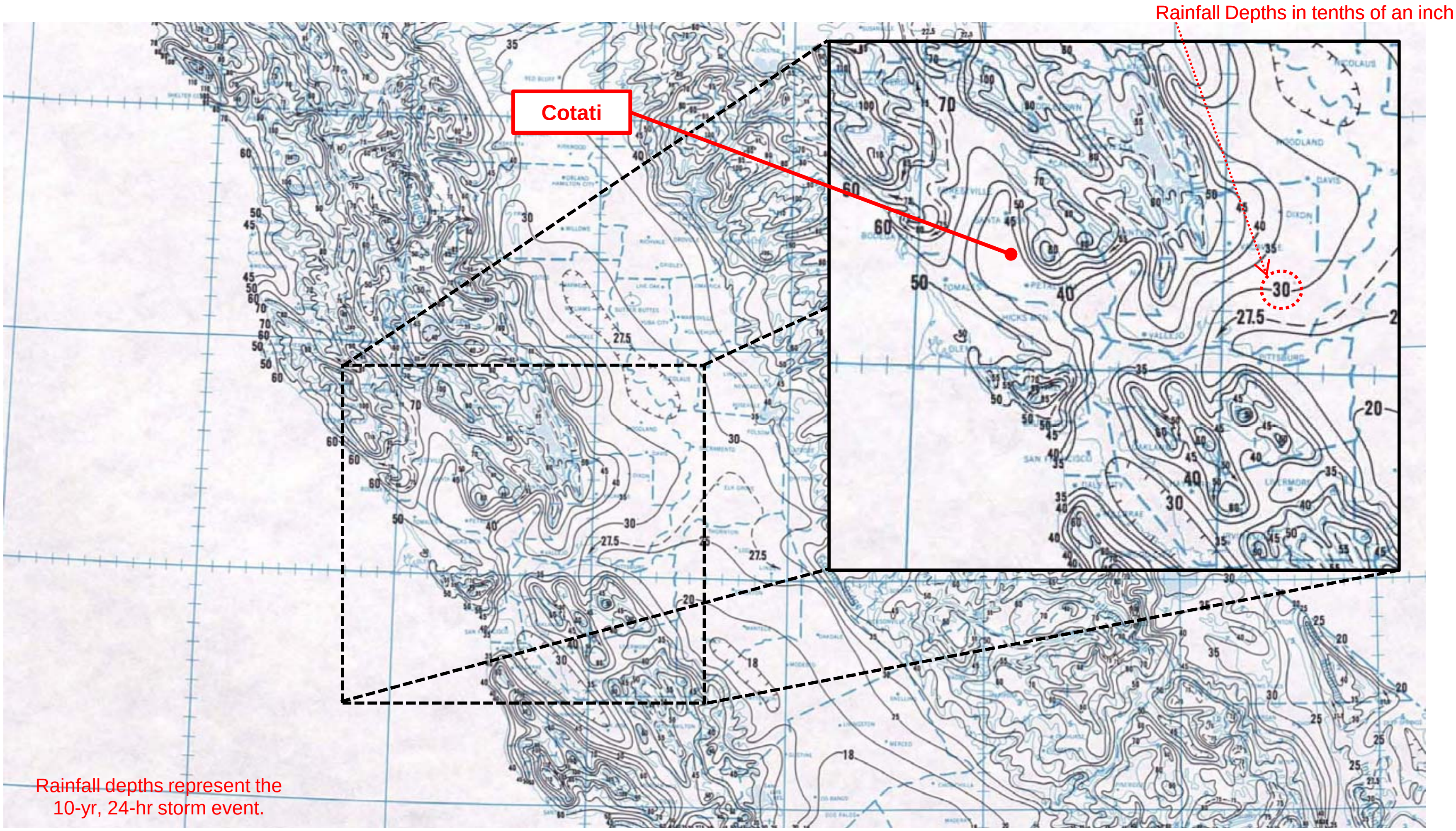
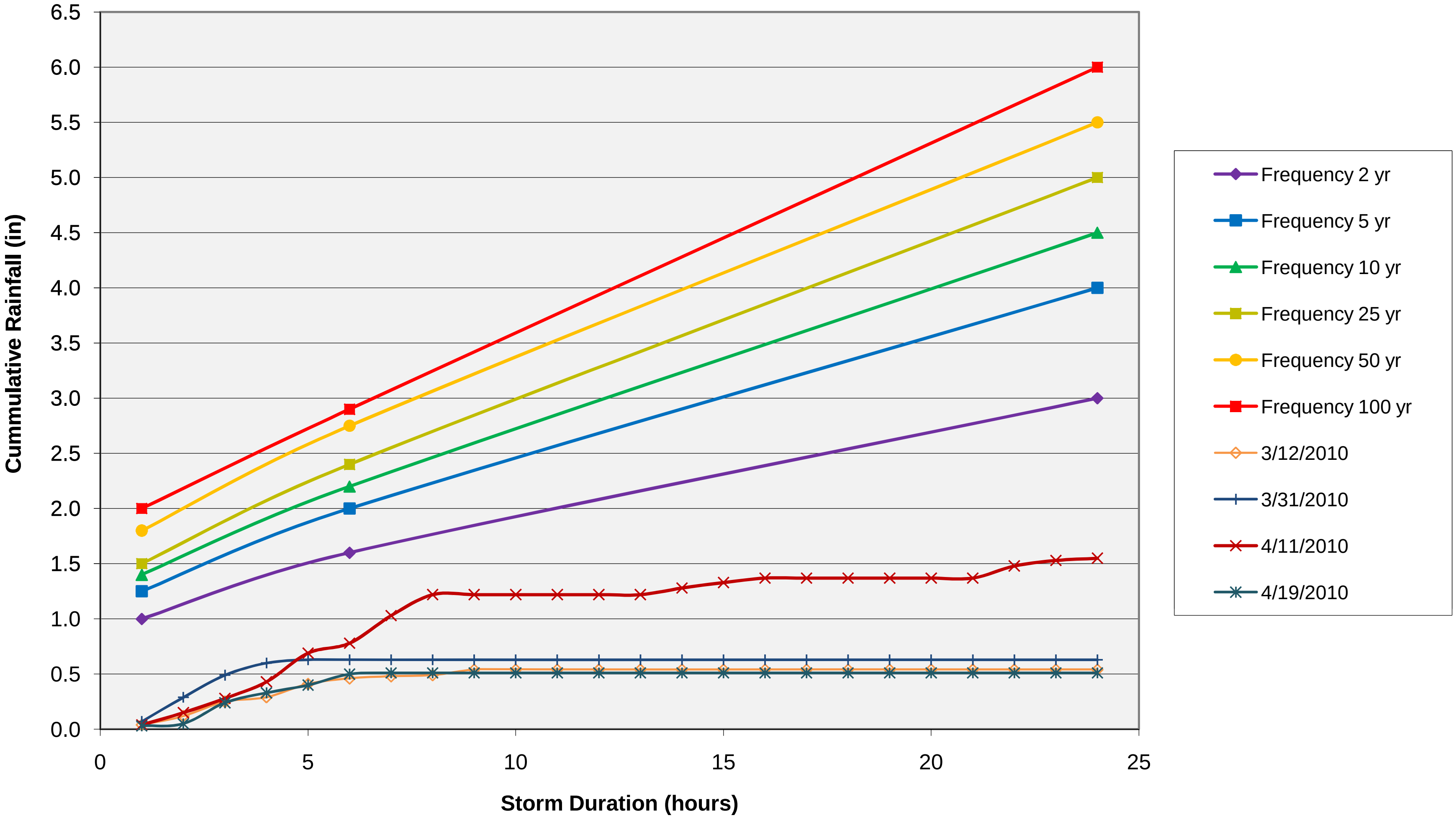


Figure 3
NOAA Atlas II Rainfall Map
Flow Monitoring Report
City of Cotati



Source: Frequency curves developed from NOAA Atlas II Isopluvial maps for California
Rainfall data collected as part of the temporary flow monitoring program conducted by US3

Figure 4
Cotati Rainfall Analysis
Flow Monitoring Report
City of Cotati

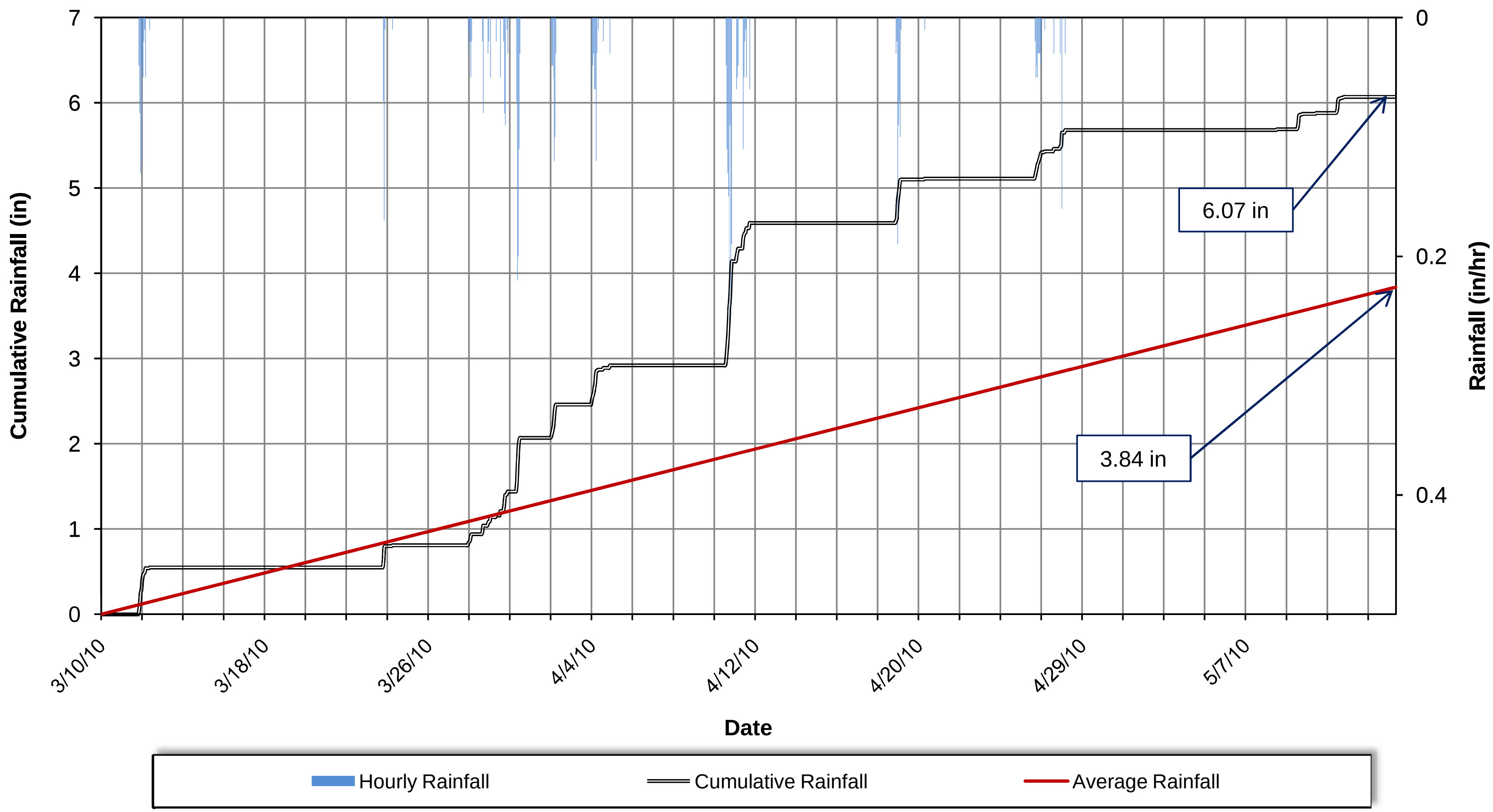


Figure 5
Cumulative, Hourly, and Average Rainfall
Flow Monitoring Report
City of Cotati

carollo

CITY of COTATI

Table 3	Significant Storm Event Summary (Greater than 0.5-inches) Flow Monitoring Report City of Cotati			
Event	Date	Total Rainfall (inches)	Peak Intensity (inches/hour)	Storm Duration (hours)
1	March 12, 2010	0.54	0.12	9
2	March 31, 2010	0.63	0.22	5
3	April 11, 2010	1.67	0.26	30
4	April 19, 2010	0.51	0.19	7

5.0 FLOW MONITORING RESULTS

5.1 Average Dry Weather Flow

Hourly patterns for weekday and weekend flows vary and are separated to better understand Average Dry Weather Flows (ADWF). For the flow-monitoring period the following days were least effected by storm events and were used to determine ADWF.

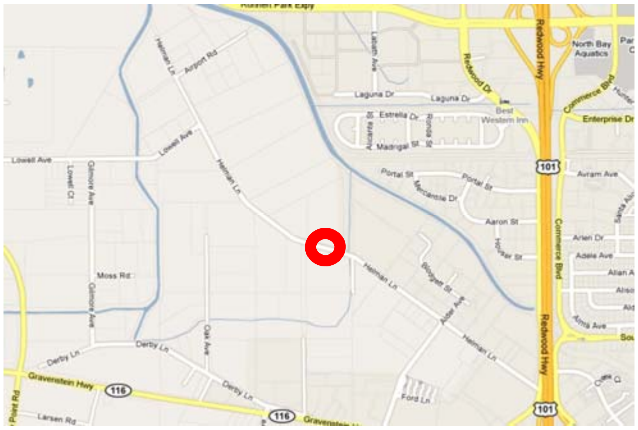
- March 15 – 24, 2010
- April 6 – 10, 2010
- April 15 – 19, 2010
- April 29 – May 9, 2010

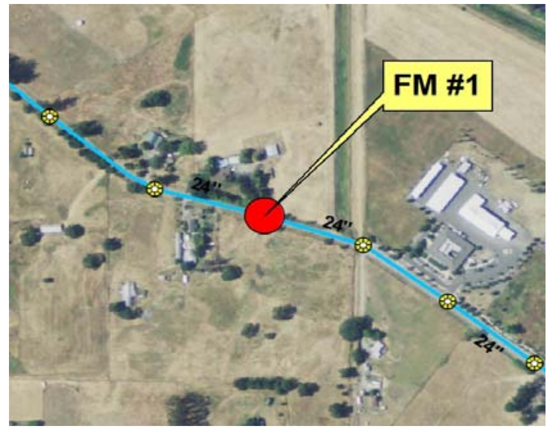
Figure 6 shows a summary of the dry weather flow analysis for Meter 1, including the average weekend and weekday flow variations. Appendix B includes a summary of the dry weather flow analysis for Meter Sites 2 to 7.

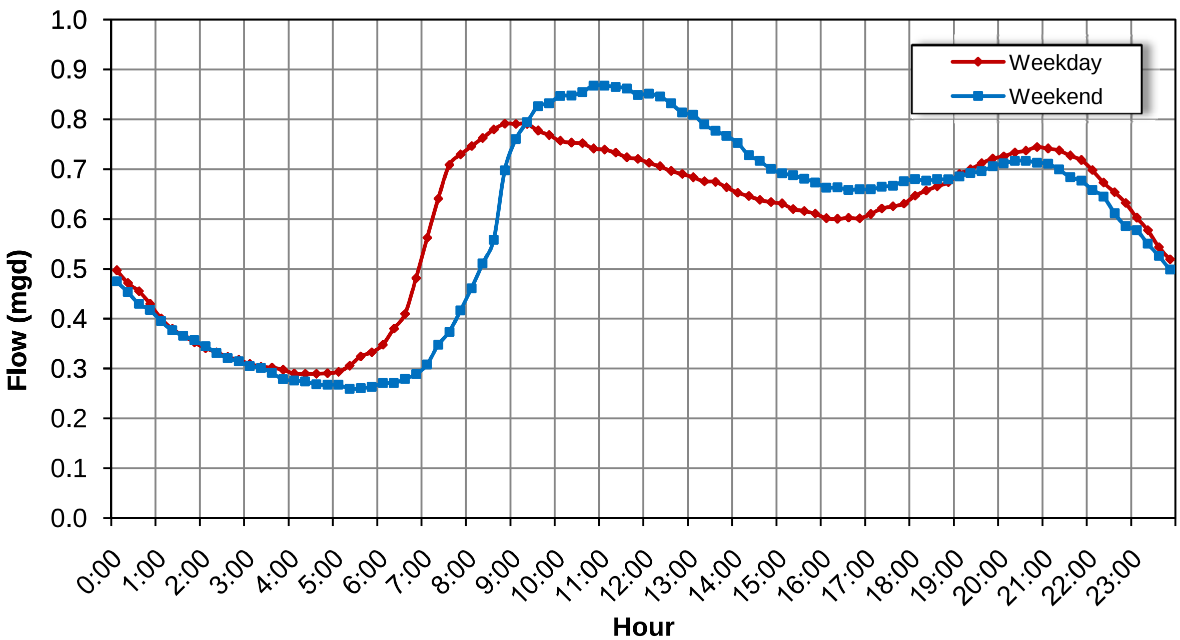
Table 4 provides the ADWF and the Peak Dry Weather Flow (PDWF) for weekends and weekdays.

The ADWF is the flow generated by the District's residential, commercial, and industrial customers. The flow has a diurnal that varies with land use categories. Typically, a residential diurnal pattern has two peaks with a more pronounced peak following the wake-up hours of the day, and a less pronounced peak occurring during the evening. Commercial and industrial patterns, though they vary depending on the type of use, typically have more consistent higher flow patterns during business hours, and lower flows at night.

Flow Monitoring Site: Site 1
Pipe Diameter: 24-inches
Location: Helman Lane approximately 1 mile west of Highway 101







Dry Weather Flow Days: March 15-24, April 6-10, April 15-19, and April 29-May 9, 2010.

Flow Condition	Weekday	Weekend	Avg.
ADWF (mgd)[1]	0.587	0.583	0.586
PDWF (mgd)[2]	0.929	0.951	0.951
PDWF/ADWF	1.58	1.63	1.62

(1) Average Dry Weather Flow (ADWF) represents the average flow during the dry weather days

(2) Peak Dry Weather Flow (PDWF) is the 15-minute peak measured during the dry weather days.

Figure 6
Flow Meter Site 1 Dry Weather Flow Summary
Flow Monitoring Report
City of Cotati

Table 4	Dry Weather Flow Summary Flow Monitoring Report City of Cotati						
Site	Average Dry Weather Flow (mgd)		Weekend/ Weekday Ratio	Peak Dry Weather Flow(1) (mgd)		PDWF/ADWF Ratio	
	Weekday	Weekend		Weekday	Weekend	Weekday	Weekend
1	0.587	0.583	1.01	0.929	0.951	1.58	1.63
2	0.563	0.552	1.02	0.961	1.027	1.71	1.86
3	0.168	0.181	0.93	0.446	0.393	2.66	2.18
4	0.031	0.029	1.04	0.066	0.066	2.15	2.25
5	0.160	0.162	0.99	0.298	0.308	1.86	1.90
6	0.051	0.052	0.98	0.208	0.202	4.11	3.91
7	0.037	0.034	1.10	0.084	0.069	2.25	2.03

Notes:

(1) Peak Dry Weather Flow represents the 15-minute peak flow during the established dry weather days (March 15-24, April 6-10, April 15-19, and April 29-May 9, 2010.

Furthermore, the diurnal flow pattern experienced during a weekend may vary from the diurnal flow experienced during a weekday. Typically, a weekend residential diurnal pattern peaks later in the morning than a weekday diurnal pattern. Residential flows also tend to peak at a higher flow rate during the weekend than during the weekday. The daily flow may also vary from the weekend to the weekday, depending on the type of use. A weekend to weekday flow ratio in excess of one is common in residential land use areas, whereas a weekend to weekday flow ration below one may be indicative of commercial or industrial areas.

The PDWF provided in Table 4 represents the maximum flow rate experienced during the flow-monitoring period only for dry weather conditions. The design PDWF will likely exceed the values listed in Table 4. This condition is commonly utilized by sewer agencies to determine the abilities of a collection system to convey the design PDWF without surcharging.

5.2 Wet Weather Flow Data and I/I Analysis

The seven flow meters captured data during the rainfall events discussed in Section 4.0. Quantitative analysis of the I/I response was performed so that an I/I response could be clearly differentiated from the ADWF, or the base flow (Appendix B). The April 11, 2010 rainfall event yielded the greatest rainfall total (1.67 inches) and peak rainfall intensity (0.26 inches/hour) of the four storms indentified in Section 4.0. For this reason, quantitative analysis was performed for the April 11, 2010 event.

5.2.1 Rainfall Derived Infiltration and Inflow Sources

Rainfall Derived I/I has two components, inflow and infiltration, and they exhibit different characteristics response patterns in the flow monitoring data.

- **Inflow**. Inflow is defined as storm water that enters the sewer system via a storm drain cross connection to the sewer system. Examples of inflow entry points are roof drain and downspout connections, leaky manhole covers, and illegal storm drain connections. Inflow is characterized in the flow monitoring data by a large magnitude, short duration increase in wastewater flows immediately following a rainfall event. Excessive inflow is a concern because, in addition to infiltration, it leads to increased peak flows in the collection system, which could result in surcharged conditions and, in severe cases, sanitary sewer overflows (SSOs) in the collection system.

- **Infiltration**. Infiltration is defined as storm water flows that enter the sewer system by percolating through the soil and then through defects in pipelines, manholes, and joints. Examples of infiltration entry points are cracks in pipelines, misaligned joints, and root penetration. Infiltration is characterized in the flow monitoring data by a gradual increase in flow after a wet weather event. The increased flow typically sustains for a period after the rainfall has stopped and then gradually drops off as soils become less saturated and groundwater levels decline to normal levels. Excessive infiltration is an issue because it increases the volume of flow that must be pumped and treated by the collection system and wastewater treatment plant.

Figure 7 provides sample graphics indicating a typical response pattern for inflow, infiltration, and combined I/I.

5.3 I/I Analysis

As previously noted, quantitative I/I analysis was performed for the April 11, 2010 wet weather event. Figure 8 shows a summary of the I/I analysis for Meter site 1. Appendix B includes a summary of the I/I analysis for the remaining Meter Sites 2 to 7.

5.3.1 Inflow Analysis

Table 5 summarizes the results of the inflow analysis. The analysis compares the measured peak I/I flow to the ADWF at each flow meter site. This parameter is considered preferable to the measured peak wet weather flow (PWWF) to ADWF ratio, because the PWWF to ADWF flow ratio can be skewed higher or lower depending on whether the inflow response occurs during high or low flow hours. The inflow results were generated for the period of April 11 – 13, 2010.

Figure 9 shows a bar chart showing the Peak I/I to ADWF ratio for the various flow meter sites. As shown in this figure, Meter Sites 6 and 7 exhibited the highest rates of inflow as compared to their ADWFs.

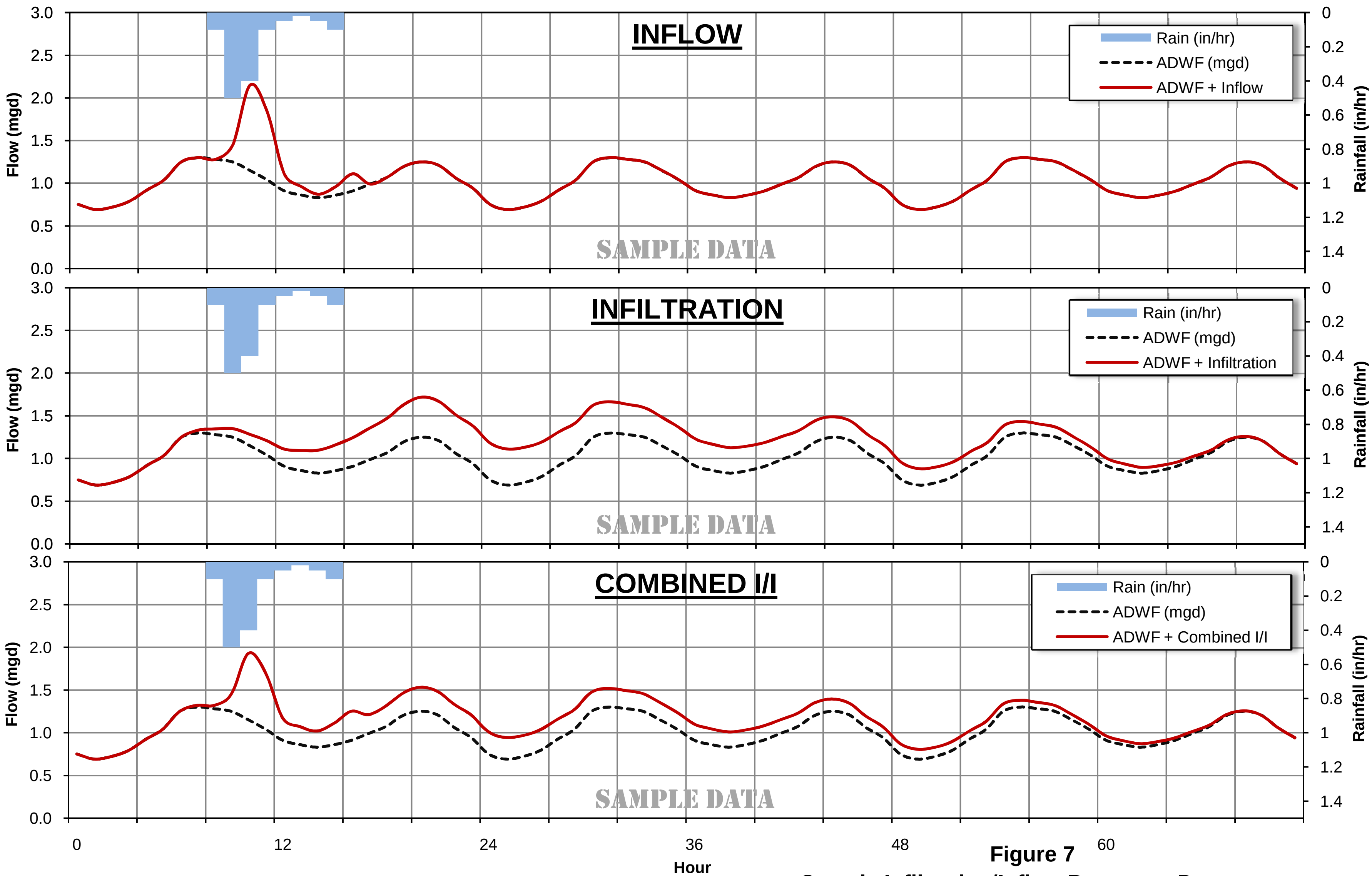


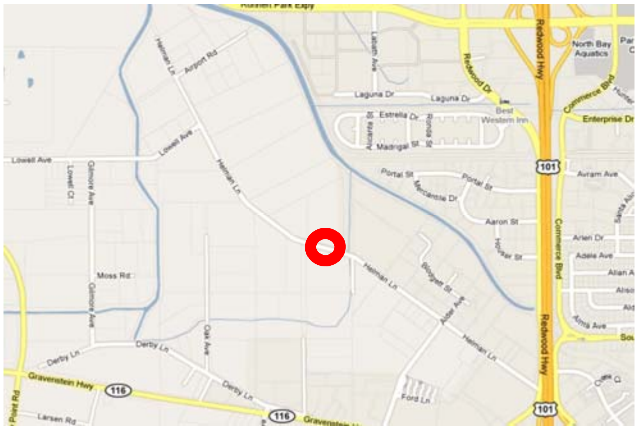
Figure 7

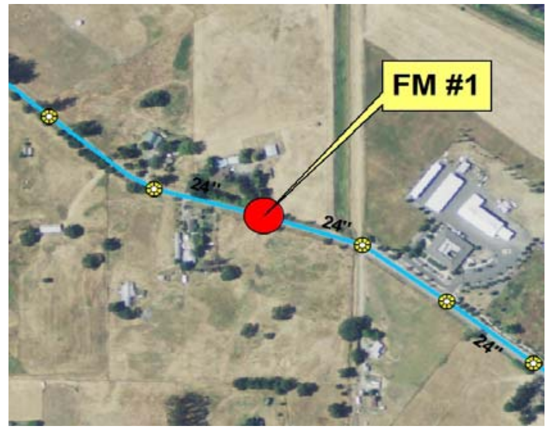
Sample Infiltration/Inflow Response Patterns

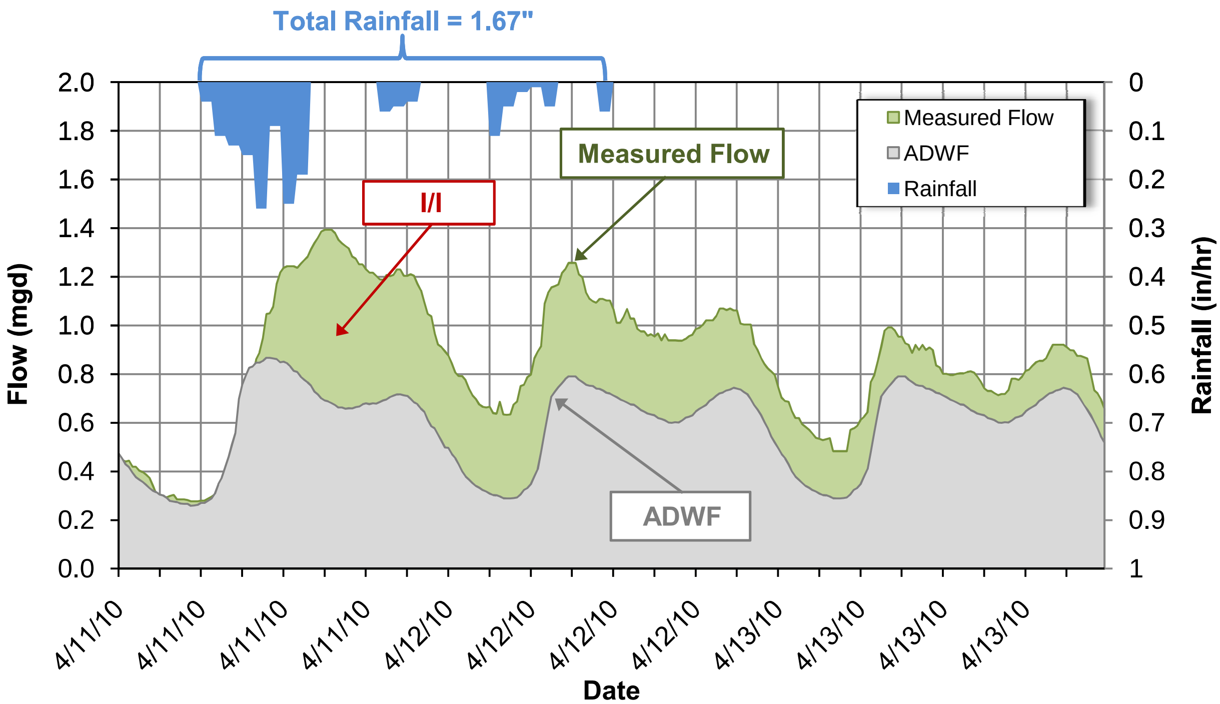
Flow Monitoring Report

City of Cotati

Flow Monitoring Site: Site 1
Pipe Diameter: 24-inches
Location: Helman Lane approximately 1 mile west of Highway 101







Wet Weather Analysis Period: April 11-13, 2010

I/I Analysis

Rainfall:	1.67	inches
Peak I/I Rate:	0.71	mgd
Peak I/I:ADWF Ratio:	1.20	
Combined I/I Volume:	824,000	gallons
R-Value:	1.59%	

Figure 8
Flow Meter Site 1 I/I Analysis Summary
Flow Monitoring Report
City of Cotati

Table 5	Inflow Analysis Summary Flow Monitoring Report City of Cotati			
Site	Average Dry Weather Flow (mgd)	Peak I/I Flow (mgd)	Peak I/I to ADWF Ratio	Inflow Ranking
1	0.59	0.71	1.20	5
2	0.56	0.60	1.07	7
3	0.17	0.20	1.18	6
4	0.03	0.07	2.33	3
5	0.16	0.36	2.25	4
6	0.05	0.18	3.60	1
7	0.04	0.12	3.00	2

Notes:
(1) Inflow analysis data is from the April 11 – 13 period.

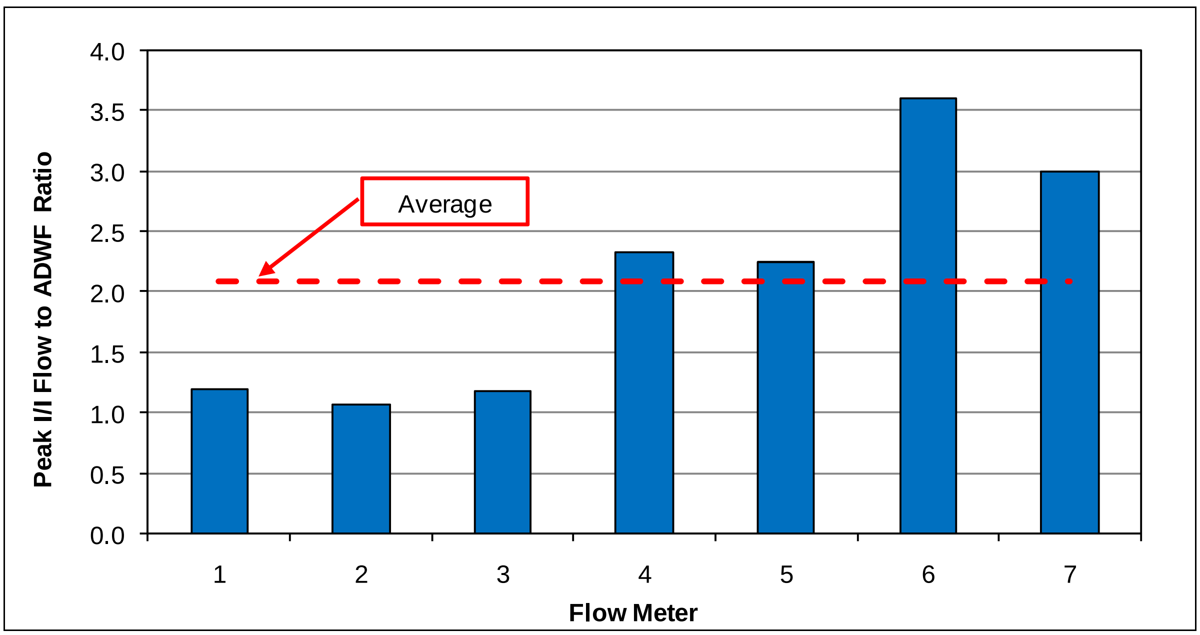


Figure 9 Peak I/I Flow to ADWF Ratio by Meter Site

5.3.2 Combined I/I Analysis

The parameter developed from the flow monitoring data used for determining the systems combined I/I response to rainfall events is the R-Value. The R-Value is used to rant the basins in terms of combined I/I. The R-Value represents the percentage of rainfall that enters into the collection system after a rainfall event. Systems with R-Values less than five percent are often considered to be performing well in terms of combined I/I. Table 6 summarizes the R-Values for the seven metering sites based on the data from the April 11 – 13, 2010 storm event.

The R-Values listed in Table 6 were determined by first calculating the total volume of I/I at each flow monitoring location during the storm event. This value was divided by the total rainfall volume tributary to each flow monitoring location to develop the R-Value, as shown in the equation below:

$$\text{R-Value (\%)} = \frac{\text{I/I Volume}_{(\text{gal.})}}{\text{Area}_{(\text{ac.})} \times \text{Rain Depth}_{(\text{in.})} \times \frac{1\text{-ft.}}{12\text{-in.}} \times \frac{43{,}560\text{-ft}^2}{\text{ac.}} \times \frac{7.48\text{-gal.}}{\text{ft}^3}} \times 100$$

Table 6 Combined I/I Analysis Summary
Flow Monitoring Report
City of Cotati

Site	Cumulative Area[1] (acres)	Rain Volume[2] (gallons)	Combined Infiltration/Inflow[2] (gallons)	R-Value[3] (%)	R-Value Ranking
1	1,144	51,898,000	824,000	1.59%	5
2	626	28,387,000	569,000	2.00%	3
3	237	10,742,000	155,000	1.44%	6
4	100	4,534,000	101,000	2.23%	2
5	363	16,481,000	301,000	1.83%	4
6	66	2,995,000	139,000	4.64%	1
7	111	5,027,000	67,000	1.33%	7
			Weighted Average R-Value	1.80%	

Notes:
(1) Represents the total area upstream of the meter, including the area tributary to upstream meters.
(2) Data represented is for the April 11-13, 2010 rainfall event. The total rain in that period was 1.67 inches.
(3) The R-Value is the percentage of the total rainfall volume that enters into the collection system. The R-Value is determined by calculating the total rainfall volume over the area tributary to the metering site. The I/I volume is then divided into that number to determine the R-Value.

Figure 10 shows a bar chart showing the R-Value results for the various flow meter sites. As shown in this figure, Meter Site 6 exhibited the highest R-Value, and was the only meter site with an R-Value approaching 5 percent.

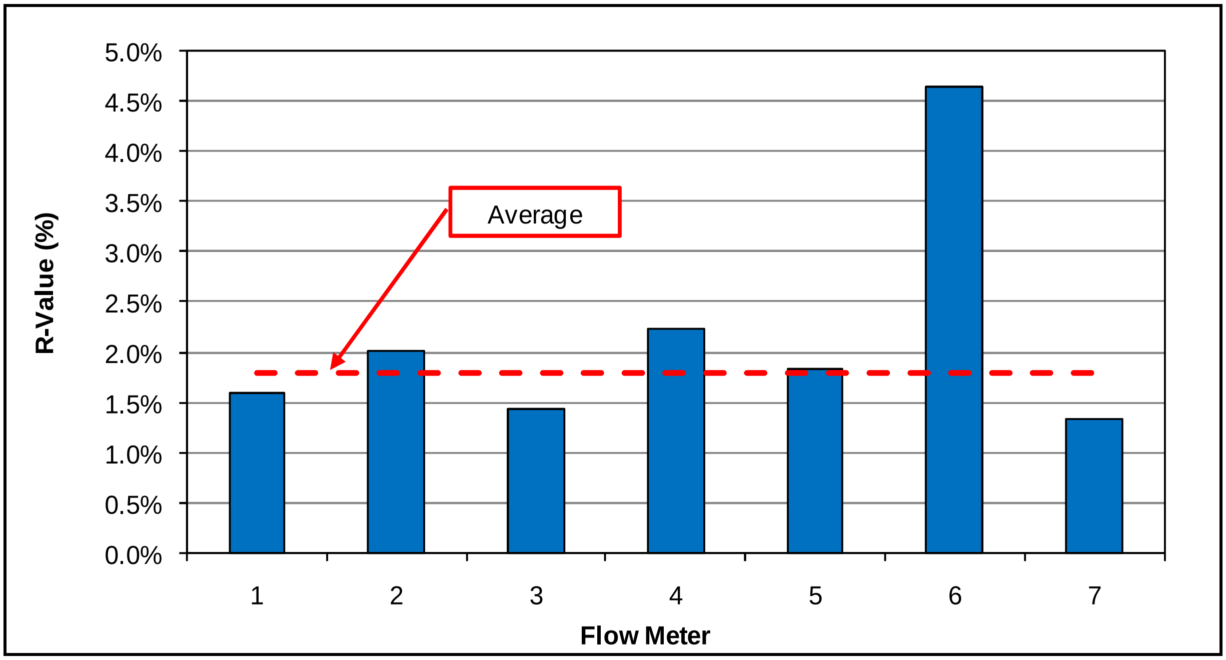


Figure 10 R-Value by Meter Site

5.4 Pipeline Capacity Analysis

Table 7 summarizes the peak flow rates and measured depth of flow observed during the flow-monitoring period. This table lists the following for each site:

- **Peak Flow:** this is the maximum flow rate (15-minute peak) measured during the flow monitoring period at a particular site;
- **Peaking Factor:** this ratio compares the measured peak flow to the ADWF for each flow meter site. A threshold value of three is typically used in the design of sanitary sewers;
- **d/D Ratio:** the maximum flow depth to pipe diameter ratio (d/D) represents the peak flow level experienced at a particular site during the flow-monitoring period. Design d/D ratios vary from 0.5 to 0.9 depending on the size of pipe, with 0.75 representing a typical design d/D value. d/D values in excess of 1 indicate a surcharged condition.

It should be noted that the values listed in Table 7 represent values measured during the flow-monitoring period only. Design peak flows, based on a 10-year, 24-hour storm event are expected to exceed those provided in Table 7 and will be presented as part of the Sewer System Master Plan.

Table 7	Peak Measured Flow Summary Flow Monitoring Report City of Cotati					
Site	**ADWF (mgd)**	**Peak Flow (mgd)**	**Peaking Factor**	**Peak Level (in.)**	**Max d/D Ratio**	**Surcharged Level (in)**
1	0.59	1.39	2.36	9.36	0.39	n/a
2	0.56	1.28	2.29	8.19	0.46	n/a
3	0.17	0.45	2.65	6.77	0.56	n/a
4	0.03	0.10	3.33	3.18	0.53	n/a
5	0.16	0.54	3.38	5.19	0.52	n/a
6	0.05	0.25	5.00	4.79	0.60	n/a
7	0.04	0.16	4.00	3.26	0.33	n/a

Notes:

1. Peak Dry Weather Flow represents the 15-minute peak flow during the established dry weather days (March 15-24, April 6-10, April 15-19, and April 29-May 9, 2010).

Figures 11 and 12 provide a graphical representation of the peaking factors and maximum d/D ratios for each flow monitoring sites, respectively. As shown in Figure 11, flow Meter Sites 4, 5, 6, and 7 exceeded the typical peaking factor threshold of 3. As shown in Figure 12, the maximum d/D ratio for the flow-monitoring period was measured at Meter Site 6 (0.6).

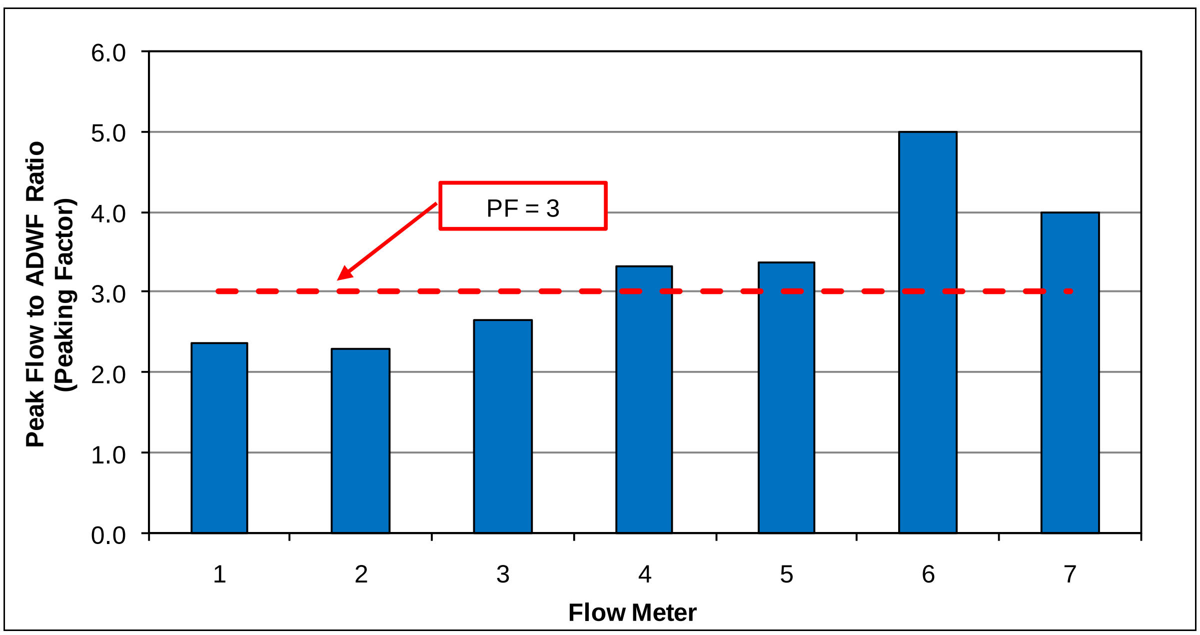


Figure 11 Peaking Factor Summary by Meter Site

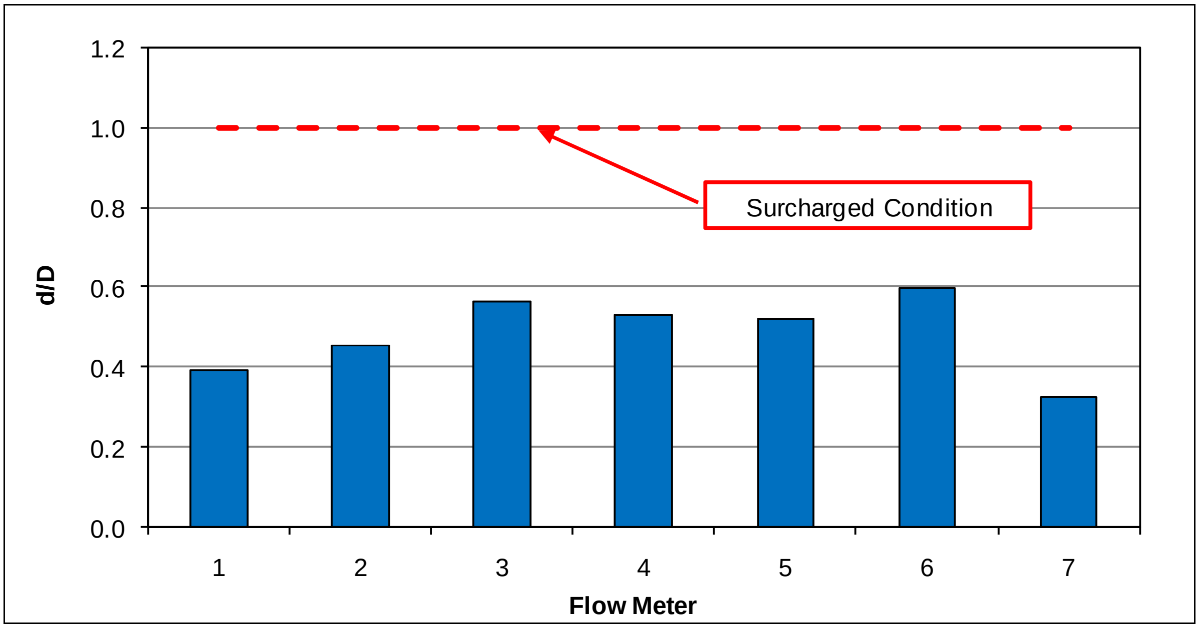


Figure 12 d/D Summary by Meter Site

It should be noted that Meter Site 7 has a relatively high peaking factor and peak I/I flow to ADWF ratio, but also has the lowest R-Value. This indicates that the I/I contribution to Meter Site 7 is primarily inflow, with a relatively small contribution due to infiltration.

5.5 Lift Station Monitoring

In addition to the flow-monitoring program summarized in the previous sections, US3 also monitored three lift station (LS) sites within the City. US3 collected data related to the number of starts per day and the daily run times from March 10 through May 16, 2010 for the Quail Hollow LS and the New Century Park LS[2]. US3 also collected daily run times for the Redwood Drive LS[2]. The data collected from the lift station monitoring effort is included in Appendix C. A summary of the lift station monitoring data is included in Table 8.

[2] In the US3 data included in Appendix C, the Quail Hollow LS is referred to as the "Myrtle Station," the New Century Park LS is referred to as the "Eagle Station," and the Redwood Drive LS is referred to as the "Redwood Station."

Table 8	Lift Station Monitoring Summary (March 10 – May 16, 2010) Flow Monitoring Report City of Cotati								
Lift Station Name	**US3 Name**	**Location**	**Pump No.**	**Starts Per Day**			**Daily Run Time (hours/day)**		
				Avg.	**Min.**	**Max.**	**Avg.**	**Min.**	**Max**
Quail Hollow LS	Myrtle Station	Myrtle Ave between Keppel & Hanhn Way	1	44	19	59	1.00	0.40	1.58
			2	44	19	58	1.02	0.48	1.57
New Century Park LS	Eagle Station	Eagle Dr between Lark Dr & Flamingo	1	40	0	58	2.11	0.40	24.0
			2	41	0	57	0.97	0.00	1.47
Redwood Drive LS	Redwood Station	Redwood Dr, south of Copeland Creek	1	-	-	-	0.70	0.00	2.54
			2	-	-	-	0.66	0.01	2.45

6.0 RECOMMENDED LOCATIONS FOR CCTV/SMOKE TESTING

As noted in Section 5.2.1, I/I has two components, infiltration and inflow, and they exhibit different characteristic response patterns in the flow monitoring data. Therefore, by examining the flow data and indentifying whether the I/I is primarily infiltration, inflow, or a combination of both, we can characterize the appropriate method for precisely locating the I/I sources. Typically, smoke testing is the best way to identify inflow sources, while closed circuit television (CCTV) is appropriate for locating infiltration.

Based on the information provided in Tables 5 and 6, we have isolated certain basins in the City for smoke testing, CCTV, or both (Figure 13), as summarized below:

- Smoke Testing – Basin 6 and Basin 7 ranked highest in terms of the Peak I/I Flow to ADWF ratio. This indicates a high rate of inflow, which may be indentified by performing smoke testing.

- CCTV Inspection – Basin 2, Basin 4, and Basin 6 had the highest R-Values, indicating that combined I/I is a major contributor to each basin. An appropriate method of I/I detection for these basins is CCTV inspection during the winter to capture periods of high ground saturation.

- Microbasin Flow Monitoring – While Basin 5 did not rank highly in terms of the Peak I/I Flow to ADWF ratio or the R-Value, there was a significant peak I/I flow from this basin (0.36 mgd). Eliminating the major sources of I/I within this basin could provide the City with the opportunity to noticeably reduce the amount of I/I into the collection system. However, due to the size of the basin, it is impractical to perform smoke testing or CCTV inspection of the entire basin. For this reason, it is recommended that the City implement a microbasin flow monitoring effort to identify specific areas within this basin that exhibit high rates of I/I. Figure 13 provides recommendation on possible locations for micro basin flow monitoring.

- Routine Preventative Maintenance – For the basins not specifically targeted for CCTV or smoke inspection on Figure 13, it is recommended that the City perform CCTV inspection following cleaning based on the City's routine preventative maintenance program.

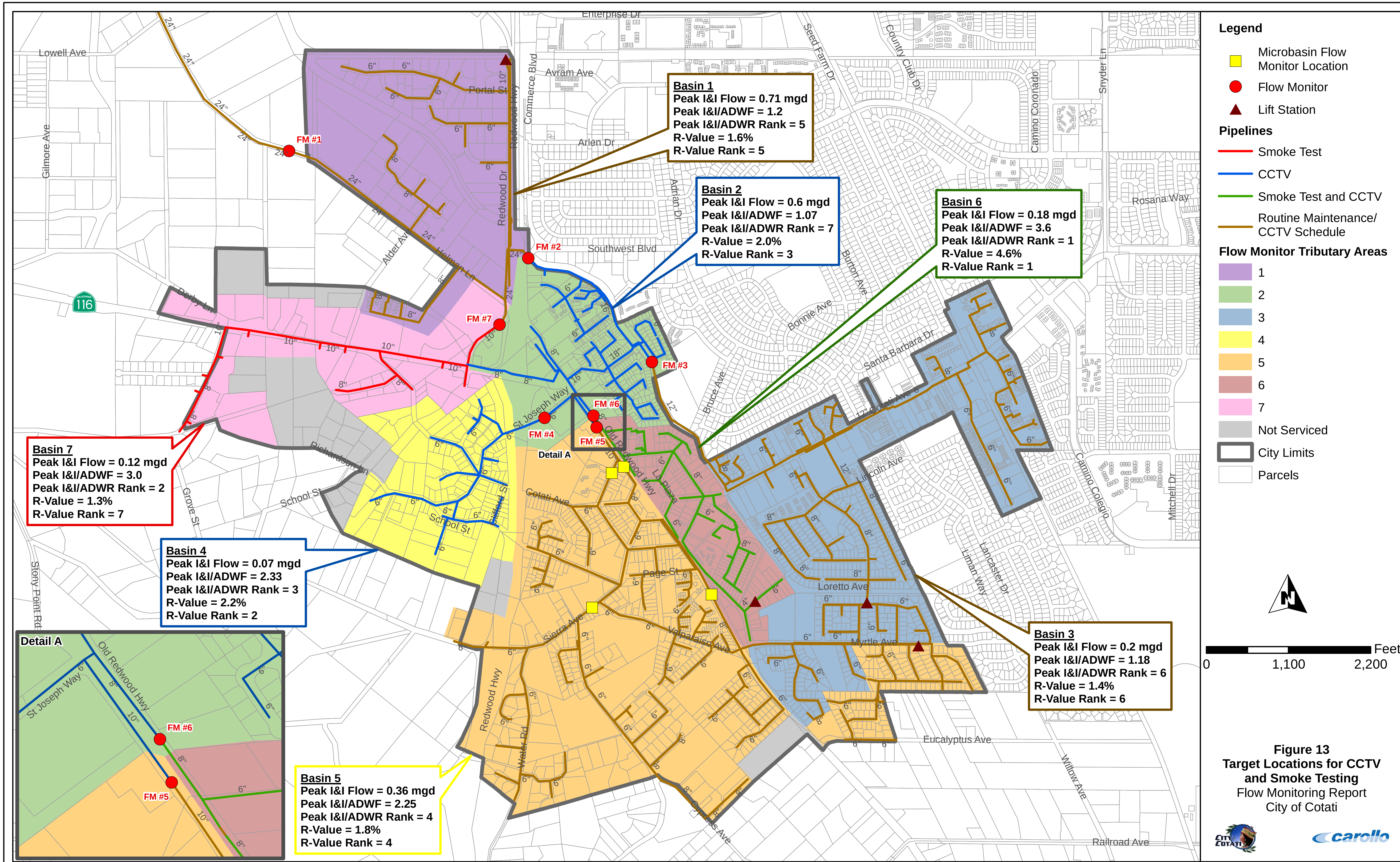


Figure 13
Target Locations for CCTV and Smoke Testing
Flow Monitoring Report
City of Cotati

APPENDIX A – FLOW MONITORING DATA, GRAPHS, AND INFORMATION

Temporary Flow Study

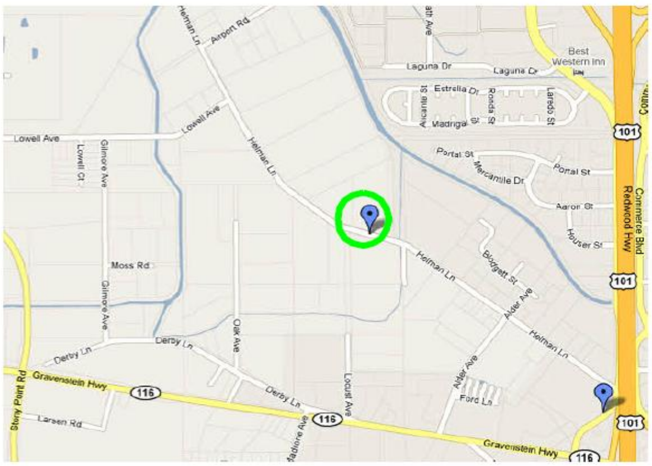
Cotati Site 1 - Behind Lowes Grass Area
Helman Avenue

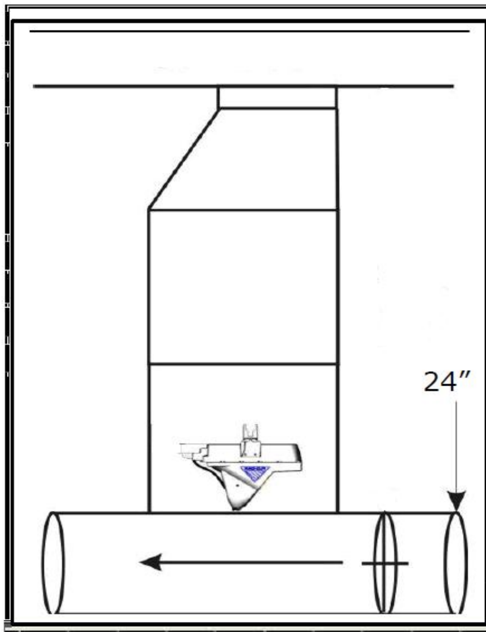
Utility Systems, Science, and Software
2101 E. 4th Street
Santa Ana, Ca 92705

From		To
3/10/2010 11:30		5/14/2010 13:00

METERING SITE DOCUMENT

City:	**Cotati**
Site Name:	**Site 1**
Location:	**Behind Lowes**
Access:	**Grass**
GPS:	**N +38° 20' 22.60", W -122° 43' 25.80"**
Install Date:	**3/10/2010**





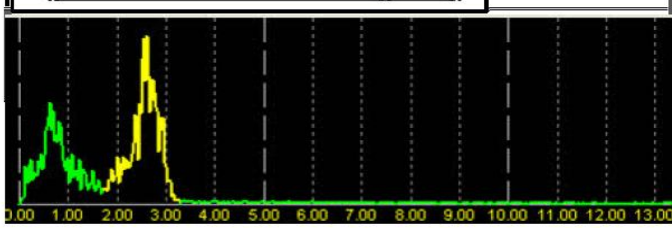
Pipe Size (inch):	24
Pipe Condition:	Good

Hydraulics:

Multiplier = 1.00

Gas	
O_2	Good
HS_2	Good

Manhole Comments:



Traffic Safety Required:

N/A

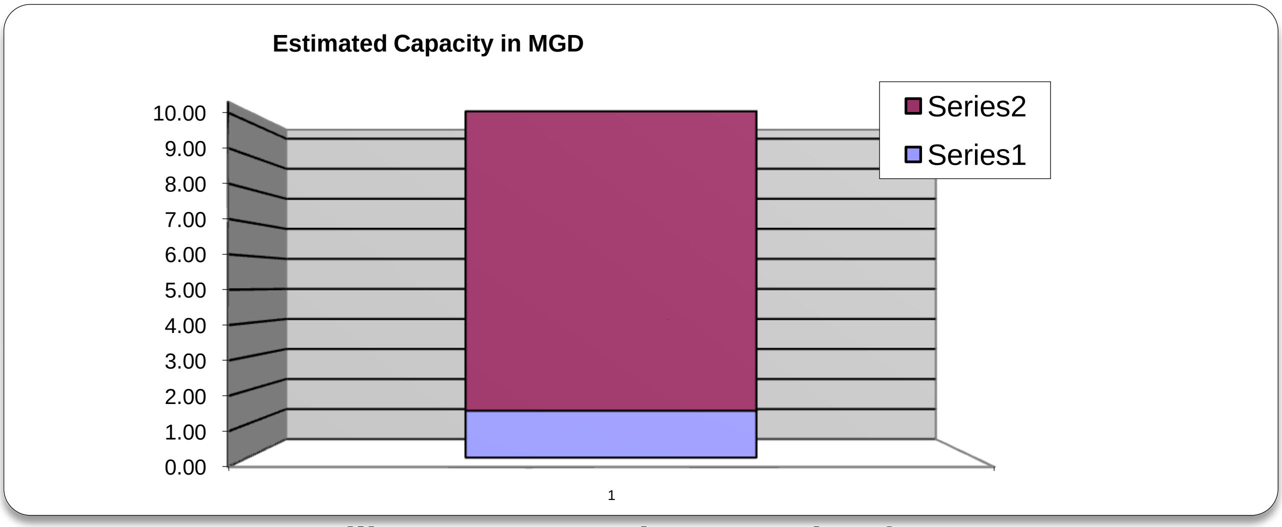
METERING SITE DOCUMENT

Site Pictures

Meter site 1
Temporary Flow Study

Cotati, CA

Meter Start Date		From	3/10/2010 11:30
Meter Stop Date		To	5/14/2010 13:00
	Velocity (fps)	Level (in)	Flow (MGD)
Average	1.36	6.40	0.61
Maximum	1.90	9.36	1.39
Minimum	0.67	4.11	0.16
Pipe Size		24	
Estimated Capacity		13.53%	
Sensor Used		Hach - FloDar	
Comment			



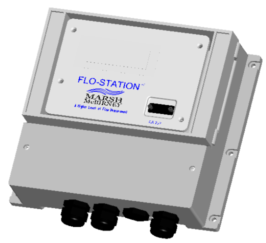
Utility Systems, Science, and Software
2101 E. 4th Street
Santa Ana, Ca 92705

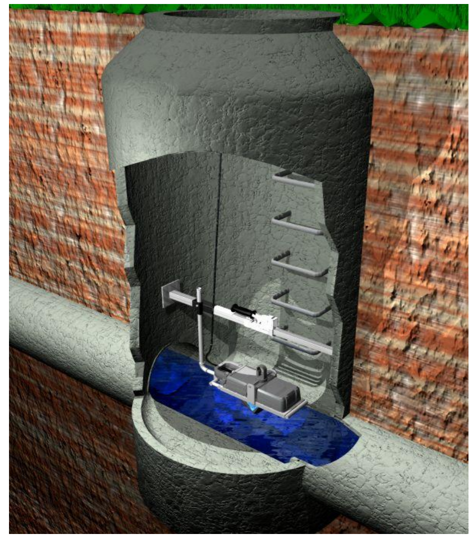
Helman Avenue

Flo-Dar incorporates a Doppler Radar Velocity Sensor and Ultrasonic Depth Transducer for use in Open Channel Applications. It is available with a Permanent Flo-Station. The Flo-Station is available with or without a display and is powered with 120/240 VAC, or 12 VDC. The Flo-Station requires Flo-Ware software, which is included on some models, and a customer supplied PC. Flo-Station with display shows flow rate, total flow, velocity and level. Both Flo-Station's have four outputs one each for level, velocity, flow rate, surcharge level, and a contact closure. Instruction manuals are included. Mounting Hardware is ordered separately.

Flo-Dar Sensor
Enclosure
Material: Polystyrene
Dimensions: 6.9" W x 16.65" L x 11.7" D
(17.5 cm x 42.3 cm x 29.7 cm)
Weight: 10.5 lbs. (4.8 kg)

Temperature
Operating Range: 14° F to 122°F
(-10° C to 50° C)
Storage Range: -40° F to 140° F
(-40° C to 60° C)





Velocity Measurement
Method: Radar
Range: 0.75 to 20 ft/s (0.23 m/s to 6.10 m/s)
Accuracy: ±0.5%; ±0.1 ft/s (±0.03 m/s)

Level Measurement
Method: Ultrasonic
Standard Operating Range:
0.25 to 60 in. (0.634 to 152.4 cm)
Optional Operating Range: 0 (0 cm) to 240" (6.1 m) (with 18" dead band)
Temperature Compensated
Accuracy: ±0.1 in. (±0.25 cm)
1% Accuracy

Surcharge Conditions Level/Velocity
Level
Method: Piezo-resistive pressure transducer
Maximum Range: 138 inches (3.5 meters)
Velocity
Method: Electromagnetic
Range: -5 to +20 ft/s (-1.5 to +6.1 m/s)

Flow Measurement
Based on Continuity Equation.
Accuracy: ±5.0% of reading typical where flow is in a channel with uniform flow conditions and is not surcharged.

Flo-Station Monitor
Data Storage
64K (16K cycles of velocity/level data)
Local Terminal
RS232C at 19.2K baud

Timebase Accuracy: 1 second per day

Outputs: Four 4-20 mA outputs; system-isolated, up to 600Ω load. Each output is selectable between FLOW, LEVEL, VELOCITY OR SURCHARGE LEVEL.

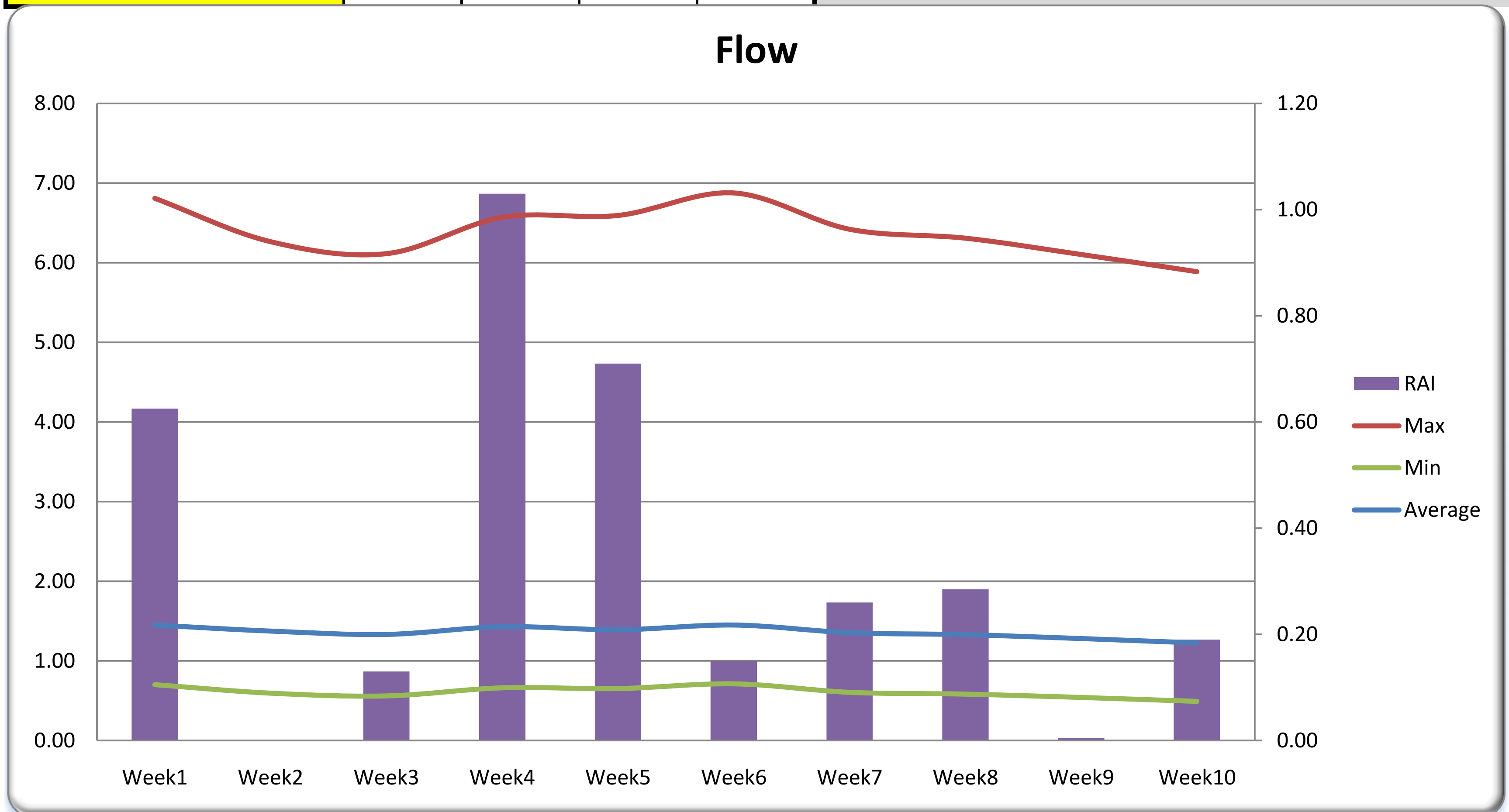
Power Requirements
AC: 85-264 VAC, 47-63 Hz. 32 watts
DC: 12 VDC for Flo-Station without Display or Flo-Station with Display (Backlight Off)
180 mA (2.1 watts) with (1) 4-20 mA utilized.

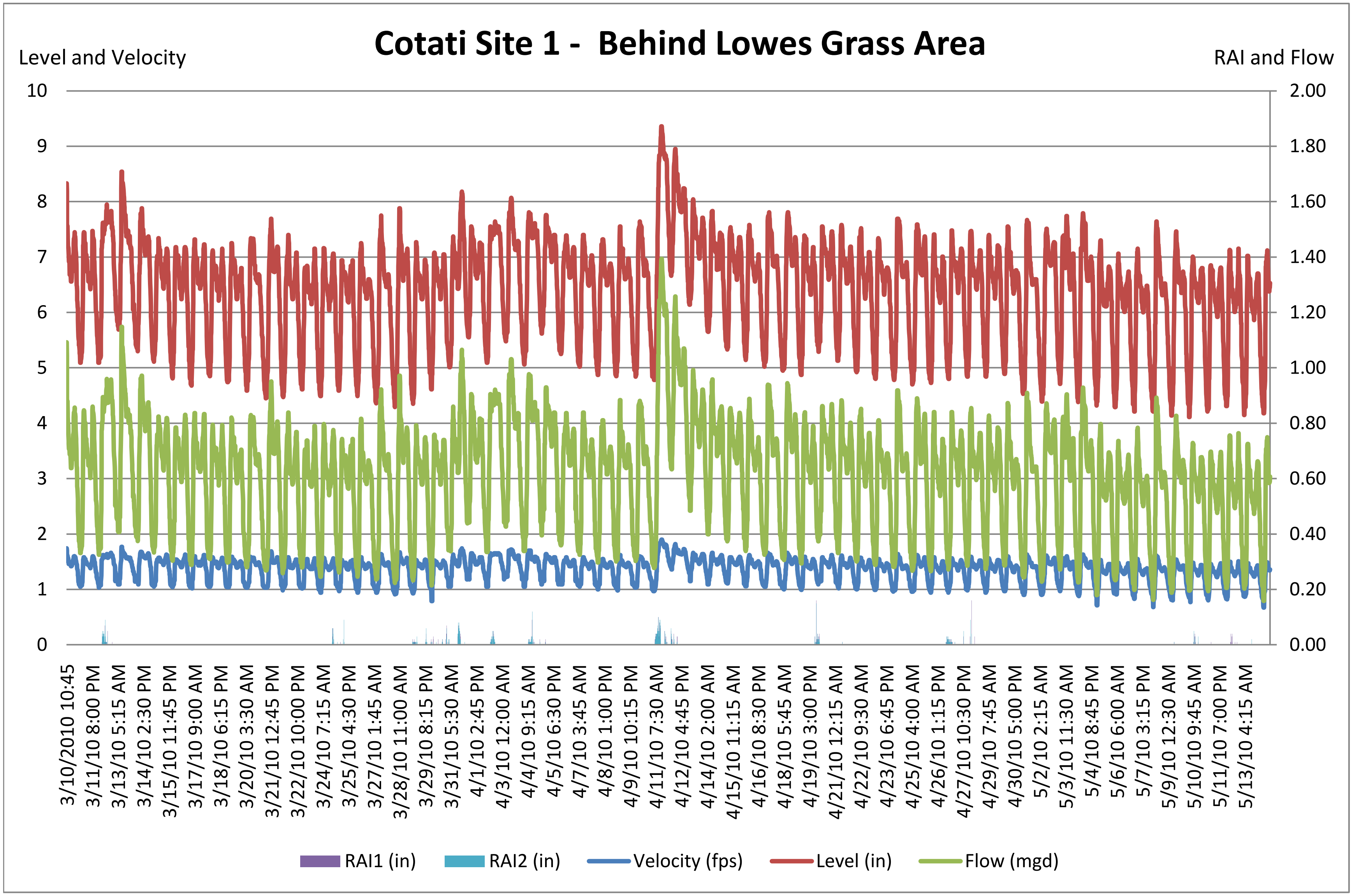
Housing
Material: ABS Plastic, NEMA 4
Dimensions: 10.2" W x 9.3" H x 4" D
(25.9 cm W x 23.6 cm H x 10.2 cm D)
Weight: 5 lbs.
Temperature Operating Range: 14° F to 122° F
(-10° C to 50° C)
Temperature Storage Range:
(without display) -40°F to 140°F (-40°C to 60°C)
(with display) 4°F to 140°F (-20°C to 60°C) w/Display

Flow Review

	Average	Max	Min	RAI
Week1	1.45	6.81	0.70	0.63
Week2	1.37	6.26	0.60	0.00
Week3	1.33	6.11	0.56	0.13
Week4	1.43	6.57	0.66	1.03
Week5	1.39	6.59	0.65	0.71
Week6	1.45	6.87	0.71	0.15
Week7	1.35	6.42	0.61	0.26
Week8	1.33	6.31	0.58	0.29
Week9	1.28	6.10	0.54	0.01
Week10	1.22	5.89	0.49	0.19

Cotati Site 1 - Behind Lowes Grass Area
Helman Avenue




Cotati Site 1 - Behind Lowes Grass Area
Level and Velocity
RAI and Flow
10
9
8
7
6
5
4
3
2
1
0
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
3/10/2010 10:45
3/11/10 8:00 PM
3/13/10 5:15 AM
3/14/10 2:30 PM
3/15/10 11:45 PM
3/17/10 9:00 AM
3/18/10 6:15 PM
3/20/10 3:30 AM
3/21/10 12:45 PM
3/22/10 10:00 PM
3/24/10 7:15 AM
3/25/10 4:30 PM
3/27/10 1:45 AM
3/28/10 11:00 AM
3/29/10 8:15 PM
3/31/10 5:30 AM
4/1/10 2:45 PM
4/3/10 12:00 AM
4/4/10 9:15 AM
4/5/10 6:30 PM
4/7/10 3:45 AM
4/8/10 1:00 PM
4/9/10 10:15 PM
4/11/10 7:30 AM
4/12/10 4:45 PM
4/14/10 2:00 AM
4/15/10 11:15 AM
4/16/10 8:30 PM
4/18/10 5:45 AM
4/19/10 3:00 PM
4/21/10 12:15 AM
4/22/10 9:30 AM
4/23/10 6:45 PM
4/25/10 4:00 AM
4/26/10 1:15 PM
4/27/10 10:30 PM
4/29/10 7:45 AM
4/30/10 5:00 PM
5/2/10 2:15 AM
5/3/10 11:30 AM
5/4/10 8:45 PM
5/6/10 6:00 AM
5/7/10 3:15 PM
5/9/10 12:30 AM
5/10/10 9:45 AM
5/11/10 7:00 PM
5/13/10 4:15 AM
RAI1 (in)
RAI2 (in)
Velocity (fps)
Level (in)
Flow (mgd)

Rainlog Rainfall Report		By Day Report
City Hall Site	Total	6.10
	Max	1.37
	Average	0.09
Date	*Rainfall*	*Comments*
3/8/10 0:00	0.04	
3/9/10 0:00	0.04	
3/10/10 0:00	0.15	
3/11/10 0:00	0.00	
3/12/10 0:00	0.55	
3/13/10 0:00	0.00	
3/14/10 0:00	0.00	
3/15/10 0:00	0.00	
3/16/10 0:00	0.00	
3/17/10 0:00	0.00	
3/18/10 0:00	0.00	
3/19/10 0:00	0.00	
3/20/10 0:00	0.00	
3/21/10 0:00	0.00	
3/22/10 0:00	0.00	
3/23/10 0:00	0.00	
3/24/10 0:00	0.25	
3/25/10 0:00	0.01	
3/26/10 0:00	0.00	
3/27/10 0:00	0.00	
3/28/10 0:00	0.00	
3/29/10 0:00	0.23	
3/30/10 0:00	0.34	
3/31/10 0:00	0.69	
4/1/10 0:00	0.00	
4/2/10 0:00	0.39	
4/3/10 0:00	0.00	
4/4/10 0:00	0.41	
4/5/10 0:00	0.05	
4/6/10 0:00	0.00	
4/7/10 0:00	0.00	
4/8/10 0:00	0.00	
4/9/10 0:00	0.00	
4/10/10 0:00	0.00	
4/11/10 0:00	1.37	
4/12/10 0:00	0.30	
4/13/10 0:00	0.00	
4/14/10 0:00	0.00	
4/15/10 0:00	0.00	
4/16/10 0:00	0.00	
4/17/10 0:00	0.00	
4/18/10 0:00	0.00	
4/19/10 0:00	0.21	
4/20/10 0:00	0.30	
4/21/10 0:00	0.01	
4/22/10 0:00	0.00	
4/23/10 0:00	0.00	
4/24/10 0:00	0.00	

Rainlog Rainfall Report

Rainlog Rainfall Report		By Day Report
City Hall Site	**Total**	**6.10**
	Max	**1.37**
	Average	**0.09**
Date	***Rainfall***	***Comments***
4/25/10 0:00	0.00	
4/26/10 0:00	0.00	
4/27/10 0:00	0.35	
4/28/10 0:00	0.22	
4/29/10 0:00	0.00	
4/30/10 0:00	0.00	
5/1/10 0:00	0.00	
5/2/10 0:00	0.00	
5/3/10 0:00	0.00	
5/4/10 0:00	0.00	
5/5/10 0:00	0.00	
5/6/10 0:00	0.00	
5/7/10 0:00	0.00	
5/8/10 0:00	0.00	
5/9/10 0:00	0.01	
5/10/10 0:00	0.18	
5/11/10 0:00	0.00	
5/12/10 0:00	0.00	
5/13/10 0:00	0.00	
5/14/10 0:00	0.00	

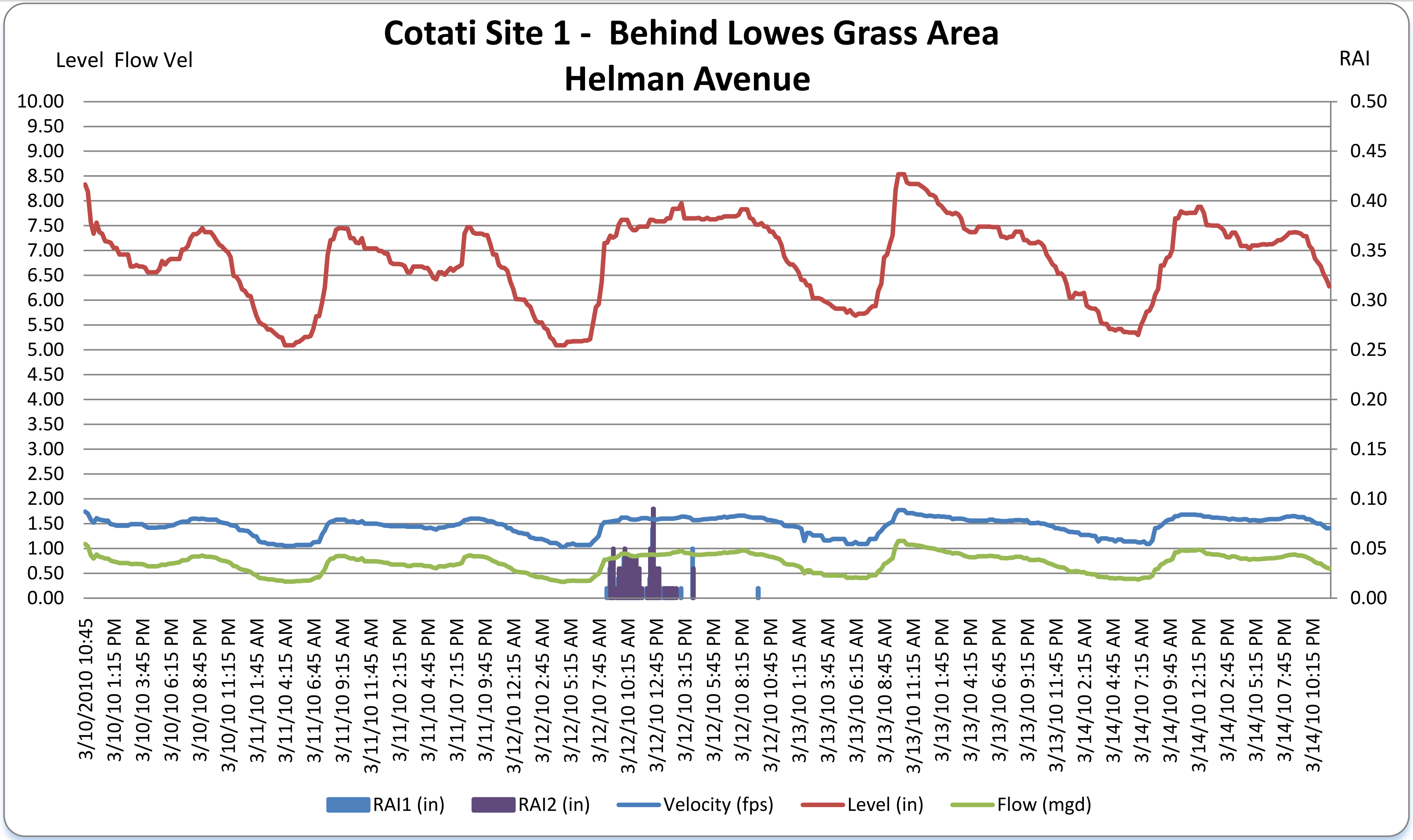
Rainlog Rainfall Report

By Day Report

North Pump Station	**Total**	**6.82**
	Max	**1.58**
	Average	**0.10**
Date	***Rainfall***	***Comments***
3/8/10 0:00	0.13	
3/9/10 0:00	0.23	
3/10/10 0:00	0.11	
3/11/10 0:00	0.00	
3/12/10 0:00	0.70	
3/13/10 0:00	0.00	
3/14/10 0:00	0.00	
3/15/10 0:00	0.00	
3/16/10 0:00	0.00	
3/17/10 0:00	0.00	
3/18/10 0:00	0.00	
3/19/10 0:00	0.00	
3/20/10 0:00	0.00	
3/21/10 0:00	0.00	
3/22/10 0:00	0.00	
3/23/10 0:00	0.00	
3/24/10 0:00	0.23	
3/25/10 0:00	0.13	
3/26/10 0:00	0.00	
3/27/10 0:00	0.00	
3/28/10 0:00	0.00	
3/29/10 0:00	0.29	
3/30/10 0:00	0.20	
3/31/10 0:00	0.75	
4/1/10 0:00	0.00	
4/2/10 0:00	0.48	
4/3/10 0:00	0.00	
4/4/10 0:00	0.47	
4/5/10 0:00	0.02	
4/6/10 0:00	0.00	
4/7/10 0:00	0.00	
4/8/10 0:00	0.00	
4/9/10 0:00	0.00	
4/10/10 0:00	0.00	
4/11/10 0:00	1.58	
4/12/10 0:00	0.27	
4/13/10 0:00	0.00	
4/14/10 0:00	0.00	
4/15/10 0:00	0.00	
4/16/10 0:00	0.00	
4/17/10 0:00	0.00	
4/18/10 0:00	0.00	
4/19/10 0:00	0.21	
4/20/10 0:00	0.26	
4/21/10 0:00	0.01	
4/22/10 0:00	0.00	
4/23/10 0:00	0.00	
4/24/10 0:00	0.00	

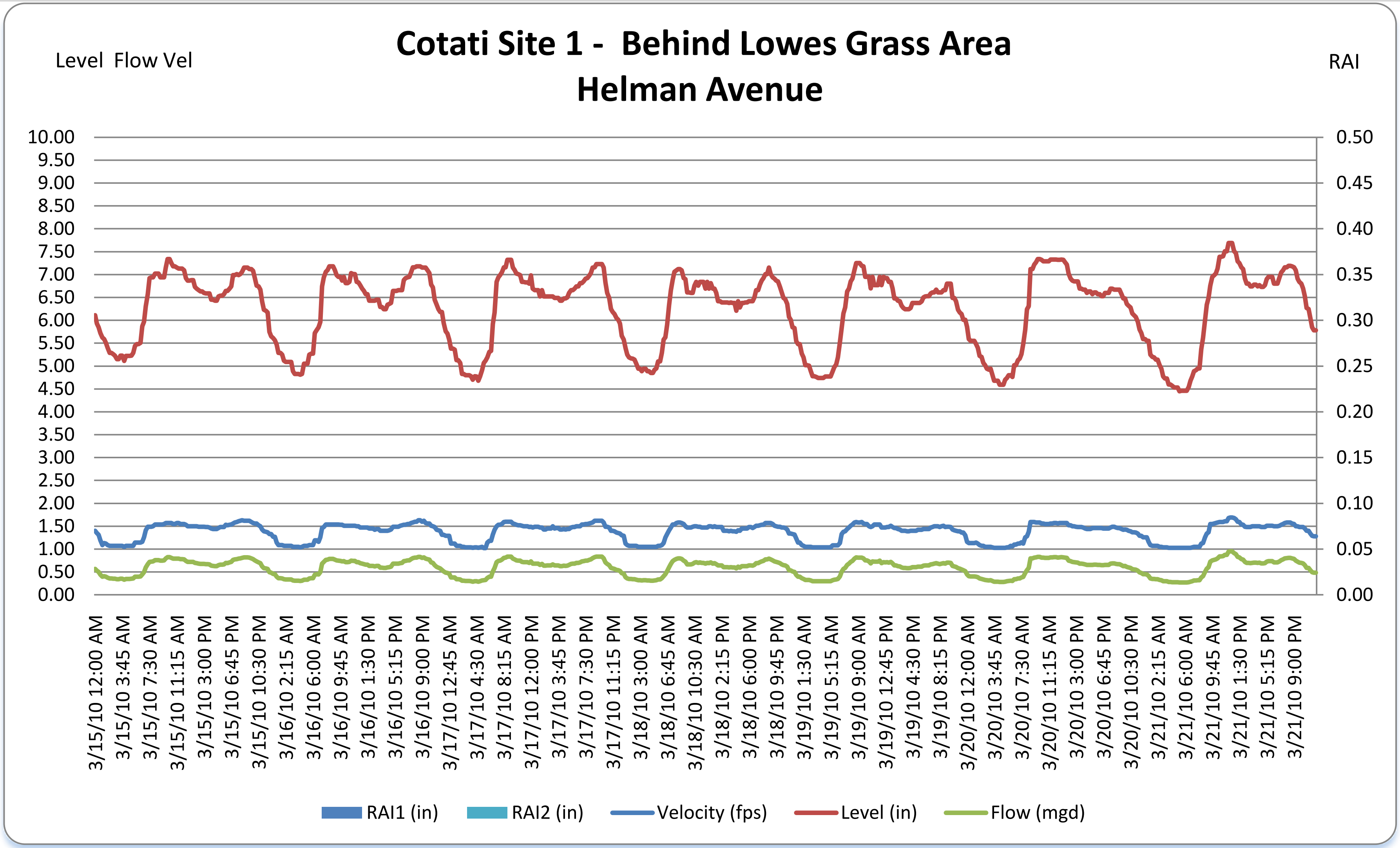
Rainlog Rainfall Report		By Day Report
North Pump Station	**Total**	**6.82**
	Max	**1.58**
	Average	**0.10**
Date	***Rainfall***	***Comments***
4/25/10 0:00	0.00	
4/26/10 0:00	0.01	
4/27/10 0:00	0.42	
4/28/10 0:00	0.13	
4/29/10 0:00	0.00	
4/30/10 0:00	0.00	
5/1/10 0:00	0.00	
5/2/10 0:00	0.00	
5/3/10 0:00	0.00	
5/4/10 0:00	0.00	
5/5/10 0:00	0.00	
5/6/10 0:00	0.00	
5/7/10 0:00	0.00	
5/8/10 0:00	0.00	
5/9/10 0:00	0.01	
5/10/10 0:00	0.16	
5/11/10 0:00	0.00	
5/12/10 0:00	0.00	
5/13/10 0:00	0.02	
5/14/10 0:00	0.00	

Week 1 3/10/2010 to 3/14/2010



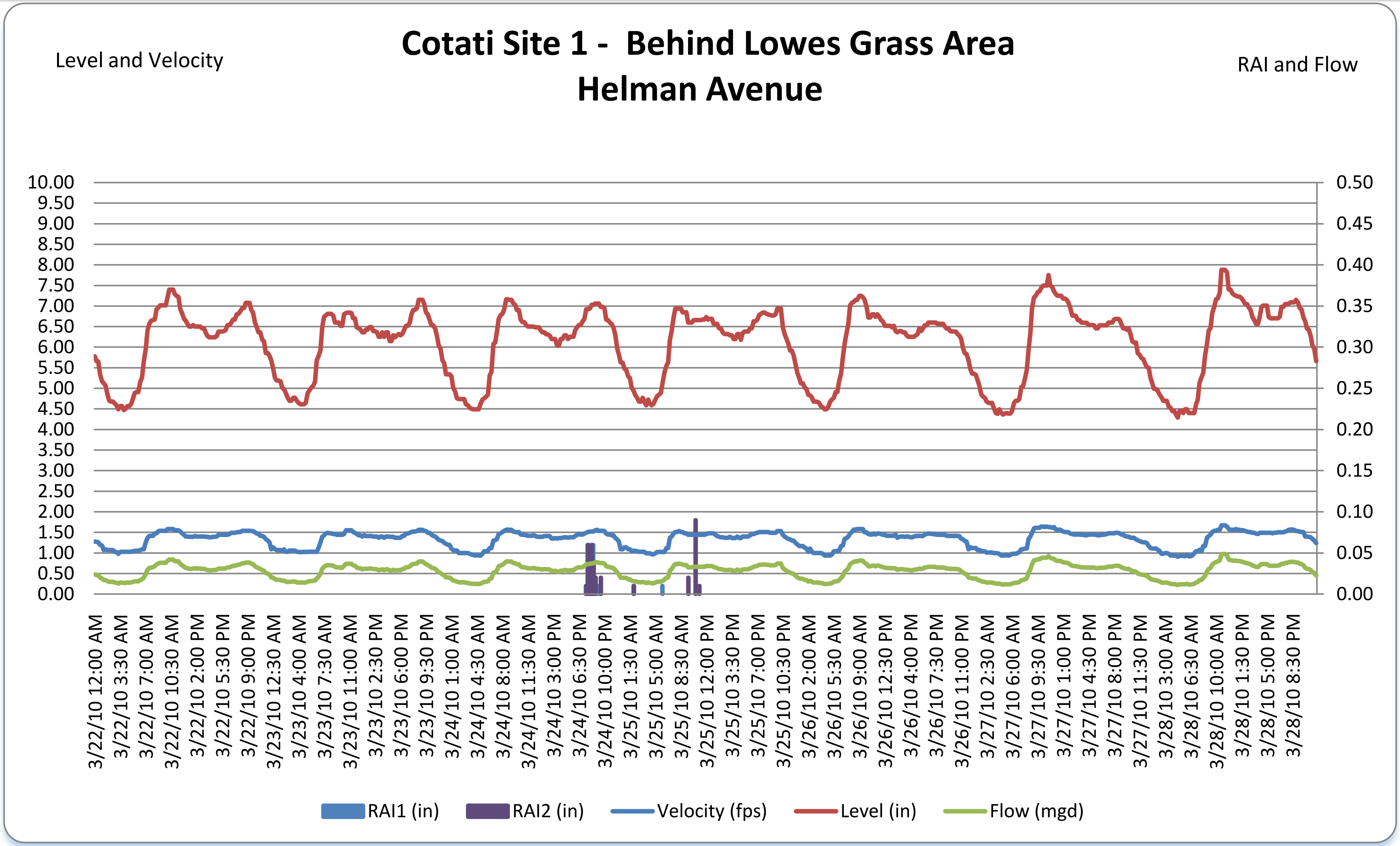
	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.45	6.81	0.70	Total Rain Averaged between Both Gauges	Inches
Maximum	1.77	8.54	1.15		0.63
Minimum	1.03	5.09	0.32		

Week 2 3/15/2010 to 3/21/2010



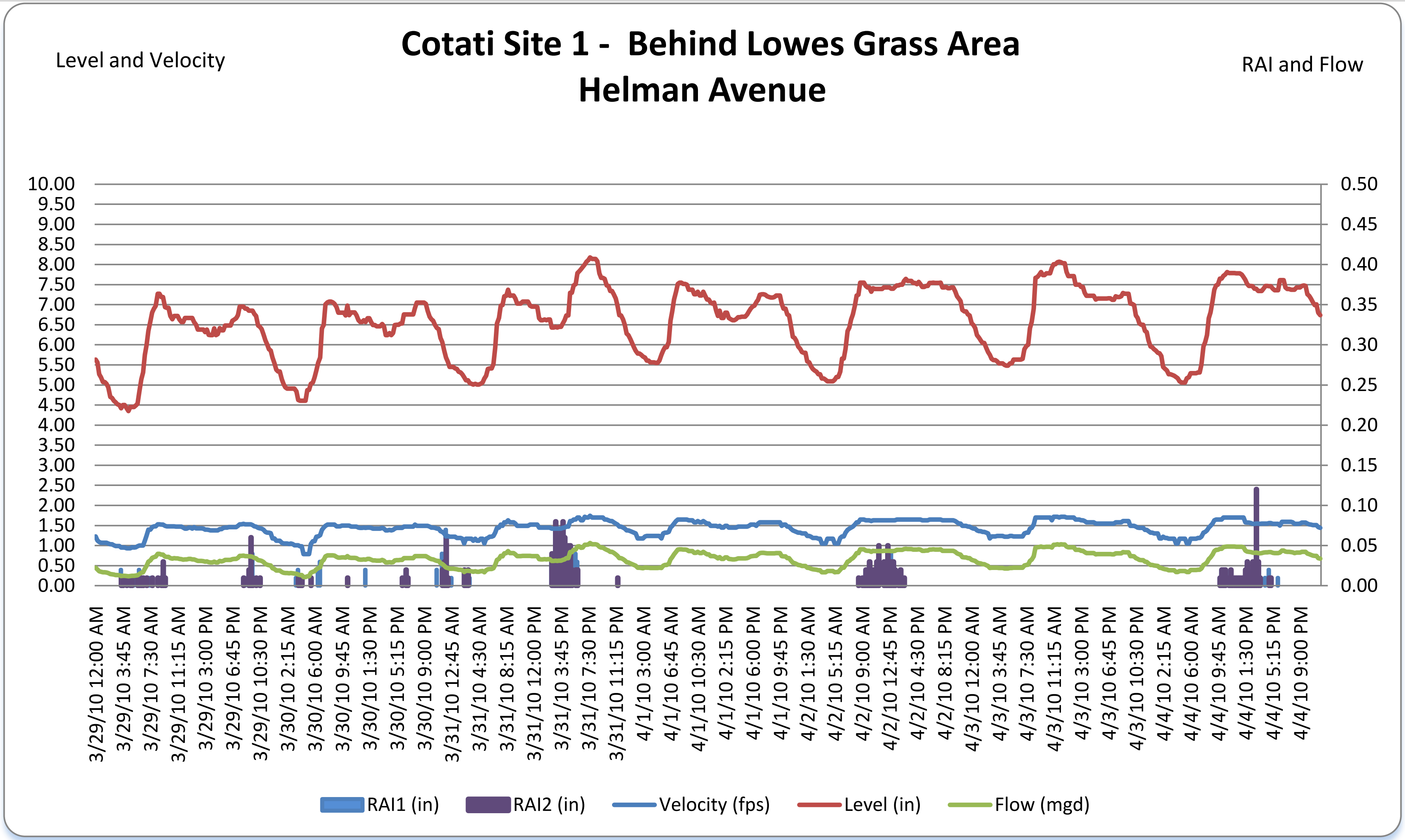
	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.37	6.26	0.60	Total Rain Averaged between Both Gauges	Inches
Maximum	1.69	7.69	0.95		0.00
Minimum	1.02	4.45	0.27		

Week 3 3/22/2010 to 3/28/2010



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.33	6.11	0.56	Total Rain Averaged between Both Gauges	Inches
Maximum	1.67	7.88	0.97		0.13
Minimum	0.91	4.29	0.22		

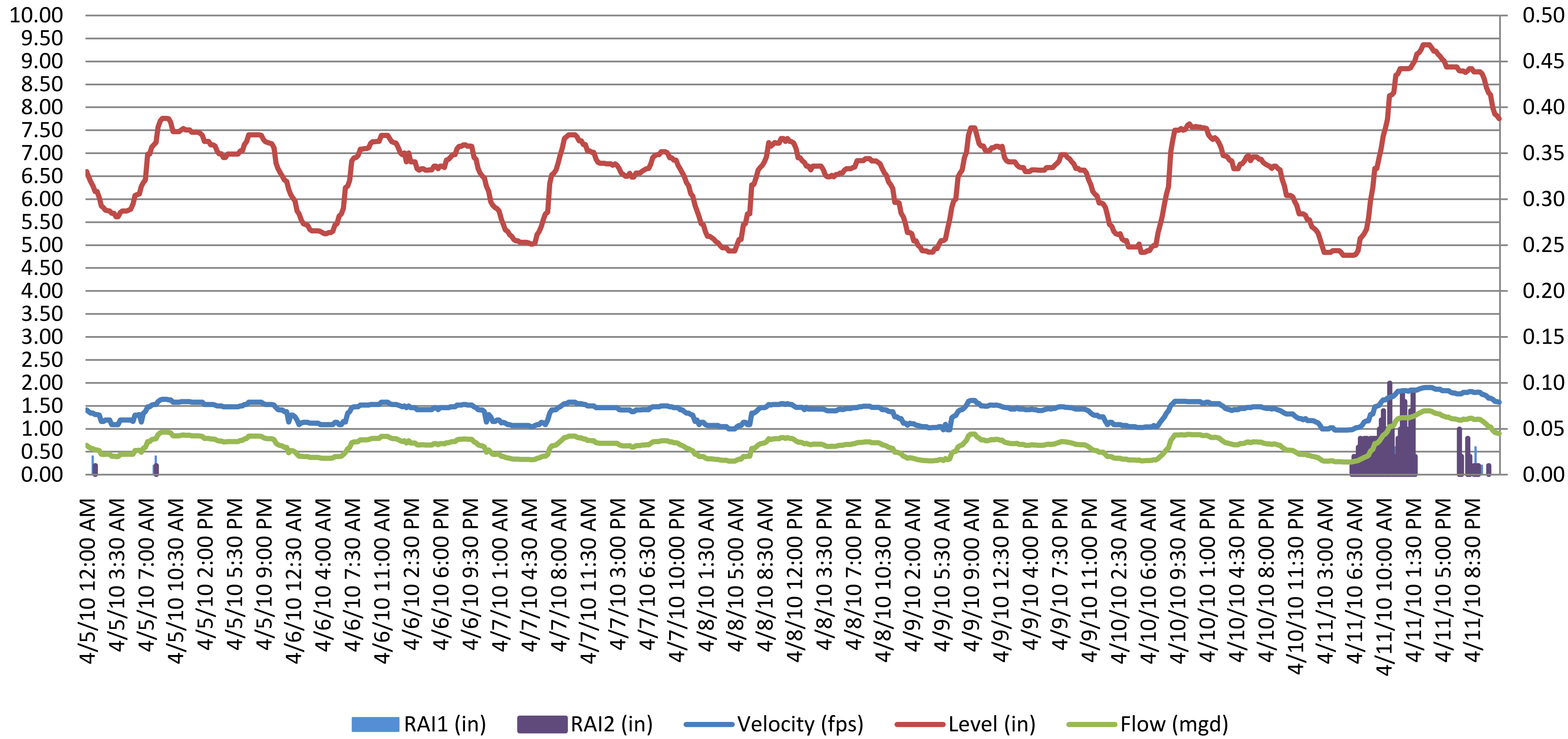
Week 4 3/29/2010 to 4/4/2010



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.43	6.57	0.66	Total Rain Averaged between Both Gauges	Inches
Maximum	1.74	8.18	1.07		1.03
Minimum	0.79	4.35	0.21		

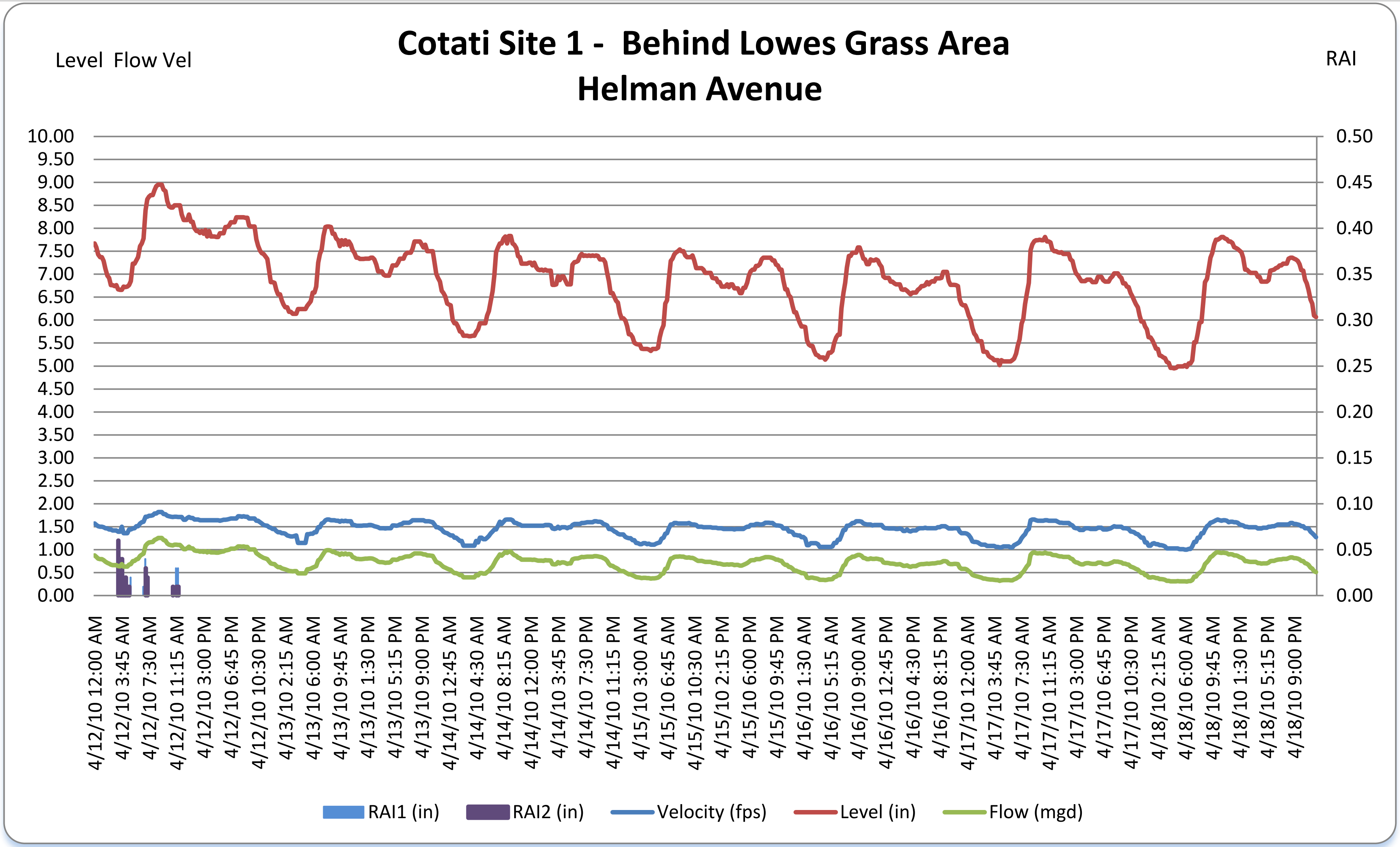
Week 5 4/4/2010 to 4/11/2010

Cotati Site 1 - Behind Lowes Grass Area Helman Avenue



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.39	6.59	0.65	Total Rain Averaged between Both Gauges	Inches
Maximum	1.90	9.36	1.39		0.71
Minimum	0.97	4.78	0.28		

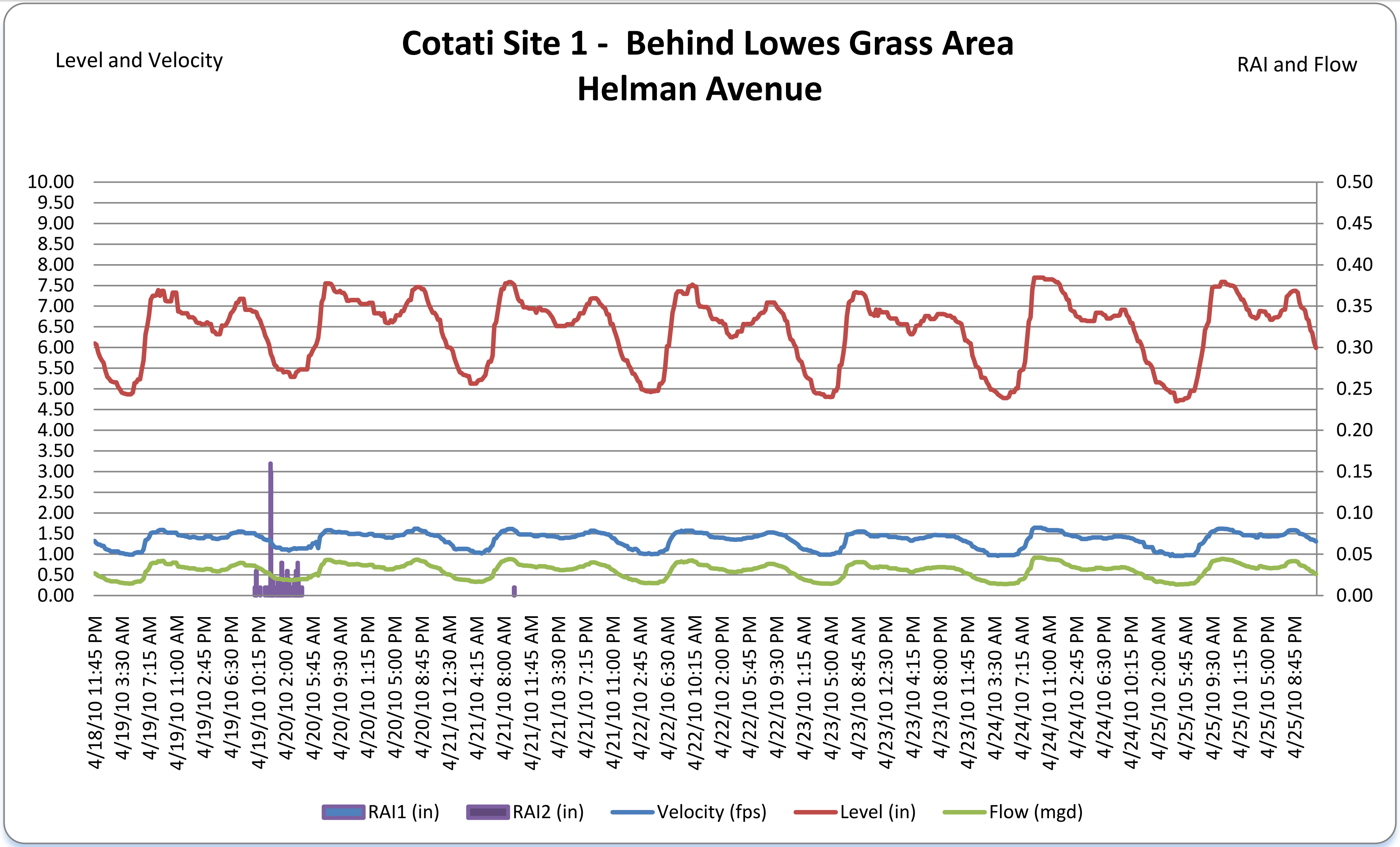
Week 6 4/12/2010 to 4/18/2010



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.45	6.87	0.71	Total Rain Averaged between Both Gauges	Inches
Maximum	1.82	8.95	1.26		0.15
Minimum	1.00	4.95	0.31		

Week 7 4/19/2010 to 4/25/2010

Cotati Site 1 - Behind Lowes Grass Area
Helman Avenue

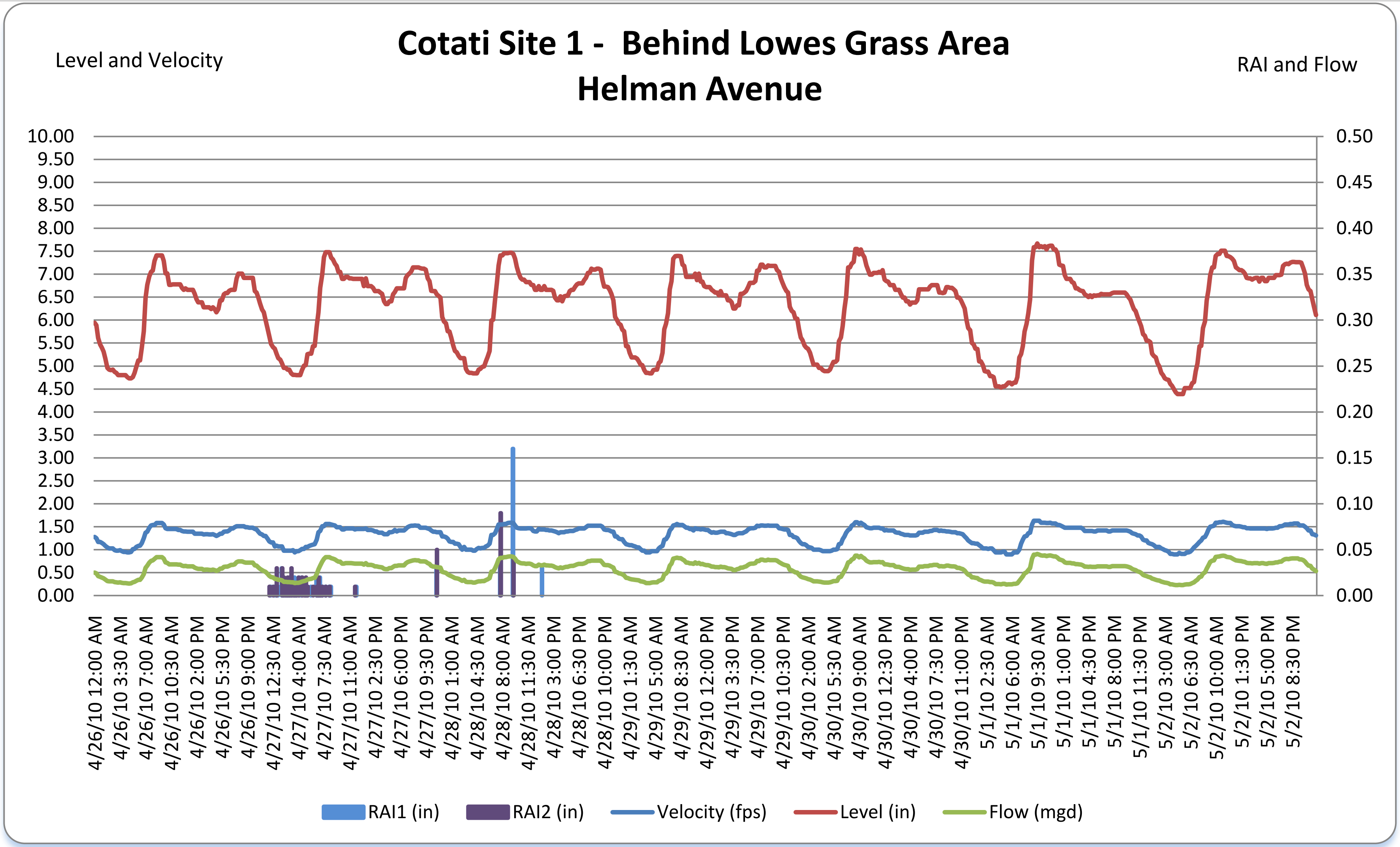


	Velocity (fps)	Level (in)	Flow (mgd)
Average	1.35	6.42	0.61
Maximum	1.64	7.69	0.92
Minimum	0.96	4.70	0.27

Total Rain Averaged between Both Gauges	Inches
	0.26

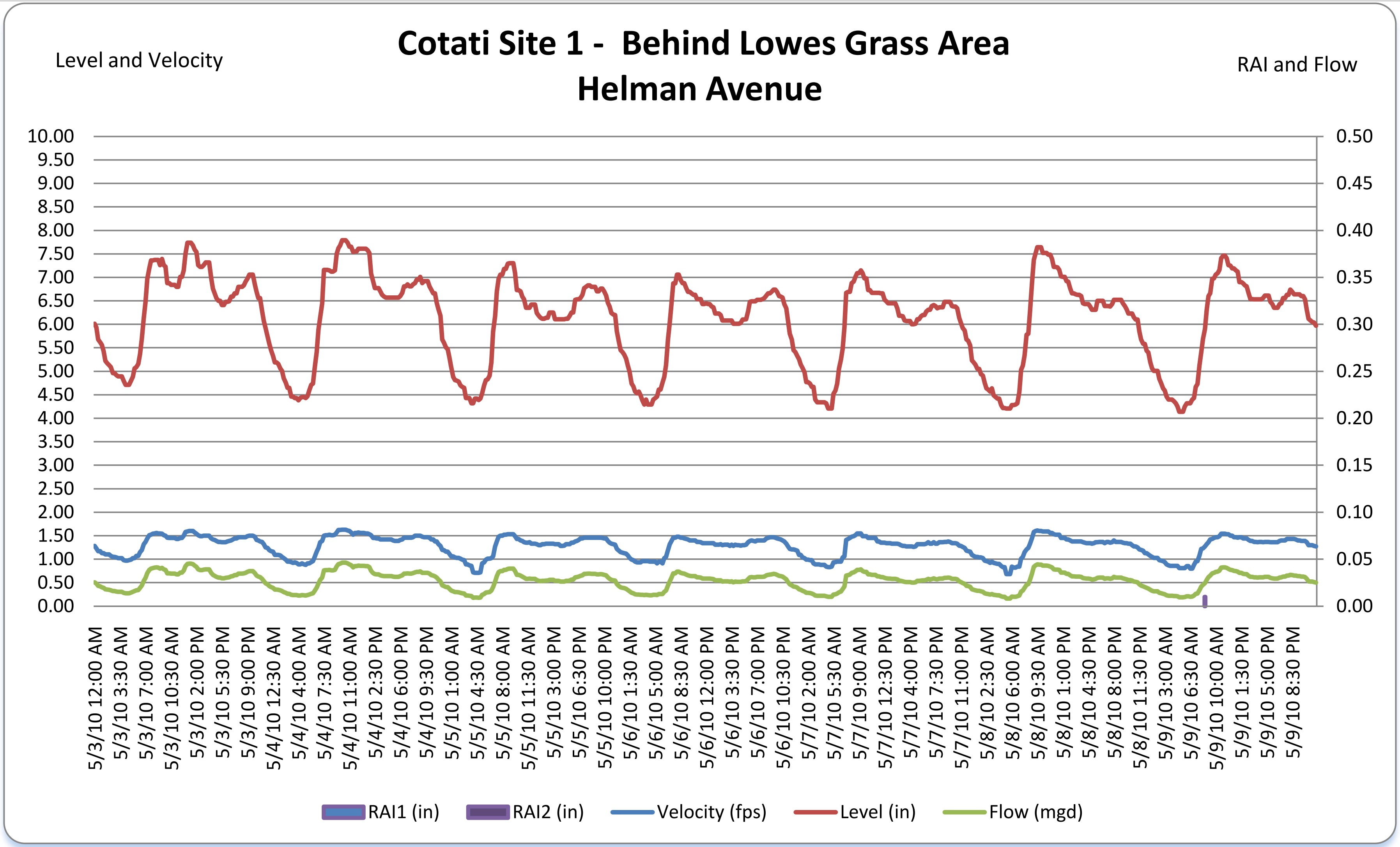
Week 8 4/26/2010 to 5/2/2010

Cotati Site 1 - Behind Lowes Grass Area Helman Avenue



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.33	6.31	0.58	Total Rain Averaged between Both Gauges	Inches
Maximum	1.63	7.67	0.91		0.29
Minimum	0.90	4.39	0.23		

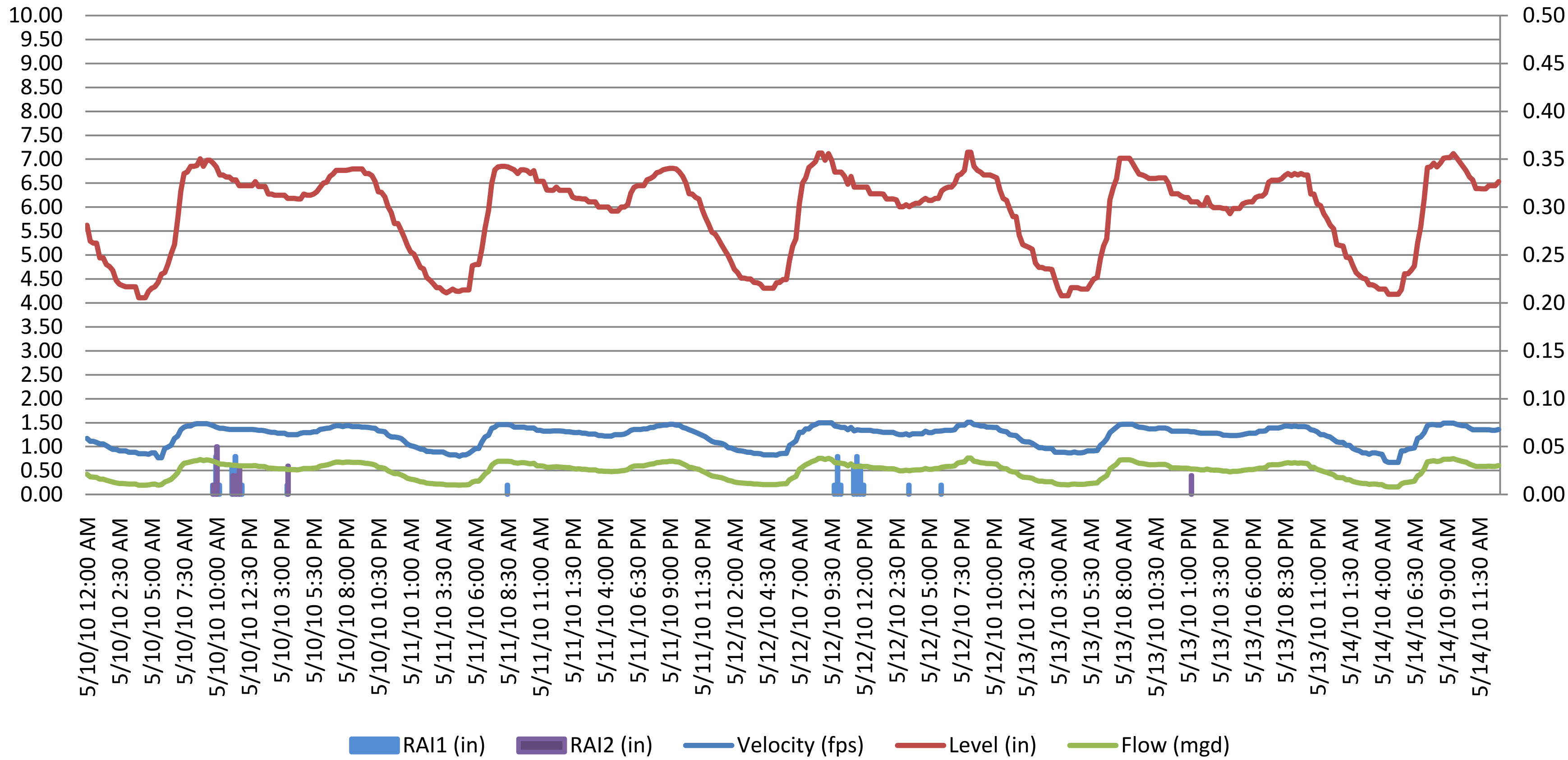
Week 9 5/3/2010 to 5/9/2010



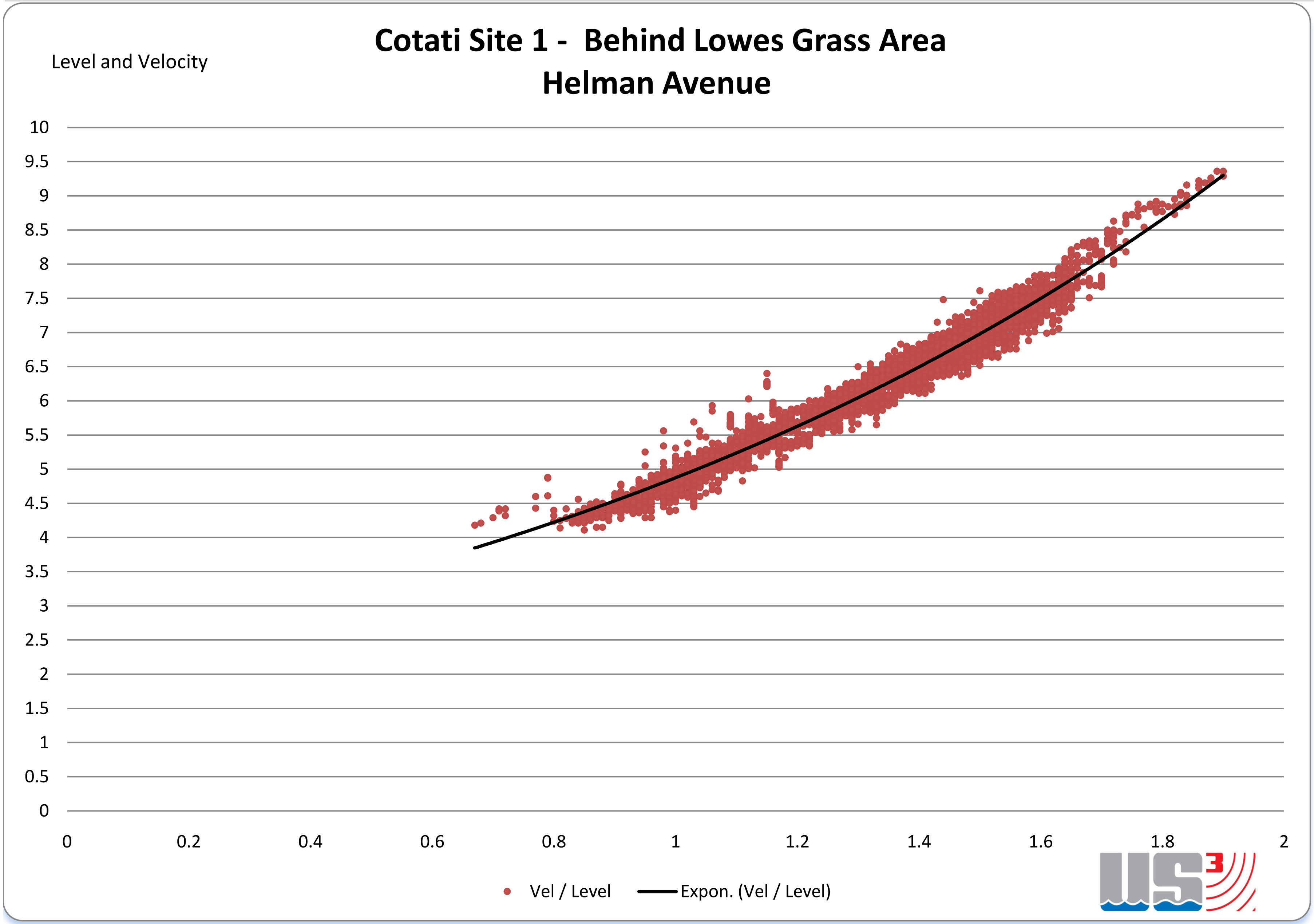
	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.28	6.10	0.54	Total Rain Averaged between Both Gauges	Inches
Maximum	1.63	7.79	0.93		0.01
Minimum	0.68	4.14	0.16		

Week 10 5/10/2010 to 5/14/2010

Cotati Site 1 - Behind Lowes Grass Area Helman Avenue



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.22	5.89	0.49	Total Rain Averaged between Both Gauges	Inches
Maximum	1.51	7.15	0.76		0.19
Minimum	0.67	4.11	0.16		



Cotati Site 1 - Behind Lowes Grass Area
Helman Avenue
Level and Velocity
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Vel / Level
Expon. (Vel / Level)

Daily Report Helman Avenue

Average Daily MGD					Minimum Daily MGD				Maximum Daily MGD		
Date	Velocity	Level	Flow		Velocity	Level	Flow		Velocity	Level	Flow
3/10/2010	1.52	7.05	0.76		1.42	6.49	0.64		1.74	8.33	1.09
3/11/2010	1.38	6.48	0.63		1.05	5.09	0.33		1.60	7.47	0.86
3/12/2010	1.45	6.87	0.72		1.03	5.09	0.32		1.66	7.95	0.96
3/13/2010	1.46	7.04	0.74		1.09	5.69	0.41		1.77	8.54	1.15
3/14/2010	1.46	6.70	0.69		1.09	5.30	0.37		1.68	7.88	0.97
3/15/2010	1.41	6.42	0.63		1.05	5.11	0.33		1.63	7.34	0.82
3/16/2010	1.38	6.31	0.60		1.04	4.81	0.30		1.63	7.18	0.83
3/17/2010	1.39	6.30	0.61		1.02	4.68	0.29		1.62	7.32	0.84
3/18/2010	1.37	6.23	0.59		1.05	4.85	0.31		1.58	7.15	0.79
3/19/2010	1.36	6.17	0.58		1.04	4.74	0.30		1.59	7.25	0.82
3/20/2010	1.35	6.20	0.58		1.03	4.59	0.28		1.59	7.34	0.83
3/21/2010	1.36	6.20	0.59		1.03	4.45	0.27		1.69	7.69	0.95
3/22/2010	1.35	6.15	0.57		0.98	4.47	0.26		1.58	7.40	0.84
3/23/2010	1.33	6.09	0.55		1.02	4.61	0.28		1.56	7.15	0.79
3/24/2010	1.33	6.10	0.56		0.94	4.49	0.25		1.57	7.16	0.80
3/25/2010	1.33	6.12	0.56		0.97	4.59	0.26		1.53	6.94	0.74
3/26/2010	1.32	6.06	0.55		0.94	4.49	0.25		1.58	7.25	0.82
3/27/2010	1.33	6.08	0.56		0.94	4.36	0.24		1.64	7.75	0.92
3/28/2010	1.32	6.12	0.58		0.91	4.29	0.22		1.67	7.88	0.97
3/29/2010	1.33	6.11	0.55		0.93	4.35	0.23		1.54	7.27	0.79
3/30/2010	1.35	6.22	0.57		0.79	4.61	0.21		1.52	7.08	0.76
3/31/2010	1.47	6.74	0.68		1.05	5.01	0.34		1.74	8.18	1.07
4/1/2010	1.46	6.70	0.69		1.18	5.55	0.44		1.65	7.55	0.90
4/2/2010	1.49	6.79	0.72		1.05	5.09	0.33		1.65	7.64	0.92
4/3/2010	1.49	6.83	0.73		1.18	5.48	0.43		1.72	8.07	1.03
4/4/2010	1.45	6.75	0.70		1.05	5.06	0.34		1.70	7.81	0.98
4/5/2010	1.44	6.85	0.70		1.09	5.62	0.40		1.64	7.76	0.93
4/6/2010	1.38	6.52	0.63		1.09	5.25	0.36		1.58	7.39	0.84
4/7/2010	1.36	6.40	0.60		1.05	5.02	0.32		1.58	7.40	0.84
4/8/2010	1.35	6.34	0.59		1.00	4.87	0.30		1.55	7.32	0.81
4/9/2010	1.35	6.35	0.59		0.98	4.85	0.30		1.62	7.55	0.88
4/10/2010	1.35	6.37	0.60		1.03	4.84	0.30		1.60	7.64	0.88
4/11/2010	1.51	7.31	0.86		0.97	4.78	0.28		1.90	9.36	1.39
4/12/2010	1.62	7.86	0.95		1.36	6.66	0.63		1.82	8.95	1.26
4/13/2010	1.50	7.15	0.77		1.15	6.14	0.48		1.66	8.04	0.99
4/14/2010	1.45	6.86	0.70		1.09	5.65	0.40		1.66	7.83	0.96
4/15/2010	1.42	6.66	0.66		1.11	5.33	0.37		1.59	7.54	0.85
4/16/2010	1.39	6.54	0.64		1.06	5.14	0.34		1.62	7.58	0.89
4/17/2010	1.38	6.53	0.64		1.05	5.02	0.32		1.66	7.81	0.94
4/18/2010	1.38	6.54	0.64		1.00	4.95	0.31		1.66	7.81	0.94
4/19/2010	1.35	6.37	0.60		0.99	4.87	0.29		1.59	7.39	0.84
4/20/2010	1.40	6.64	0.65		1.09	5.29	0.37		1.62	7.55	0.87
4/21/2010	1.38	6.51	0.63		1.02	5.13	0.33		1.61	7.58	0.88
4/22/2010	1.35	6.38	0.60		1.00	4.92	0.30		1.57	7.52	0.85
4/23/2010	1.33	6.30	0.58		0.99	4.80	0.29		1.55	7.34	0.81
4/24/2010	1.32	6.37	0.59		0.96	4.78	0.28		1.64	7.69	0.92
4/25/2010	1.34	6.35	0.60		0.96	4.70	0.27		1.62	7.59	0.89
4/26/2010	1.32	6.21	0.56		0.94	4.73	0.27		1.58	7.41	0.84
4/27/2010	1.33	6.36	0.59		0.94	4.80	0.27		1.56	7.48	0.84

Daily Report

Helman Avenue

	Average Daily MGD				**Minimum Daily MGD**				**Maximum Daily MGD**		
Date	Velocity	Level	Flow		Velocity	Level	Flow		Velocity	Level	Flow
4/28/2010	1.35	6.38	0.60		0.98	4.84	0.29		1.59	7.47	0.85
4/29/2010	1.34	6.37	0.59		0.94	4.84	0.27		1.56	7.40	0.83
4/30/2010	1.31	6.35	0.58		0.97	4.89	0.29		1.60	7.55	0.87
5/1/2010	1.32	6.19	0.57		0.90	4.53	0.24		1.63	7.67	0.91
5/2/2010	1.33	6.28	0.59		0.90	4.39	0.23		1.61	7.51	0.87
5/3/2010	1.35	6.43	0.61		0.97	4.71	0.27		1.60	7.74	0.90
5/4/2010	1.34	6.37	0.60		0.88	4.38	0.22		1.63	7.79	0.93
5/5/2010	1.26	6.02	0.52		0.71	4.32	0.18		1.53	7.30	0.80
5/6/2010	1.26	5.95	0.51		0.91	4.29	0.23		1.48	7.06	0.74
5/7/2010	1.24	5.94	0.50		0.83	4.21	0.20		1.55	7.15	0.78
5/8/2010	1.25	6.01	0.52		0.68	4.21	0.16		1.61	7.64	0.89
5/9/2010	1.25	5.99	0.52		0.80	4.14	0.19		1.54	7.46	0.83
5/10/2010	1.24	5.96	0.51		0.77	4.11	0.20		1.48	7.01	0.73
5/11/2010	1.23	5.91	0.50		0.80	4.21	0.19		1.47	6.85	0.70
5/12/2010	1.24	5.96	0.50		0.82	4.31	0.21		1.51	7.15	0.76
5/13/2010	1.23	5.87	0.49		0.87	4.15	0.20		1.47	7.02	0.73
5/14/2010	1.15	5.61	0.44		0.67	4.18	0.16		1.49	7.12	0.75

Temporary Flow Study

Cotati Site 2 - Near Car Wash

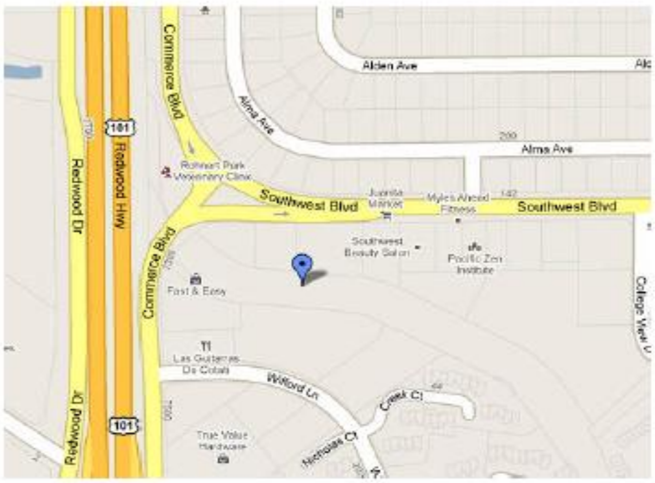
Laguna de Santa Rosa-East of Commerce Blvd.

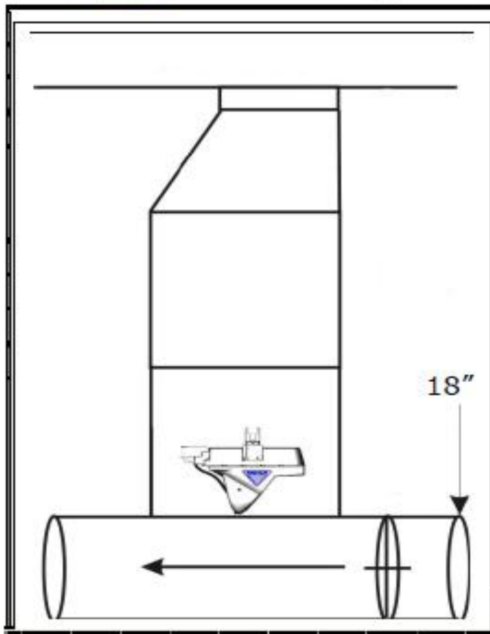
Utility Systems, Science, and Software
2101 E. 4th Street
Santa Ana, Ca 92705

From		To
3/10/2010 11:30		5/14/2010 13:00

METERING SITE DOCUMENT

City:	Cotati
Site Name:	Site 2
Location:	Near car wash
Access:	Grass
GPS:	N +38° 20' 7.30", W -122° 42' 39.70"
Install Date:	3/10/2010





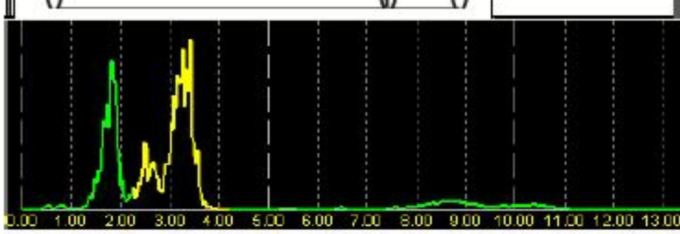
Pipe Size (inch):	18
Pipe Condition:	Good

Hydraulics:

Multiplier = 1.00

Gas	
O_2	Good
HS_2	Good

Manhole Comments:



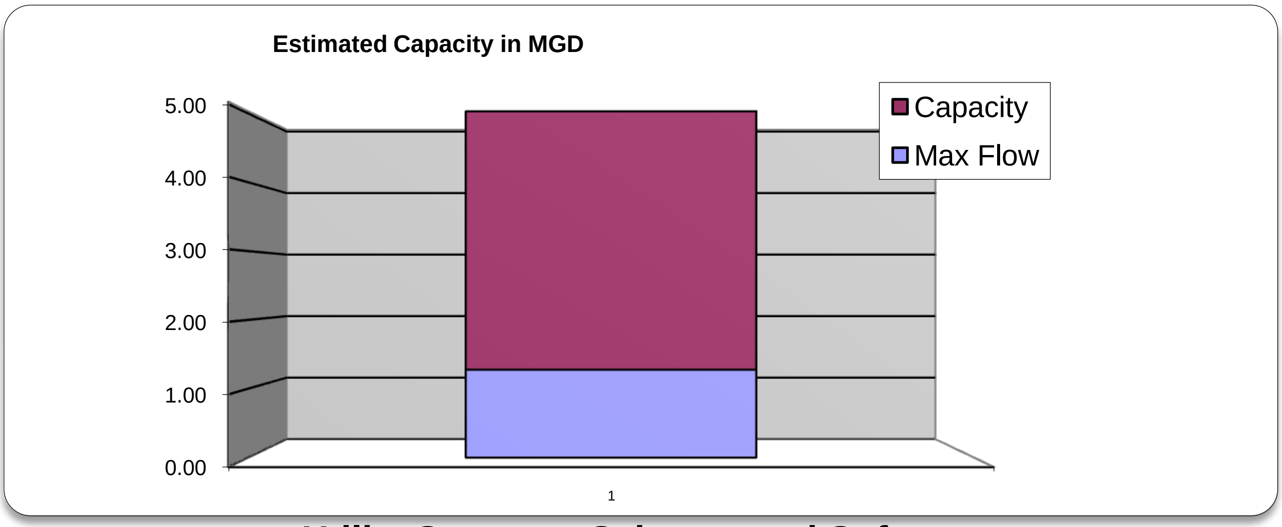
Traffic Safety Required:

N/A

Meter site 2
Temporary Flow Study

Cotati, CA

Meter Start Date		From	3/10/2010 11:30
Meter Stop Date		To	5/14/2010 13:00
	Velocity (fps)	Level (in)	Flow (MGD)
Average	1.49	6.52	0.57
Maximum	2.55	8.19	1.28
Minimum	0.68	4.93	0.18
	Pipe Size	18	
	Estimated Capacity	25.26%	
	Sensor Used	Hach - FloDar	
	Comment		

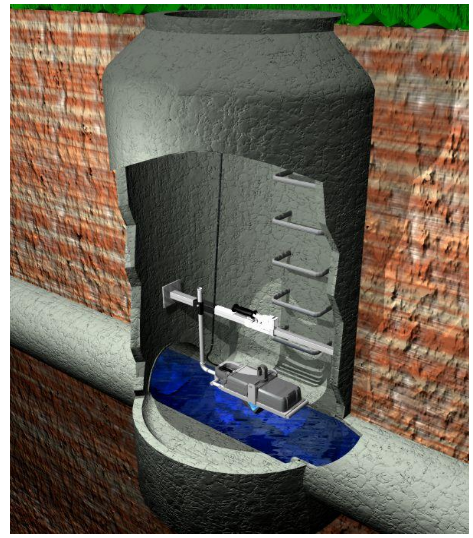


Utility Systems, Science, and Software
2101 E. 4th Street
Santa Ana, Ca 92705

Laguna de Santa Rosa-East of Commerce Blvd.

Flo-Dar incorporates a Doppler Radar Velocity Sensor and Ultrasonic Depth Transducer for use in Open Channel Applications. It is available with a Permanent Flo-Station. The Flo-Station is available with or without a display and is powered with 120/240 VAC, or 12 VDC. The Flo-Station requires Flo-Ware software, which is included on some models, and a customer supplied PC. Flo-Station with display shows flow rate, total flow, velocity and level. Both Flo-Station's have four outputs one each for level, velocity, flow rate, surcharge level, and a contact closure. Instruction manuals are included. Mounting Hardware is ordered separately.

Laguna de erce Blvd.



Flo-Dar Sensor
Enclosure
Material: Polystyrene
Dimensions: 6.9" W x 16.65" L x 11.7" D
(17.5 cm x 42.3 cm x 29.7 cm)
Weight: 10.5 lbs. (4.8 kg)

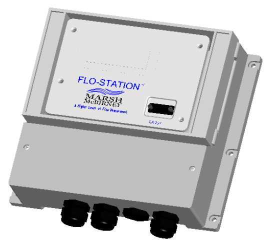
Temperature
Operating Range: 14° F to 122°F
(-10° C to 50° C)
Storage Range: -40° F to 140° F
(-40° C to 60° C)

Velocity Measurement
Method: Radar
Range: 0.75 to 20 ft/s (0.23 m/s to 6.10 m/s)
Accuracy: ±0.5%; ±0.1 ft/s (±0.03 m/s)

Level Measurement
Method: Ultrasonic
Standard Operating Range:
0.25 to 60 in. (0.634 to 152.4 cm)
Optional Operating Range: 0 (0 cm) to 240" (6.1 m) (with 18" dead band)
Temperature Compensated
Accuracy: ±0.1 in. (±0.25 cm)
1% Accuracy

Surcharge Conditions Level/Velocity
Level
Method: Piezo-resistive pressure transducer
Maximum Range: 138 inches (3.5 meters)
Velocity
Method: Electromagnetic
Range: -5 to +20 ft/s (-1.5 to +6.1 m/s)

Flow Measurement
Based on Continuity Equation.
Accuracy: ±5.0% of reading typical where flow is in a channel with uniform flow conditions and is not surcharged.



Flo-Station Monitor
Data Storage
64K (16K cycles of velocity/level data)
Local Terminal
RS232C at 19.2K baud

Timebase Accuracy: 1 second per day

Outputs: Four 4-20 mA outputs; system-isolated, up to 600Ω load. Each output is selectable between FLOW, LEVEL, VELOCITY OR SURCHARGE LEVEL.

Power Requirements
AC: 85-264 VAC, 47-63 Hz. 32 watts
DC: 12 VDC for Flo-Station without Display or Flo-Station with Display (Backlight Off)
180 mA (2.1 watts) with (1) 4-20 mA utilized.

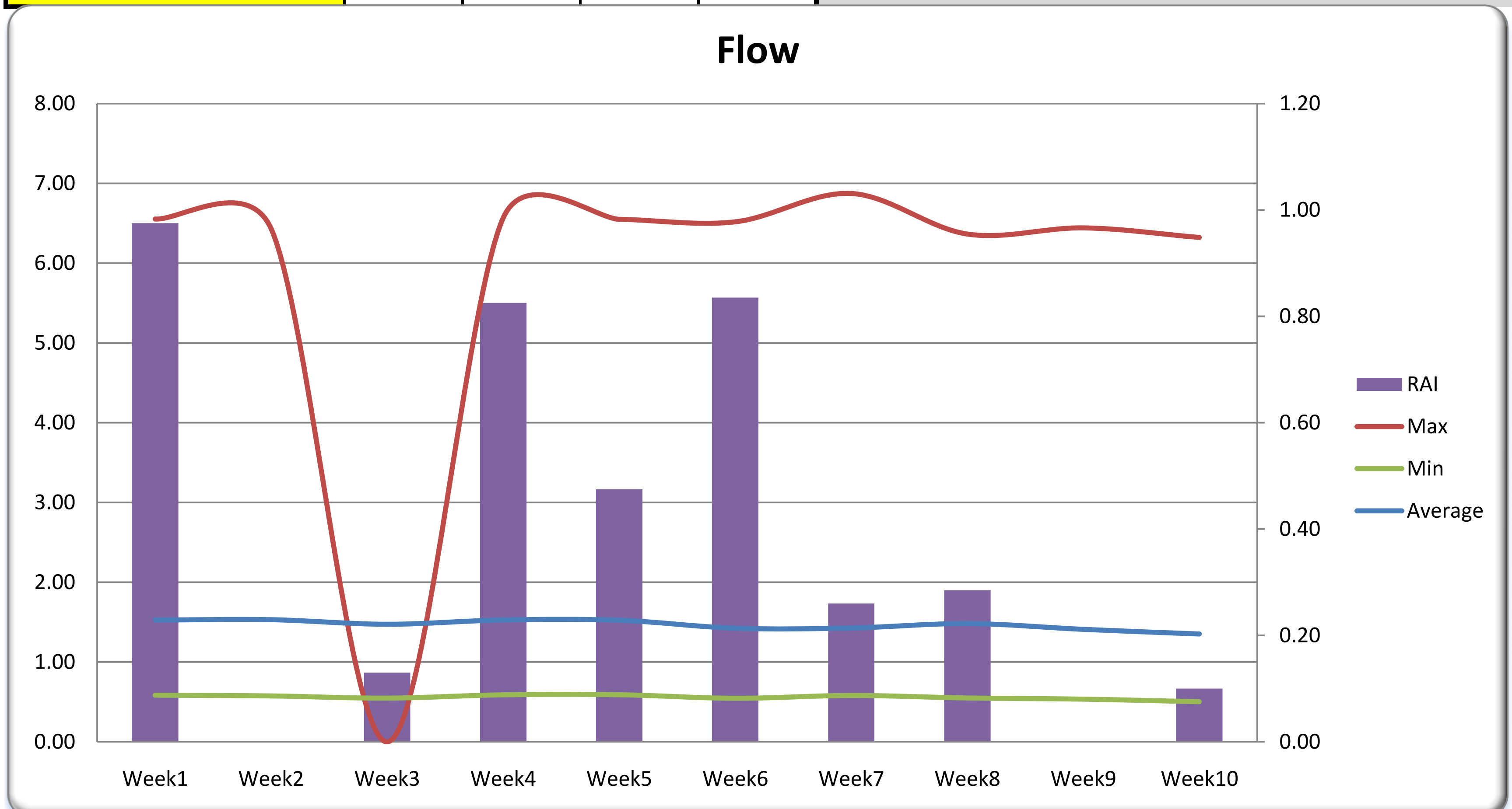
Housing
Material: ABS Plastic, NEMA 4
Dimensions: 10.2" W x 9.3" H x 4" D
(25.9 cm W x 23.6 cm H x 10.2 cm D)
Weight: 5 lbs.
Temperature Operating Range: 14° F to 122° F
(-10° C to 50° C)
Temperature Storage Range:
(without display) -40°F to 140°F (-40°C to 60°C)
(with display) 4°F to 140°F (-20°C to 60°C) w/Display

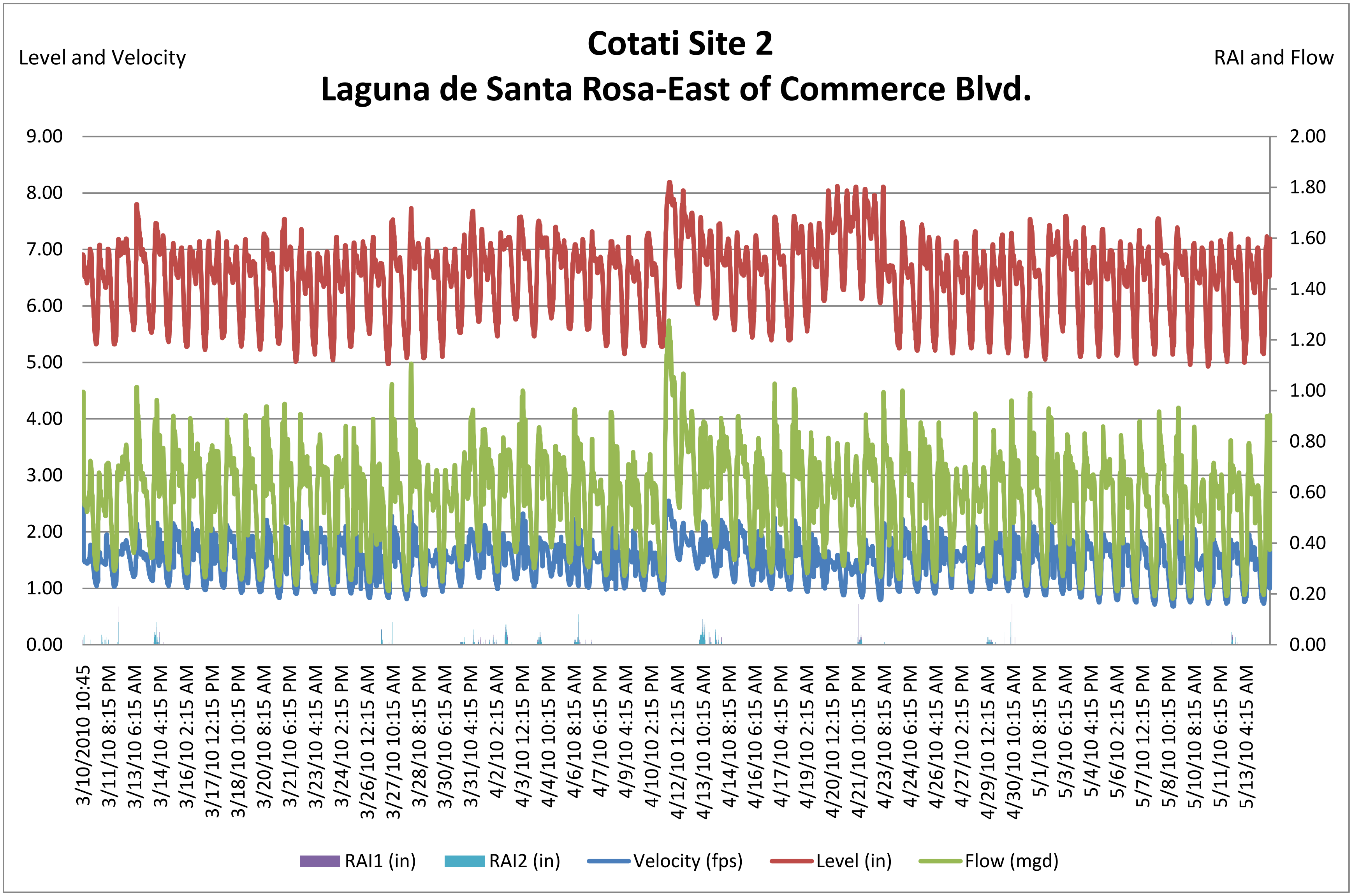
Flow Review

	Average	Max	Min	RAI
Week1	1.53	6.55	0.58	0.98
Week2	1.53	6.43	0.58	0.00
Week3	1.47	Laguna de	0.55	0.13
Week4	1.53	6.57	0.59	0.83
Week5	1.52	6.55	0.59	0.48
Week6	1.42	6.52	0.55	0.84
Week7	1.43	6.87	0.58	0.26
Week8	1.48	6.36	0.55	0.29
Week9	1.41	6.44	0.53	0.00
Week10	1.35	6.32	0.50	0.10

Cotati Site 2 - Near Car Wash

Laguna de Santa Rosa-East of Commerce Blvd.





Cotati Site 2
Laguna de Santa Rosa-East of Commerce Blvd.
Level and Velocity
RAI and Flow
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
3/10/2010 10:45
3/11/10 8:15 PM
3/13/10 6:15 AM
3/14/10 4:15 PM
3/16/10 2:15 AM
3/17/10 12:15 PM
3/18/10 10:15 PM
3/20/10 8:15 AM
3/21/10 6:15 PM
3/23/10 4:15 AM
3/24/10 2:15 PM
3/26/10 12:15 AM
3/27/10 10:15 AM
3/28/10 8:15 PM
3/30/10 6:15 AM
3/31/10 4:15 PM
4/2/10 2:15 AM
4/3/10 12:15 PM
4/4/10 10:15 PM
4/6/10 8:15 AM
4/7/10 6:15 PM
4/9/10 4:15 AM
4/10/10 2:15 PM
4/12/10 12:15 AM
4/13/10 10:15 AM
4/14/10 8:15 PM
4/16/10 6:15 AM
4/17/10 4:15 PM
4/19/10 2:15 AM
4/20/10 12:15 PM
4/21/10 10:15 PM
4/23/10 8:15 AM
4/24/10 6:15 PM
4/26/10 4:15 AM
4/27/10 2:15 PM
4/29/10 12:15 AM
4/30/10 10:15 AM
5/1/10 8:15 PM
5/3/10 6:15 AM
5/4/10 4:15 PM
5/6/10 2:15 AM
5/7/10 12:15 PM
5/8/10 10:15 PM
5/10/10 8:15 AM
5/11/10 6:15 PM
5/13/10 4:15 AM
RAI1 (in)
RAI2 (in)
Velocity (fps)
Level (in)
Flow (mgd)

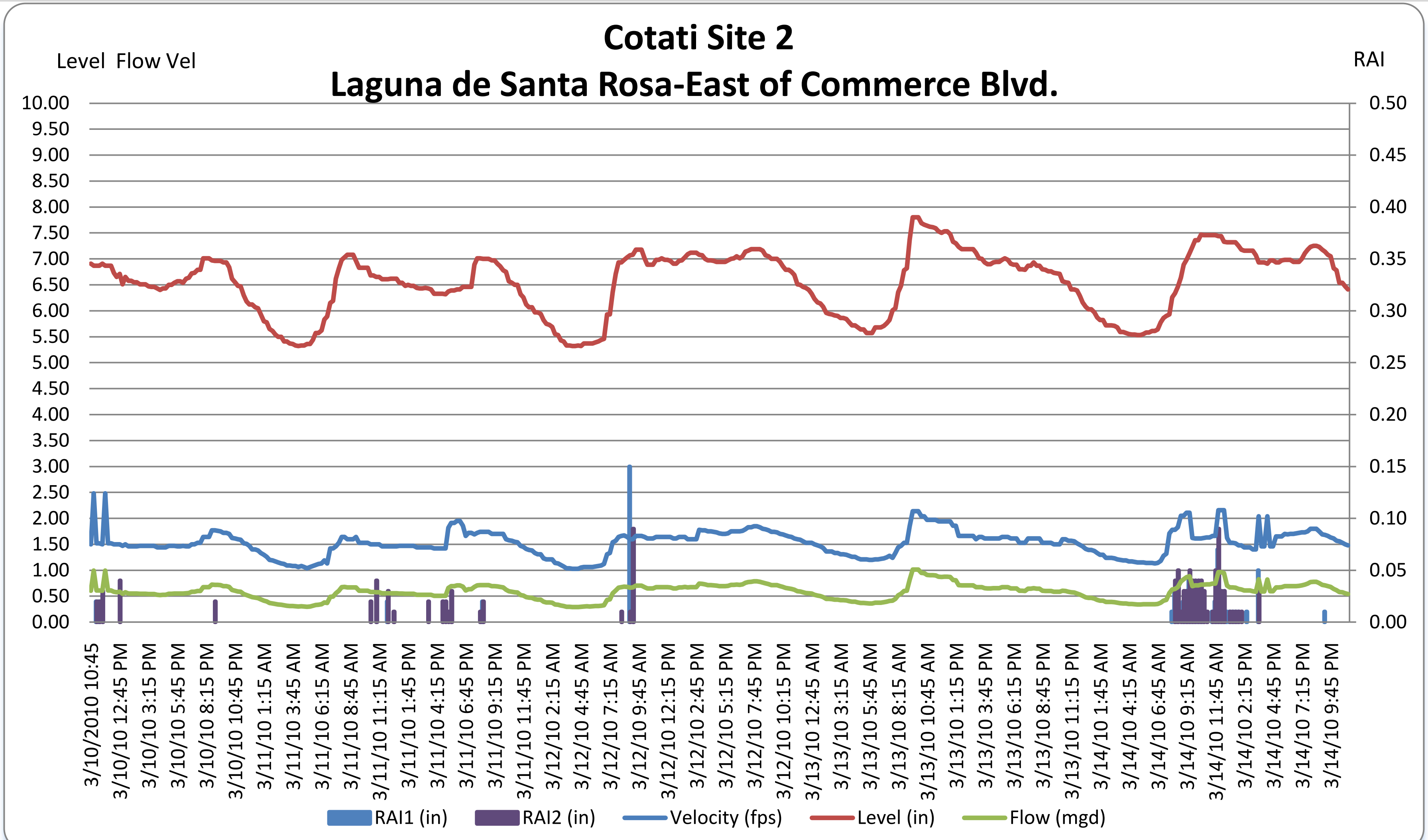
Rainlog Rainfall Report		**By Day Report**
City Hall Site	**Total**	**6.10**
	Max	**na de Santa Rosa-East of Commerce Blvd.**
	Average	**0.09**
Date	***Rainfall***	***Comments***
3/8/10 0:00	0.04	
3/9/10 0:00	0.04	
3/10/10 0:00	0.15	
3/11/10 0:00	0.00	
3/12/10 0:00	0.55	
3/13/10 0:00	0.00	
3/14/10 0:00	0.00	
3/15/10 0:00	0.00	
3/16/10 0:00	0.00	
3/17/10 0:00	0.00	
3/18/10 0:00	0.00	
3/19/10 0:00	0.00	
3/20/10 0:00	0.00	
3/21/10 0:00	0.00	
3/22/10 0:00	0.00	
3/23/10 0:00	0.00	
3/24/10 0:00	0.25	
3/25/10 0:00	0.01	
3/26/10 0:00	0.00	
3/27/10 0:00	0.00	
3/28/10 0:00	0.00	
3/29/10 0:00	0.23	
3/30/10 0:00	0.34	
3/31/10 0:00	0.69	
4/1/10 0:00	0.00	
4/2/10 0:00	0.39	
4/3/10 0:00	0.00	
4/4/10 0:00	0.41	
4/5/10 0:00	0.05	
4/6/10 0:00	0.00	
4/7/10 0:00	0.00	
4/8/10 0:00	0.00	
4/9/10 0:00	0.00	
4/10/10 0:00	0.00	
4/11/10 0:00	1.37	
4/12/10 0:00	0.30	
4/13/10 0:00	0.00	
4/14/10 0:00	0.00	
4/15/10 0:00	0.00	
4/16/10 0:00	0.00	
4/17/10 0:00	0.00	
4/18/10 0:00	0.00	
4/19/10 0:00	0.21	
4/20/10 0:00	0.30	
4/21/10 0:00	0.01	
4/22/10 0:00	0.00	
4/23/10 0:00	0.00	
4/24/10 0:00	0.00	

Rainlog Rainfall Report		By Day Report
City Hall Site	Total	6.10
	Max	na de Santa Rosa-East of Commerce Blvd.
	Average	0.09
Date	*Rainfall*	*Comments*
4/25/10 0:00	0.00	
4/26/10 0:00	0.00	
4/27/10 0:00	0.35	
4/28/10 0:00	0.22	
4/29/10 0:00	0.00	
4/30/10 0:00	0.00	
5/1/10 0:00	0.00	
5/2/10 0:00	0.00	
5/3/10 0:00	0.00	
5/4/10 0:00	0.00	
5/5/10 0:00	0.00	
5/6/10 0:00	0.00	
5/7/10 0:00	0.00	
5/8/10 0:00	0.00	
5/9/10 0:00	0.01	
5/10/10 0:00	0.18	
5/11/10 0:00	0.00	
5/12/10 0:00	0.00	
5/13/10 0:00	0.00	
5/14/10 0:00	0.00	

Rainlog Rainfall Report		By Day Report
North Pump Station	Total	6.82
	Max	ıa de Santa Rosa-East of Commerce Blvd.
	Average	0.10
Date	*Rainfall*	*Comments*
3/8/10 0:00	0.13	
3/9/10 0:00	0.23	
3/10/10 0:00	0.11	
3/11/10 0:00	0.00	
3/12/10 0:00	0.70	
3/13/10 0:00	0.00	
3/14/10 0:00	0.00	
3/15/10 0:00	0.00	
3/16/10 0:00	0.00	
3/17/10 0:00	0.00	
3/18/10 0:00	0.00	
3/19/10 0:00	0.00	
3/20/10 0:00	0.00	
3/21/10 0:00	0.00	
3/22/10 0:00	0.00	
3/23/10 0:00	0.00	
3/24/10 0:00	0.23	
3/25/10 0:00	0.13	
3/26/10 0:00	0.00	
3/27/10 0:00	0.00	
3/28/10 0:00	0.00	
3/29/10 0:00	0.29	
3/30/10 0:00	0.20	
3/31/10 0:00	0.75	
4/1/10 0:00	0.00	
4/2/10 0:00	0.48	
4/3/10 0:00	0.00	
4/4/10 0:00	0.47	
4/5/10 0:00	0.02	
4/6/10 0:00	0.00	
4/7/10 0:00	0.00	
4/8/10 0:00	0.00	
4/9/10 0:00	0.00	
4/10/10 0:00	0.00	
4/11/10 0:00	1.58	
4/12/10 0:00	0.27	
4/13/10 0:00	0.00	
4/14/10 0:00	0.00	
4/15/10 0:00	0.00	
4/16/10 0:00	0.00	
4/17/10 0:00	0.00	
4/18/10 0:00	0.00	
4/19/10 0:00	0.21	
4/20/10 0:00	0.26	
4/21/10 0:00	0.01	
4/22/10 0:00	0.00	
4/23/10 0:00	0.00	
4/24/10 0:00	0.00	

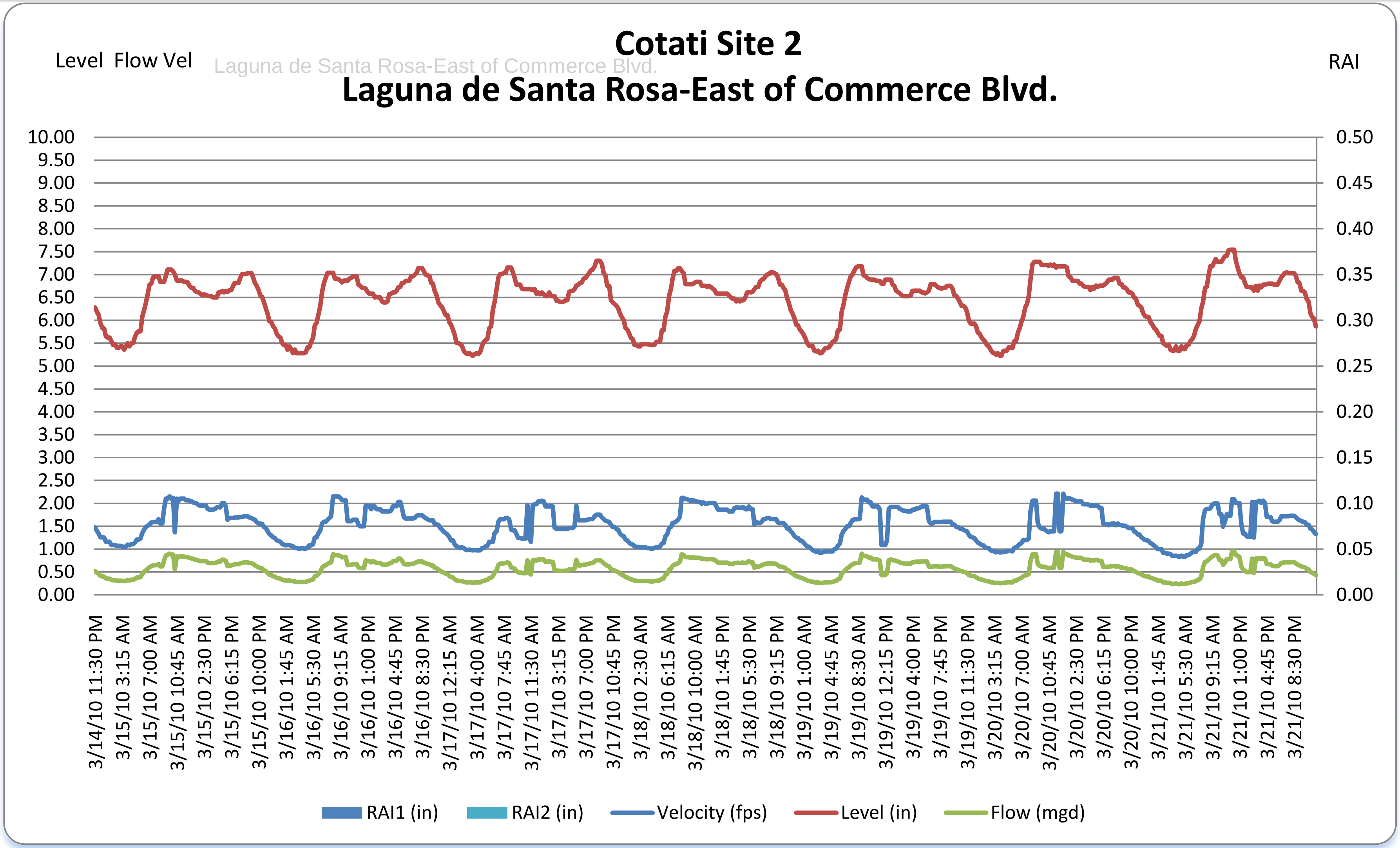
Rainlog Rainfall Report		By Day Report
North Pump Station	Total	6.82
	Max	na de Santa Rosa-East of Commerce Blvd.
	Average	0.10
Date	***Rainfall***	***Comments***
4/25/10 0:00	0.00	
4/26/10 0:00	0.01	
4/27/10 0:00	0.42	
4/28/10 0:00	0.13	
4/29/10 0:00	0.00	
4/30/10 0:00	0.00	
5/1/10 0:00	0.00	
5/2/10 0:00	0.00	
5/3/10 0:00	0.00	
5/4/10 0:00	0.00	
5/5/10 0:00	0.00	
5/6/10 0:00	0.00	
5/7/10 0:00	0.00	
5/8/10 0:00	0.00	
5/9/10 0:00	0.01	
5/10/10 0:00	0.16	
5/11/10 0:00	0.00	
5/12/10 0:00	0.00	
5/13/10 0:00	0.02	
5/14/10 0:00	0.00	

Week 1 3/10/2010 to 3/14/2010



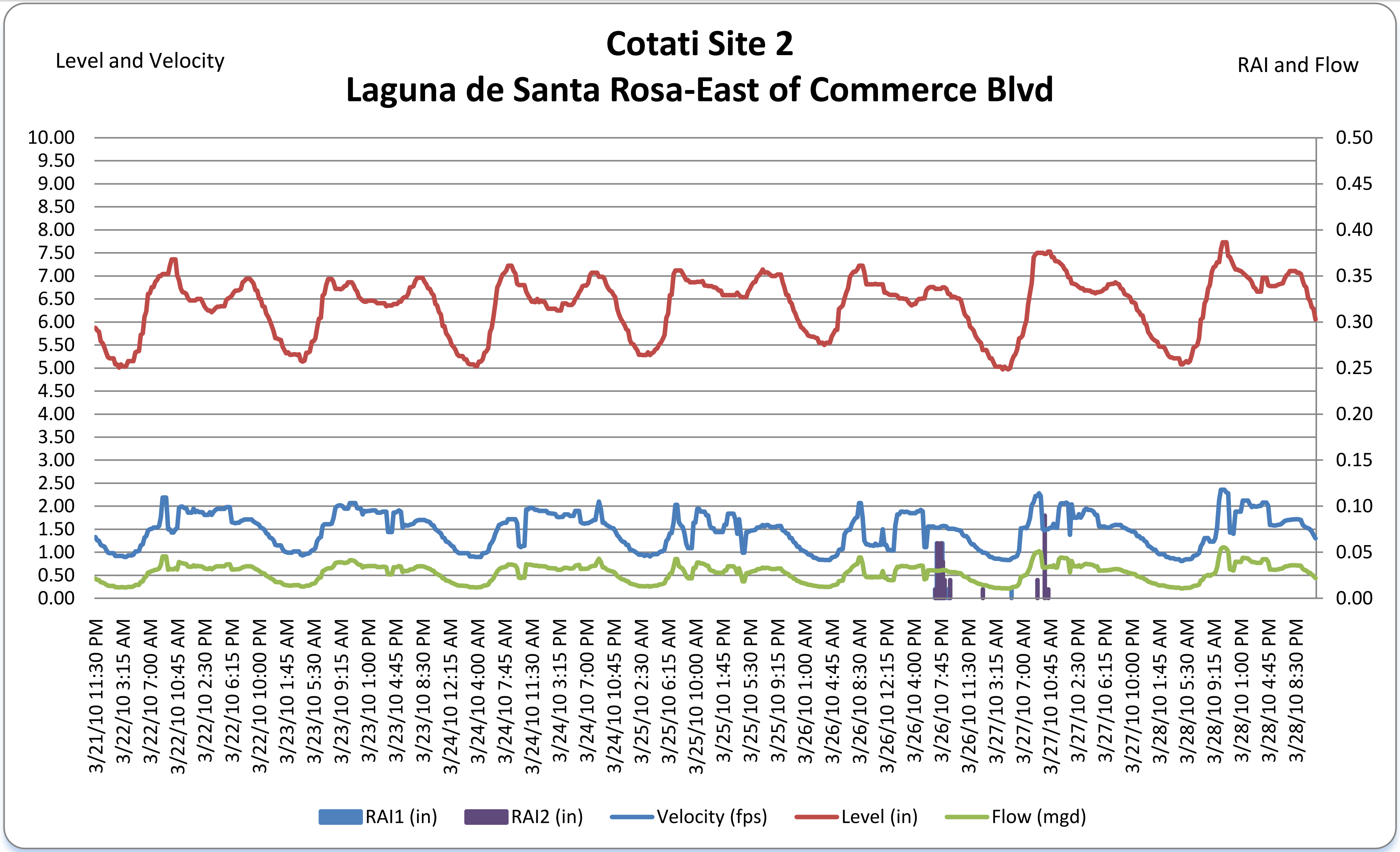
	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.53	6.55	0.58	Total Rain Averaged between Both Gauges	Inches
Maximum	2.48	7.80	1.01		0.98
Minimum	1.03	5.32	0.29		

Week 2 3/15/2010 to 3/21/2010



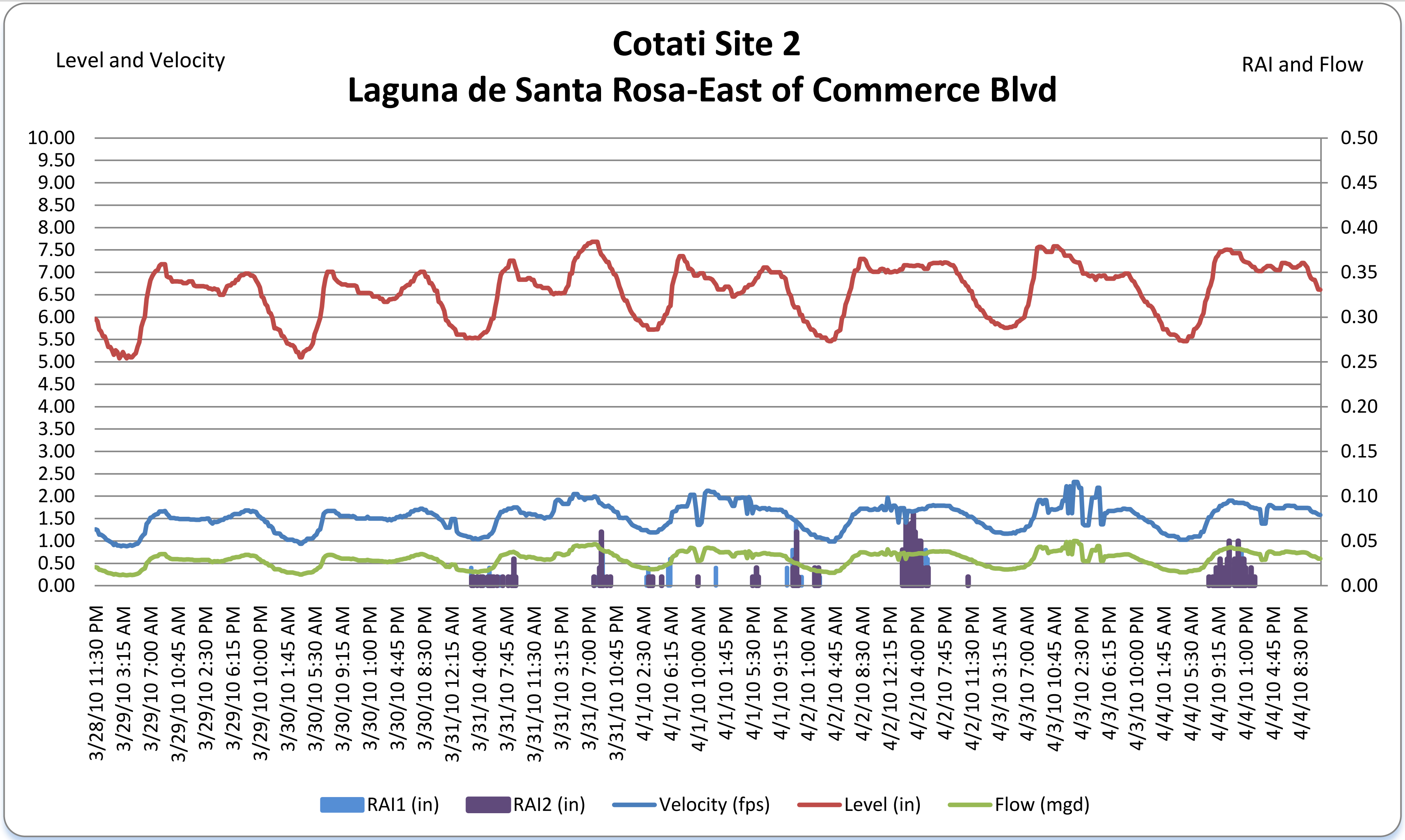
	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.53	6.43	0.58	Total Rain Averaged between Both Gauges	Inches
Maximum	2.21	7.54	0.95		0.00
Minimum	0.83	5.22	0.23		

Week 3 3/22/2010 to 3/28/2010



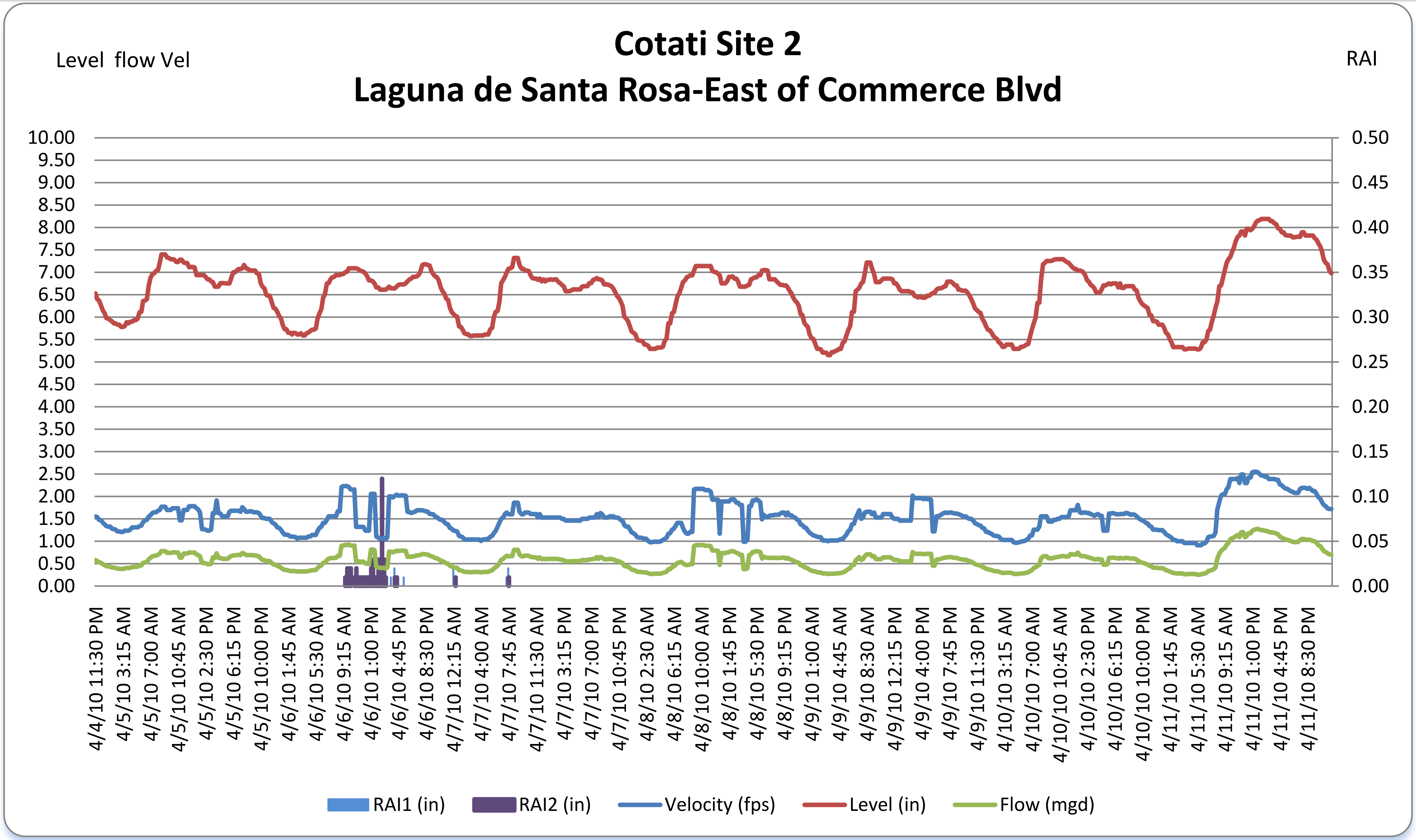
	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.47	6.36	0.55	Total Rain Averaged between Both Gauges	Inches
Maximum	2.36	7.73	1.11		0.13
Minimum	0.81	4.97	0.21		

Week 4 3/29/2010 to 4/4/2010



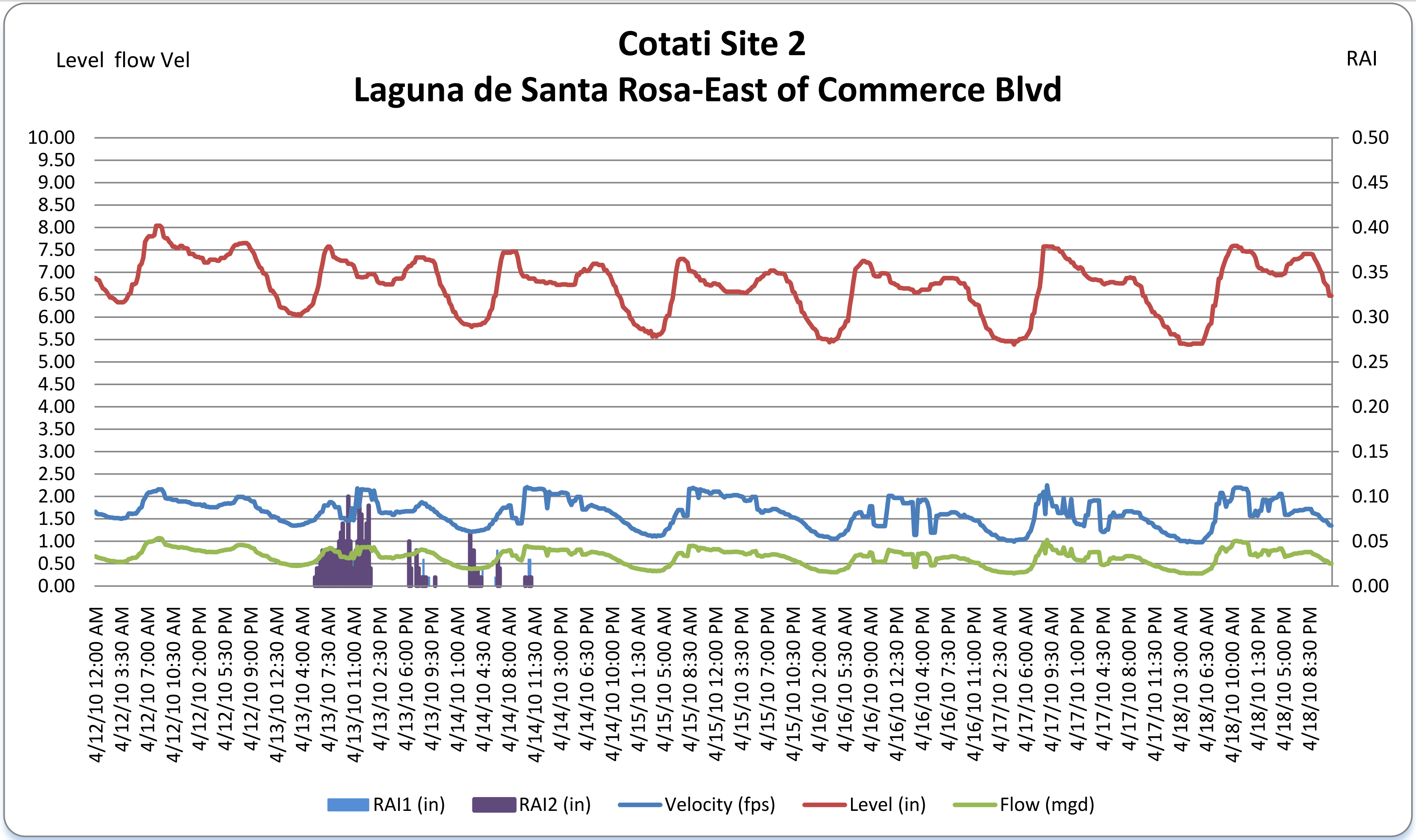
	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.53	6.57	0.59	Total Rain Averaged between Both Gauges	Inches
Maximum	2.32	7.68	1.00		0.83
Minimum	0.88	5.08	0.23		

Week 5 4/4/2010 to 4/11/2010



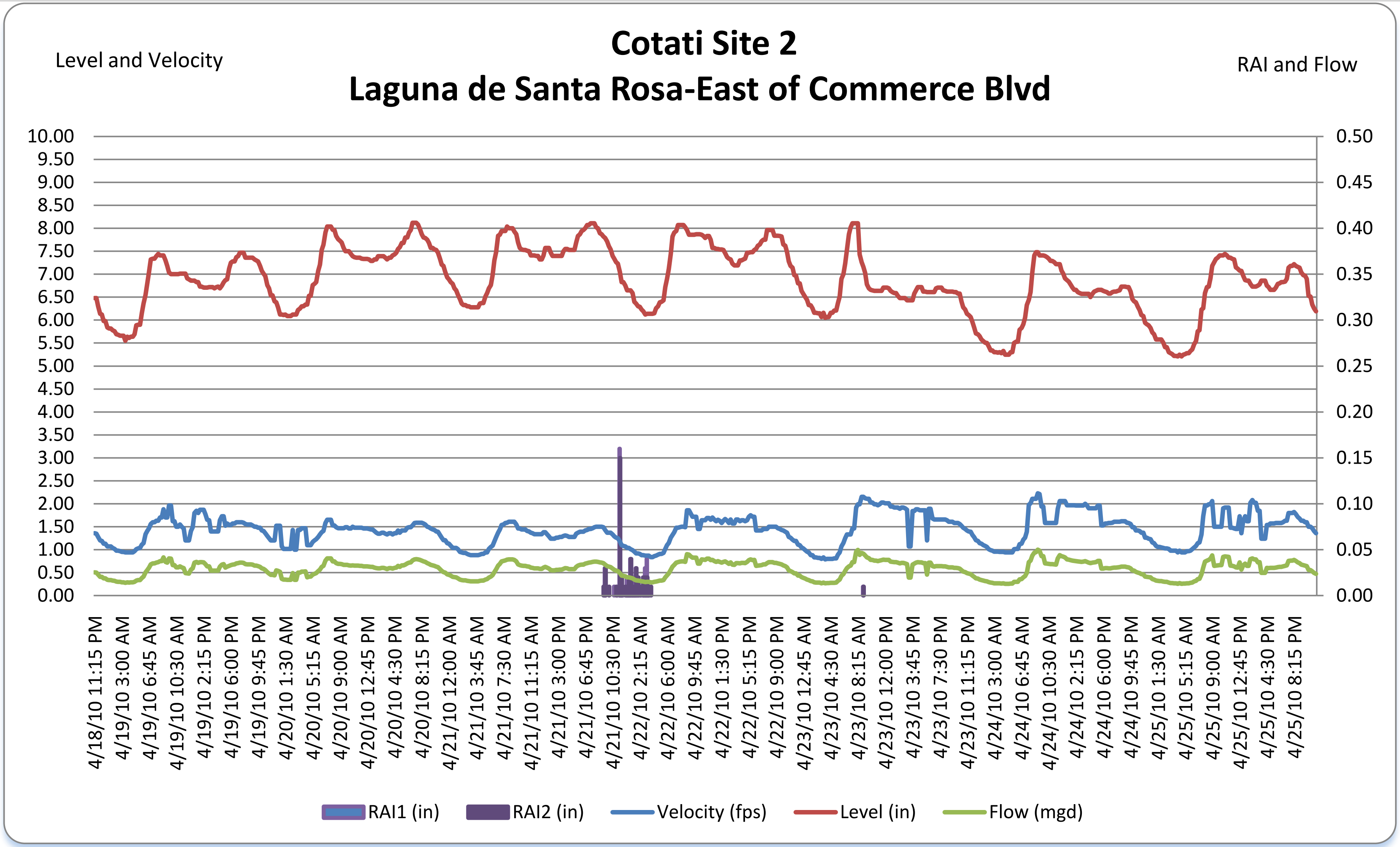
	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.52	6.55	0.59	Total Rain Averaged between Both Gauges	Inches
Maximum	2.55	8.19	1.28		0.48
Minimum	0.91	5.15	0.26		

Week 6 4/12/2010 to 4/18/2010



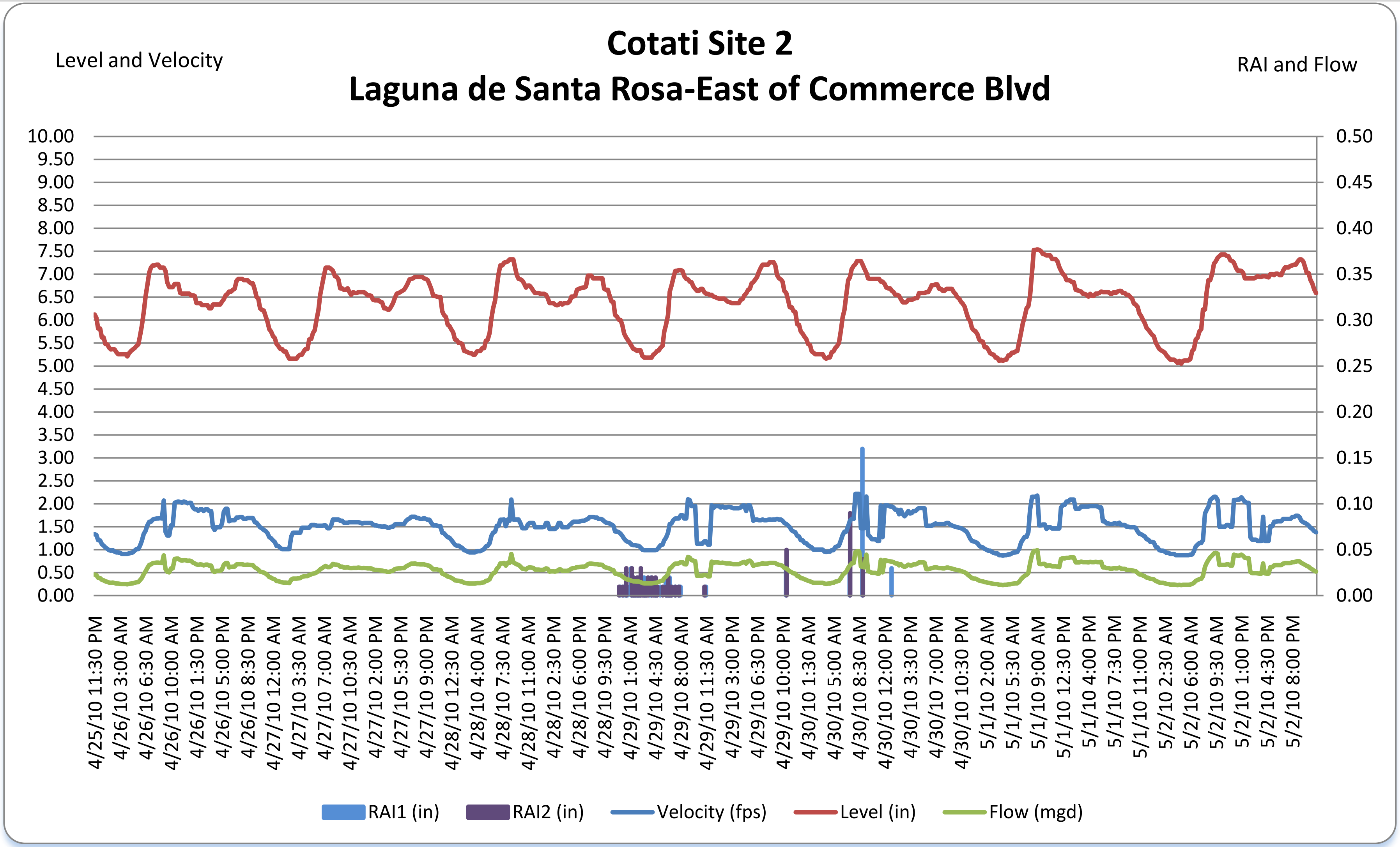
	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.42	6.52	0.55	Total Rain Averaged between Both Gauges	Inches
Maximum	2.23	8.12	1.00		0.84
Minimum	0.68	4.93	0.18		

Week 7 4/19/2010 to 4/25/2010



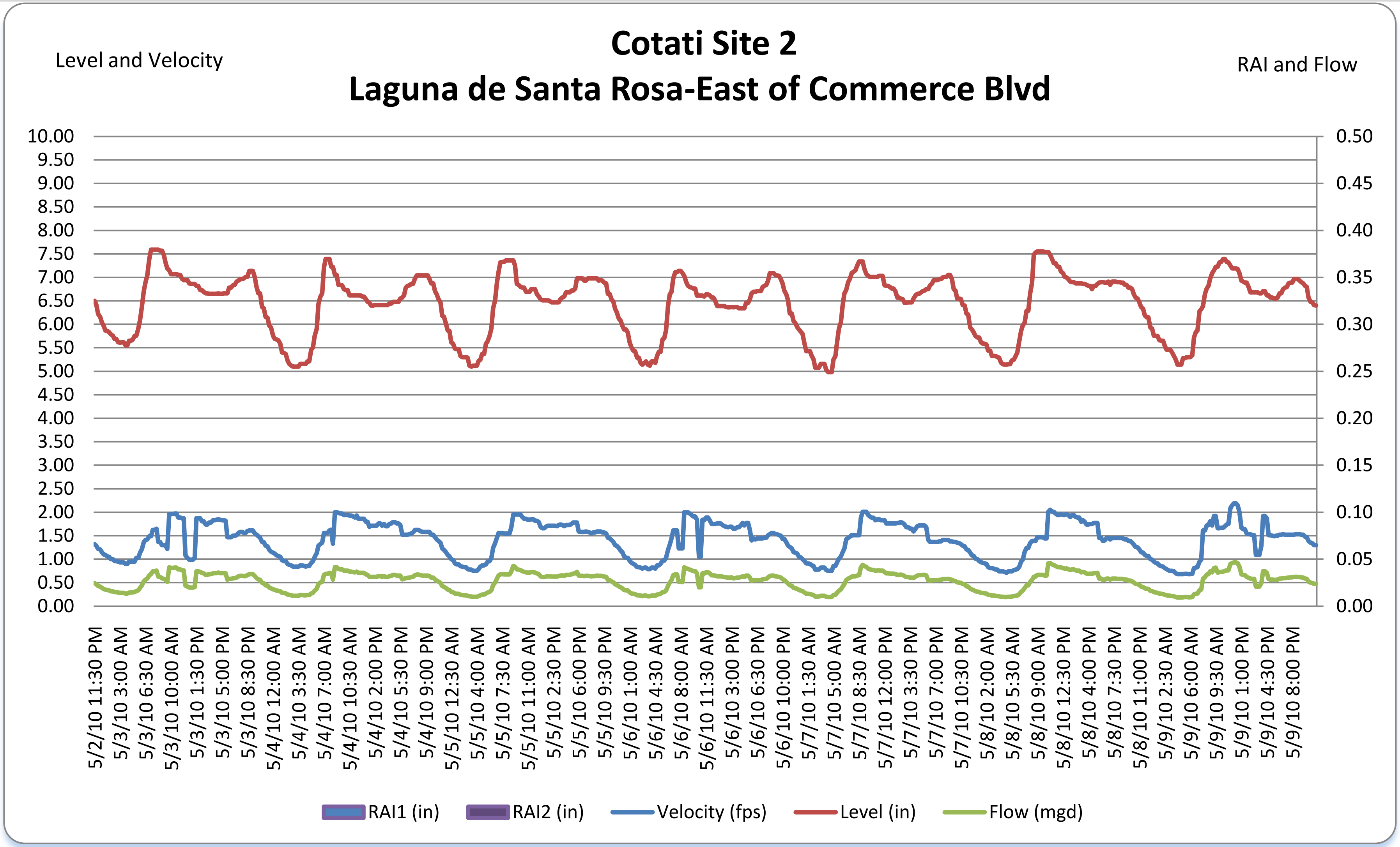
	Velocity (fps)	Level (in)	Flow (mgd)	Total Rain Averaged between Both Gauges	Inches
Average	1.43	6.87	0.58		
Maximum	2.23	8.12	1.00		0.26
Minimum	0.79	5.21	0.26		

Week 8 4/26/2010 to 5/2/2010



	Velocity (fps)	Level (in)	Flow (mgd)		
				Total Rain Averaged between Both Gauges	Inches
Average	1.48	6.36	0.55		0.29
Maximum	2.22	7.54	0.99		
Minimum	0.87	5.05	0.23		

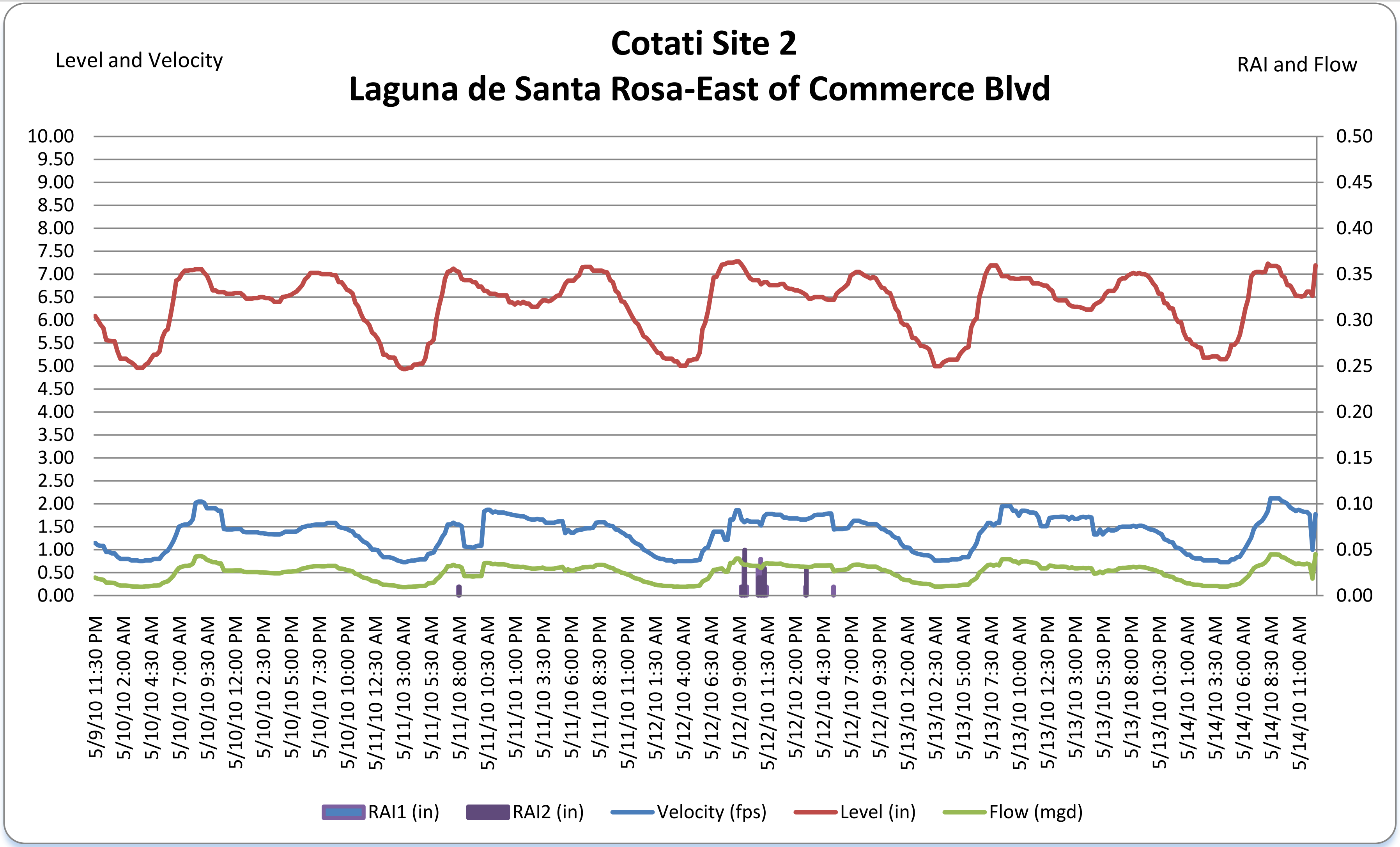
Week 9 5/3/2010 to 5/9/2010



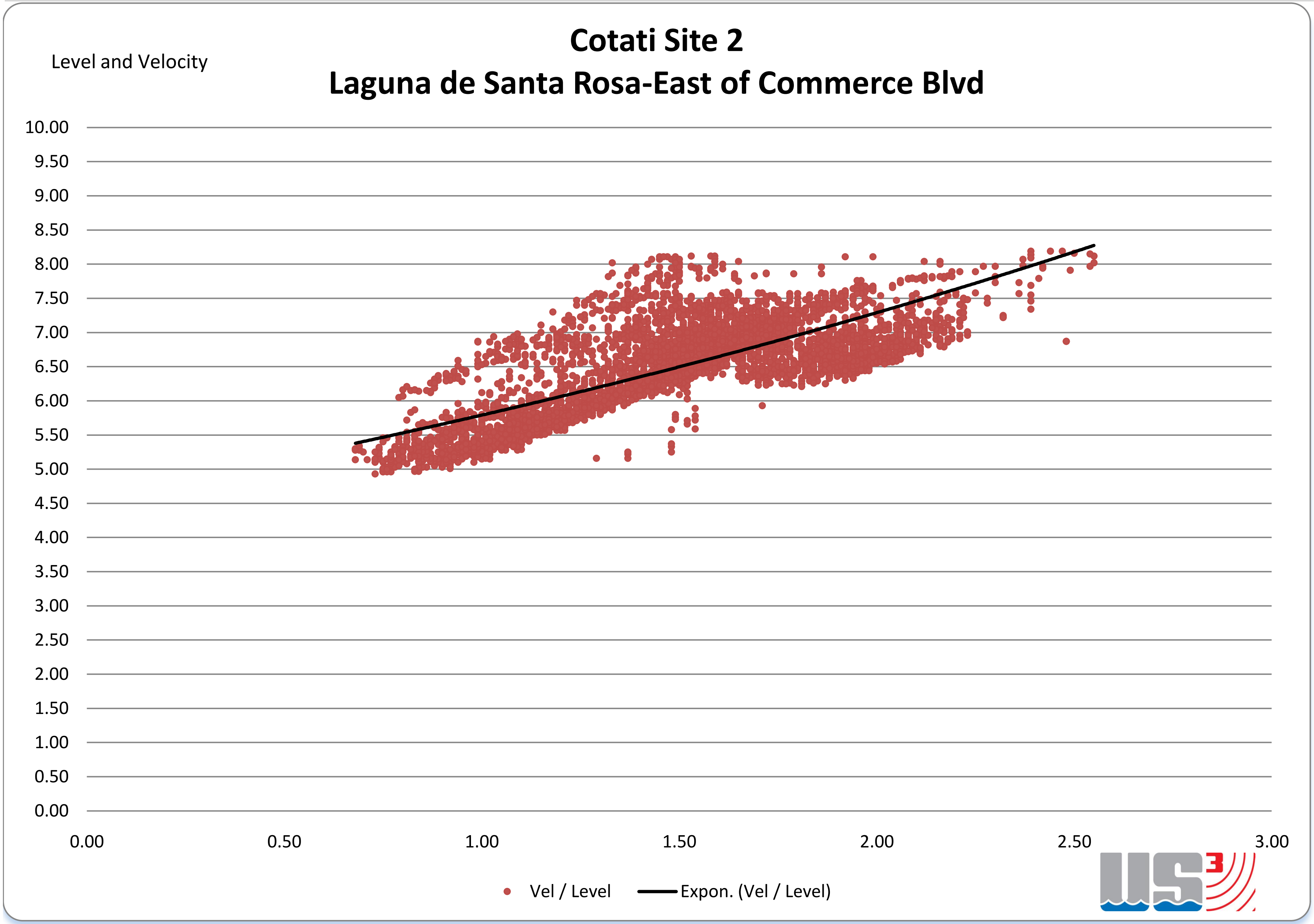
	Velocity (fps)	Level (in)	Flow (mgd)
Average	1.41	6.44	0.53
Maximum	2.19	7.59	0.93
Minimum	0.68	4.98	0.18

Total Rain Averaged between Both Gauges	Inches
	0.00

Week 10 5/10/2010 to 5/14/2010



	Velocity (fps)	Level (in)	Flow (mgd)		
				Total Rain Averaged between Both Gauges	Inches
Average	1.35	6.32	0.50		0.10
Maximum	2.12	7.28	0.90		
Minimum	0.73	4.93	0.19		


Cotati Site 2
Laguna de Santa Rosa-East of Commerce Blvd
Level and Velocity
10.00
9.50
9.00
8.50
8.00
7.50
7.00
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
Vel / Level
Expon. (Vel / Level)

Daily Report Laguna de Santa Rosa-East of Commerce Blvd.

Average Daily MGD	Laguna de Santa Ros				Minimum Daily MGD				Maximum Daily MGD		
Date	Velocity	Level	Flow		Velocity	Level	Flow		Velocity	Level	Flow
3/10/2010	1.57	6.69	0.61		1.44	6.40	0.52		2.48	7.01	0.99
3/11/2010	1.46	6.33	0.53		1.04	5.32	0.30		1.95	7.08	0.72
3/12/2010	1.52	6.54	0.58		1.03	5.32	0.29		1.85	7.19	0.79
3/13/2010	1.57	6.65	0.61		1.20	5.57	0.36		2.14	7.80	1.01
3/14/2010	1.54	6.61	0.60		1.13	5.53	0.34		2.16	7.47	0.96
3/15/2010	1.62	6.44	0.61		1.04	5.36	0.30		2.15	7.11	0.90
3/16/2010	1.58	6.41	0.59		1.01	5.28	0.28		2.15	7.14	0.89
3/17/2010	1.46	6.42	0.54		0.97	5.22	0.27		2.06	7.30	0.78
3/18/2010	1.60	6.42	0.60		1.01	5.43	0.29		2.12	7.14	0.89
3/19/2010	1.52	6.40	0.57		0.92	5.28	0.26		2.13	7.18	0.90
3/20/2010	1.49	6.45	0.56		0.93	5.23	0.26		2.21	7.28	0.94
3/21/2010	1.46	6.47	0.56		0.83	5.33	0.23		2.09	7.54	0.95
3/22/2010	1.54	6.27	0.56		0.90	5.01	0.24		2.19	7.36	0.91
3/23/2010	1.56	6.27	0.57		0.93	5.14	0.25		2.07	6.96	0.83
3/24/2010	1.52	6.29	0.55		0.90	5.04	0.23		2.10	7.22	0.86
3/25/2010	1.40	6.45	0.53		0.91	5.28	0.26		2.03	7.14	0.85
3/26/2010	1.36	6.37	0.50		0.83	5.21	0.25		2.07	7.22	0.89
3/27/2010	1.47	6.38	0.56		0.83	4.97	0.21		2.28	7.53	1.03
3/28/2010	1.46	6.39	0.56		0.81	5.08	0.22		2.36	7.73	1.11
3/29/2010	1.38	6.37	0.51		0.88	5.08	0.23		1.68	7.18	0.71
3/30/2010	1.44	6.32	0.52		0.94	5.10	0.25		1.72	7.01	0.71
3/31/2010	1.61	6.69	0.62		1.04	5.53	0.31		2.05	7.68	0.92
4/1/2010	1.66	6.60	0.64		1.19	5.72	0.37		2.12	7.36	0.85
4/2/2010	1.53	6.68	0.61		0.99	5.46	0.29		1.97	7.30	0.82
4/3/2010	1.59	6.71	0.63		1.16	5.76	0.36		2.32	7.58	1.00
4/4/2010	1.54	6.68	0.61		1.03	5.46	0.30		1.90	7.51	0.86
4/5/2010	1.54	6.70	0.60		1.21	5.78	0.38		1.91	7.40	0.78
4/6/2010	1.52	6.55	0.58		1.04	5.59	0.32		2.23	7.18	0.93
4/7/2010	1.43	6.50	0.54		1.01	5.58	0.31		1.86	7.32	0.81
4/8/2010	1.52	6.46	0.58		0.98	5.29	0.27		2.17	7.14	0.92
4/9/2010	1.47	6.31	0.53		1.00	5.15	0.27		2.02	7.22	0.76
4/10/2010	1.40	6.38	0.52		0.97	5.29	0.27		1.81	7.29	0.75
4/11/2010	1.80	6.94	0.78		0.91	5.28	0.26		2.55	8.19	1.28
4/12/2010	1.80	7.24	0.78		1.50	6.33	0.54		2.16	8.04	1.07
4/13/2010	1.66	6.84	0.66		1.35	6.03	0.45		2.18	7.57	0.88
4/14/2010	1.69	6.68	0.66		1.21	5.78	0.38		2.21	7.46	0.89
4/15/2010	1.68	6.53	0.64		1.11	5.57	0.33		2.19	7.30	0.90
4/16/2010	1.51	6.48	0.57		1.06	5.44	0.31		2.01	7.25	0.81
4/17/2010	1.48	6.52	0.57		0.99	5.39	0.29		2.25	7.58	1.03
4/18/2010	1.56	6.65	0.62		0.98	5.39	0.28		2.20	7.59	1.01
4/19/2010	1.42	6.72	0.56		0.94	5.55	0.28		1.96	7.47	0.84
4/20/2010	1.39	7.24	0.60		1.00	6.09	0.34		1.65	8.12	0.81
4/21/2010	1.27	7.34	0.57		0.88	6.28	0.31		1.61	8.11	0.79
4/22/2010	1.38	7.31	0.61		0.84	6.12	0.29		1.86	8.07	0.91
4/23/2010	1.52	6.67	0.59		0.79	6.05	0.27		2.15	8.11	0.99
4/24/2010	1.54	6.38	0.58		0.94	5.25	0.26		2.23	7.48	1.00
4/25/2010	1.46	6.45	0.55		0.94	5.21	0.26		2.08	7.44	0.87
4/26/2010	1.51	6.31	0.55		0.91	5.21	0.25		2.07	7.21	0.87
4/27/2010	1.50	6.31	0.54		1.01	5.16	0.27		1.72	7.14	0.70

Daily Report

Laguna de Santa Rosa-East of Commerce Blvd.

Average Daily MGD	Laguna de Santa Ros				Minimum Daily MGD				Maximum Daily MGD		
Date	Velocity	Level	Flow		Velocity	Level	Flow		Velocity	Level	Flow
4/28/2010	1.43	6.37	0.53		0.94	5.25	0.26		2.09	7.32	0.91
4/29/2010	1.53	6.37	0.57		0.99	5.18	0.27		2.10	7.26	0.84
4/30/2010	1.49	6.35	0.55		0.95	5.16	0.26		2.22	7.29	0.96
5/1/2010	1.48	6.35	0.55		0.87	5.11	0.23		2.18	7.54	0.99
5/2/2010	1.43	6.48	0.55		0.88	5.05	0.23		2.15	7.43	0.93
5/3/2010	1.43	6.62	0.55		0.90	5.55	0.27		1.97	7.59	0.83
5/4/2010	1.48	6.35	0.55		0.84	5.10	0.22		2.00	7.39	0.83
5/5/2010	1.44	6.42	0.55		0.75	5.10	0.20		1.95	7.36	0.86
5/6/2010	1.41	6.34	0.52		0.79	5.12	0.21		2.00	7.14	0.82
5/7/2010	1.40	6.43	0.53		0.75	4.98	0.19		2.01	7.34	0.88
5/8/2010	1.36	6.48	0.53		0.71	5.14	0.19		2.05	7.55	0.92
5/9/2010	1.34	6.44	0.51		0.68	5.14	0.18		2.19	7.39	0.93
5/10/2010	1.33	6.33	0.49		0.75	4.96	0.19		2.05	7.11	0.86
5/11/2010	1.34	6.31	0.49		0.73	4.93	0.19		1.87	7.16	0.72
5/12/2010	1.38	6.39	0.52		0.73	5.01	0.19		1.86	7.28	0.80
5/13/2010	1.39	6.34	0.51		0.76	5.00	0.20		1.95	7.19	0.79
5/14/2010	1.29	6.17	0.48		0.73	5.15	0.20		2.12	7.23	0.90

Temporary Flow Study

Cotati Site 3 - Near Park

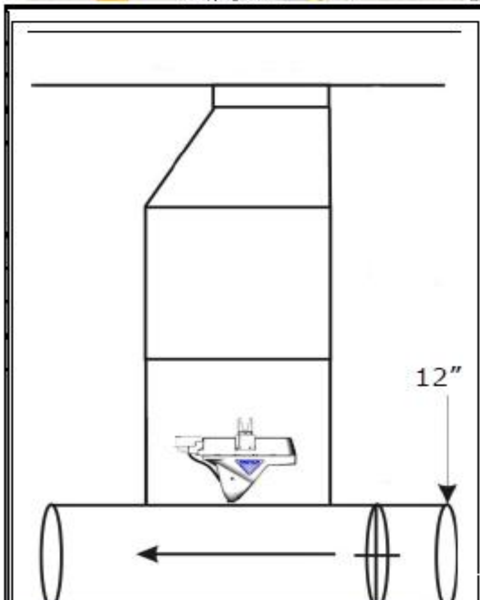
Palletti Park

Utility Systems, Science, and Software
2101 E. 4th Street
Santa Ana, Ca 92705

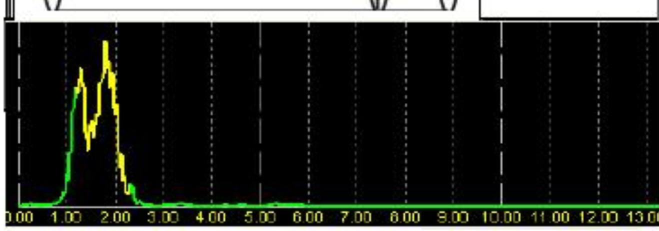
From		To
3/10/2010 11:30		5/14/2010 13:00

METERING SITE DOCUMENT

City:	Cotati
Site Name:	Site 3
Location:	Near park
Access:	Grass
GPS:	N +38° 19' 55.10", W -122° 42' 22.70"
Install Date:	3/10/2010



Pipe Size (inch):	12
Pipe Condition:	Good
Hydraulics:	
Multiplier = 1.00	
Gas	
O_2	Good
HS_2	Good
Manhole Comments:	



Traffic Safety Required:
N/A

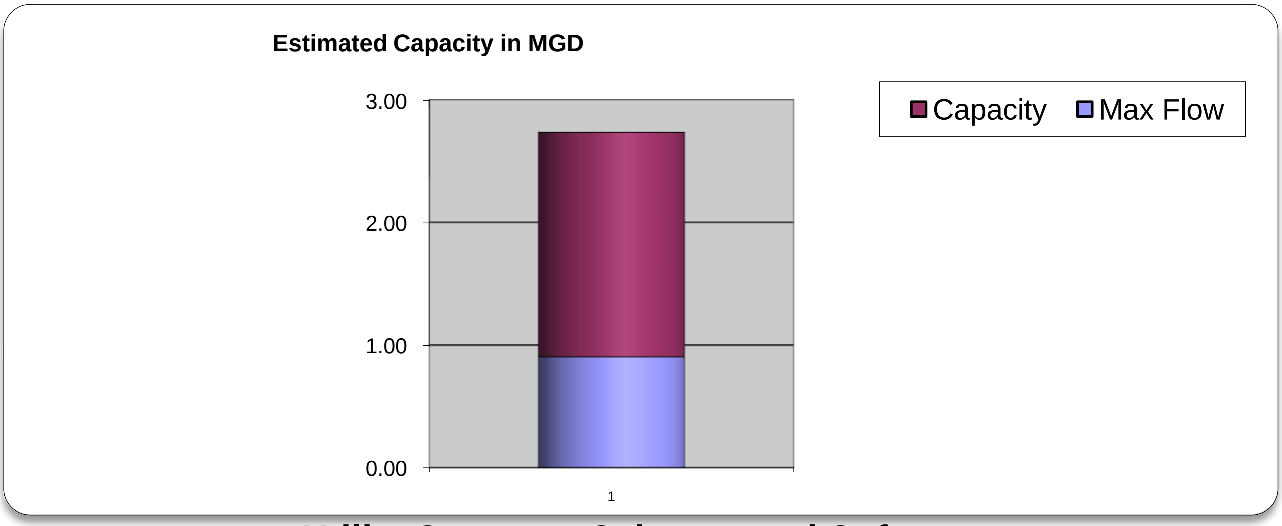
METERING SITE DOCUMENT

Site Pictures

Meter site 3
Temporary Flow Study

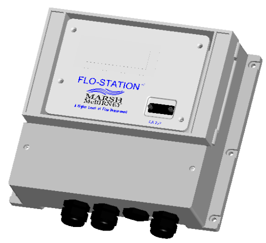
Cotati, CA

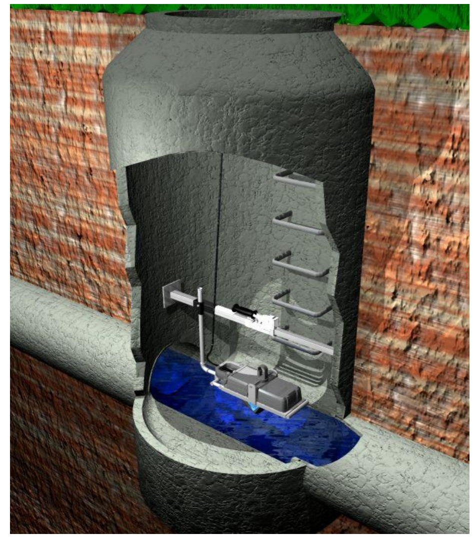
Meter Start Date		From	3/10/2010 11:30
Meter Stop Date		To	5/14/2010 13:00
	Velocity (fps)	Level (in)	Flow (MGD)
Average	1.09	4.11	0.18
Maximum	1.77	7.19	0.90
Minimum	0.57	2.28	0.04
	Pipe Size	12	
	Estimated Capacity	49.42%	
	Sensor Used	Hach - FloDar	
	Comment		



Utility Systems, Science, and Software
2101 E. 4th Street
Santa Ana, Ca 92705

Flo-Dar incorporates a Doppler Radar Velocity Sensor and Ultrasonic Depth Transducer for use in Open Channel Applications. It is available with a Permanent Flo-Station. The Flo-Station is available with or without a display and is powered with 120/240 VAC, or 12 VDC. The Flo-Station requires Flo-Ware software, which is included on some models, and a customer supplied PC. Flo-Station with display shows flow rate, total flow, velocity and level. Both Flo-Station's have four outputs one each for level, velocity, flow rate, surcharge level, and a contact closure. Instruction manuals are included. Mounting Hardware is ordered separately.





Flo-Dar Sensor
Enclosure
Material: Polystyrene
Dimensions: 6.9" W x 16.65" L x 11.7" D
(17.5 cm x 42.3 cm x 29.7 cm)
Weight: 10.5 lbs. (4.8 kg)

Temperature
Operating Range: 14° F to 122°F
(-10° C to 50° C)
Storage Range: -40° F to 140° F
(-40° C to 60° C)

Velocity Measurement
Method: Radar
Range: 0.75 to 20 ft/s (0.23 m/s to 6.10 m/s)
Accuracy: ±0.5%; ±0.1 ft/s (±0.03 m/s)

Level Measurement
Method: Ultrasonic
Standard Operating Range:
0.25 to 60 in. (0.634 to 152.4 cm)
Optional Operating Range: 0 (0 cm) to 240" (6.1 m)
(with 18" dead band)
Temperature Compensated
Accuracy: ±0.1 in. (±0.25 cm)
1% Accuracy

Surcharge Conditions Level/Velocity
Level
Method: Piezo-resistive pressure transducer
Maximum Range: 138 inches (3.5 meters)
Velocity
Method: Electromagnetic
Range: -5 to +20 ft/s (-1.5 to +6.1 m/s)

Flow Measurement
Based on Continuity Equation.
Accuracy: ±5.0% of reading typical where flow is in a channel with uniform flow conditions and is not surcharged.

Flo-Station Monitor
Data Storage
64K (16K cycles of velocity/level data)
Local Terminal
RS232C at 19.2K baud

Timebase Accuracy: 1 second per day

Outputs: Four 4-20 mA outputs; system-isolated, up to 600Ω load. Each output is selectable between FLOW, LEVEL, VELOCITY OR SURCHARGE LEVEL.

Power Requirements
AC: 85-264 VAC, 47-63 Hz. 32 watts
DC: 12 VDC for Flo-Station without Display or Flo-Station with Display (Backlight Off)
180 mA (2.1 watts) with (1) 4-20 mA utilized.

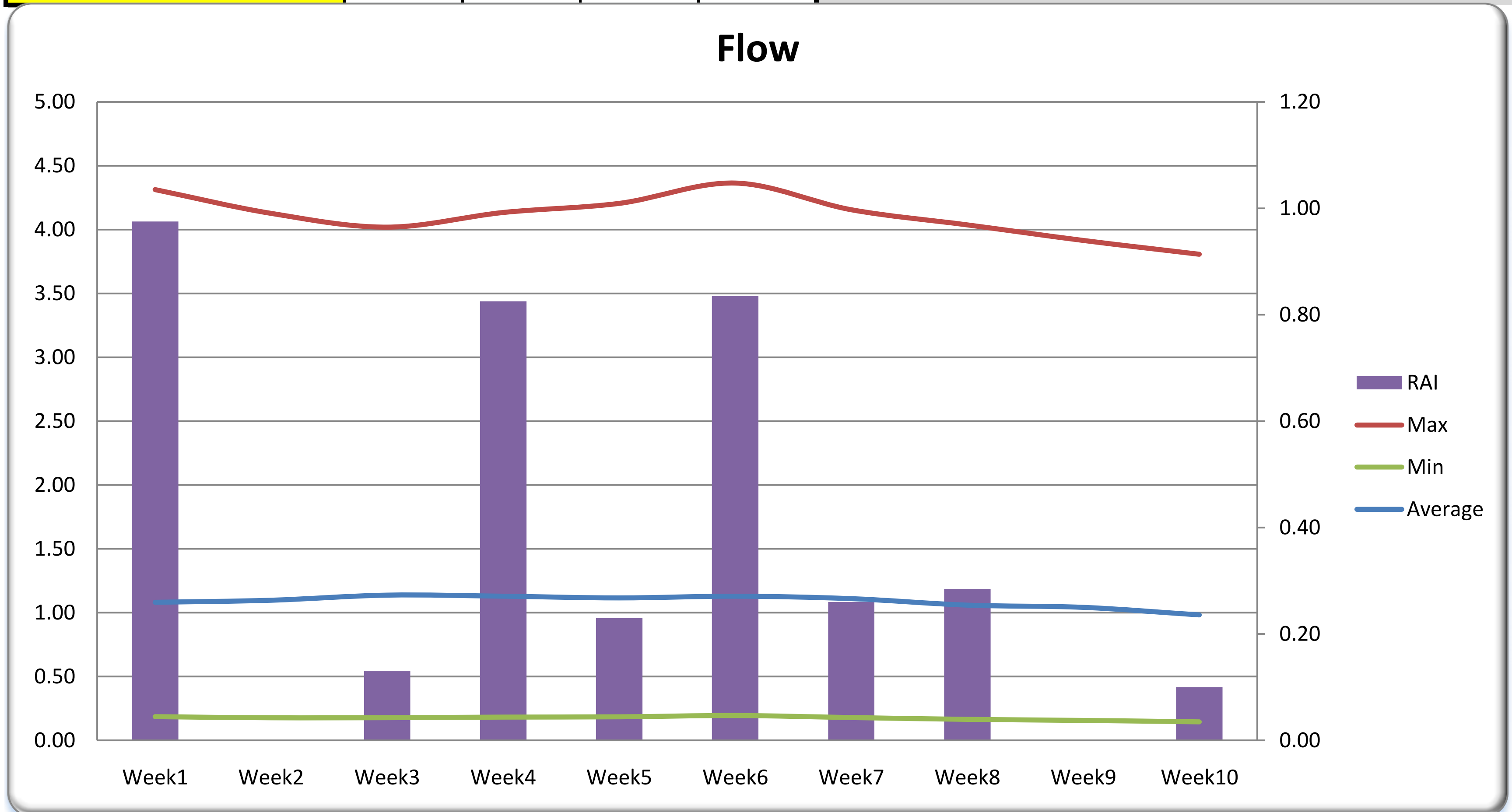
Housing
Material: ABS Plastic, NEMA 4
Dimensions: 10.2" W x 9.3" H x 4" D
(25.9 cm W x 23.6 cm H x 10.2 cm D)
Weight: 5 lbs.
Temperature Operating Range: 14° F to 122° F
(-10° C to 50° C)
Temperature Storage Range:
(without display) -40°F to 140°F (-40°C to 60°C)
(with display) 4°F to 140°F (-20°C to 60°C) w/Display

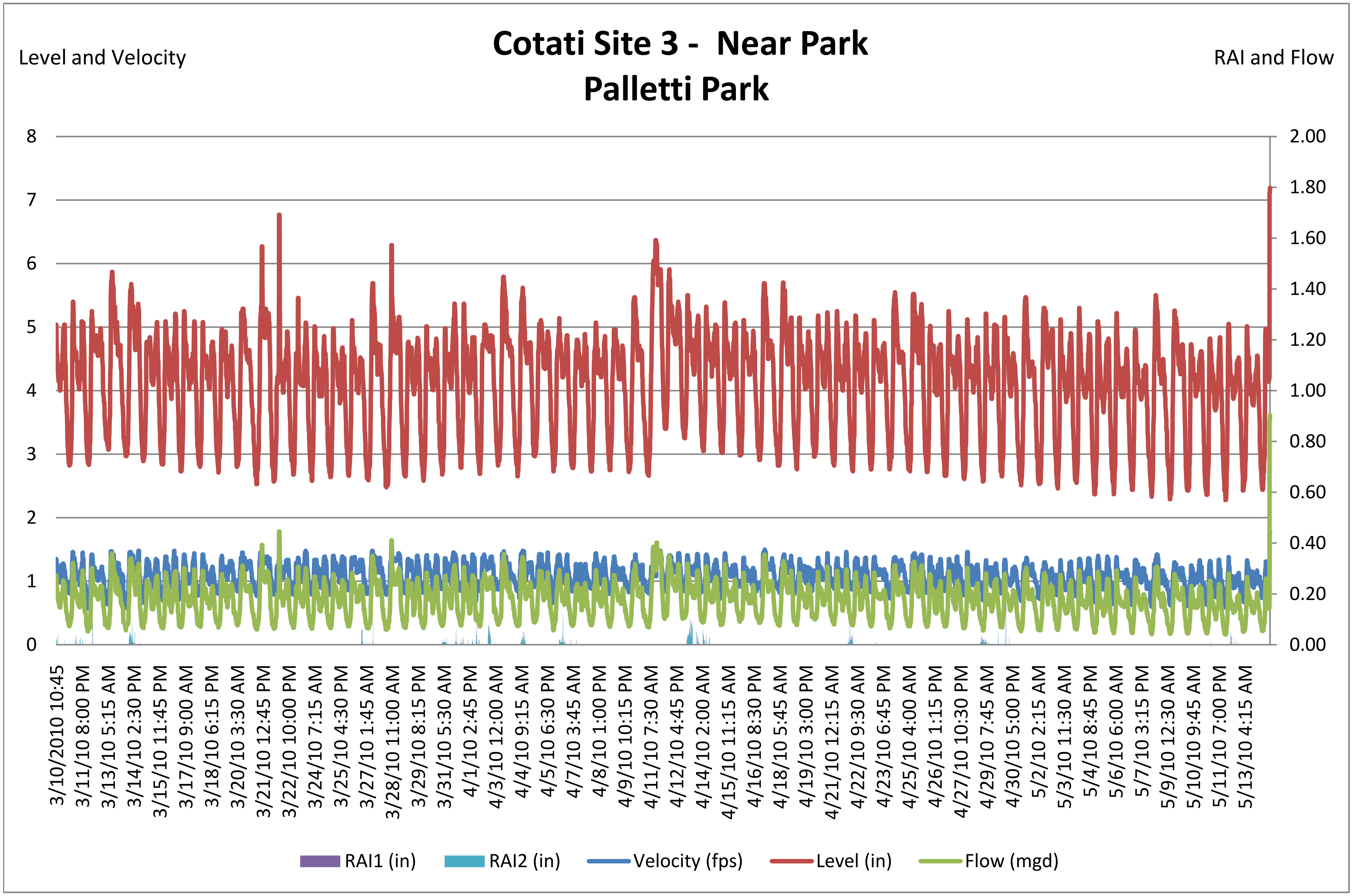
Flow Review

	Average	Max	Min	RAI
Week1	1.08	4.31	0.19	0.98
Week2	1.10	4.13	0.18	0.00
Week3	1.14	4.02	0.18	0.13
Week4	1.13	4.13	0.18	0.83
Week5	1.12	4.20	0.19	0.23
Week6	1.13	4.36	0.20	0.84
Week7	1.11	4.15	0.18	0.26
Week8	1.06	4.04	0.17	0.29
Week9	1.04	3.91	0.16	0.00
Week10	0.98	3.81	0.15	0.10

Cotati Site 3 - Near Park

Palletti Park




Cotati Site 3 - Near Park
Palletti Park
Level and Velocity
RAI and Flow
8
7
6
5
4
3
2
1
0
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
3/10/2010 10:45
3/11/10 8:00 PM
3/13/10 5:15 AM
3/14/10 2:30 PM
3/15/10 11:45 PM
3/17/10 9:00 AM
3/18/10 6:15 PM
3/20/10 3:30 AM
3/21/10 12:45 PM
3/22/10 10:00 PM
3/24/10 7:15 AM
3/25/10 4:30 PM
3/27/10 1:45 AM
3/28/10 11:00 AM
3/29/10 8:15 PM
3/31/10 5:30 AM
4/1/10 2:45 PM
4/3/10 12:00 AM
4/4/10 9:15 AM
4/5/10 6:30 PM
4/7/10 3:45 AM
4/8/10 1:00 PM
4/9/10 10:15 PM
4/11/10 7:30 AM
4/12/10 4:45 PM
4/14/10 2:00 AM
4/15/10 11:15 AM
4/16/10 8:30 PM
4/18/10 5:45 AM
4/19/10 3:00 PM
4/21/10 12:15 AM
4/22/10 9:30 AM
4/23/10 6:45 PM
4/25/10 4:00 AM
4/26/10 1:15 PM
4/27/10 10:30 PM
4/29/10 7:45 AM
4/30/10 5:00 PM
5/2/10 2:15 AM
5/3/10 11:30 AM
5/4/10 8:45 PM
5/6/10 6:00 AM
5/7/10 3:15 PM
5/9/10 12:30 AM
5/10/10 9:45 AM
5/11/10 7:00 PM
5/13/10 4:15 AM
RAI1 (in)
RAI2 (in)
Velocity (fps)
Level (in)
Flow (mgd)

Rainlog Rainfall Report		By Day Report
City Hall Site	**Total**	**6.10**
	Max	**1.37**
	Average	**0.09**
Date	***Rainfall***	***Comments***
3/8/10 0:00	0.04	
3/9/10 0:00	0.04	
3/10/10 0:00	0.15	
3/11/10 0:00	0.00	
3/12/10 0:00	0.55	
3/13/10 0:00	0.00	
3/14/10 0:00	0.00	
3/15/10 0:00	0.00	
3/16/10 0:00	0.00	
3/17/10 0:00	0.00	
3/18/10 0:00	0.00	
3/19/10 0:00	0.00	
3/20/10 0:00	0.00	
3/21/10 0:00	0.00	
3/22/10 0:00	0.00	
3/23/10 0:00	0.00	
3/24/10 0:00	0.25	
3/25/10 0:00	0.01	
3/26/10 0:00	0.00	
3/27/10 0:00	0.00	
3/28/10 0:00	0.00	
3/29/10 0:00	0.23	
3/30/10 0:00	0.34	
3/31/10 0:00	0.69	
4/1/10 0:00	0.00	
4/2/10 0:00	0.39	
4/3/10 0:00	0.00	
4/4/10 0:00	0.41	
4/5/10 0:00	0.05	
4/6/10 0:00	0.00	
4/7/10 0:00	0.00	
4/8/10 0:00	0.00	
4/9/10 0:00	0.00	
4/10/10 0:00	0.00	
4/11/10 0:00	1.37	
4/12/10 0:00	0.30	
4/13/10 0:00	0.00	
4/14/10 0:00	0.00	
4/15/10 0:00	0.00	
4/16/10 0:00	0.00	
4/17/10 0:00	0.00	
4/18/10 0:00	0.00	
4/19/10 0:00	0.21	
4/20/10 0:00	0.30	
4/21/10 0:00	0.01	
4/22/10 0:00	0.00	
4/23/10 0:00	0.00	
4/24/10 0:00	0.00	

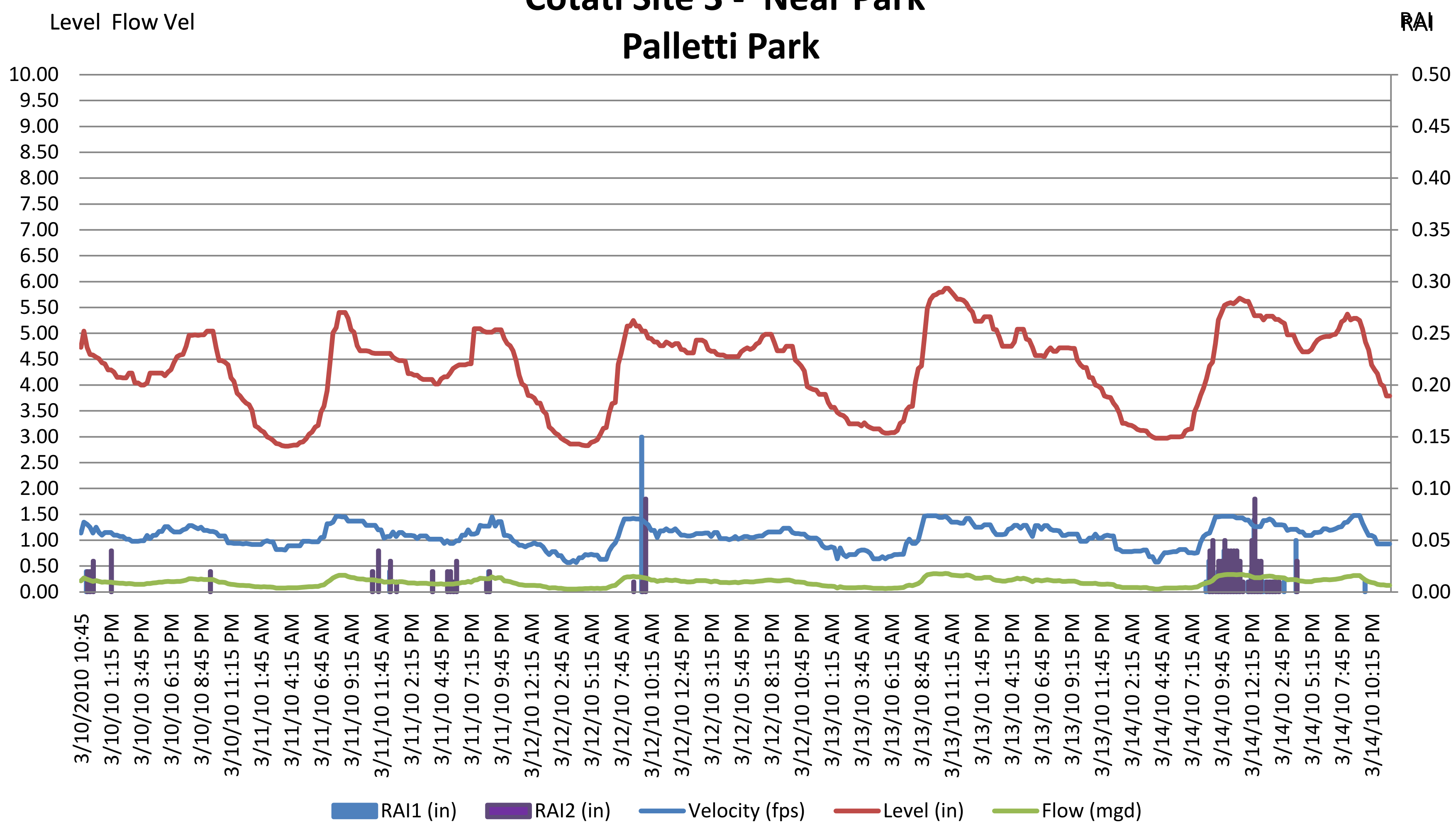
Rainlog Rainfall Report		By Day Report
City Hall Site	**Total**	**6.10**
	Max	**1.37**
	Average	**0.09**
Date	***Rainfall***	***Comments***
4/25/10 0:00	0.00	
4/26/10 0:00	0.00	
4/27/10 0:00	0.35	
4/28/10 0:00	0.22	
4/29/10 0:00	0.00	
4/30/10 0:00	0.00	
5/1/10 0:00	0.00	
5/2/10 0:00	0.00	
5/3/10 0:00	0.00	
5/4/10 0:00	0.00	
5/5/10 0:00	0.00	
5/6/10 0:00	0.00	
5/7/10 0:00	0.00	
5/8/10 0:00	0.00	
5/9/10 0:00	0.01	
5/10/10 0:00	0.18	
5/11/10 0:00	0.00	
5/12/10 0:00	0.00	
5/13/10 0:00	0.00	
5/14/10 0:00	0.00	

Rainlog Rainfall Report		By Day Report
North Pump Station	Total	6.82
	Max	1.58
	Average	0.10
Date	*Rainfall*	*Comments*
3/8/10 0:00	0.13	
3/9/10 0:00	0.23	
3/10/10 0:00	0.11	
3/11/10 0:00	0.00	
3/12/10 0:00	0.70	
3/13/10 0:00	0.00	
3/14/10 0:00	0.00	
3/15/10 0:00	0.00	
3/16/10 0:00	0.00	
3/17/10 0:00	0.00	
3/18/10 0:00	0.00	
3/19/10 0:00	0.00	
3/20/10 0:00	0.00	
3/21/10 0:00	0.00	
3/22/10 0:00	0.00	
3/23/10 0:00	0.00	
3/24/10 0:00	0.23	
3/25/10 0:00	0.13	
3/26/10 0:00	0.00	
3/27/10 0:00	0.00	
3/28/10 0:00	0.00	
3/29/10 0:00	0.29	
3/30/10 0:00	0.20	
3/31/10 0:00	0.75	
4/1/10 0:00	0.00	
4/2/10 0:00	0.48	
4/3/10 0:00	0.00	
4/4/10 0:00	0.47	
4/5/10 0:00	0.02	
4/6/10 0:00	0.00	
4/7/10 0:00	0.00	
4/8/10 0:00	0.00	
4/9/10 0:00	0.00	
4/10/10 0:00	0.00	
4/11/10 0:00	1.58	
4/12/10 0:00	0.27	
4/13/10 0:00	0.00	
4/14/10 0:00	0.00	
4/15/10 0:00	0.00	
4/16/10 0:00	0.00	
4/17/10 0:00	0.00	
4/18/10 0:00	0.00	
4/19/10 0:00	0.21	
4/20/10 0:00	0.26	
4/21/10 0:00	0.01	
4/22/10 0:00	0.00	
4/23/10 0:00	0.00	
4/24/10 0:00	0.00	

Rainlog Rainfall Report		By Day Report
North Pump Station	Total	6.82
	Max	1.58
	Average	0.10
Date	*Rainfall*	*Comments*
4/25/10 0:00	0.00	
4/26/10 0:00	0.01	
4/27/10 0:00	0.42	
4/28/10 0:00	0.13	
4/29/10 0:00	0.00	
4/30/10 0:00	0.00	
5/1/10 0:00	0.00	
5/2/10 0:00	0.00	
5/3/10 0:00	0.00	
5/4/10 0:00	0.00	
5/5/10 0:00	0.00	
5/6/10 0:00	0.00	
5/7/10 0:00	0.00	
5/8/10 0:00	0.00	
5/9/10 0:00	0.01	
5/10/10 0:00	0.16	
5/11/10 0:00	0.00	
5/12/10 0:00	0.00	
5/13/10 0:00	0.02	
5/14/10 0:00	0.00	

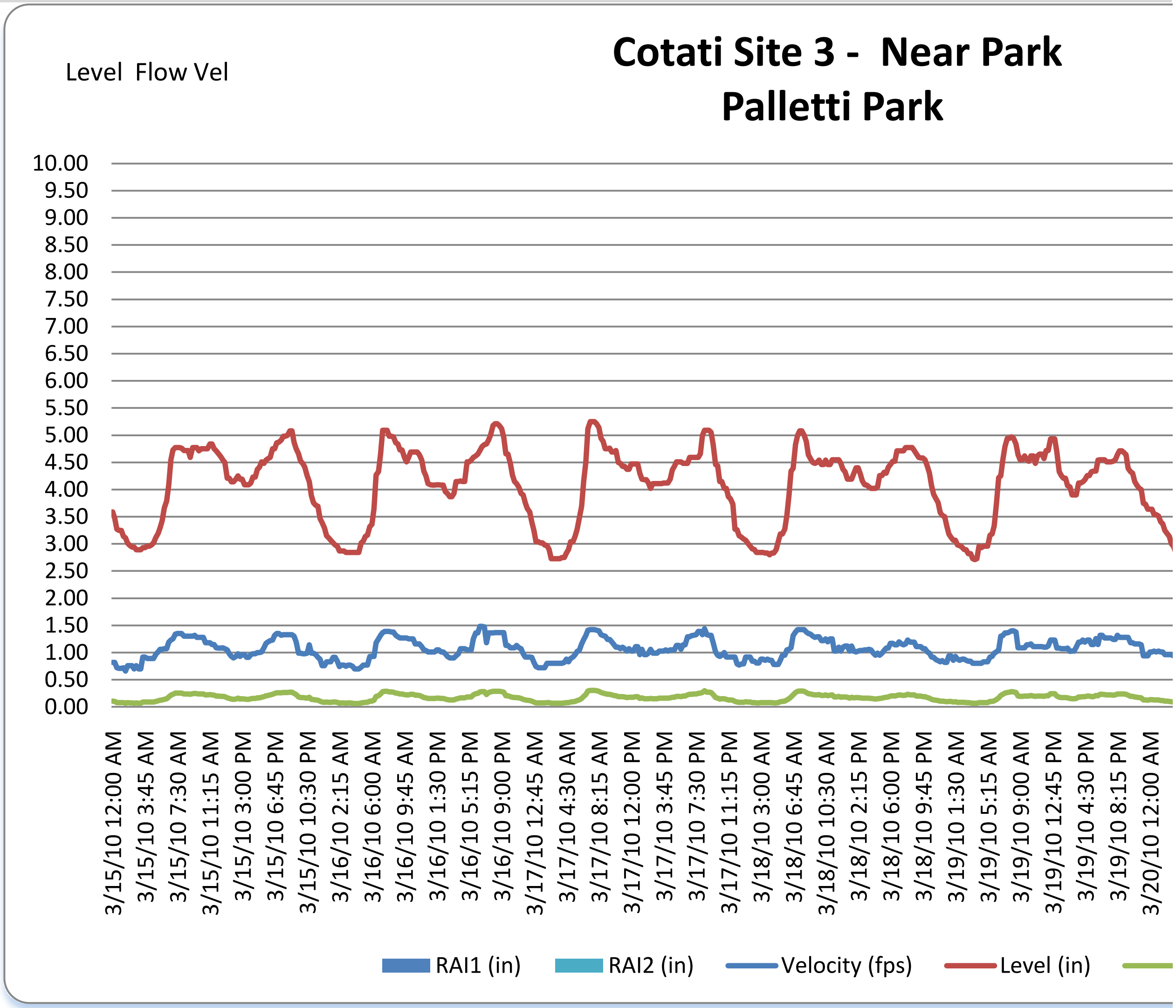
Week 1 3/10/2010 to 3/14/2010

Cotati Site 3 - Near Park
Palletti Park

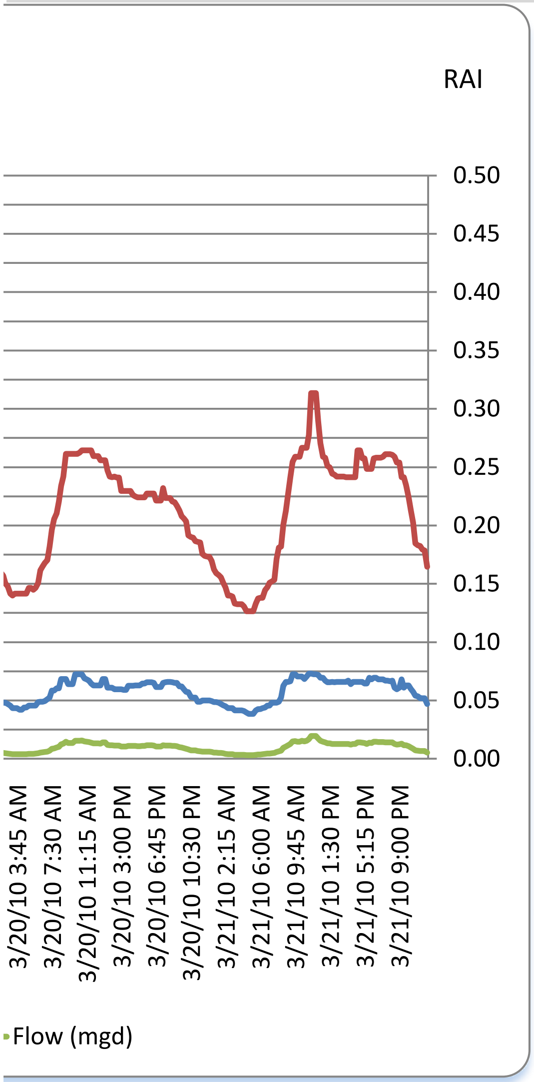


	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.08	4.31	0.19	Total Rain Averaged between Both Gauges	Inches
Maximum	1.48	5.87	0.36		0.98
Minimum	0.57	2.82	0.05		

Week 2 3/15/2010 to 3/21/2010



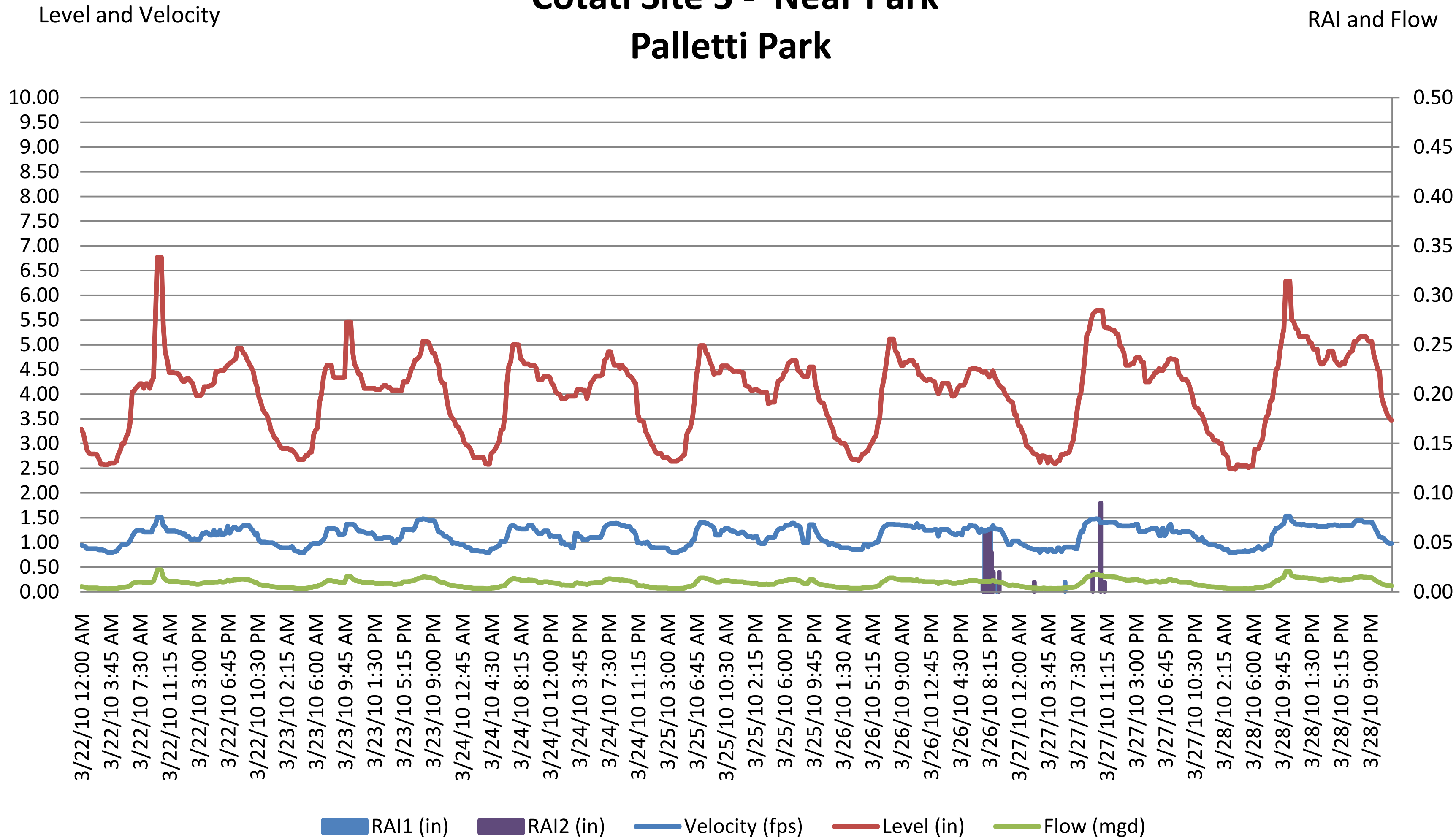
	Velocity (fps)	Level (in)	Flow (mgd)	Total Rain Averaged between Both Gauges	Inches
Average	1.10	4.13	0.18		
Maximum	1.48	6.27	0.39		
Minimum	0.66	2.53	0.06		0.00



RAI
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
3/20/10 3:45 AM
3/20/10 7:30 AM
3/20/10 11:15 AM
3/20/10 3:00 PM
3/20/10 6:45 PM
3/20/10 10:30 PM
3/21/10 2:15 AM
3/21/10 6:00 AM
3/21/10 9:45 AM
3/21/10 1:30 PM
3/21/10 5:15 PM
3/21/10 9:00 PM
Flow (mgd)

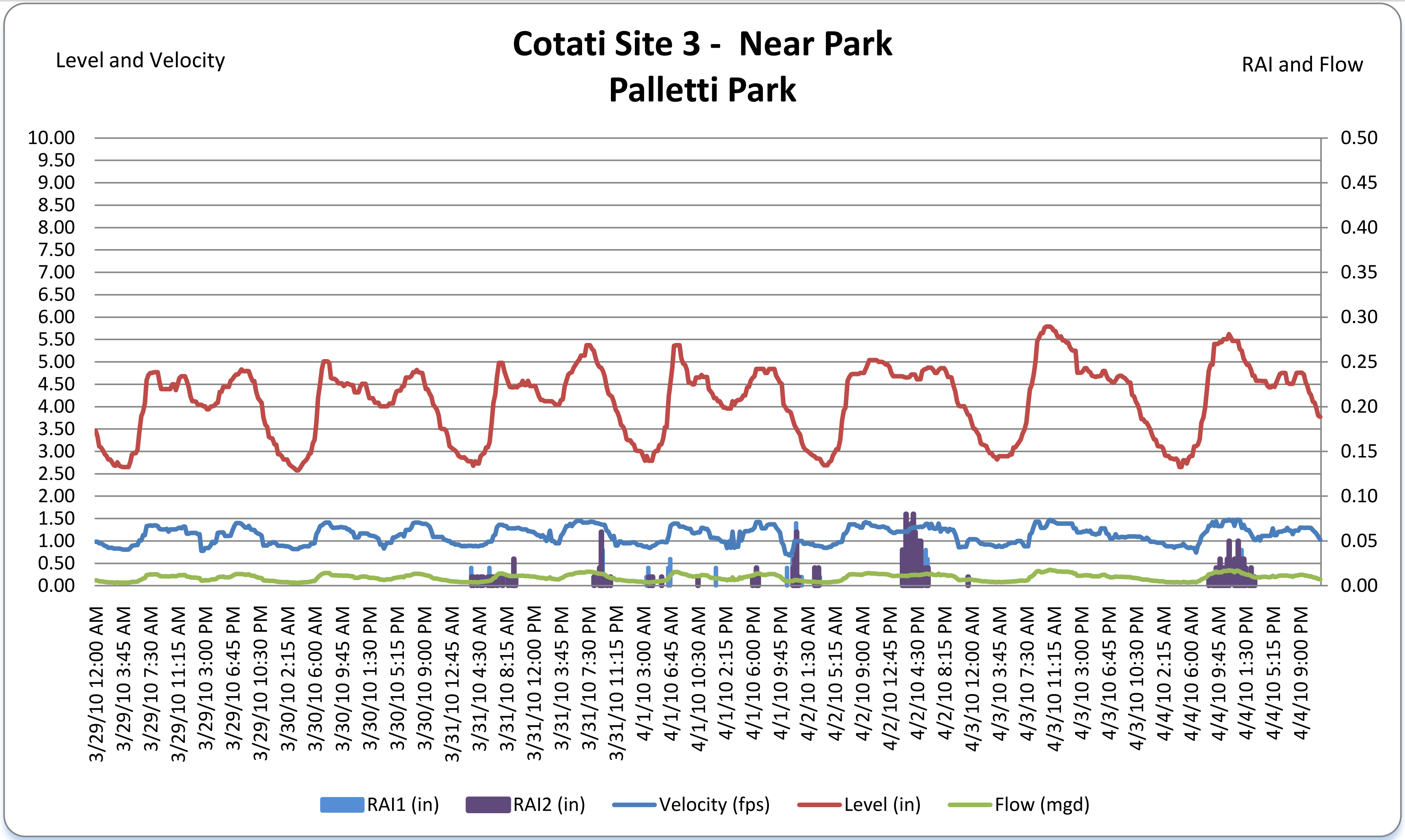
Week 3 3/22/2010 to 3/28/2010

Cotati Site 3 - Near Park
Palletti Park



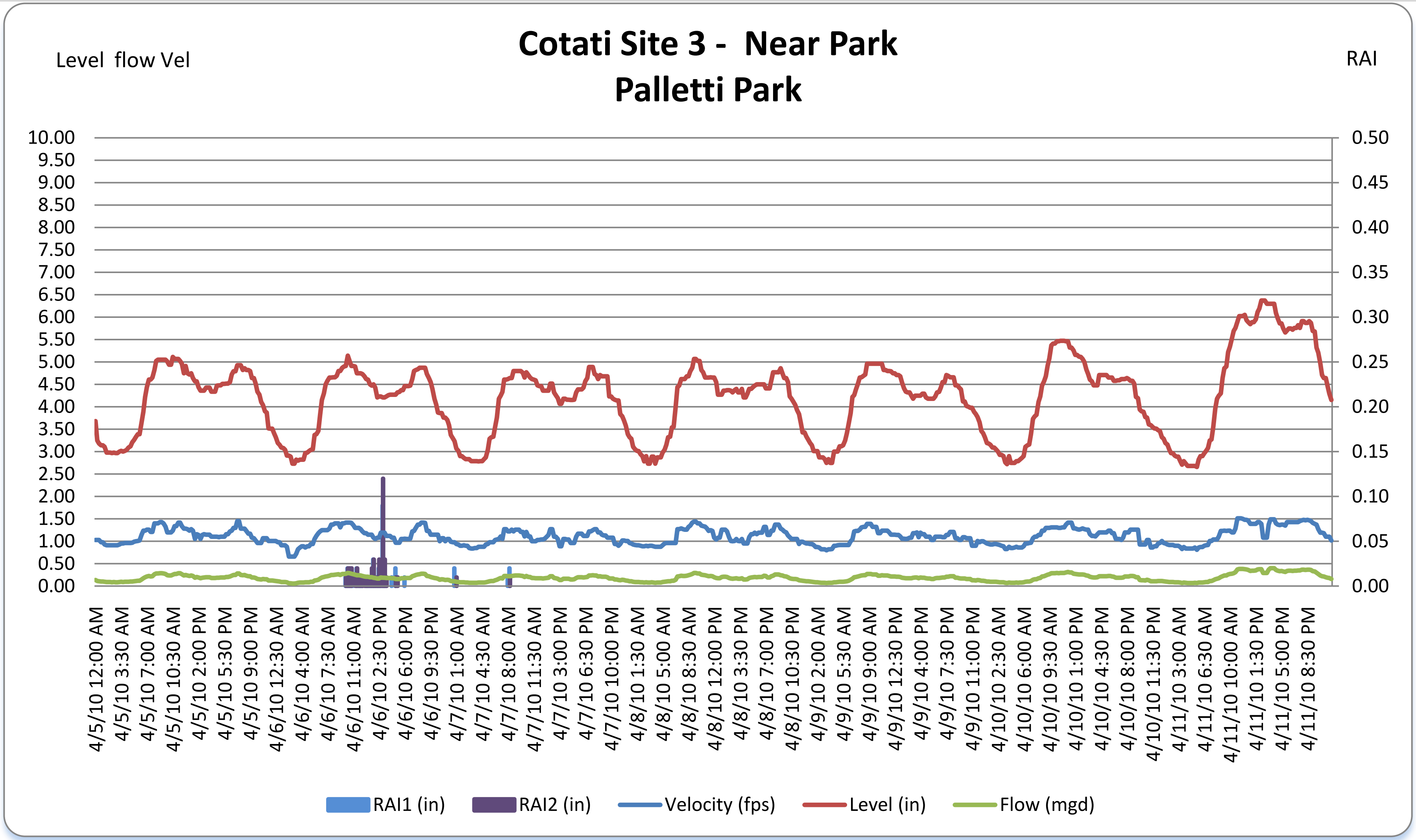
	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.14	4.02	0.18	Total Rain Averaged between Both Gauges	Inches
Maximum	1.53	6.77	0.45		0.13
Minimum	0.79	2.48	0.06		

Week 4 3/29/2010 to 4/4/2010



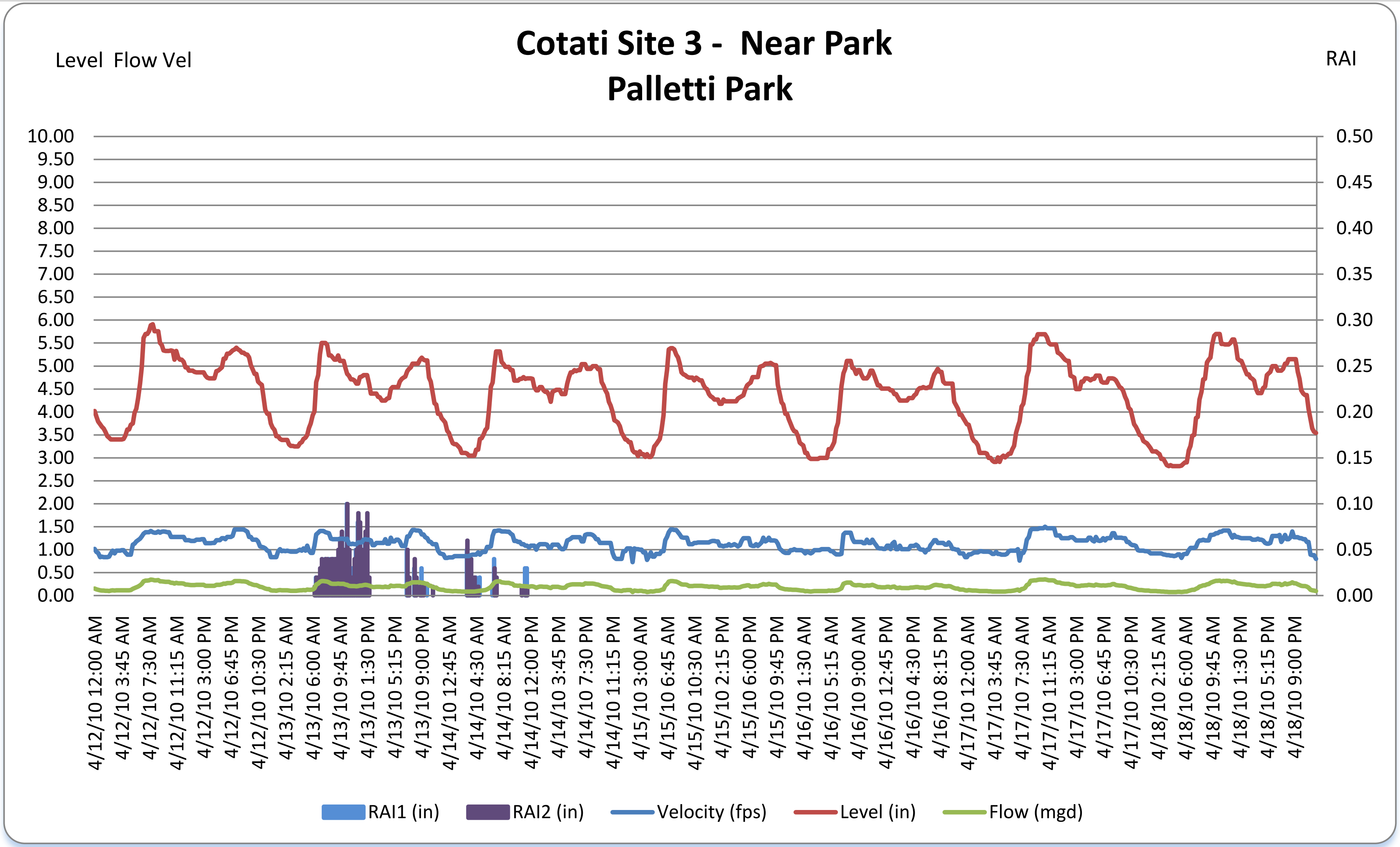
	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.13	4.13	0.18	Total Rain Averaged between Both Gauges	Inches
Maximum	1.48	5.79	0.36		0.83
Minimum	0.68	2.58	0.07		

Week 5 4/4/2010 to 4/11/2010



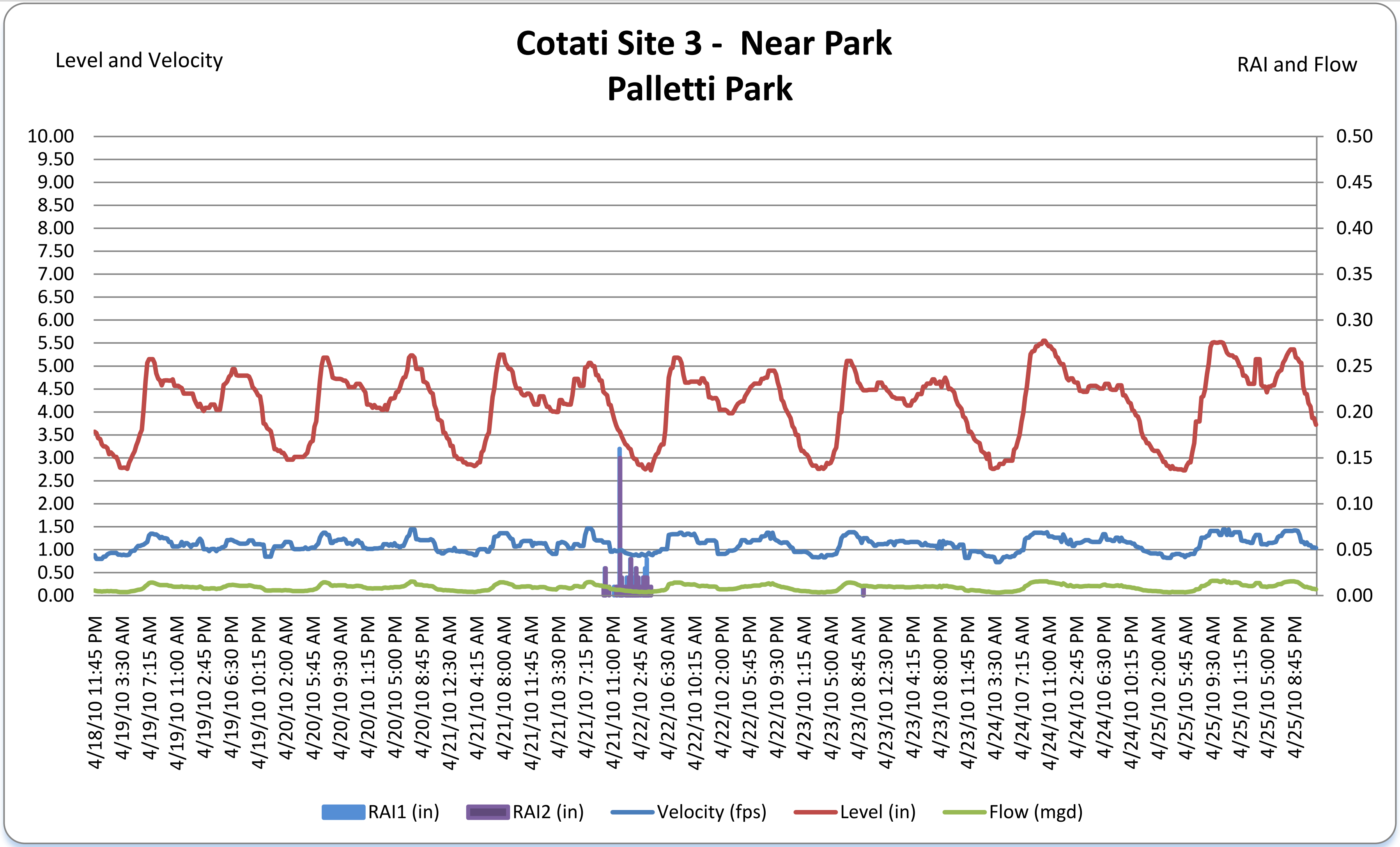
	Velocity (fps)	Level (in)	Flow (mgd)	Total Rain Averaged between Both Gauges	Inches
Average	1.12	4.20	0.19		
Maximum	1.51	6.37	0.40		0.23
Minimum	0.66	2.66	0.06		

Week 6 4/12/2010 to 4/18/2010



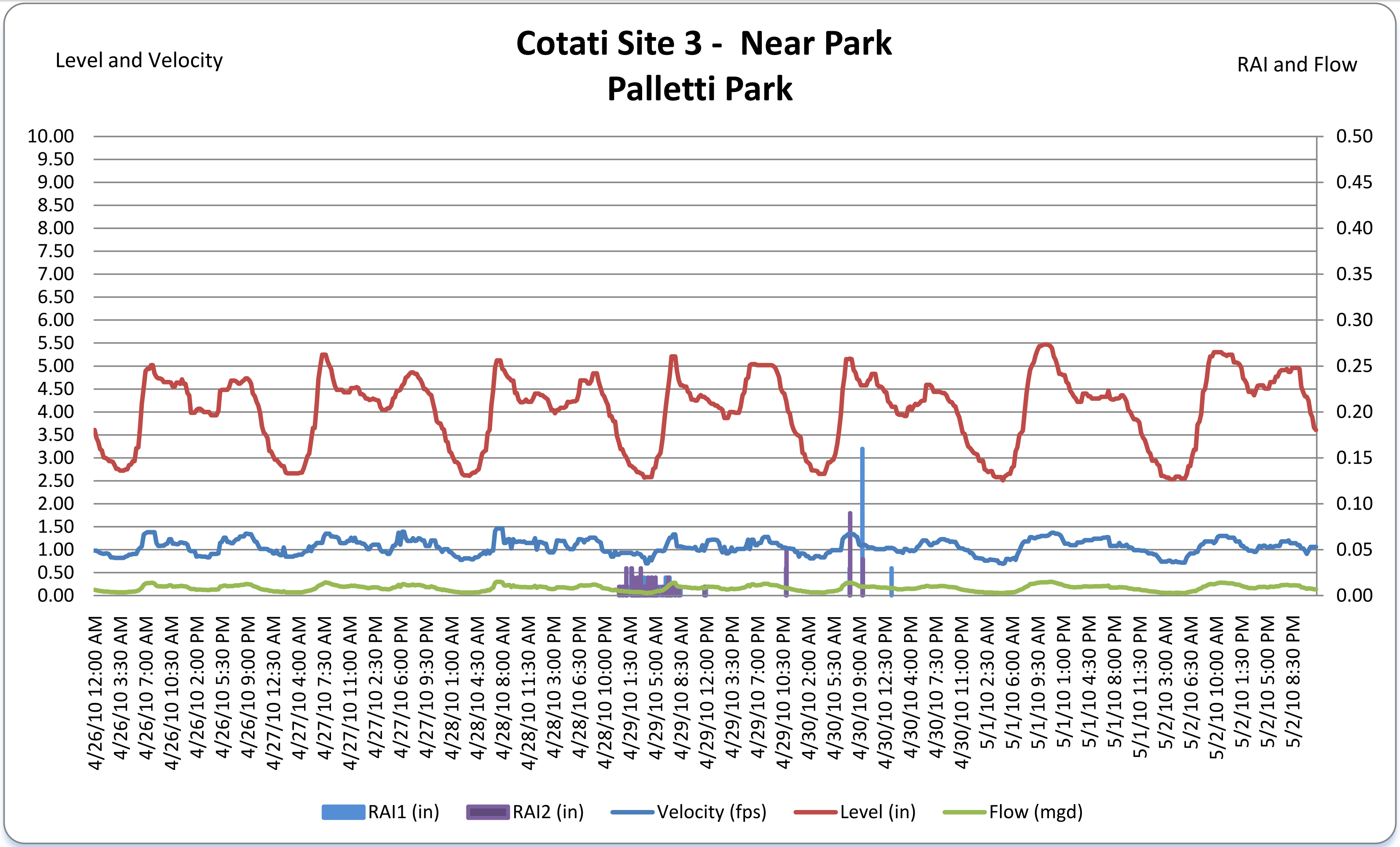
	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.13	4.36	0.20	Total Rain Averaged between Both Gauges	Inches
Maximum	1.50	5.91	0.36		0.84
Minimum	0.73	2.82	0.08		

Week 7 4/19/2010 to 4/25/2010



	Velocity (fps)	Level (in)	Flow (mgd)		
				Total Rain Averaged between Both Gauges	Inches
Average	1.11	4.15	0.18		
Maximum	1.46	5.55	0.33		0.26
Minimum	0.73	2.73	0.07		

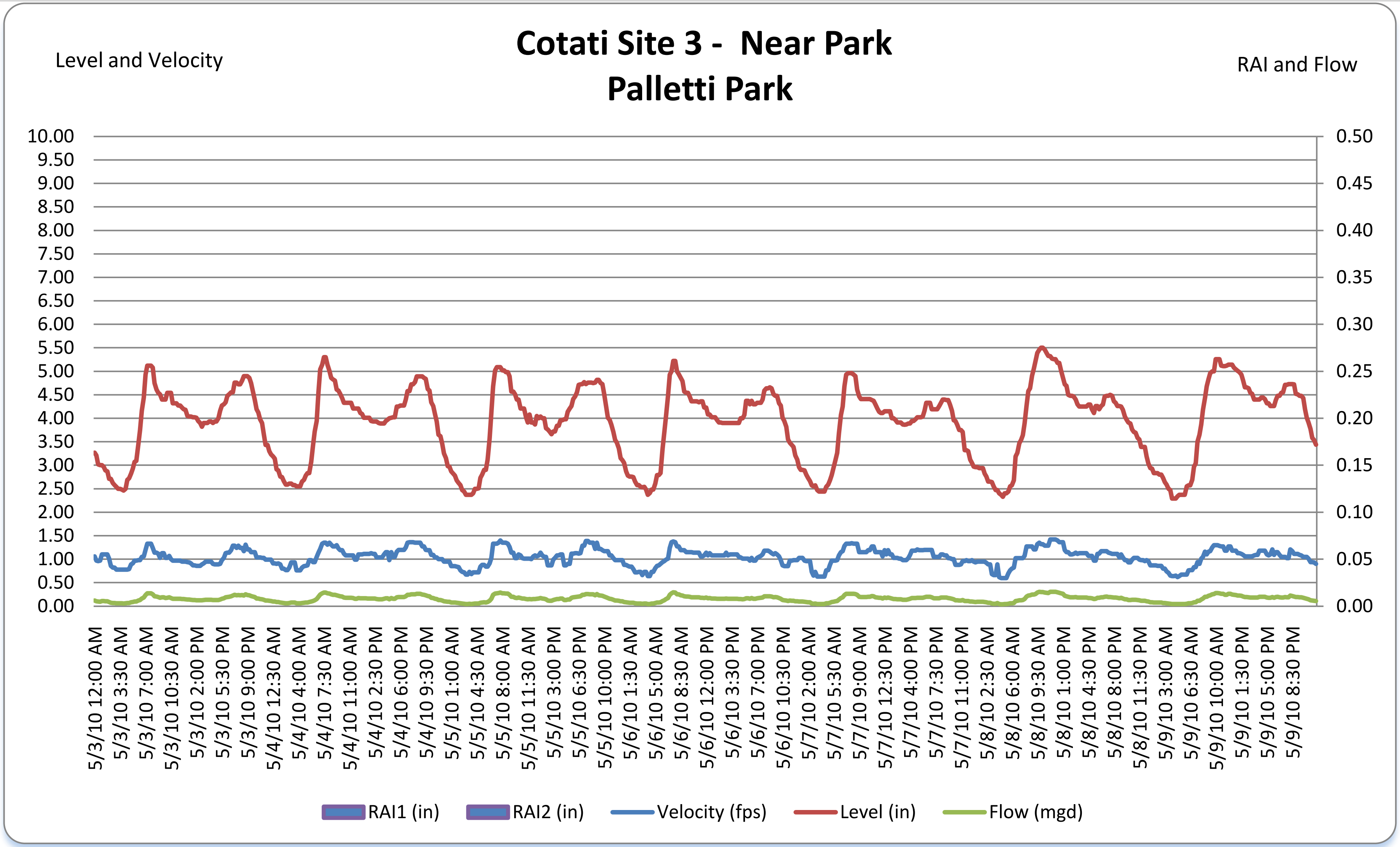
Week 8 4/26/2010 to 5/2/2010



	Velocity (fps)	Level (in)	Flow (mgd)
Average	1.06	4.04	0.17
Maximum	1.46	5.47	0.30
Minimum	0.69	2.51	0.05

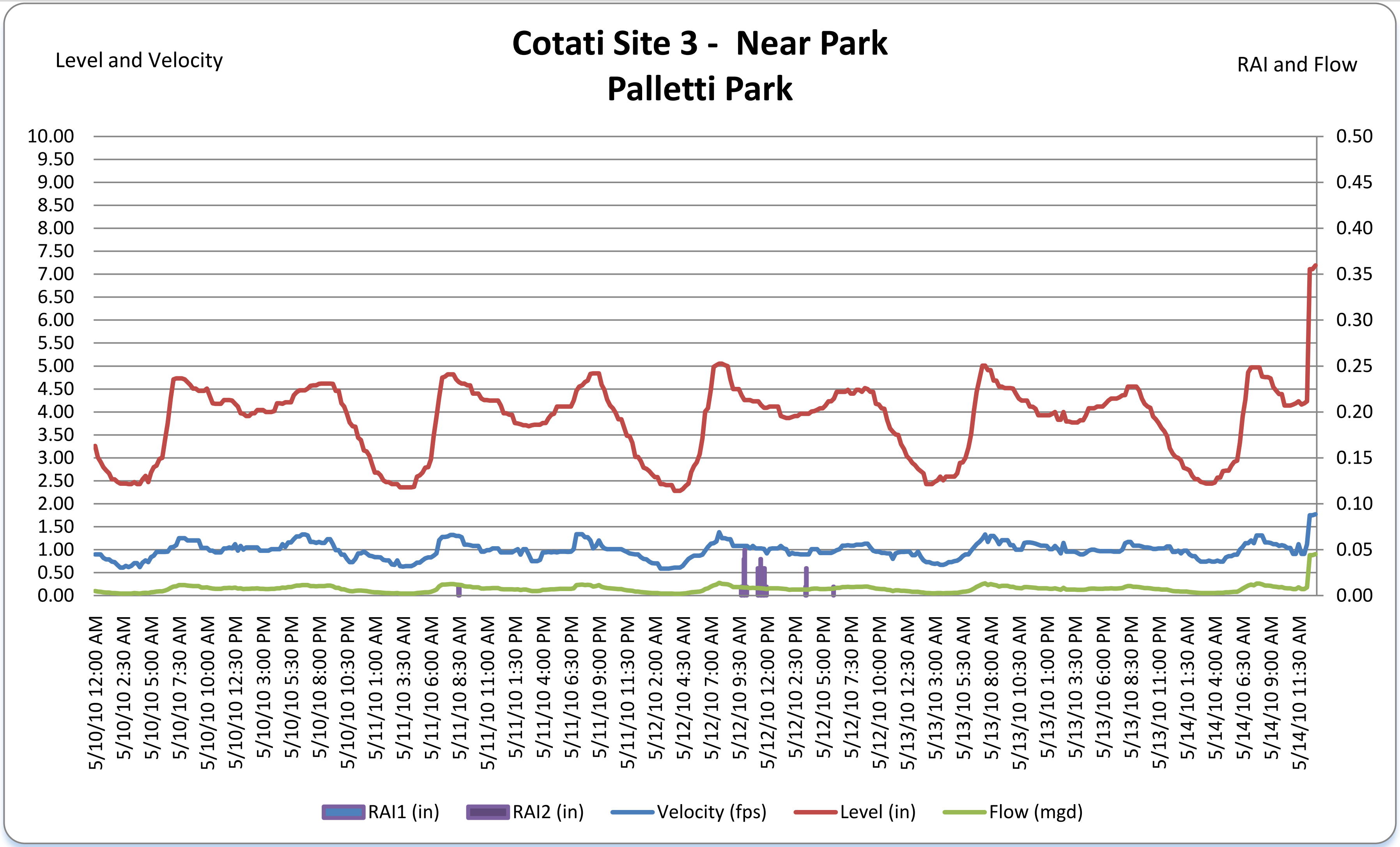
Total Rain Averaged between Both Gauges	Inches
	0.29

Week 9 5/3/2010 to 5/9/2010



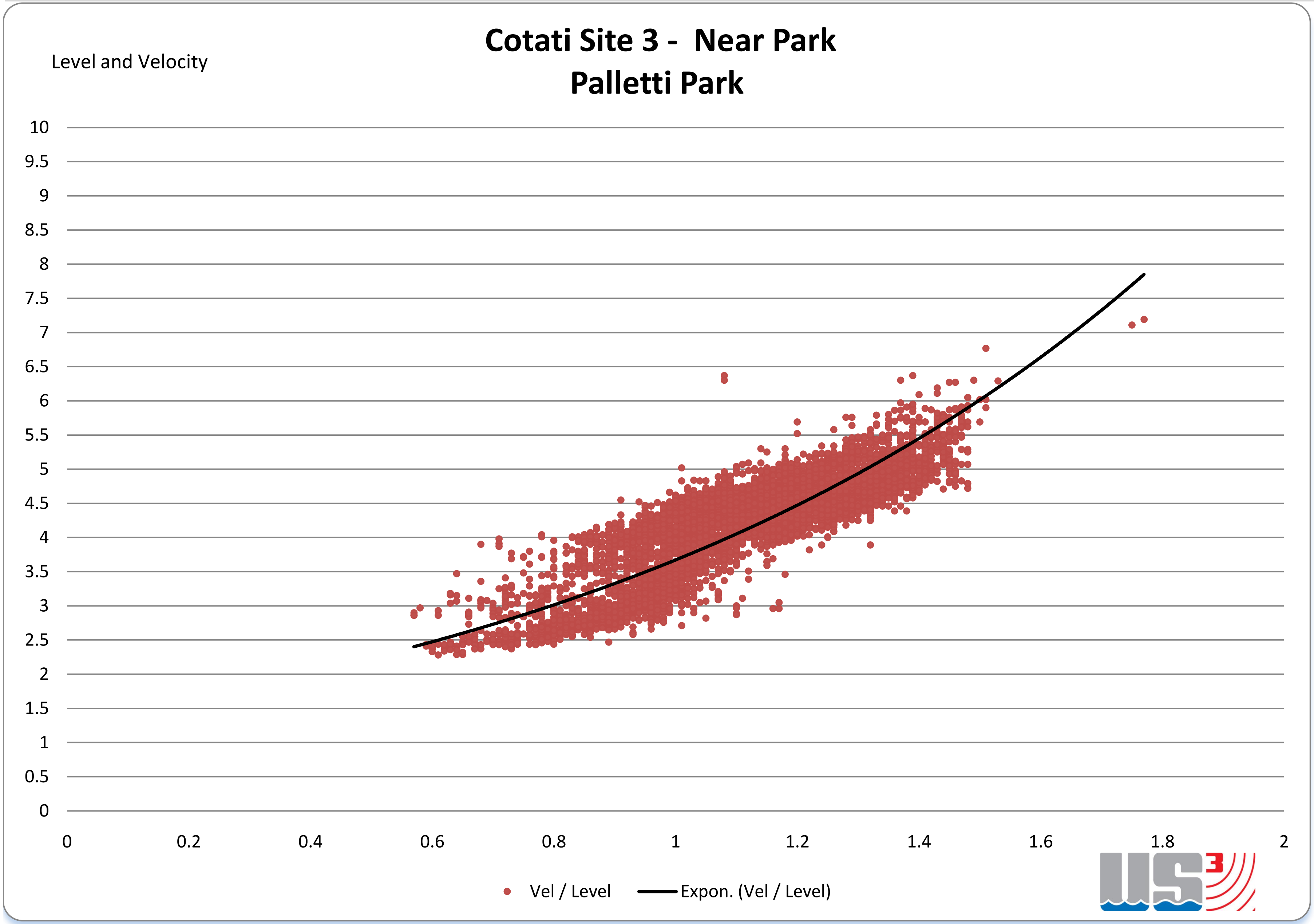
	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.04	3.91	0.16	Total Rain Averaged between Both Gauges	Inches
Maximum	1.42	5.50	0.31		0.00
Minimum	0.60	2.29	0.04		

Week 10 5/10/2010 to 5/14/2010



	Velocity (fps)	Level (in)	Flow (mgd)
Average	0.98	3.81	0.15
Maximum	1.77	7.19	0.90
Minimum	0.59	2.28	0.04

Total Rain Averaged between Both Gauges	Inches
	0.10



Cotati Site 3 - Near Park
Palletti Park
Level and Velocity
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Vel / Level
Expon. (Vel / Level)

Daily Report

Palletti Park

Average Daily MGD					**Minimum Daily MGD**				**Maximum Daily MGD**		
Date	Velocity	Level	Flow		Velocity	Level	Flow		Velocity	Level	Flow
3/10/2010	1.13	4.45	0.19		0.94	3.84	0.13		1.35	5.04	0.27
3/11/2010	1.09	4.15	0.18		0.81	2.82	0.07		1.46	5.40	0.32
3/12/2010	1.03	4.24	0.17		0.57	2.83	0.05		1.42	5.25	0.30
3/13/2010	1.08	4.40	0.19		0.64	3.07	0.07		1.47	5.87	0.36
3/14/2010	1.10	4.38	0.20		0.58	2.97	0.06		1.48	5.68	0.34
3/15/2010	1.06	4.15	0.17		0.66	2.89	0.07		1.35	5.08	0.27
3/16/2010	1.07	4.11	0.17		0.70	2.84	0.06		1.48	5.21	0.29
3/17/2010	1.06	4.10	0.17		0.72	2.73	0.07		1.44	5.25	0.30
3/18/2010	1.06	4.06	0.17		0.77	2.80	0.07		1.42	5.08	0.29
3/19/2010	1.10	4.06	0.17		0.80	2.71	0.07		1.40	4.97	0.28
3/20/2010	1.16	4.16	0.19		0.84	2.80	0.08		1.45	5.29	0.31
3/21/2010	1.17	4.24	0.20		0.77	2.53	0.06		1.46	6.27	0.39
3/22/2010	1.12	4.02	0.18		0.79	2.57	0.06		1.51	6.77	0.45
3/23/2010	1.13	3.99	0.17		0.79	2.68	0.07		1.48	5.46	0.31
3/24/2010	1.11	3.96	0.17		0.79	2.58	0.06		1.39	5.01	0.27
3/25/2010	1.12	3.94	0.17		0.79	2.64	0.07		1.40	4.98	0.28
3/26/2010	1.16	3.96	0.18		0.80	2.62	0.07		1.38	5.11	0.28
3/27/2010	1.15	4.07	0.19		0.80	2.50	0.07		1.48	5.69	0.35
3/28/2010	1.16	4.13	0.20		0.79	2.48	0.06		1.53	6.29	0.41
3/29/2010	1.10	3.96	0.17		0.78	2.58	0.07		1.40	4.83	0.26
3/30/2010	1.12	3.98	0.17		0.83	2.68	0.07		1.41	5.01	0.28
3/31/2010	1.15	4.14	0.19		0.85	2.73	0.07		1.45	5.37	0.31
4/1/2010	1.10	4.11	0.18		0.68	2.79	0.08		1.42	5.37	0.30
4/2/2010	1.16	4.21	0.19		0.85	2.69	0.07		1.42	5.04	0.28
4/3/2010	1.13	4.31	0.20		0.87	2.82	0.08		1.47	5.79	0.36
4/4/2010	1.14	4.21	0.19		0.74	2.65	0.07		1.48	5.62	0.35
4/5/2010	1.14	4.22	0.19		0.91	2.97	0.09		1.45	5.11	0.29
4/6/2010	1.12	4.10	0.18		0.66	2.73	0.06		1.42	5.14	0.29
4/7/2010	1.06	4.05	0.16		0.84	2.78	0.08		1.27	4.89	0.24
4/8/2010	1.11	4.09	0.18		0.88	2.73	0.08		1.44	5.07	0.29
4/9/2010	1.08	4.09	0.17		0.80	2.75	0.07		1.39	4.96	0.27
4/10/2010	1.10	4.16	0.18		0.83	2.72	0.07		1.42	5.47	0.32
4/11/2010	1.19	4.72	0.24		0.81	2.66	0.07		1.51	6.37	0.40
4/12/2010	1.19	4.72	0.23		0.84	3.40	0.10		1.44	5.91	0.35
4/13/2010	1.15	4.42	0.20		0.84	3.25	0.10		1.43	5.50	0.32
4/14/2010	1.10	4.33	0.19		0.80	3.05	0.09		1.42	5.32	0.31
4/15/2010	1.10	4.26	0.18		0.73	3.02	0.08		1.44	5.39	0.32
4/16/2010	1.06	4.19	0.17		0.84	2.98	0.09		1.37	5.11	0.28
4/17/2010	1.16	4.31	0.20		0.76	2.91	0.09		1.50	5.69	0.36
4/18/2010	1.14	4.31	0.20		0.82	2.82	0.08		1.42	5.70	0.33
4/19/2010	1.07	4.12	0.17		0.80	2.76	0.08		1.35	5.15	0.28
4/20/2010	1.13	4.16	0.18		0.85	2.96	0.10		1.44	5.23	0.31
4/21/2010	1.10	4.11	0.17		0.88	2.82	0.08		1.46	5.25	0.30
4/22/2010	1.11	4.11	0.18		0.87	2.73	0.08		1.37	5.18	0.29
4/23/2010	1.09	4.10	0.17		0.82	2.76	0.07		1.38	5.11	0.28
4/24/2010	1.11	4.21	0.18		0.73	2.76	0.07		1.38	5.55	0.31
4/25/2010	1.15	4.29	0.20		0.82	2.73	0.07		1.44	5.52	0.33
4/26/2010	1.06	4.03	0.16		0.82	2.72	0.07		1.38	5.02	0.28
4/27/2010	1.10	4.05	0.17		0.85	2.66	0.07		1.39	5.25	0.29

Daily Report

Palletti Park

Average Daily MGD					Minimum Daily MGD				Maximum Daily MGD		
Date	Velocity	Level	Flow		Velocity	Level	Flow		Velocity	Level	Flow
4/28/2010	1.07	4.00	0.16		0.78	2.61	0.06		1.46	5.12	0.30
4/29/2010	1.04	4.06	0.16		0.70	2.57	0.06		1.33	5.21	0.28
4/30/2010	1.05	3.99	0.16		0.81	2.65	0.07		1.34	5.16	0.28
5/1/2010	1.07	4.01	0.17		0.69	2.51	0.05		1.37	5.47	0.30
5/2/2010	1.03	4.12	0.17		0.72	2.53	0.06		1.30	5.30	0.28
5/3/2010	1.02	3.93	0.15		0.78	2.46	0.06		1.33	5.12	0.27
5/4/2010	1.09	3.95	0.17		0.76	2.55	0.06		1.36	5.30	0.29
5/5/2010	1.04	3.89	0.16		0.67	2.37	0.05		1.40	5.09	0.29
5/6/2010	1.02	3.87	0.15		0.64	2.37	0.05		1.38	5.22	0.29
5/7/2010	1.05	3.82	0.15		0.63	2.44	0.05		1.34	4.96	0.27
5/8/2010	1.06	3.96	0.16		0.60	2.33	0.04		1.42	5.50	0.31
5/9/2010	1.01	3.97	0.16		0.62	2.29	0.04		1.30	5.26	0.28
5/10/2010	0.99	3.84	0.15		0.61	2.43	0.05		1.33	4.73	0.23
5/11/2010	0.97	3.79	0.14		0.63	2.36	0.04		1.34	4.84	0.25
5/12/2010	0.95	3.81	0.14		0.59	2.28	0.04		1.38	5.05	0.28
5/13/2010	1.00	3.81	0.14		0.67	2.43	0.05		1.33	5.01	0.27
5/14/2010	1.02	3.77	0.17		0.74	2.44	0.05		1.77	7.19	0.90

Temporary Flow Study

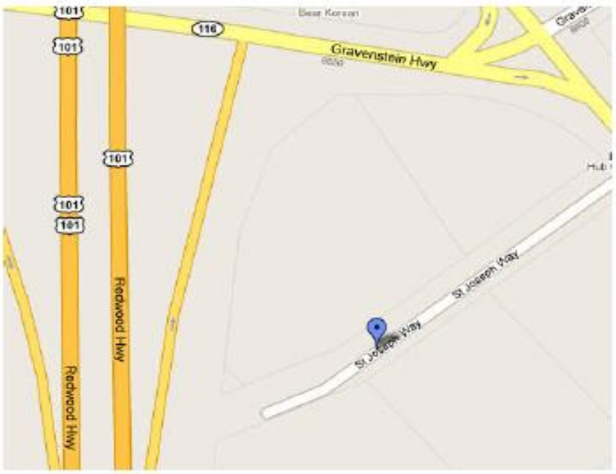
Cotati Site 4 - At park and Ride Lot
St. Joseph Way Park & Ride

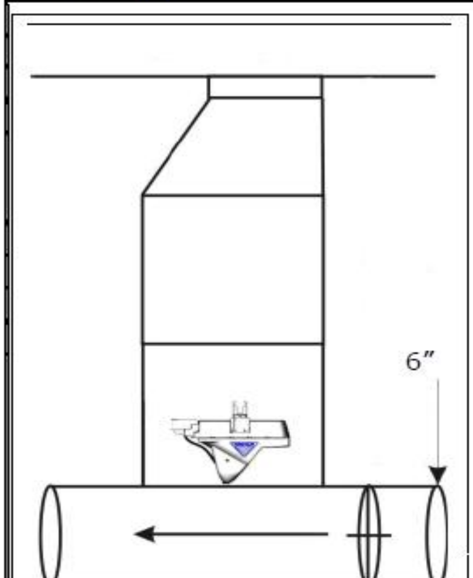
Utility Systems, Science, and Software
2101 E. 4th Street
Santa Ana, Ca 92705

From		To
3/10/2010 11:30		5/14/2010 10:45

METERING SITE DOCUMENT

City:	Cotati
Site Name:	Site 4
Location:	Park and ride, and baseball field
Access:	Shoulder
GPS:	N +38° 19' 47.50", W -122° 42' 41.10"
Install Date:	3/10/2010





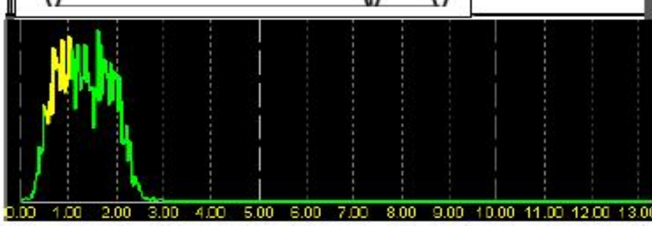
Pipe Size (inch):	6
Pipe Condition:	Good

Hydraulics:

Multiplier = 1.00

Gas	
O_2	Good
HS_2	Good

Manhole Comments:



Traffic Safety Required:

Minimal traffic, cones

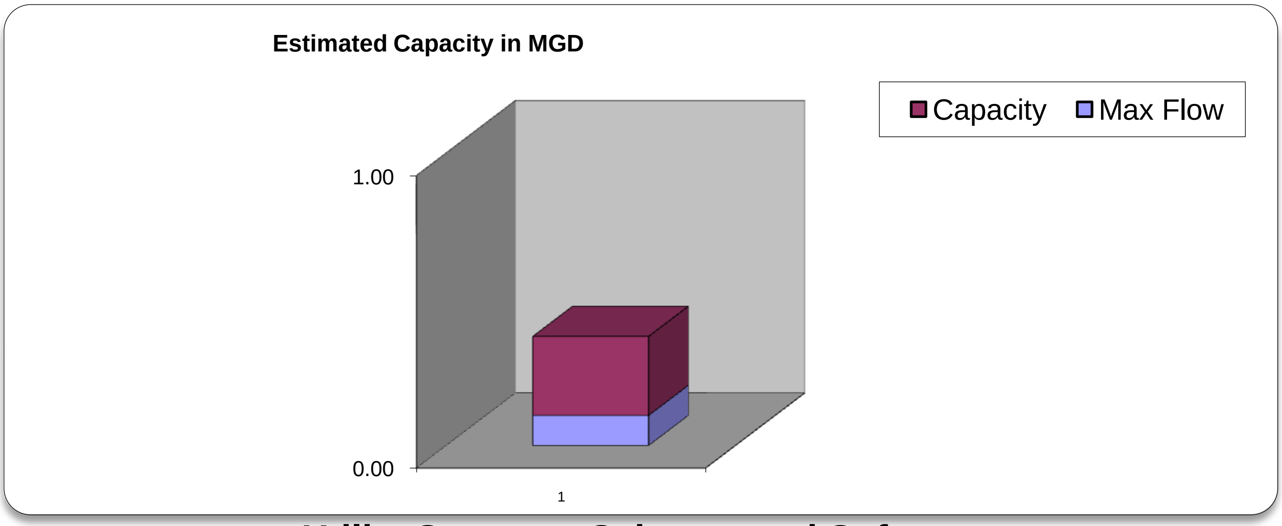
METERING SITE DOCUMENT

Site Pictures

Meter site 4
Temporary Flow Study

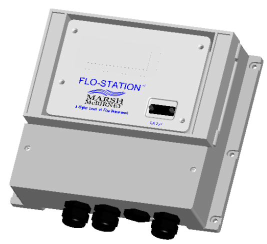
Cotati, CA

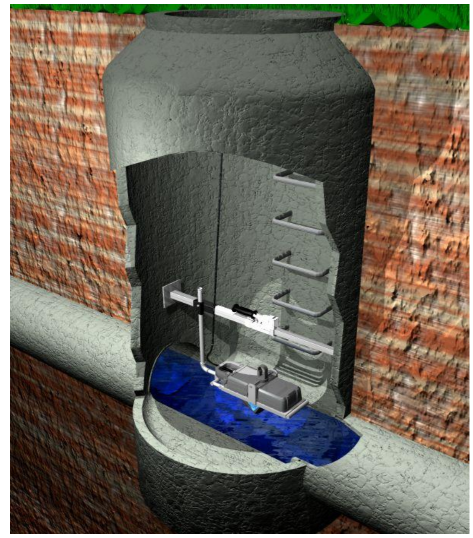
Meter Start Date		From	3/10/2010 11:30
Meter Stop Date		To	5/14/2010 10:45
	Velocity (fps)	Level (in)	Flow (MGD)
Average	0.91	1.96	0.03
Maximum	1.70	3.18	0.10
Minimum	0.00	0.80	0.00
	Pipe Size	6	
	Estimated Capacity	38.19%	
	Sensor Used	Hach - FloDar	
	Comment		



Utility Systems, Science, and Software
2101 E. 4th Street
Santa Ana, Ca 92705

Flo-Dar incorporates a Doppler Radar Velocity Sensor and Ultrasonic Depth Transducer for use in Open Channel Applications. It is available with a Permanent Flo-Station. The Flo-Station is available with or without a display and is powered with 120/240 VAC, or 12 VDC. The Flo-Station requires Flo-Ware software, which is included on some models, and a customer supplied PC. Flo-Station with display shows flow rate, total flow, velocity and level. Both Flo-Station's have four outputs one each for level, velocity, flow rate, surcharge level, and a contact closure. Instruction manuals are included. Mounting Hardware is ordered separately.





Flo-Dar Sensor
Enclosure
   Material: Polystyrene
   Dimensions: 6.9" W x 16.65" L x 11.7" D
     (17.5 cm x 42.3 cm x 29.7 cm)
   Weight: 10.5 lbs. (4.8 kg)

Temperature
   Operating Range: 14° F to 122°F
     (-10° C to 50° C)
   Storage Range: -40° F to 140° F
     (-40° C to 60° C)

Velocity Measurement
   Method: Radar
   Range: 0.75 to 20 ft/s (0.23 m/s to 6.10 m/s)
   Accuracy: ±0.5%; ±0.1 ft/s (±0.03 m/s)

Level Measurement
   Method: Ultrasonic
   Standard Operating Range:
     0.25 to 60 in. (0.634 to 152.4 cm)
Optional Operating Range: 0 (0 cm) to 240" (6.1 m)
(with 18" dead band)
   Temperature Compensated
   Accuracy: ±0.1 in. (±0.25 cm)
   1% Accuracy

Surcharge Conditions Level/Velocity
   Level
   Method: Piezo-resistive pressure transducer
   Maximum Range: 138 inches (3.5 meters)
   Velocity
   Method: Electromagnetic
   Range: -5 to +20 ft/s (-1.5 to +6.1 m/s)

Flow Measurement
   Based on Continuity Equation.
   Accuracy: ±5.0% of reading typical where flow is in a channel with uniform flow conditions and is not surcharged.

Flo-Station Monitor
Data Storage
   64K (16K cycles of velocity/level data)
Local Terminal
   RS232C at 19.2K baud

Timebase Accuracy: 1 second per day

Outputs: Four 4-20 mA outputs; system-isolated, up to 600Ω load. Each output is selectable between FLOW, LEVEL, VELOCITY OR SURCHARGE LEVEL.

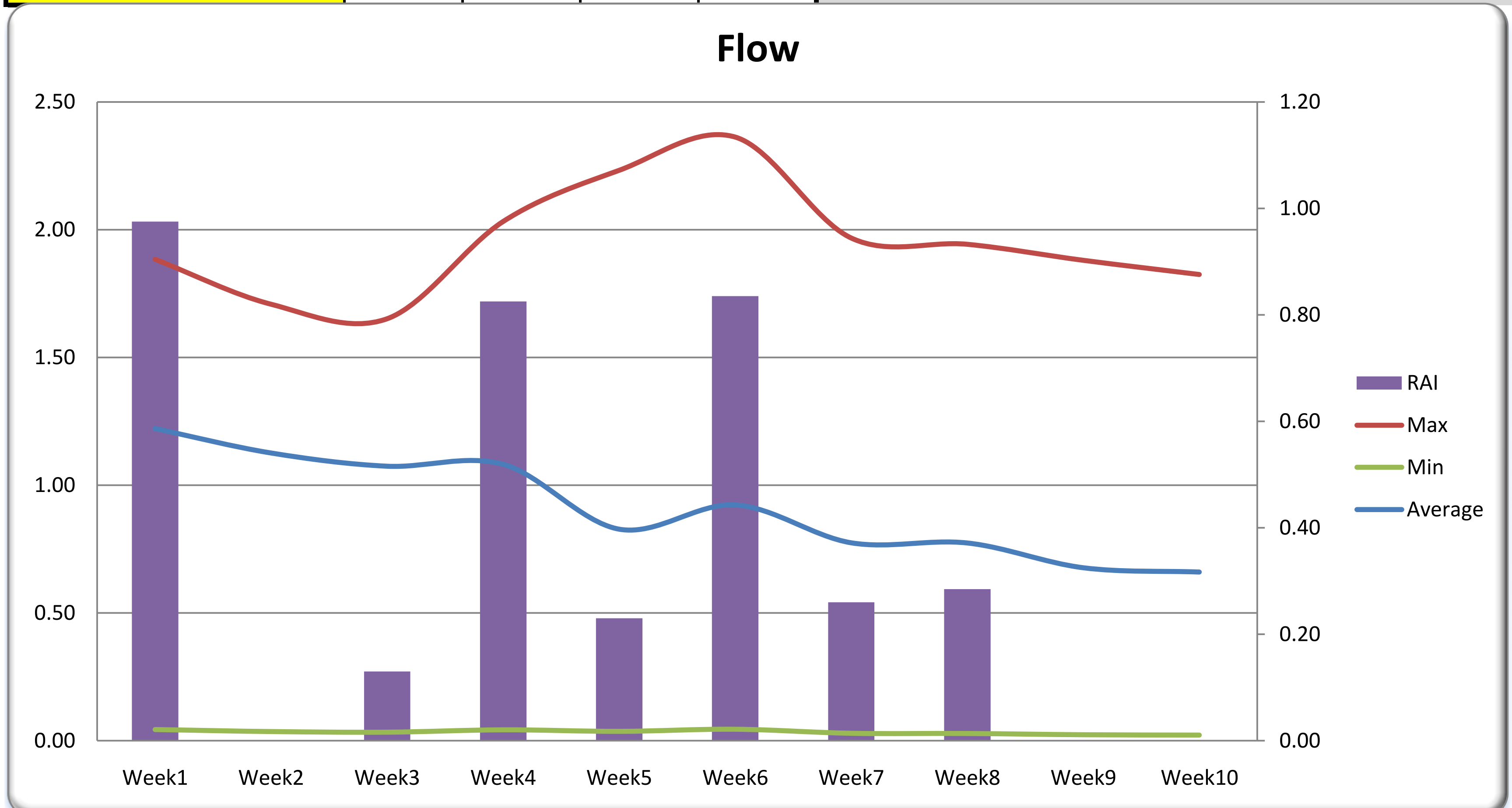
Power Requirements
AC: 85-264 VAC, 47-63 Hz. 32 watts
DC: 12 VDC for Flo-Station without Display or Flo-Station with Display (Backlight Off)
180 mA (2.1 watts) with (1) 4-20 mA utilized.

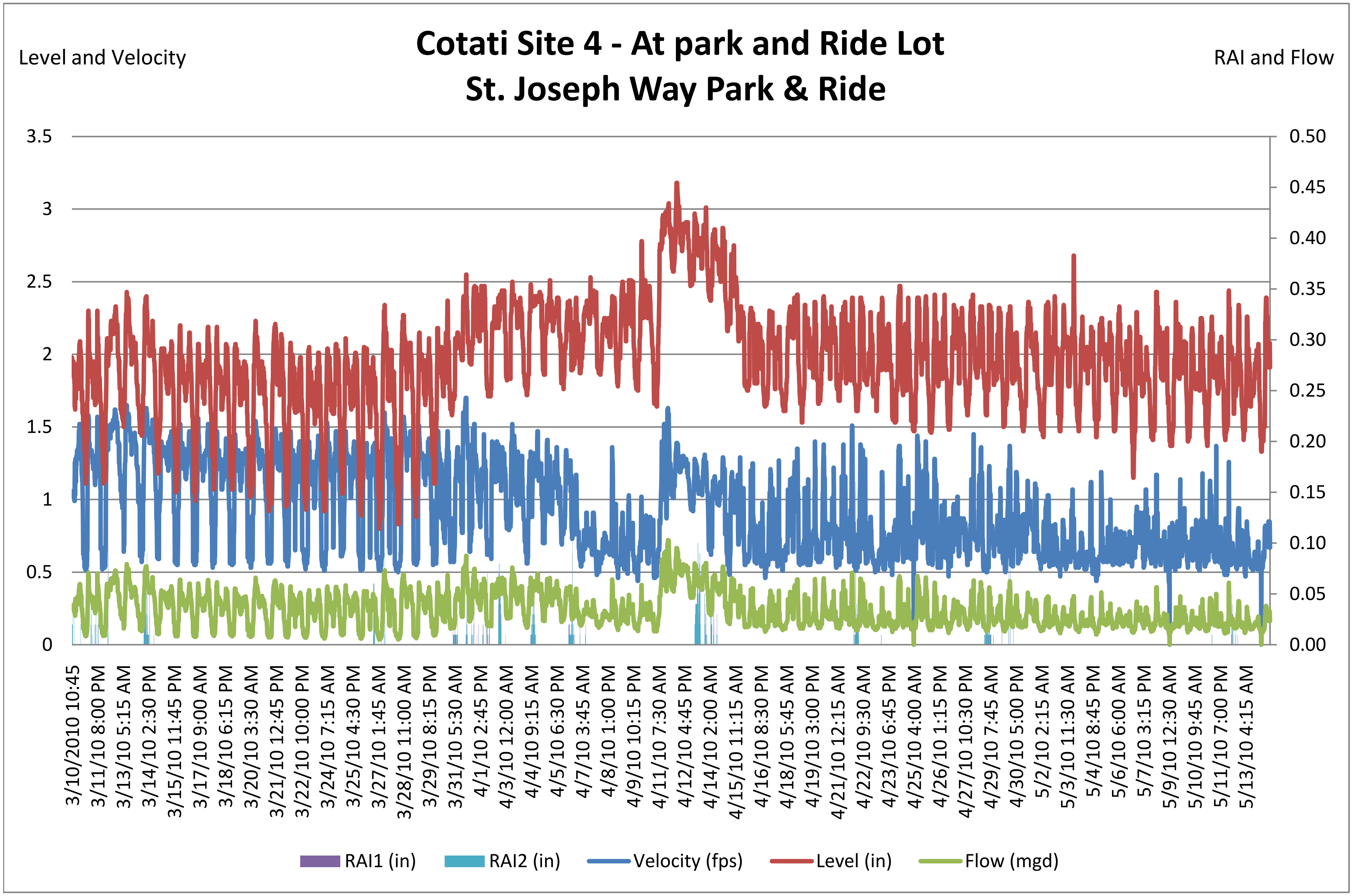
Housing
Material: ABS Plastic, NEMA 4
Dimensions: 10.2" W x 9.3" H x 4" D
  (25.9 cm W x 23.6 cm H x 10.2 cm D)
Weight: 5 lbs.
Temperature Operating Range: 14° F to 122° F
  (-10° C to 50° C)
Temperature Storage Range:
(without display) -40°F to 140°F (-40°C to 60°C)
(with display) 4°F to 140°F (-20°C to 60°C) w/Display

Flow Review

	Average	Max	Min	RAI
Week1	1.22	1.88	0.04	0.98
Week2	1.13	1.71	0.04	0.00
Week3	1.07	1.65	0.03	0.13
Week4	1.08	2.03	0.04	0.83
Week5	0.83	2.23	0.04	0.23
Week6	0.92	2.36	0.05	0.84
Week7	0.77	1.97	0.03	0.26
Week8	0.77	1.94	0.03	0.29
Week9	0.68	1.88	0.02	0.00
Week10	0.66	1.82	0.02	0.00

Cotati Site 4 - At park and Ride Lot
St. Joseph Way Park & Ride





Cotati Site 4 - At park and Ride Lot
St. Joseph Way Park & Ride
Level and Velocity
RAI and Flow
3.5
3
2.5
2
1.5
1
0.5
0
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
3/10/2010 10:45
3/11/10 8:00 PM
3/13/10 5:15 AM
3/14/10 2:30 PM
3/15/10 11:45 PM
3/17/10 9:00 AM
3/18/10 6:15 PM
3/20/10 3:30 AM
3/21/10 12:45 PM
3/22/10 10:00 PM
3/24/10 7:15 AM
3/25/10 4:30 PM
3/27/10 1:45 AM
3/28/10 11:00 AM
3/29/10 8:15 PM
3/31/10 5:30 AM
4/1/10 2:45 PM
4/3/10 12:00 AM
4/4/10 9:15 AM
4/5/10 6:30 PM
4/7/10 3:45 AM
4/8/10 1:00 PM
4/9/10 10:15 PM
4/11/10 7:30 AM
4/12/10 4:45 PM
4/14/10 2:00 AM
4/15/10 11:15 AM
4/16/10 8:30 PM
4/18/10 5:45 AM
4/19/10 3:00 PM
4/21/10 12:15 AM
4/22/10 9:30 AM
4/23/10 6:45 PM
4/25/10 4:00 AM
4/26/10 1:15 PM
4/27/10 10:30 PM
4/29/10 7:45 AM
4/30/10 5:00 PM
5/2/10 2:15 AM
5/3/10 11:30 AM
5/4/10 8:45 PM
5/6/10 6:00 AM
5/7/10 3:15 PM
5/9/10 12:30 AM
5/10/10 9:45 AM
5/11/10 7:00 PM
5/13/10 4:15 AM
RAI1 (in)
RAI2 (in)
Velocity (fps)
Level (in)
Flow (mgd)

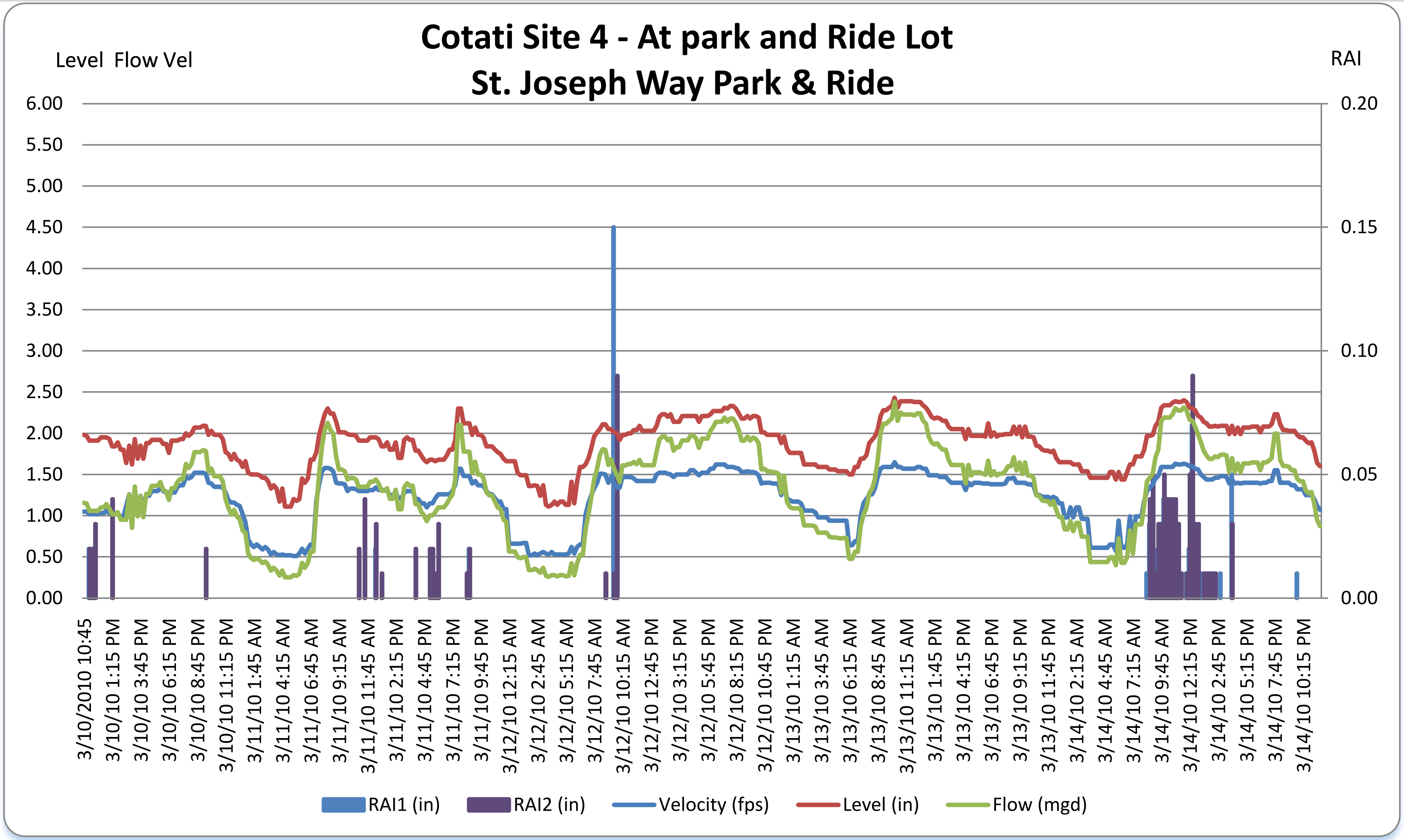
Rainlog Rainfall Report		By Day Report
City Hall Site	**Total**	**6.10**
	Max	**1.37**
	Average	**0.09**
Date	***Rainfall***	***Comments***
3/8/10 0:00	0.04	
3/9/10 0:00	0.04	
3/10/10 0:00	0.15	
3/11/10 0:00	0.00	
3/12/10 0:00	0.55	
3/13/10 0:00	0.00	
3/14/10 0:00	0.00	
3/15/10 0:00	0.00	
3/16/10 0:00	0.00	
3/17/10 0:00	0.00	
3/18/10 0:00	0.00	
3/19/10 0:00	0.00	
3/20/10 0:00	0.00	
3/21/10 0:00	0.00	
3/22/10 0:00	0.00	
3/23/10 0:00	0.00	
3/24/10 0:00	0.25	
3/25/10 0:00	0.01	
3/26/10 0:00	0.00	
3/27/10 0:00	0.00	
3/28/10 0:00	0.00	
3/29/10 0:00	0.23	
3/30/10 0:00	0.34	
3/31/10 0:00	0.69	
4/1/10 0:00	0.00	
4/2/10 0:00	0.39	
4/3/10 0:00	0.00	
4/4/10 0:00	0.41	
4/5/10 0:00	0.05	
4/6/10 0:00	0.00	
4/7/10 0:00	0.00	
4/8/10 0:00	0.00	
4/9/10 0:00	0.00	
4/10/10 0:00	0.00	
4/11/10 0:00	1.37	
4/12/10 0:00	0.30	
4/13/10 0:00	0.00	
4/14/10 0:00	0.00	
4/15/10 0:00	0.00	
4/16/10 0:00	0.00	
4/17/10 0:00	0.00	
4/18/10 0:00	0.00	
4/19/10 0:00	0.21	
4/20/10 0:00	0.30	
4/21/10 0:00	0.01	
4/22/10 0:00	0.00	
4/23/10 0:00	0.00	
4/24/10 0:00	0.00	

Rainlog Rainfall Report		By Day Report
City Hall Site	Total	6.10
	Max	1.37
	Average	0.09
Date	*Rainfall*	*Comments*
4/25/10 0:00	0.00	
4/26/10 0:00	0.00	
4/27/10 0:00	0.35	
4/28/10 0:00	0.22	
4/29/10 0:00	0.00	
4/30/10 0:00	0.00	
5/1/10 0:00	0.00	
5/2/10 0:00	0.00	
5/3/10 0:00	0.00	
5/4/10 0:00	0.00	
5/5/10 0:00	0.00	
5/6/10 0:00	0.00	
5/7/10 0:00	0.00	
5/8/10 0:00	0.00	
5/9/10 0:00	0.01	
5/10/10 0:00	0.18	
5/11/10 0:00	0.00	
5/12/10 0:00	0.00	
5/13/10 0:00	0.00	
5/14/10 0:00	0.00	

Rainlog Rainfall Report		By Day Report
North Pump Station	Total	6.82
	Max	1.58
	Average	0.10
Date	*Rainfall*	*Comments*
3/8/10 0:00	0.13	
3/9/10 0:00	0.23	
3/10/10 0:00	0.11	
3/11/10 0:00	0.00	
3/12/10 0:00	0.70	
3/13/10 0:00	0.00	
3/14/10 0:00	0.00	
3/15/10 0:00	0.00	
3/16/10 0:00	0.00	
3/17/10 0:00	0.00	
3/18/10 0:00	0.00	
3/19/10 0:00	0.00	
3/20/10 0:00	0.00	
3/21/10 0:00	0.00	
3/22/10 0:00	0.00	
3/23/10 0:00	0.00	
3/24/10 0:00	0.23	
3/25/10 0:00	0.13	
3/26/10 0:00	0.00	
3/27/10 0:00	0.00	
3/28/10 0:00	0.00	
3/29/10 0:00	0.29	
3/30/10 0:00	0.20	
3/31/10 0:00	0.75	
4/1/10 0:00	0.00	
4/2/10 0:00	0.48	
4/3/10 0:00	0.00	
4/4/10 0:00	0.47	
4/5/10 0:00	0.02	
4/6/10 0:00	0.00	
4/7/10 0:00	0.00	
4/8/10 0:00	0.00	
4/9/10 0:00	0.00	
4/10/10 0:00	0.00	
4/11/10 0:00	1.58	
4/12/10 0:00	0.27	
4/13/10 0:00	0.00	
4/14/10 0:00	0.00	
4/15/10 0:00	0.00	
4/16/10 0:00	0.00	
4/17/10 0:00	0.00	
4/18/10 0:00	0.00	
4/19/10 0:00	0.21	
4/20/10 0:00	0.26	
4/21/10 0:00	0.01	
4/22/10 0:00	0.00	
4/23/10 0:00	0.00	
4/24/10 0:00	0.00	

Rainlog Rainfall Report		By Day Report
North Pump Station	Total	6.82
	Max	1.58
	Average	0.10
Date	*Rainfall*	*Comments*
4/25/10 0:00	0.00	
4/26/10 0:00	0.01	
4/27/10 0:00	0.42	
4/28/10 0:00	0.13	
4/29/10 0:00	0.00	
4/30/10 0:00	0.00	
5/1/10 0:00	0.00	
5/2/10 0:00	0.00	
5/3/10 0:00	0.00	
5/4/10 0:00	0.00	
5/5/10 0:00	0.00	
5/6/10 0:00	0.00	
5/7/10 0:00	0.00	
5/8/10 0:00	0.00	
5/9/10 0:00	0.01	
5/10/10 0:00	0.16	
5/11/10 0:00	0.00	
5/12/10 0:00	0.00	
5/13/10 0:00	0.02	
5/14/10 0:00	0.00	

Week 1 3/10/2010 to 3/14/2010

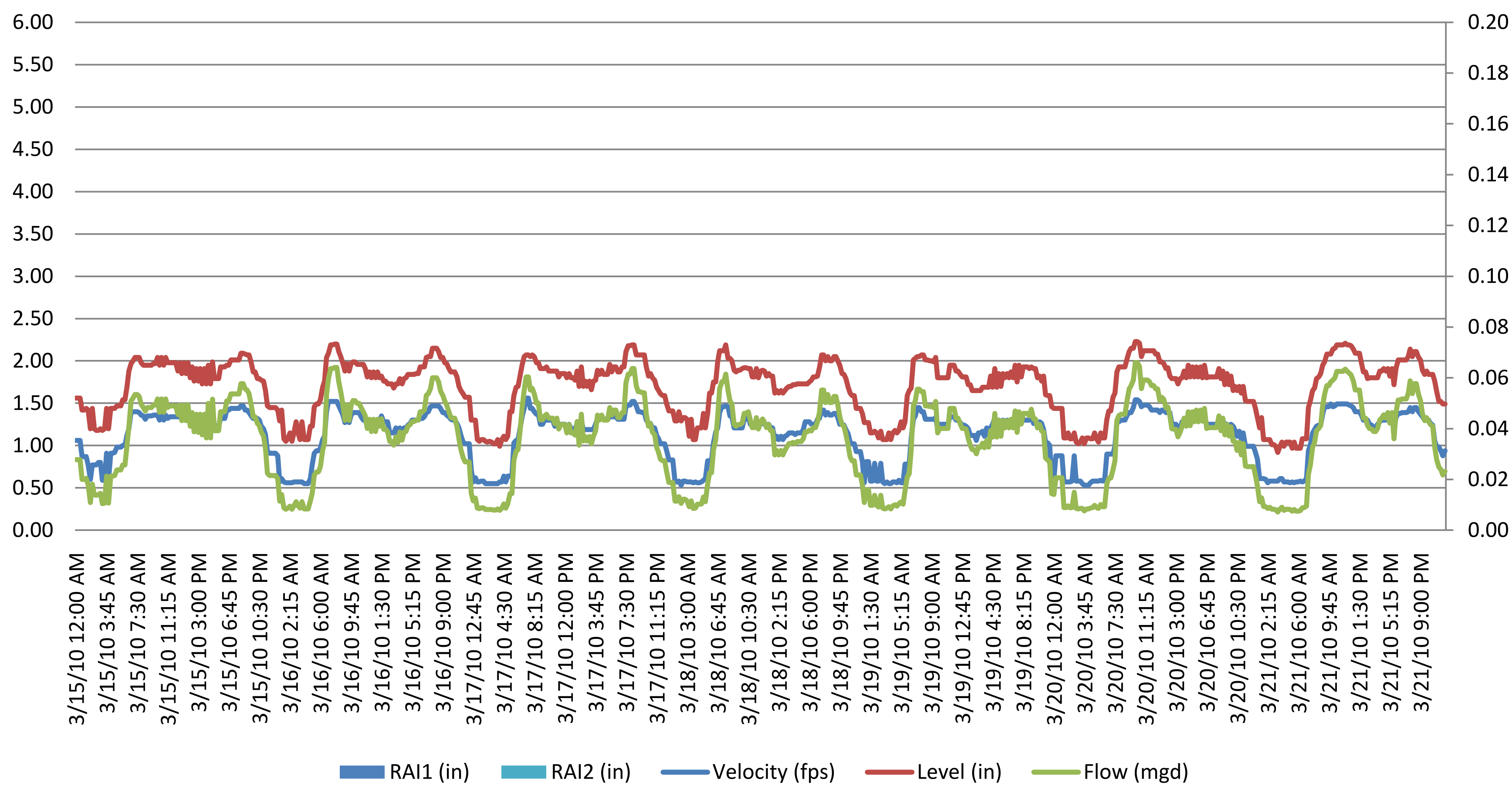


	Velocity (fps)	Level (in)	Flow (mgd)
Average	1.22	1.88	0.04
Maximum	1.65	2.43	0.08
Minimum	0.51	1.11	0.01

Total Rain Averaged between Both Gauges	Inches
	0.98

Week 2 3/15/2010 to 3/21/2010

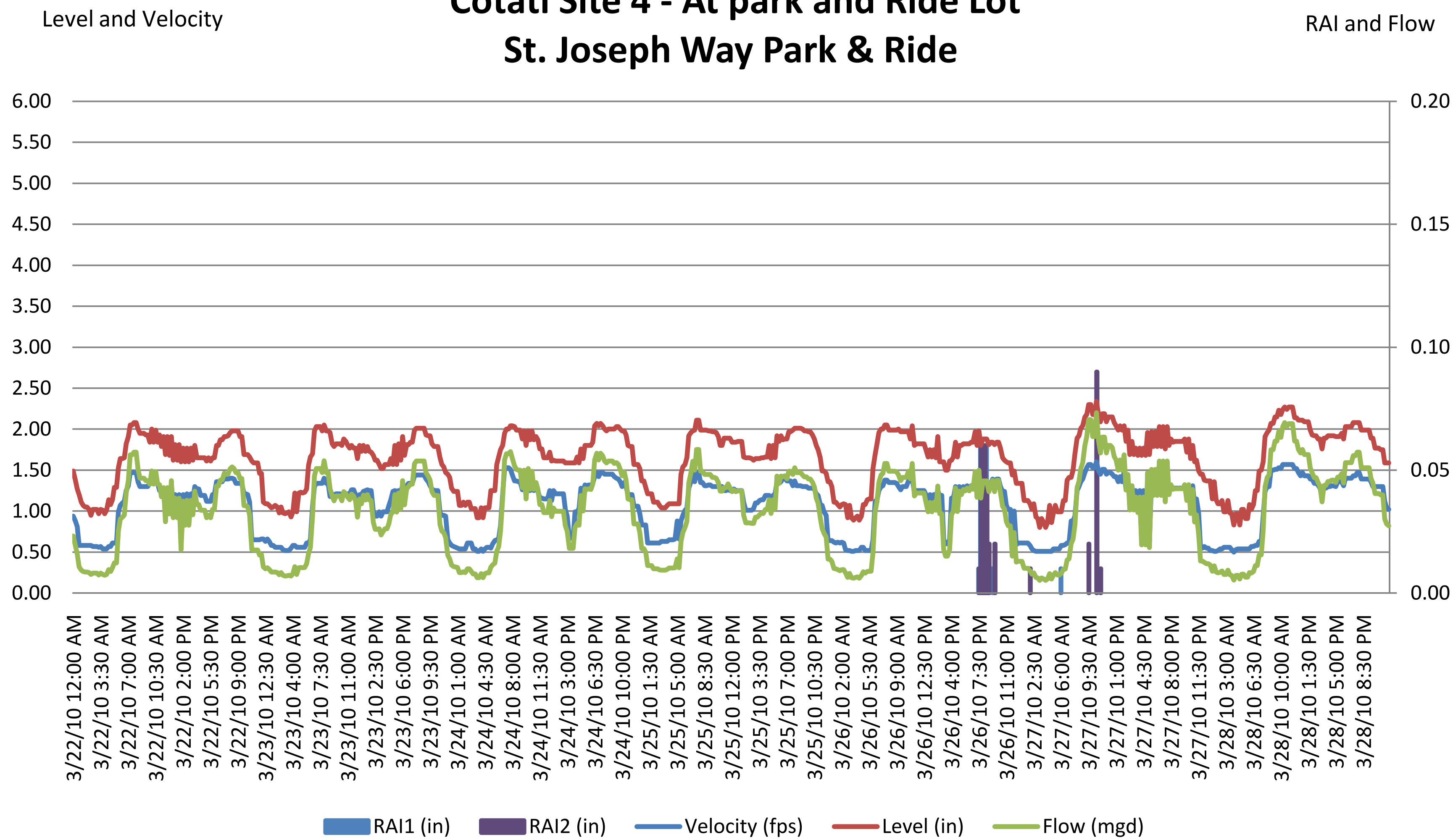
Cotati Site 4 - At park and Ride Lot
St. Joseph Way Park & Ride



	Velocity (fps)	Level (in)	Flow (mgd)	Total Rain Averaged between Both Gauges	Inches
Average	1.13	1.71	0.04		
Maximum	1.56	2.23	0.07		0.00
Minimum	0.53	0.92	0.01		

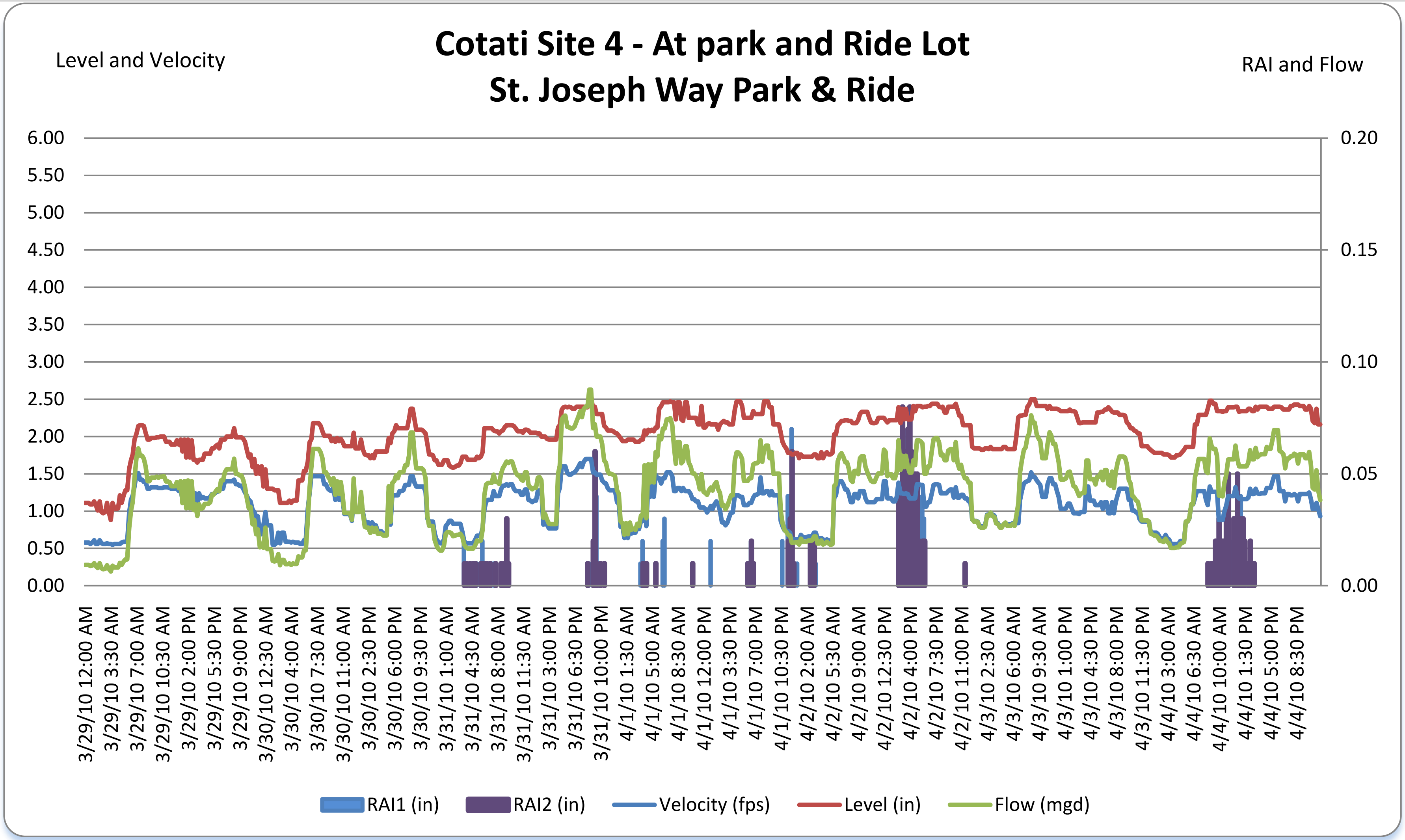
Week 3 3/22/2010 to 3/28/2010

Cotati Site 4 - At park and Ride Lot
St. Joseph Way Park & Ride



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.07	1.65	0.03	Total Rain Averaged between Both Gauges	Inches
Maximum	1.60	2.34	0.07		0.13
Minimum	0.50	0.80	0.01		

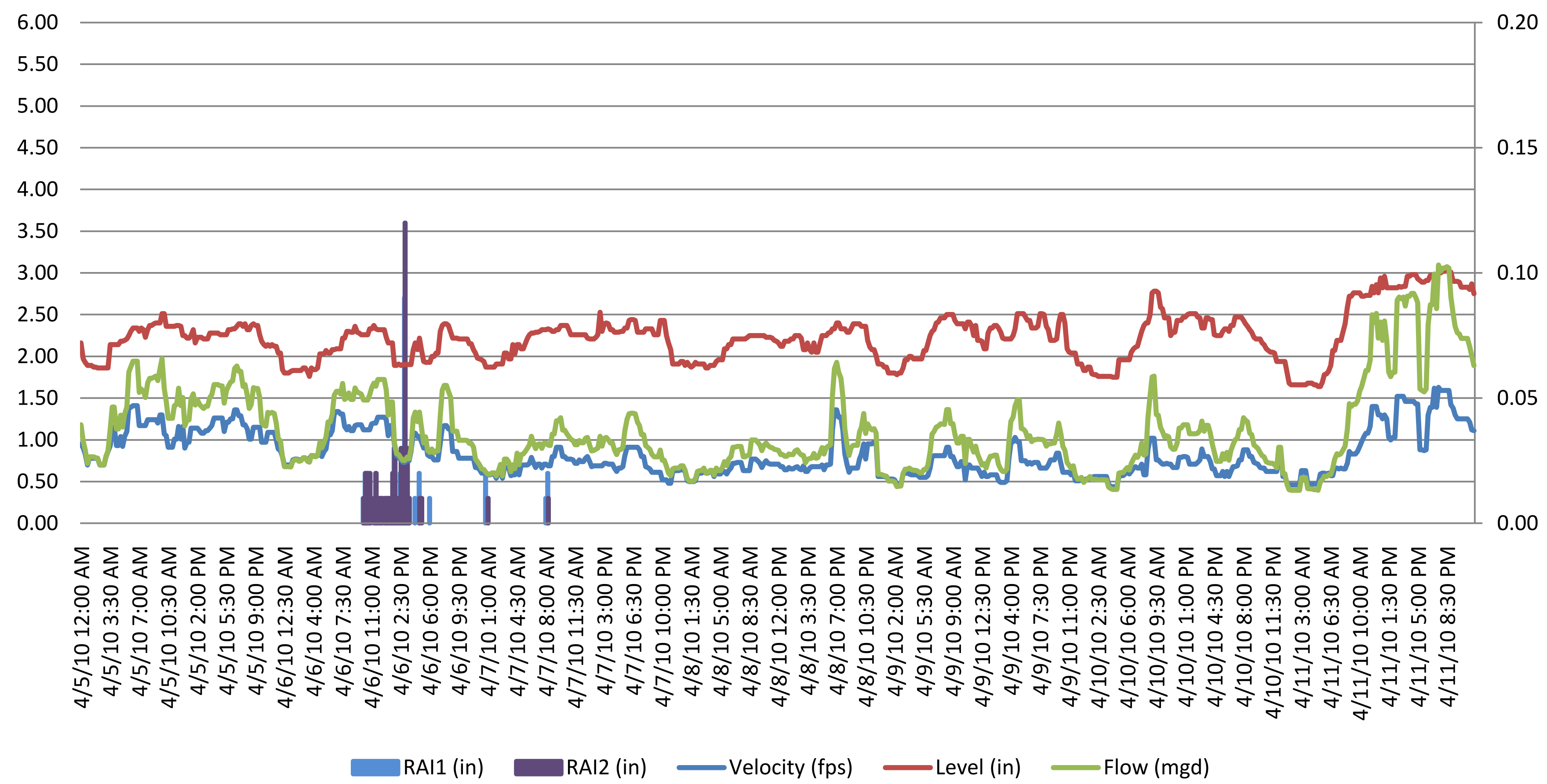
Week 4 3/29/2010 to 4/4/2010



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.08	2.03	0.04	Total Rain Averaged between Both Gauges	Inches
Maximum	1.70	2.55	0.09		0.83
Minimum	0.55	0.88	0.01		

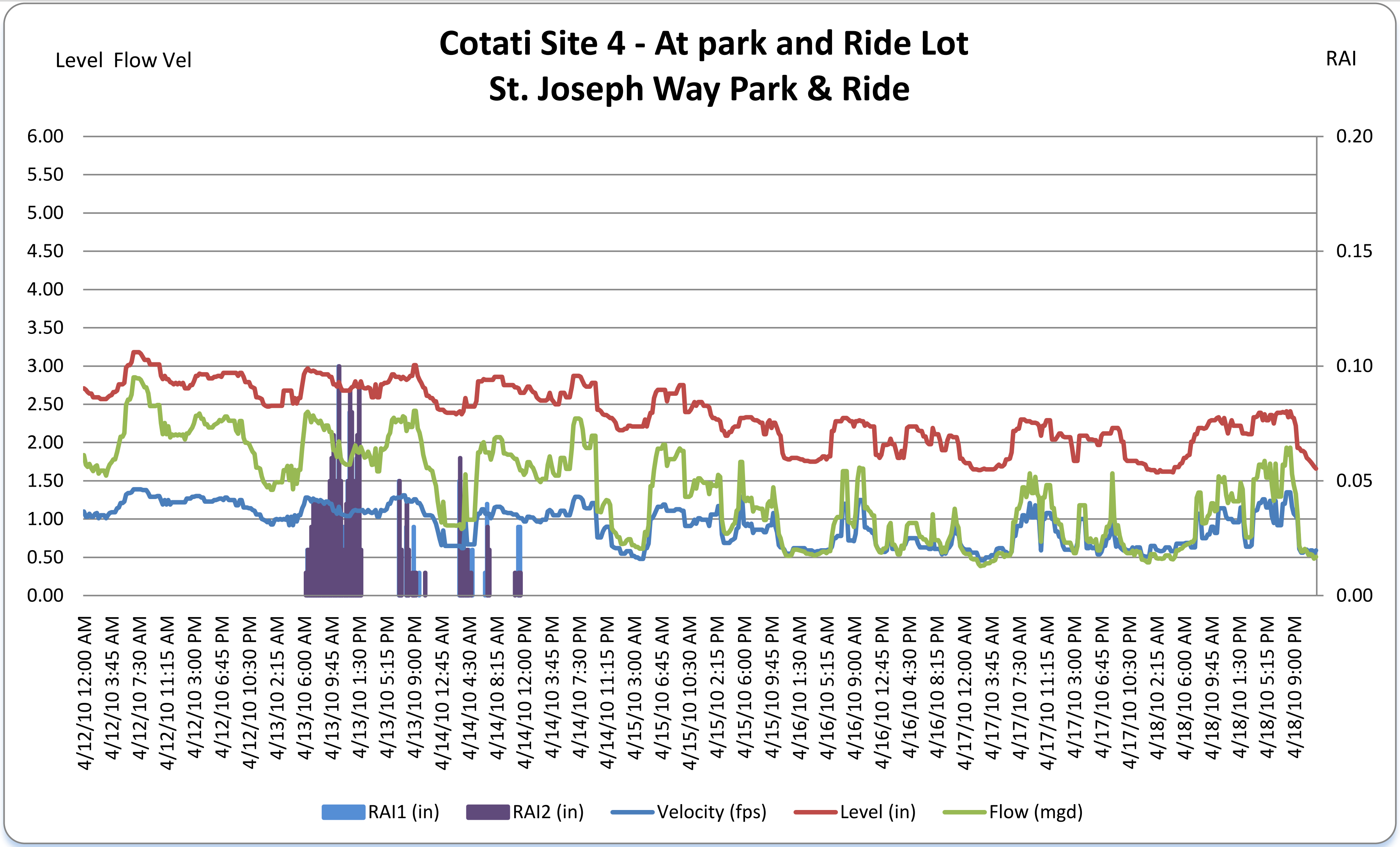
Week 5 4/4/2010 to 4/11/2010

Cotati Site 4 - At park and Ride Lot
St. Joseph Way Park & Ride



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	0.83	2.23	0.04	**Total Rain Averaged between Both Gauges**	**Inches**
Maximum	1.63	3.04	0.10		**0.23**
Minimum	0.44	1.64	0.01		

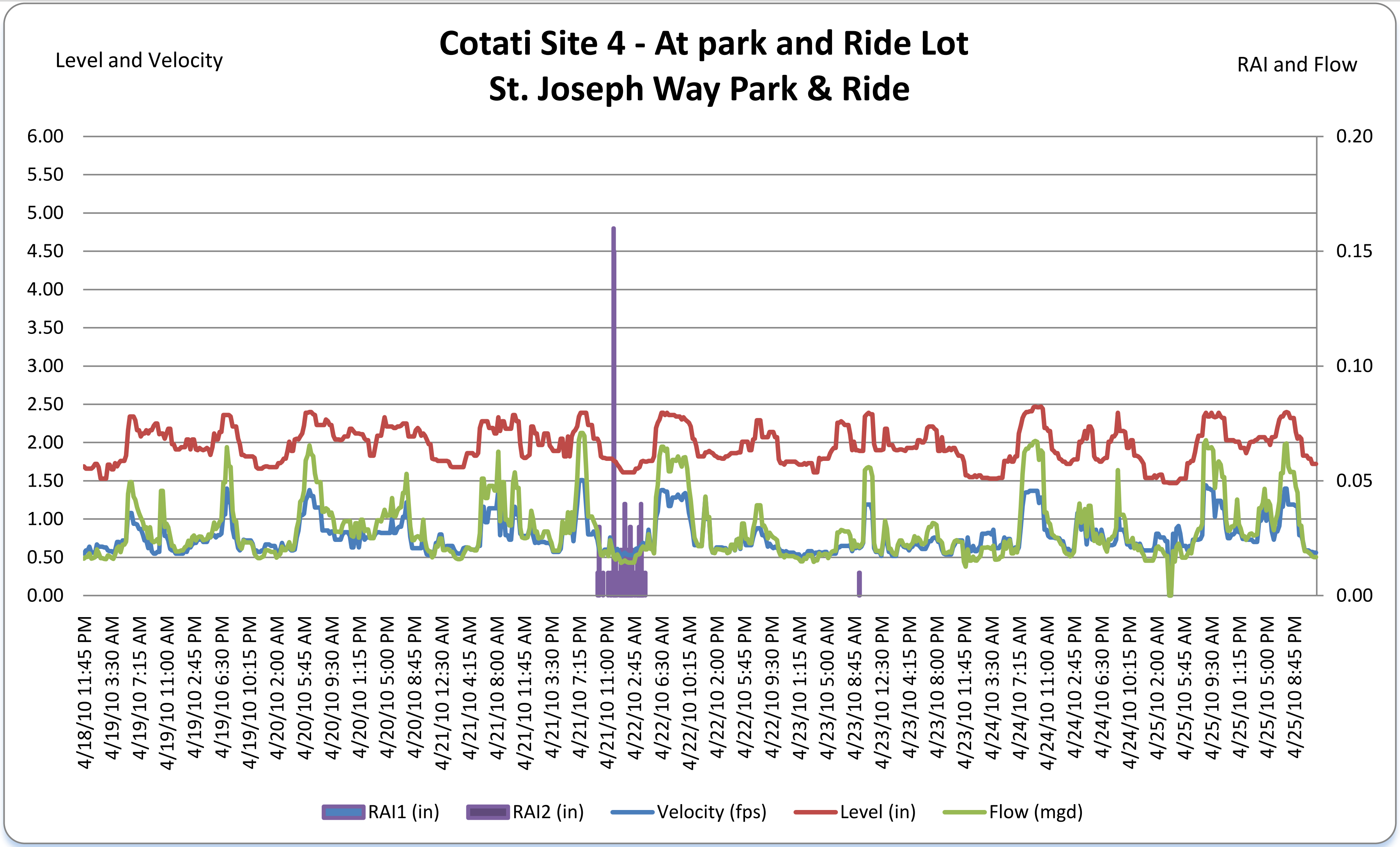
Week 6 4/12/2010 to 4/18/2010



	Velocity (fps)	Level (in)	Flow (mgd)
Average	0.92	2.36	0.05
Maximum	1.39	3.18	0.10
Minimum	0.46	1.61	0.01

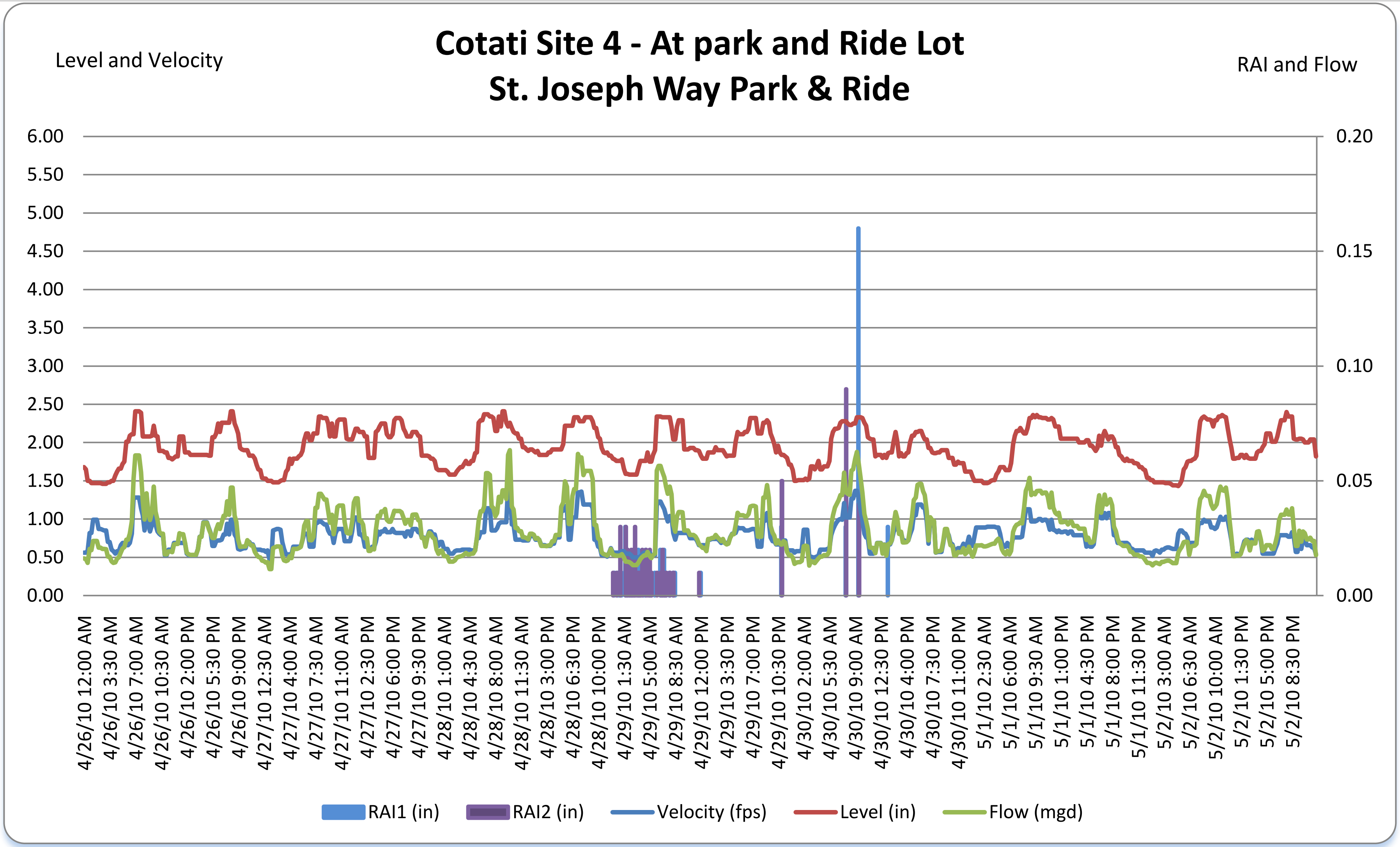
Total Rain Averaged between Both Gauges	Inches
	0.84

Week 7 4/19/2010 to 4/25/2010



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	0.77	1.97	0.03	Total Rain Averaged between Both Gauges	Inches
Maximum	1.51	2.47	0.07		0.26
Minimum	0.00	1.47	0.00		

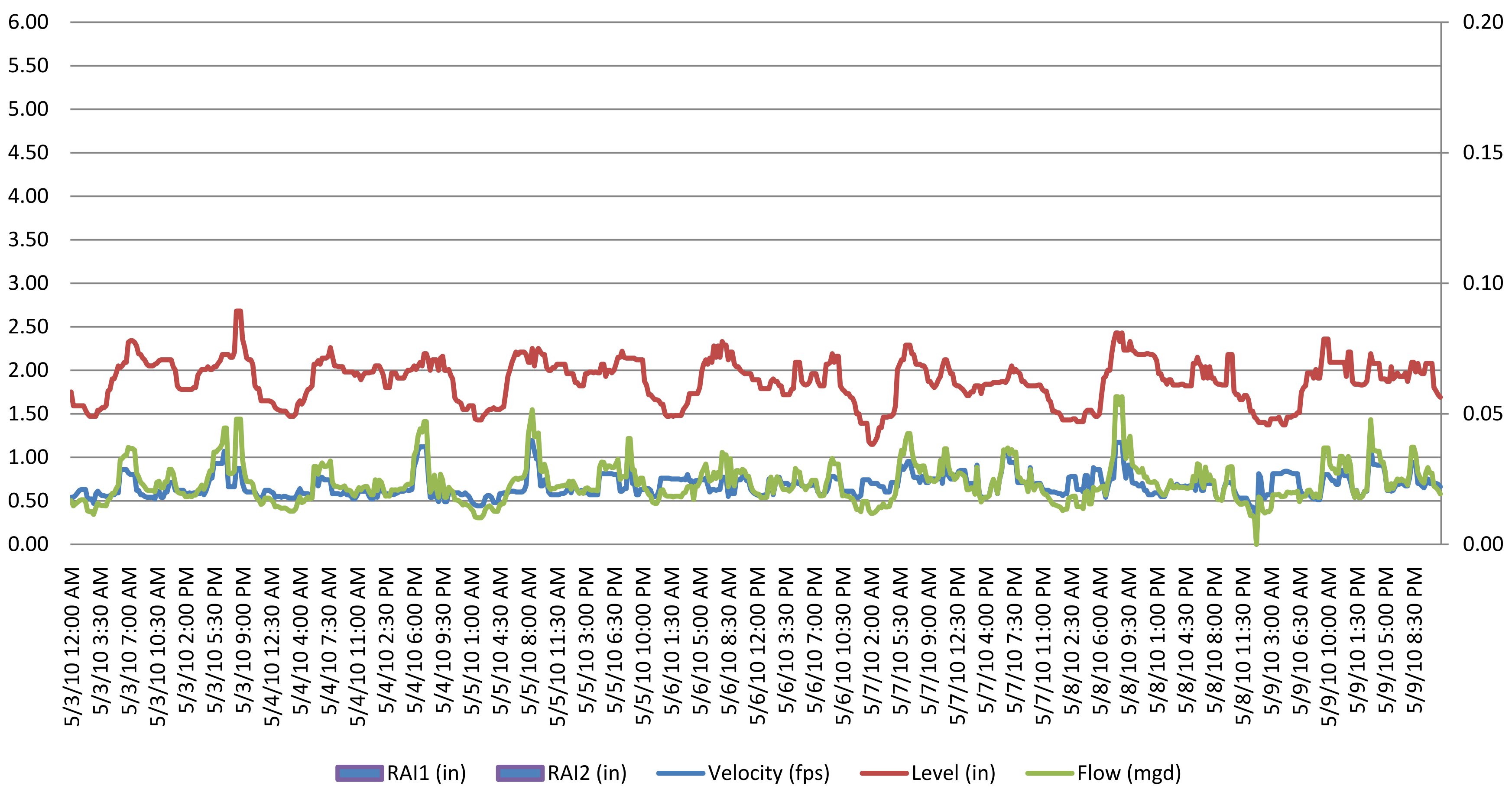
Week 8 4/26/2010 to 5/2/2010



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	0.77	1.94	0.03	Total Rain Averaged between Both Gauges	Inches
Maximum	1.45	2.41	0.06		0.29
Minimum	0.47	1.43	0.01		

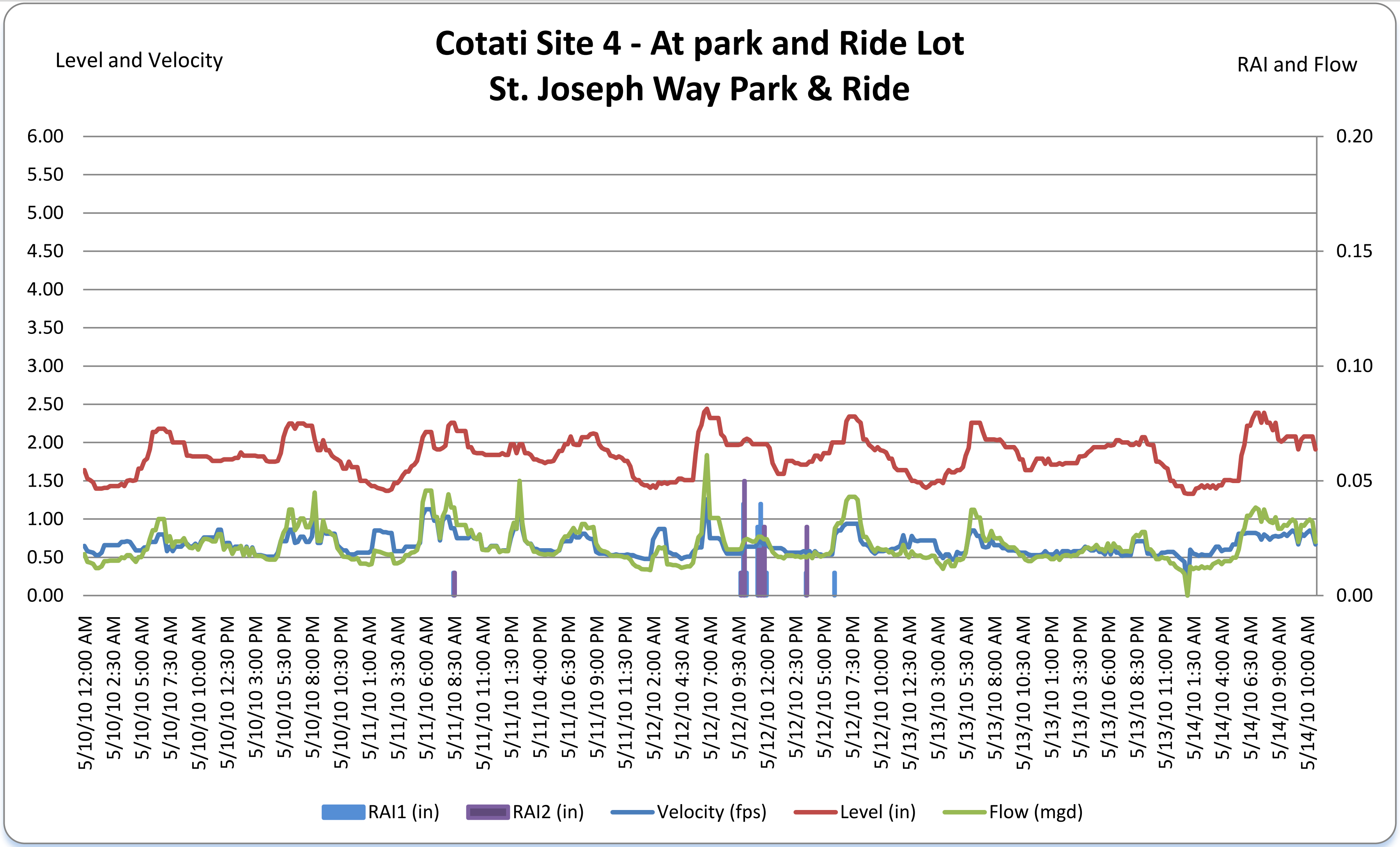
Week 9 5/3/2010 to 5/9/2010

Cotati Site 4 - At park and Ride Lot
St. Joseph Way Park & Ride

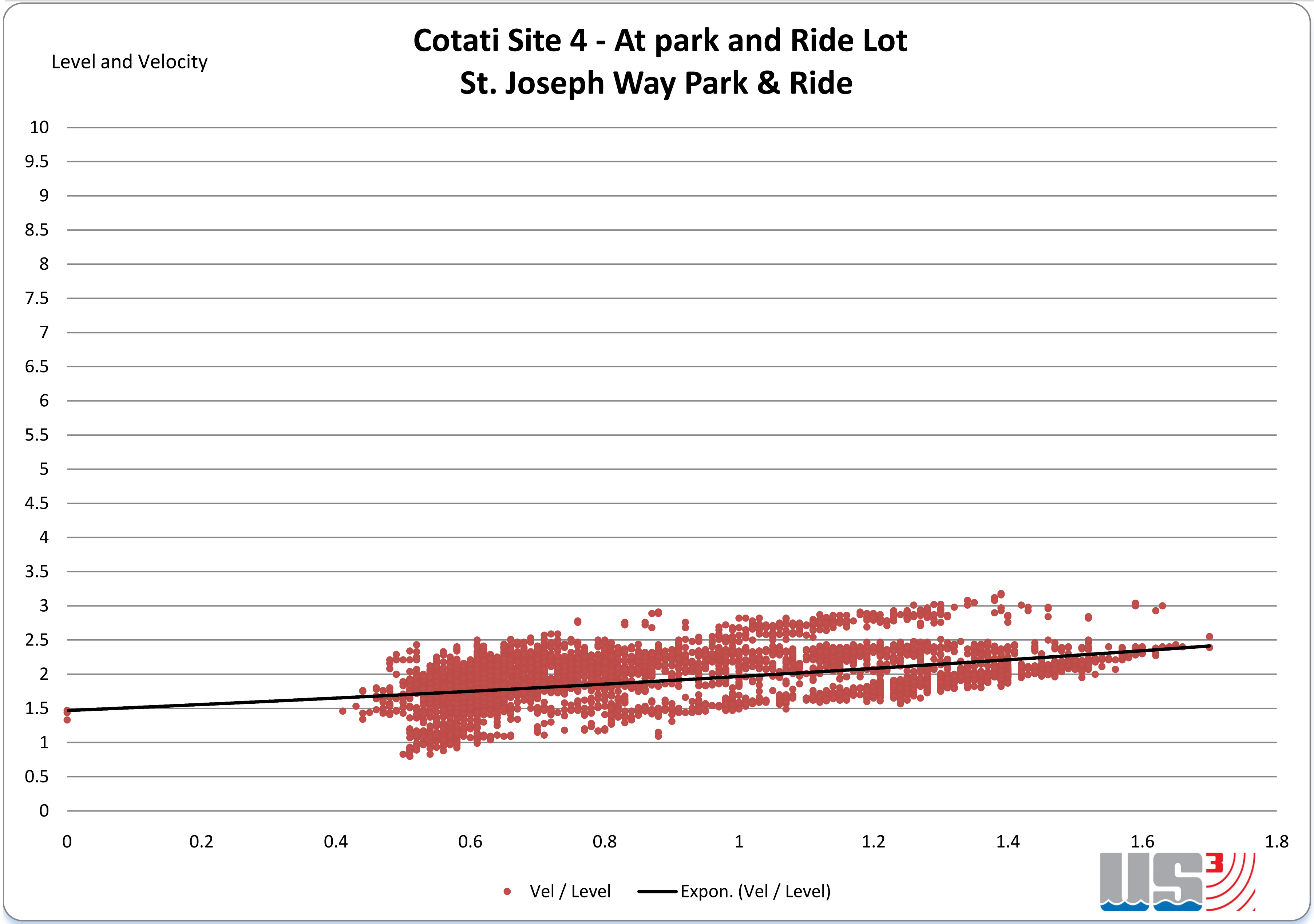


	Velocity (fps)	Level (in)	Flow (mgd)		
Average	0.68	1.88	0.02	Total Rain Averaged between Both Gauges	Inches
Maximum	1.19	2.68	0.06		0.00
Minimum	0.00	1.15	0.00		

Week 10 5/10/2010 to 5/14/2010



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	0.66	1.82	0.02	Total Rain Averaged between Both Gauges	Inches
Maximum	1.37	2.44	0.06		0.00
Minimum	0.00	1.33	0.00		


Cotati Site 4 - At park and Ride Lot
St. Joseph Way Park & Ride
Level and Velocity
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
Vel / Level
Expon. (Vel / Level)

Daily Report

St. Joseph Way Park & Ride

Average Daily MGD					Minimum Daily MGD				Maximum Daily MGD		
Date	Velocity	Level	Flow		Velocity	Level	Flow		Velocity	Level	Flow
3/10/2010	1.24	1.90	0.04		0.99	1.62	0.03		1.52	2.09	0.06
3/11/2010	1.12	1.76	0.04		0.51	1.11	0.01		1.58	2.30	0.07
3/12/2010	1.22	1.89	0.05		0.52	1.11	0.01		1.62	2.33	0.07
3/13/2010	1.30	1.95	0.05		0.64	1.50	0.02		1.65	2.43	0.08
3/14/2010	1.24	1.92	0.05		0.57	1.44	0.01		1.63	2.40	0.08
3/15/2010	1.20	1.77	0.04		0.59	1.18	0.01		1.47	2.09	0.06
3/16/2010	1.15	1.73	0.04		0.55	1.05	0.01		1.52	2.20	0.06
3/17/2010	1.13	1.71	0.04		0.55	0.99	0.01		1.56	2.19	0.06
3/18/2010	1.09	1.71	0.03		0.53	1.07	0.01		1.47	2.19	0.06
3/19/2010	1.09	1.67	0.03		0.55	1.07	0.01		1.45	2.07	0.06
3/20/2010	1.11	1.67	0.04		0.53	1.02	0.01		1.54	2.23	0.07
3/21/2010	1.11	1.68	0.04		0.56	0.92	0.01		1.49	2.21	0.06
3/22/2010	1.06	1.63	0.03		0.54	0.95	0.01		1.47	2.08	0.06
3/23/2010	1.04	1.61	0.03		0.52	0.93	0.01		1.44	2.05	0.05
3/24/2010	1.07	1.65	0.03		0.51	0.92	0.01		1.53	2.07	0.06
3/25/2010	1.12	1.68	0.03		0.61	1.04	0.01		1.47	2.11	0.06
3/26/2010	1.05	1.62	0.03		0.51	0.80	0.01		1.39	2.05	0.05
3/27/2010	1.05	1.66	0.03		0.51	0.80	0.01		1.60	2.34	0.07
3/28/2010	1.11	1.68	0.04		0.50	0.83	0.01		1.57	2.27	0.07
3/29/2010	1.10	1.71	0.03		0.55	1.03	0.01		1.51	2.15	0.06
3/30/2010	1.00	1.85	0.03		0.56	1.14	0.01		1.47	2.37	0.07
3/31/2010	1.17	2.10	0.05		0.57	1.69	0.02		1.70	2.55	0.09
4/1/2010	1.11	2.19	0.05		0.64	1.78	0.02		1.52	2.47	0.07
4/2/2010	1.09	2.16	0.05		0.59	1.71	0.02		1.40	2.44	0.07
4/3/2010	1.08	2.17	0.05		0.79	1.82	0.03		1.52	2.50	0.08
4/4/2010	1.07	2.20	0.05		0.56	1.72	0.02		1.47	2.48	0.07
4/5/2010	1.09	2.22	0.05		0.70	1.86	0.02		1.41	2.51	0.07
4/6/2010	0.96	2.09	0.04		0.67	1.76	0.02		1.34	2.39	0.06
4/7/2010	0.70	2.22	0.03		0.48	1.87	0.02		0.91	2.53	0.04
4/8/2010	0.72	2.15	0.03		0.50	1.86	0.02		1.36	2.40	0.06
4/9/2010	0.66	2.23	0.03		0.46	1.78	0.01		1.03	2.51	0.05
4/10/2010	0.67	2.22	0.03		0.44	1.75	0.01		1.02	2.78	0.06
4/11/2010	1.01	2.50	0.06		0.46	1.64	0.01		1.63	3.04	0.10
4/12/2010	1.21	2.83	0.07		1.01	2.57	0.05		1.39	3.18	0.10
4/13/2010	1.12	2.73	0.06		0.92	2.47	0.05		1.31	3.01	0.08
4/14/2010	0.98	2.62	0.05		0.62	2.32	0.03		1.29	2.87	0.08
4/15/2010	0.87	2.33	0.04		0.48	1.79	0.02		1.29	2.75	0.07
4/16/2010	0.71	2.01	0.03		0.54	1.75	0.02		1.25	2.32	0.06
4/17/2010	0.72	1.97	0.03		0.46	1.64	0.01		1.27	2.30	0.05
4/18/2010	0.85	2.05	0.03		0.51	1.61	0.01		1.35	2.41	0.06
4/19/2010	0.72	1.96	0.03		0.55	1.53	0.02		1.40	2.36	0.06
4/20/2010	0.80	2.06	0.03		0.53	1.66	0.02		1.38	2.40	0.07
4/21/2010	0.81	2.01	0.03		0.54	1.68	0.02		1.51	2.39	0.07
4/22/2010	0.79	1.95	0.03		0.51	1.61	0.01		1.38	2.39	0.06
4/23/2010	0.64	1.95	0.02		0.48	1.61	0.01		1.19	2.39	0.06
4/24/2010	0.80	1.91	0.03		0.48	1.53	0.01		1.37	2.47	0.07
4/25/2010	0.85	1.94	0.03		0.00	1.47	0.00		1.44	2.40	0.07
4/26/2010	0.76	1.90	0.03		0.53	1.46	0.01		1.28	2.41	0.06
4/27/2010	0.77	1.99	0.03		0.47	1.48	0.01		1.02	2.34	0.04

Daily Report

St. Joseph Way Park & Ride

Average Daily MGD					Minimum Daily MGD				Maximum Daily MGD		
Date	Velocity	Level	Flow		Velocity	Level	Flow		Velocity	Level	Flow
4/28/2010	0.81	2.00	0.03		0.51	1.58	0.01		1.45	2.41	0.06
4/29/2010	0.74	1.96	0.03		0.50	1.58	0.01		1.23	2.34	0.06
4/30/2010	0.79	1.91	0.03		0.50	1.50	0.01		1.37	2.33	0.06
5/1/2010	0.83	1.93	0.03		0.59	1.47	0.02		1.13	2.36	0.05
5/2/2010	0.71	1.91	0.03		0.52	1.43	0.01		1.03	2.40	0.05
5/3/2010	0.65	1.96	0.02		0.47	1.47	0.01		1.07	2.68	0.05
5/4/2010	0.63	1.90	0.02		0.49	1.47	0.01		1.12	2.26	0.05
5/5/2010	0.65	1.92	0.02		0.44	1.43	0.01		1.19	2.25	0.05
5/6/2010	0.68	1.87	0.02		0.55	1.47	0.02		0.80	2.33	0.04
5/7/2010	0.74	1.80	0.02		0.53	1.15	0.01		1.07	2.29	0.04
5/8/2010	0.69	1.87	0.02		0.51	1.41	0.01		1.17	2.43	0.06
5/9/2010	0.70	1.84	0.02		0.00	1.37	0.00		1.14	2.36	0.05
5/10/2010	0.67	1.82	0.02		0.51	1.40	0.01		1.18	2.25	0.04
5/11/2010	0.71	1.84	0.02		0.53	1.37	0.01		1.37	2.26	0.05
5/12/2010	0.64	1.84	0.02		0.48	1.41	0.01		1.26	2.44	0.06
5/13/2010	0.61	1.81	0.02		0.47	1.41	0.01		0.85	2.26	0.04
5/14/2010	0.68	1.81	0.02		0.00	1.33	0.00		0.85	2.39	0.04

Temporary Flow Study

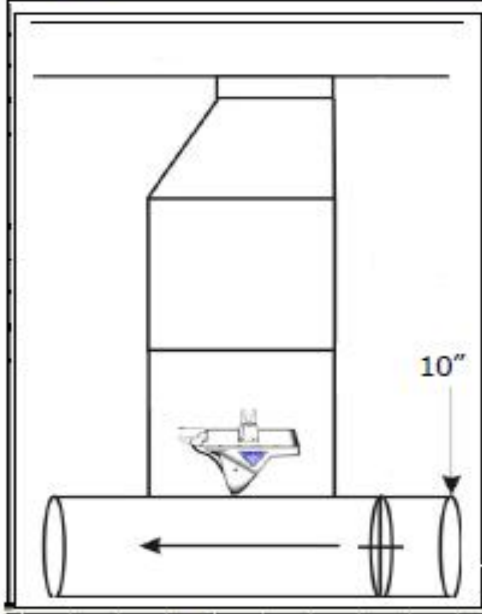
Cotati Site 5 - Near Bicycle Shop
West Side of Old Redwood Highway

Utility Systems, Science, and Software
2101 E. 4th Street
Santa Ana, Ca 92705

From		To
3/10/2010 11:30		5/14/2010 13:00

METERING SITE DOCUMENT

City:	**Cotati**
Site Name:	**Site 5**
Location:	**Bicycle shop**
Access:	**Sidewalk**
GPS:	**N +38° 19' 46.30", W -122° 42' 33.20"**
Install Date:	**3/10/2010**

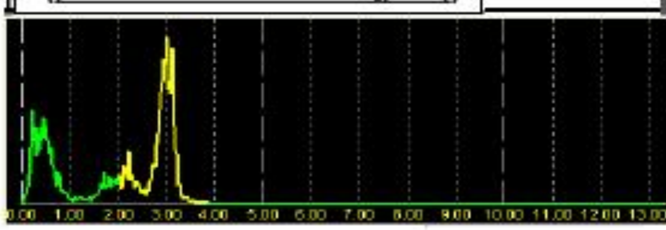


Pipe Size (inch):	10
Pipe Condition:	Good

Hydraulics:
Multiplier = 1.00

Gas	
O_2	Good
HS_2	Good

Manhole Comments:



Traffic Safety Required:
Cones for pedestrians

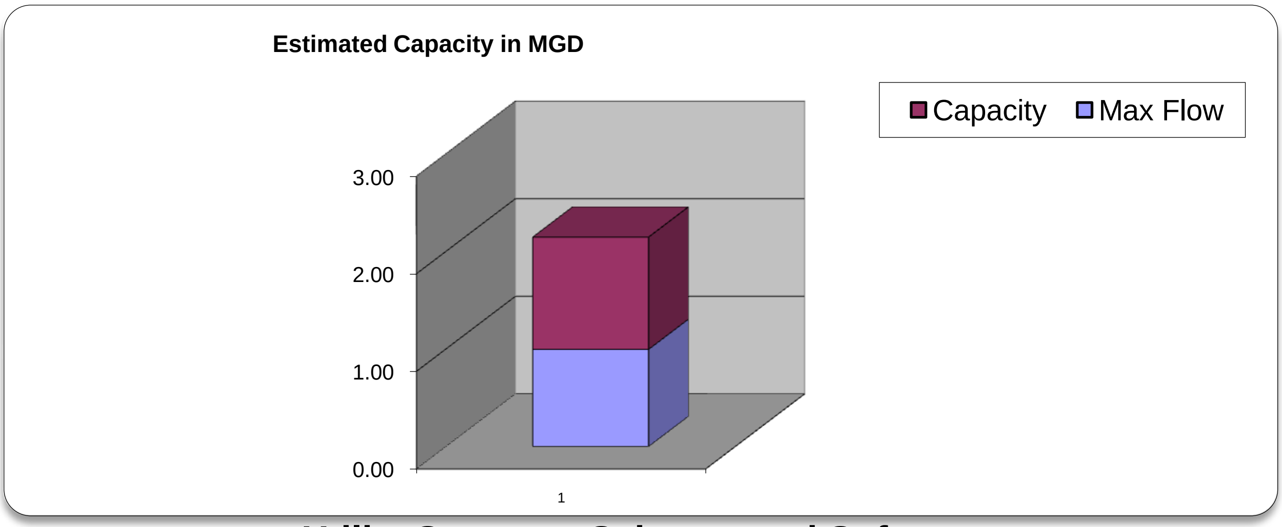
METERING SITE DOCUMENT

Site Pictures

Meter site 5
Temporary Flow Study

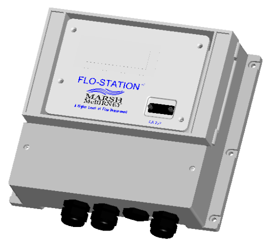
Cotati, CA

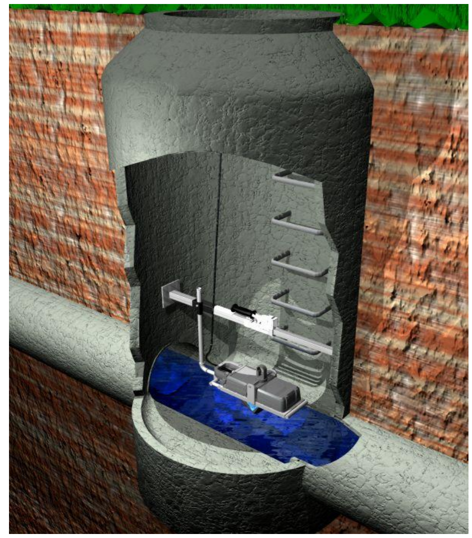
Meter Start Date		From	3/10/2010 11:30
Meter Stop Date		To	5/14/2010 13:00
	Velocity (fps)	Level (in)	Flow (MGD)
Average	2.14	2.68	0.17
Maximum	3.30	7.19	1.00
Minimum	1.21	1.53	0.04
	Pipe Size	10	
	Estimated Capacity	86.55%	
	Sensor Used	Hach - FloDar	
	Comment		



Utility Systems, Science, and Software
2101 E. 4th Street
Santa Ana, Ca 92705

Flo-Dar incorporates a Doppler Radar Velocity Sensor and Ultrasonic Depth Transducer for use in Open Channel Applications. It is available with a Permanent Flo-Station. The Flo-Station is available with or without a display and is powered with 120/240 VAC, or 12 VDC. The Flo-Station requires Flo-Ware software, which is included on some models, and a customer supplied PC. Flo-Station with display shows flow rate, total flow, velocity and level. Both Flo-Station's have four outputs one each for level, velocity, flow rate, surcharge level, and a contact closure. Instruction manuals are included. Mounting Hardware is ordered separately.





Flo-Dar Sensor
Enclosure
  Material: Polystyrene
  Dimensions: 6.9" W x 16.65" L x 11.7" D
   (17.5 cm x 42.3 cm x 29.7 cm)
  Weight: 10.5 lbs. (4.8 kg)

Temperature
  Operating Range: 14° F to 122°F
   (-10° C to 50° C)
  Storage Range: -40° F to 140° F
   (-40° C to 60° C)

Velocity Measurement
  Method: Radar
  Range: 0.75 to 20 ft/s (0.23 m/s to 6.10 m/s)
  Accuracy: ±0.5%; ±0.1 ft/s (±0.03 m/s)

Level Measurement
  Method: Ultrasonic
  Standard Operating Range:
   0.25 to 60 in. (0.634 to 152.4 cm)
Optional Operating Range: 0 (0 cm) to 240" (6.1 m)
(with 18" dead band)
  Temperature Compensated
  Accuracy: ±0.1 in. (±0.25 cm)
  1% Accuracy

Surcharge Conditions Level/Velocity
  Level
  Method: Piezo-resistive pressure transducer
  Maximum Range: 138 inches (3.5 meters)
  Velocity
  Method: Electromagnetic
  Range: -5 to +20 ft/s (-1.5 to +6.1 m/s)

Flow Measurement
  Based on Continuity Equation.
  Accuracy: ±5.0% of reading typical where flow is in a channel with uniform flow conditions and is not surcharged.

Flo-Station Monitor
Data Storage
  64K (16K cycles of velocity/level data)
Local Terminal
  RS232C at 19.2K baud

Timebase Accuracy: 1 second per day

Outputs: Four 4-20 mA outputs; system-isolated, up to 600Ω load. Each output is selectable between FLOW, LEVEL, VELOCITY OR SURCHARGE LEVEL.

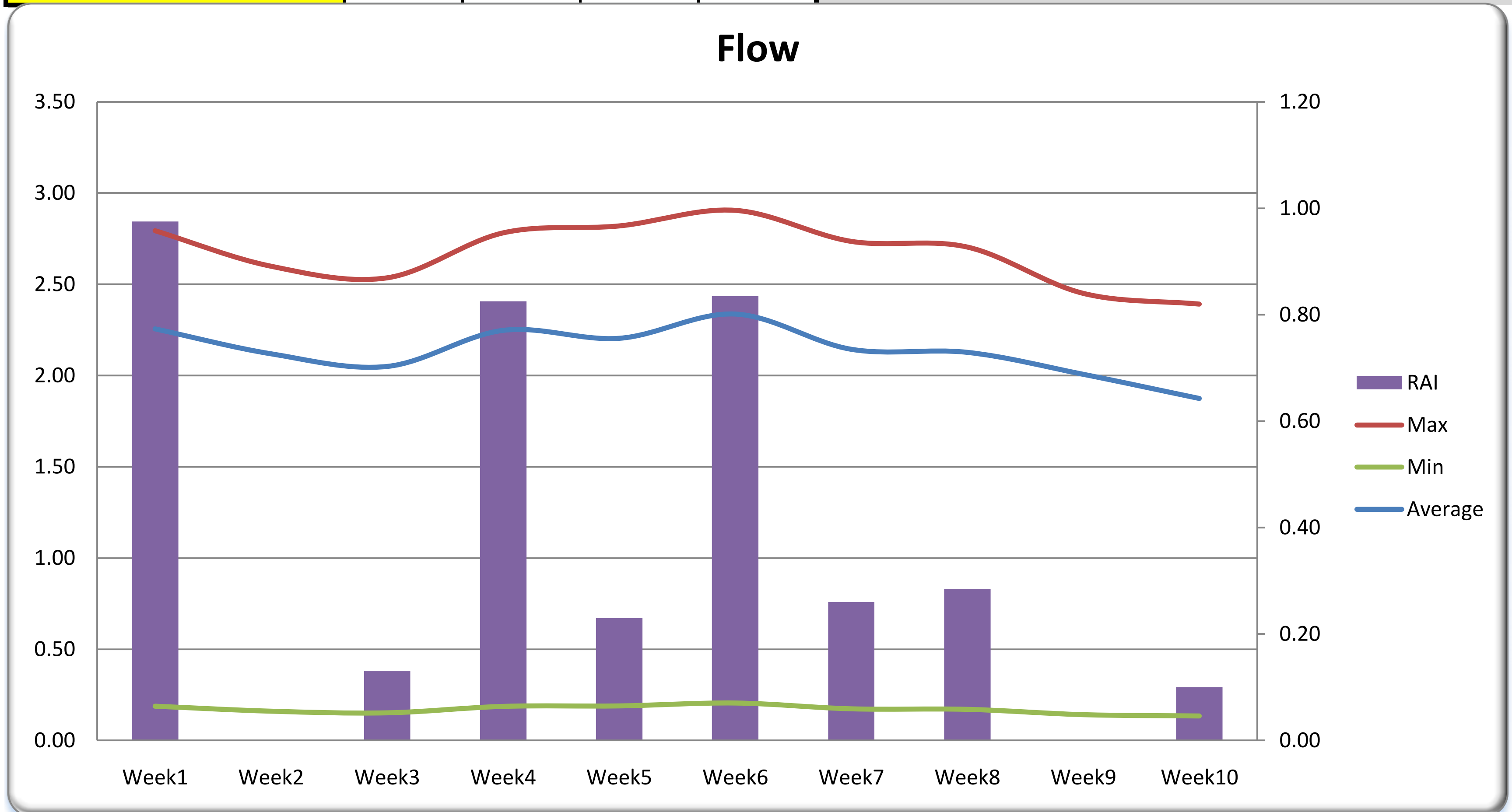
Power Requirements
AC: 85-264 VAC, 47-63 Hz. 32 watts
DC: 12 VDC for Flo-Station without Display or Flo-Station with Display (Backlight Off)
180 mA (2.1 watts) with (1) 4-20 mA utilized.

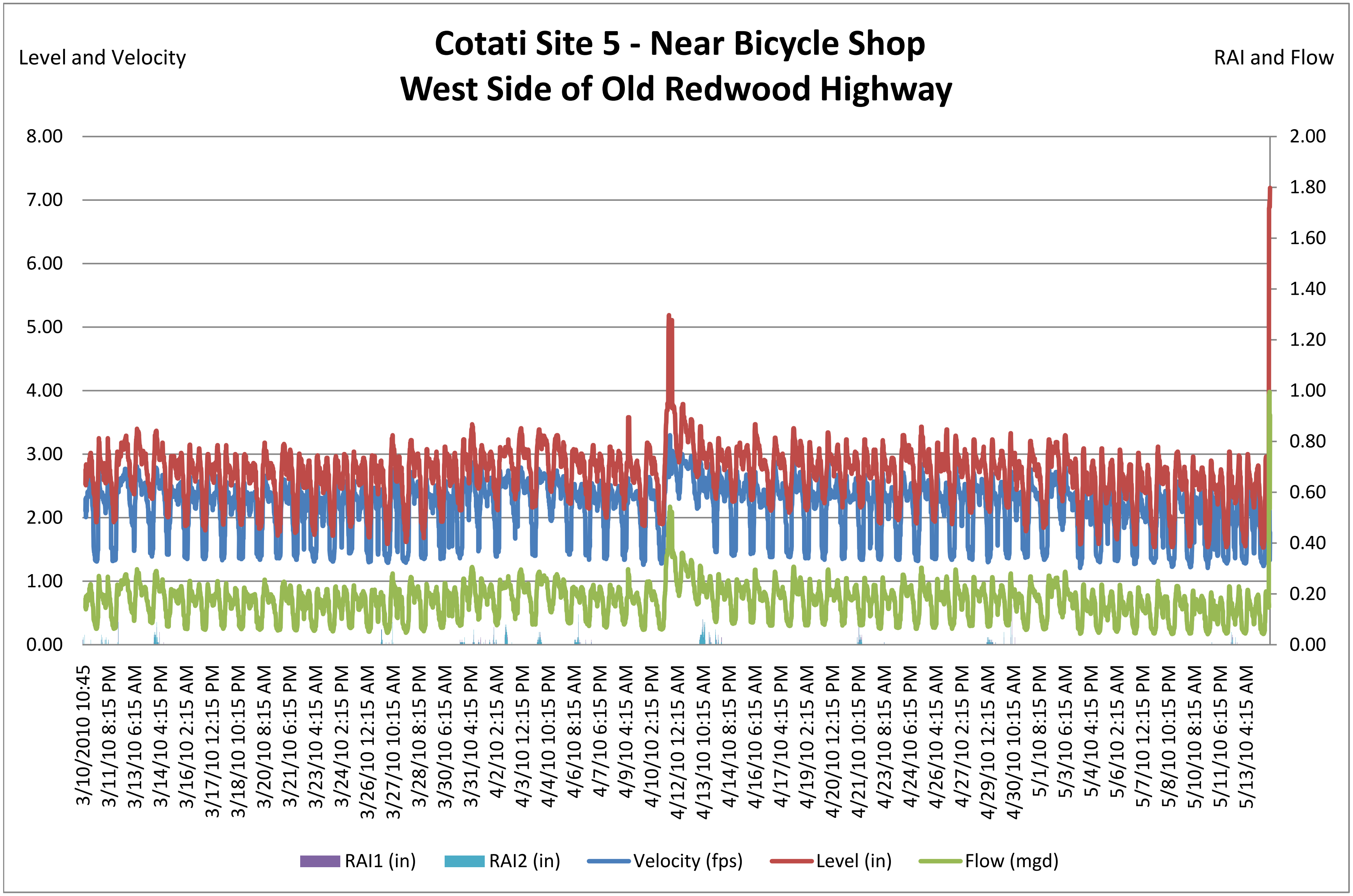
Housing
Material: ABS Plastic, NEMA 4
Dimensions: 10.2" W x 9.3" H x 4" D
 (25.9 cm W x 23.6 cm H x 10.2 cm D)
Weight: 5 lbs.
Temperature Operating Range: 14° F to 122° F
 (-10° C to 50° C)
Temperature Storage Range:
(without display) -40°F to 140°F (-40°C to 60°C)
(with display) 4°F to 140°F (-20°C to 60°C) w/Display

Flow Review

	Average	Max	Min	RAI
Week1	2.26	2.79	0.19	0.98
Week2	2.12	2.60	0.16	0.00
Week3	2.05	2.53	0.15	0.13
Week4	2.25	2.78	0.19	0.83
Week5	2.20	2.82	0.19	0.23
Week6	2.34	2.90	0.20	0.84
Week7	2.14	2.73	0.17	0.26
Week8	2.13	2.70	0.17	0.29
Week9	2.01	2.45	0.14	0.00
Week10	1.87	2.39	0.13	0.10

Cotati Site 5 - Near Bicycle Shop
West Side of Old Redwood Highway





Cotati Site 5 - Near Bicycle Shop
West Side of Old Redwood Highway
Level and Velocity
RAI and Flow
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
3/10/2010 10:45
3/11/10 8:15 PM
3/13/10 6:15 AM
3/14/10 4:15 PM
3/16/10 2:15 AM
3/17/10 12:15 PM
3/18/10 10:15 PM
3/20/10 8:15 AM
3/21/10 6:15 PM
3/23/10 4:15 AM
3/24/10 2:15 PM
3/26/10 12:15 AM
3/27/10 10:15 AM
3/28/10 8:15 PM
3/30/10 6:15 AM
3/31/10 4:15 PM
4/2/10 2:15 AM
4/3/10 12:15 PM
4/4/10 10:15 PM
4/6/10 8:15 AM
4/7/10 6:15 PM
4/9/10 4:15 AM
4/10/10 2:15 PM
4/12/10 12:15 AM
4/13/10 10:15 AM
4/14/10 8:15 PM
4/16/10 6:15 AM
4/17/10 4:15 PM
4/19/10 2:15 AM
4/20/10 12:15 PM
4/21/10 10:15 PM
4/23/10 8:15 AM
4/24/10 6:15 PM
4/26/10 4:15 AM
4/27/10 2:15 PM
4/29/10 12:15 AM
4/30/10 10:15 AM
5/1/10 8:15 PM
5/3/10 6:15 AM
5/4/10 4:15 PM
5/6/10 2:15 AM
5/7/10 12:15 PM
5/8/10 10:15 PM
5/10/10 8:15 AM
5/11/10 6:15 PM
5/13/10 4:15 AM
RAI1 (in)
RAI2 (in)
Velocity (fps)
Level (in)
Flow (mgd)

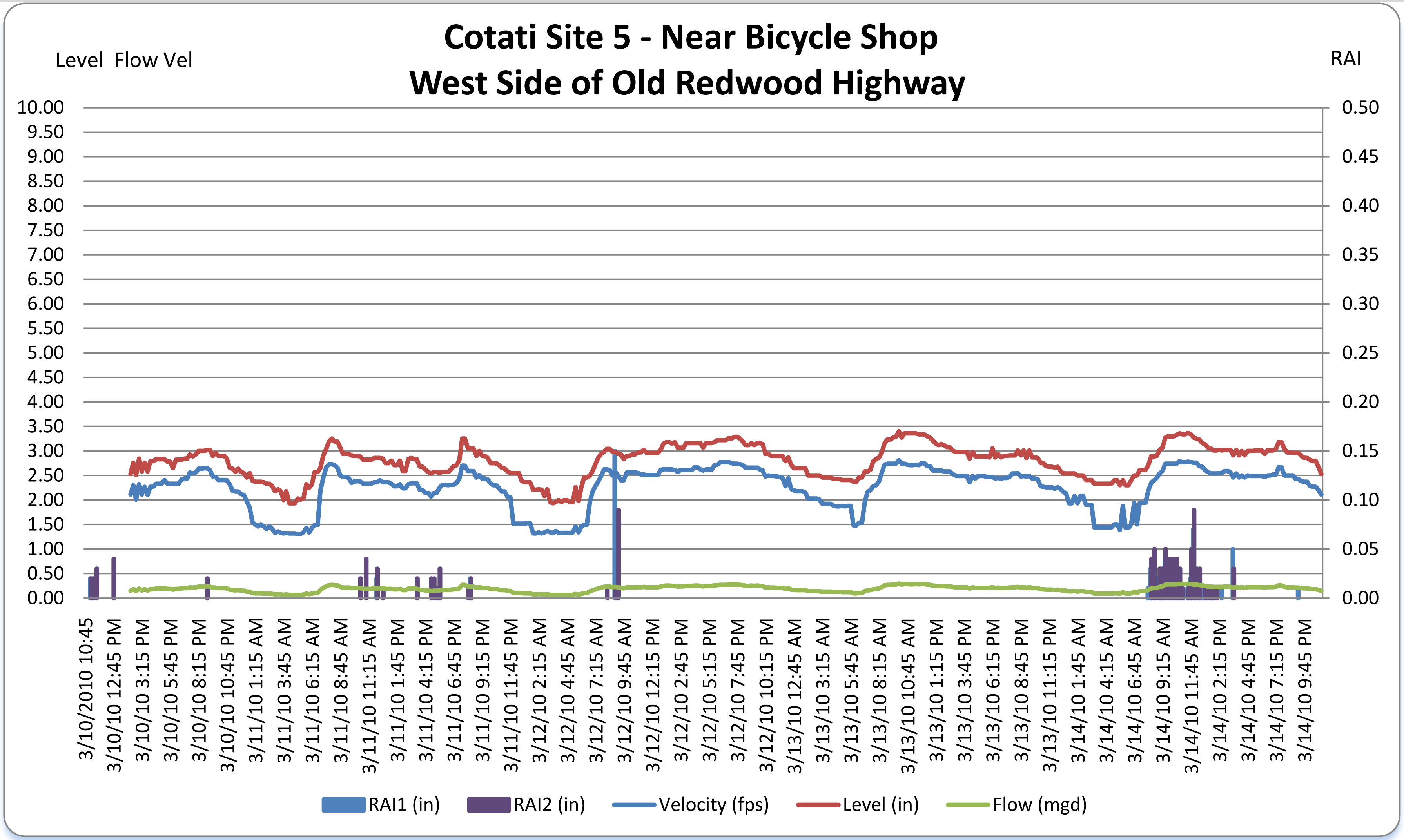
Rainlog Rainfall Report		By Day Report
City Hall Site	Total	6.10
	Max	1.37
	Average	0.09
Date	*Rainfall*	*Comments*
3/8/10 0:00	0.04	
3/9/10 0:00	0.04	
3/10/10 0:00	0.15	
3/11/10 0:00	0.00	
3/12/10 0:00	0.55	
3/13/10 0:00	0.00	
3/14/10 0:00	0.00	
3/15/10 0:00	0.00	
3/16/10 0:00	0.00	
3/17/10 0:00	0.00	
3/18/10 0:00	0.00	
3/19/10 0:00	0.00	
3/20/10 0:00	0.00	
3/21/10 0:00	0.00	
3/22/10 0:00	0.00	
3/23/10 0:00	0.00	
3/24/10 0:00	0.25	
3/25/10 0:00	0.01	
3/26/10 0:00	0.00	
3/27/10 0:00	0.00	
3/28/10 0:00	0.00	
3/29/10 0:00	0.23	
3/30/10 0:00	0.34	
3/31/10 0:00	0.69	
4/1/10 0:00	0.00	
4/2/10 0:00	0.39	
4/3/10 0:00	0.00	
4/4/10 0:00	0.41	
4/5/10 0:00	0.05	
4/6/10 0:00	0.00	
4/7/10 0:00	0.00	
4/8/10 0:00	0.00	
4/9/10 0:00	0.00	
4/10/10 0:00	0.00	
4/11/10 0:00	1.37	
4/12/10 0:00	0.30	
4/13/10 0:00	0.00	
4/14/10 0:00	0.00	
4/15/10 0:00	0.00	
4/16/10 0:00	0.00	
4/17/10 0:00	0.00	
4/18/10 0:00	0.00	
4/19/10 0:00	0.21	
4/20/10 0:00	0.30	
4/21/10 0:00	0.01	
4/22/10 0:00	0.00	
4/23/10 0:00	0.00	
4/24/10 0:00	0.00	

Rainlog Rainfall Report		By Day Report
City Hall Site	**Total**	**6.10**
	Max	**1.37**
	Average	**0.09**
Date	***Rainfall***	***Comments***
4/25/10 0:00	0.00	
4/26/10 0:00	0.00	
4/27/10 0:00	0.35	
4/28/10 0:00	0.22	
4/29/10 0:00	0.00	
4/30/10 0:00	0.00	
5/1/10 0:00	0.00	
5/2/10 0:00	0.00	
5/3/10 0:00	0.00	
5/4/10 0:00	0.00	
5/5/10 0:00	0.00	
5/6/10 0:00	0.00	
5/7/10 0:00	0.00	
5/8/10 0:00	0.00	
5/9/10 0:00	0.01	
5/10/10 0:00	0.18	
5/11/10 0:00	0.00	
5/12/10 0:00	0.00	
5/13/10 0:00	0.00	
5/14/10 0:00	0.00	

Rainlog Rainfall Report		By Day Report
North Pump Station	**Total**	**6.82**
	Max	**1.58**
	Average	**0.10**
Date	***Rainfall***	***Comments***
3/8/10 0:00	0.13	
3/9/10 0:00	0.23	
3/10/10 0:00	0.11	
3/11/10 0:00	0.00	
3/12/10 0:00	0.70	
3/13/10 0:00	0.00	
3/14/10 0:00	0.00	
3/15/10 0:00	0.00	
3/16/10 0:00	0.00	
3/17/10 0:00	0.00	
3/18/10 0:00	0.00	
3/19/10 0:00	0.00	
3/20/10 0:00	0.00	
3/21/10 0:00	0.00	
3/22/10 0:00	0.00	
3/23/10 0:00	0.00	
3/24/10 0:00	0.23	
3/25/10 0:00	0.13	
3/26/10 0:00	0.00	
3/27/10 0:00	0.00	
3/28/10 0:00	0.00	
3/29/10 0:00	0.29	
3/30/10 0:00	0.20	
3/31/10 0:00	0.75	
4/1/10 0:00	0.00	
4/2/10 0:00	0.48	
4/3/10 0:00	0.00	
4/4/10 0:00	0.47	
4/5/10 0:00	0.02	
4/6/10 0:00	0.00	
4/7/10 0:00	0.00	
4/8/10 0:00	0.00	
4/9/10 0:00	0.00	
4/10/10 0:00	0.00	
4/11/10 0:00	1.58	
4/12/10 0:00	0.27	
4/13/10 0:00	0.00	
4/14/10 0:00	0.00	
4/15/10 0:00	0.00	
4/16/10 0:00	0.00	
4/17/10 0:00	0.00	
4/18/10 0:00	0.00	
4/19/10 0:00	0.21	
4/20/10 0:00	0.26	
4/21/10 0:00	0.01	
4/22/10 0:00	0.00	
4/23/10 0:00	0.00	
4/24/10 0:00	0.00	

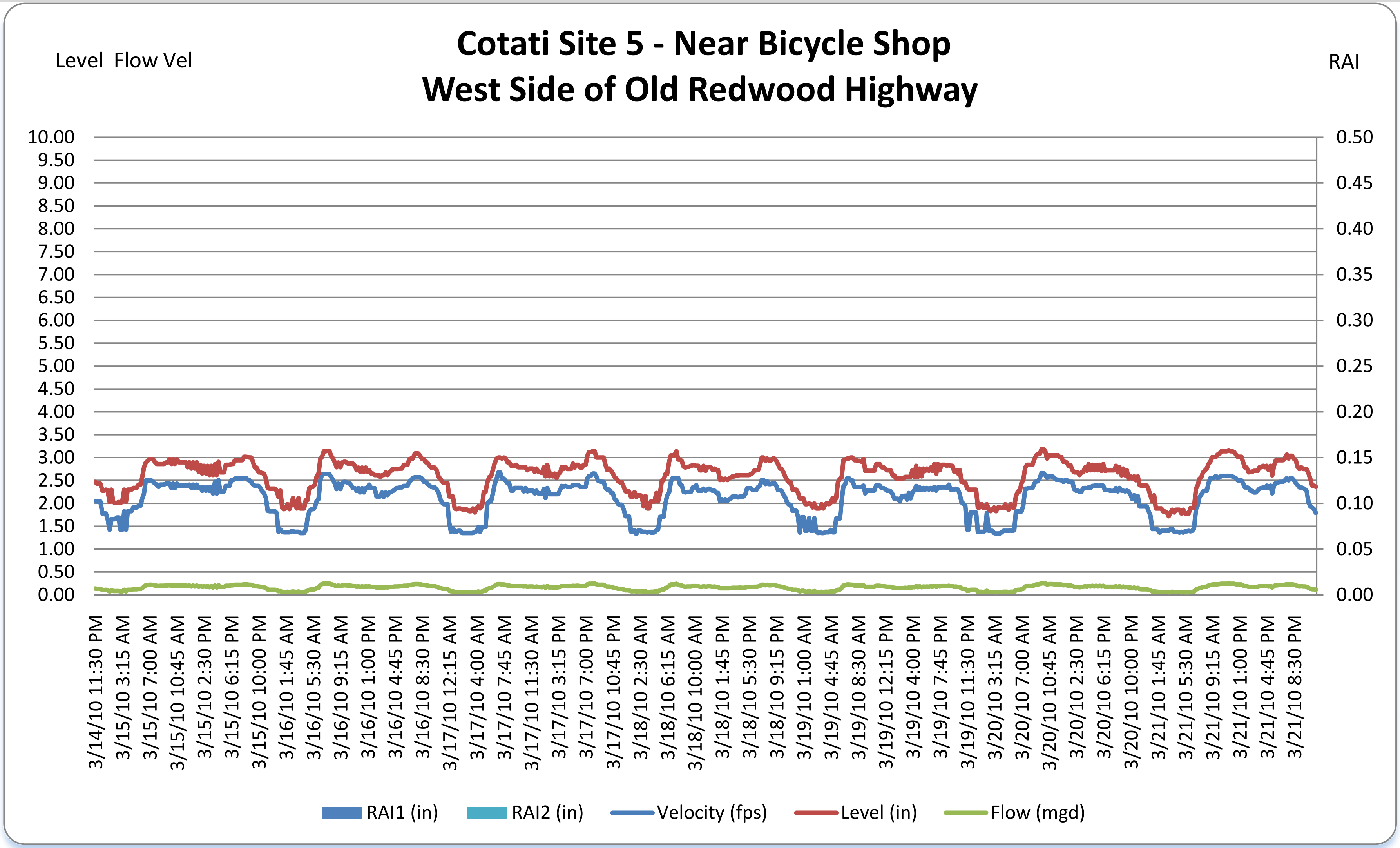
Rainlog Rainfall Report		By Day Report
North Pump Station	**Total**	**6.82**
	Max	**1.58**
	Average	**0.10**
Date	***Rainfall***	***Comments***
4/25/10 0:00	0.00	
4/26/10 0:00	0.01	
4/27/10 0:00	0.42	
4/28/10 0:00	0.13	
4/29/10 0:00	0.00	
4/30/10 0:00	0.00	
5/1/10 0:00	0.00	
5/2/10 0:00	0.00	
5/3/10 0:00	0.00	
5/4/10 0:00	0.00	
5/5/10 0:00	0.00	
5/6/10 0:00	0.00	
5/7/10 0:00	0.00	
5/8/10 0:00	0.00	
5/9/10 0:00	0.01	
5/10/10 0:00	0.16	
5/11/10 0:00	0.00	
5/12/10 0:00	0.00	
5/13/10 0:00	0.02	
5/14/10 0:00	0.00	

Week 1 3/10/2010 to 3/14/2010



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	2.26	2.79	0.19	Total Rain Averaged between Both Gauges	Inches
Maximum	2.81	3.40	0.30		0.98
Minimum	1.31	1.93	0.06		

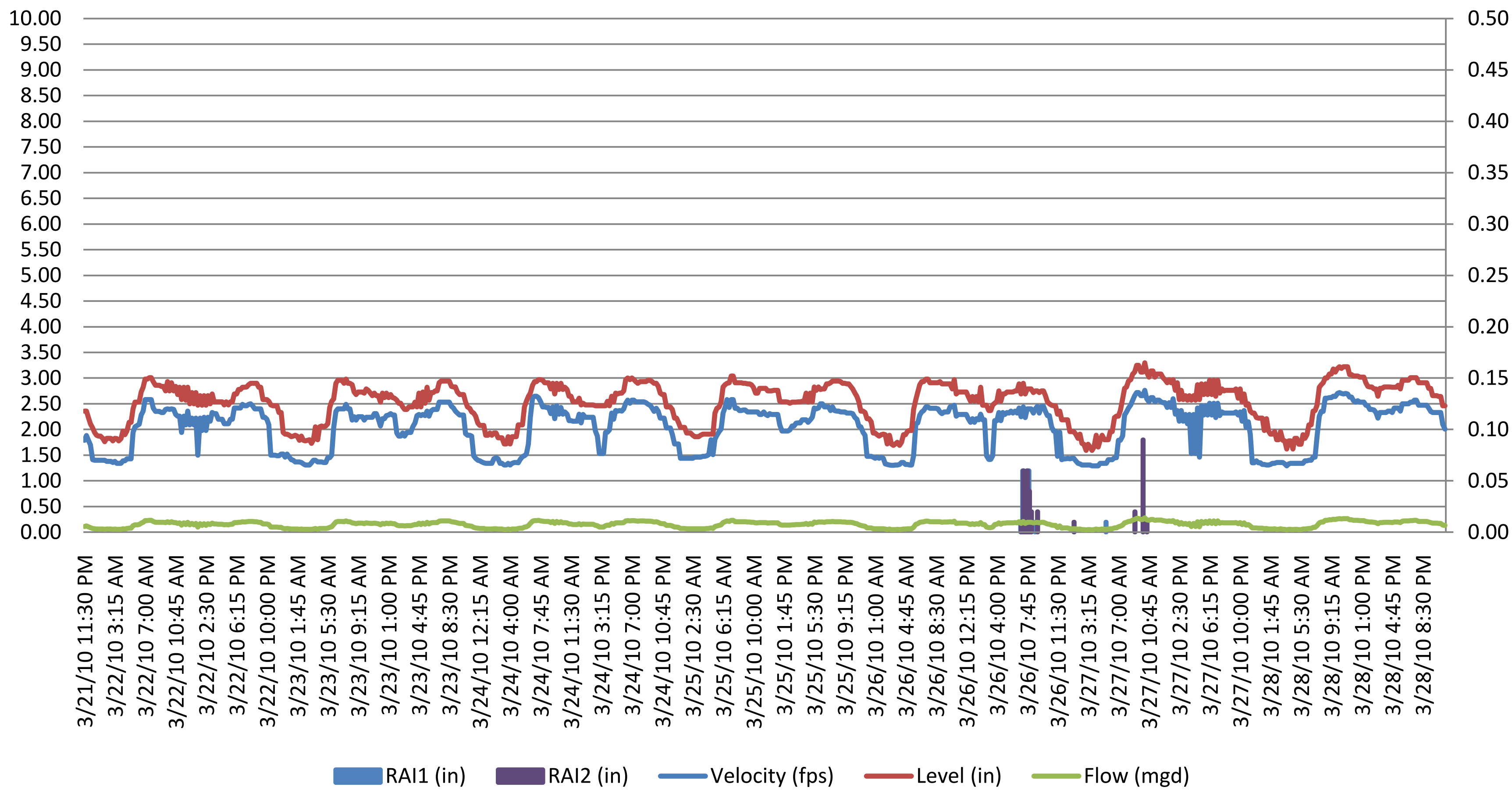
Week 2 3/15/2010 to 3/21/2010



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	2.12	2.60	0.16	Total Rain Averaged between Both Gauges	Inches
Maximum	2.68	3.18	0.26		0.00
Minimum	1.33	1.72	0.06		

Week 3   3/22/2010   to   3/28/2010

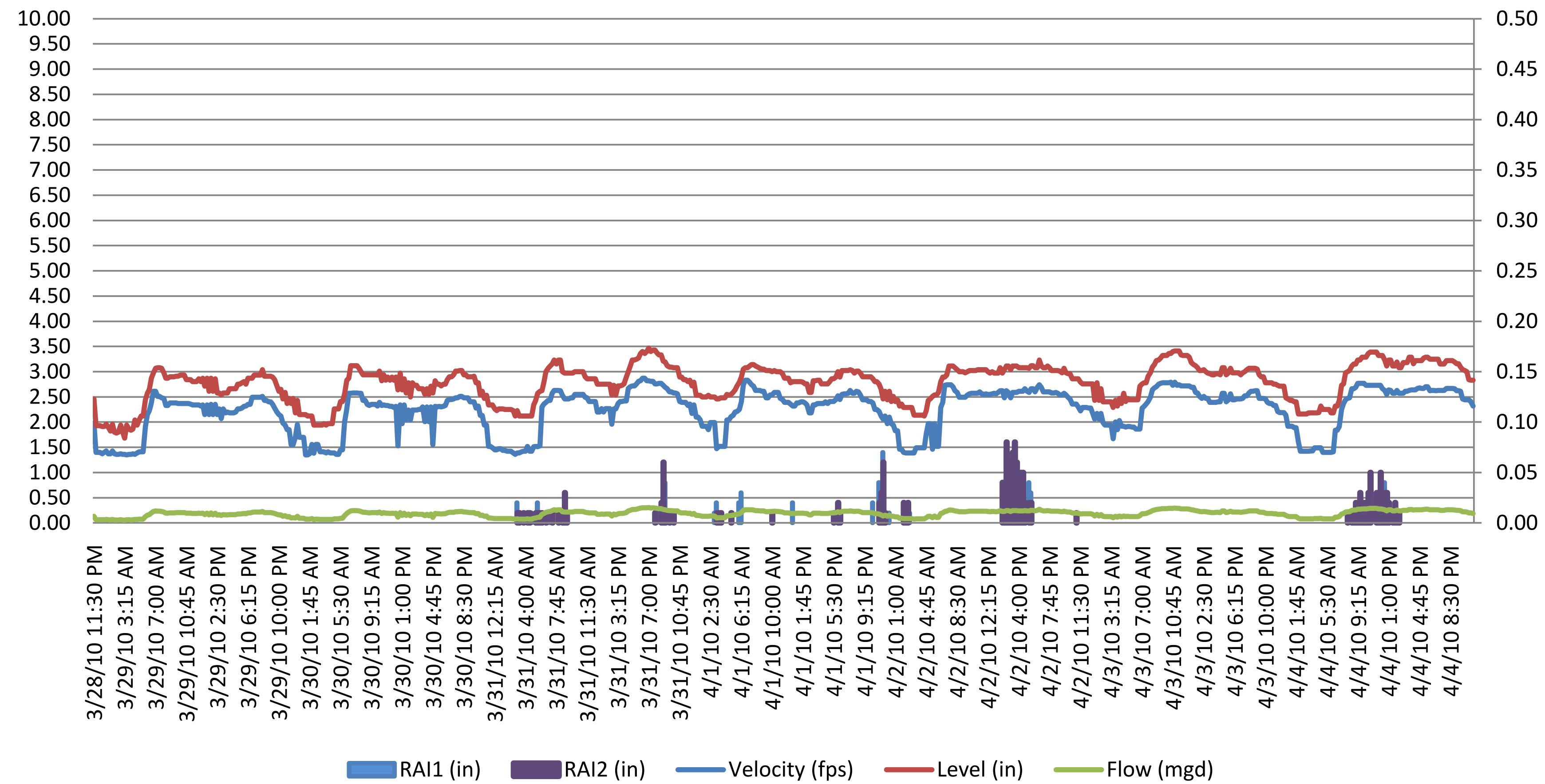
Cotati Site 5 - Near Bicycle Shop
West Side of Old Redwood Highway



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	2.05	2.53	0.15	Total Rain Averaged between Both Gauges	Inches
Maximum	2.76	3.30	0.28		0.13
Minimum	1.29	1.59	0.05		

Week 4 3/29/2010 to 4/4/2010

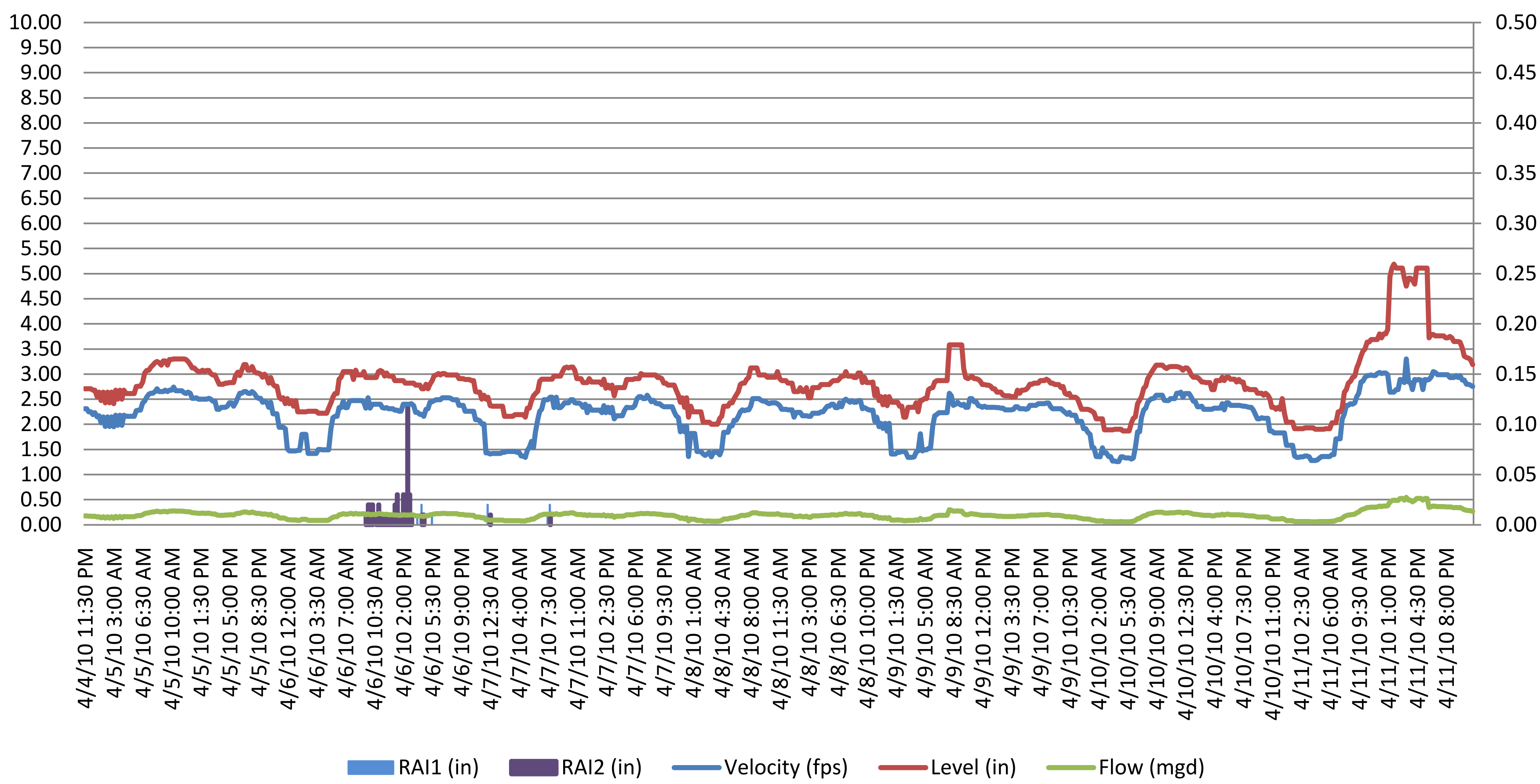
Cotati Site 5 - Near Bicycle Shop
West Side of Old Redwood Highway



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	2.25	2.78	0.19	Total Rain Averaged between Both Gauges	Inches
Maximum	2.87	3.47	0.31		0.83
Minimum	1.35	1.68	0.05		

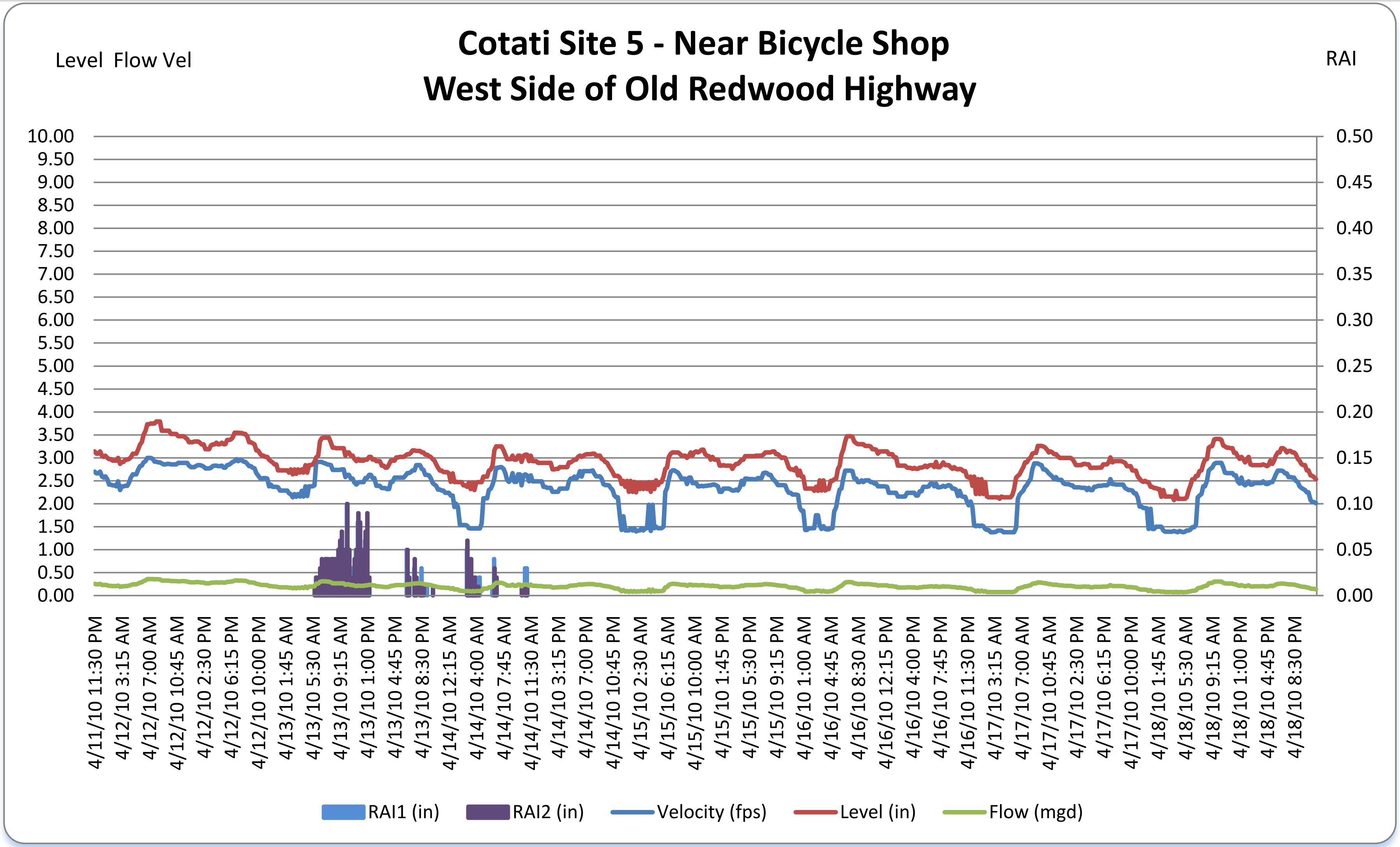
Week 5 4/4/2010 to 4/11/2010

Cotati Site 5 - Near Bicycle Shop
West Side of Old Redwood Highway



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	2.20	2.82	0.19	Total Rain Averaged between Both Gauges	Inches
Maximum	3.30	5.19	0.54		0.23
Minimum	1.26	1.87	0.06		

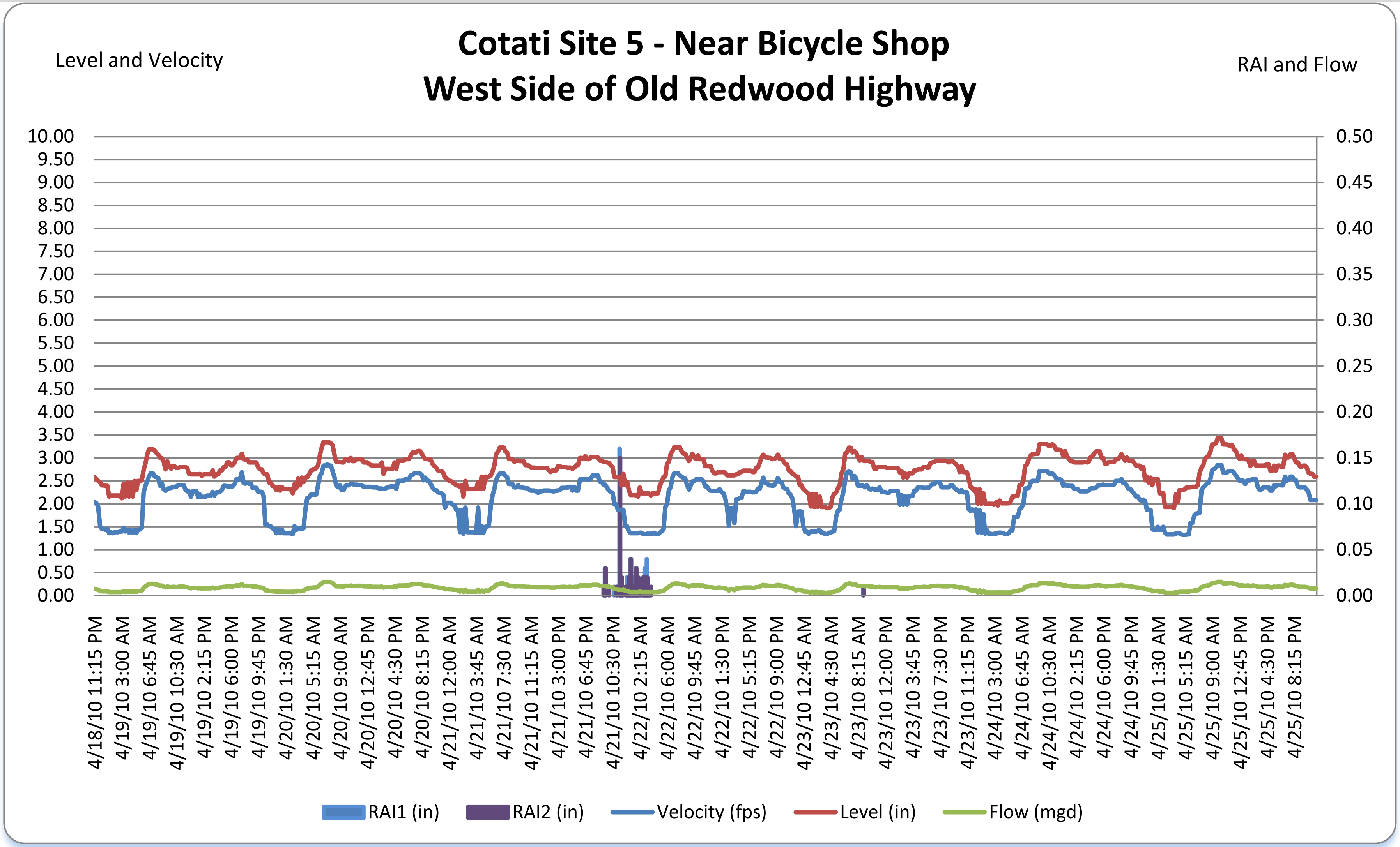
Week 6 4/12/2010 to 4/18/2010



	Velocity (fps)	Level (in)	Flow (mgd)
Average	2.34	2.90	0.20
Maximum	3.00	3.79	0.36
Minimum	1.38	2.08	0.07

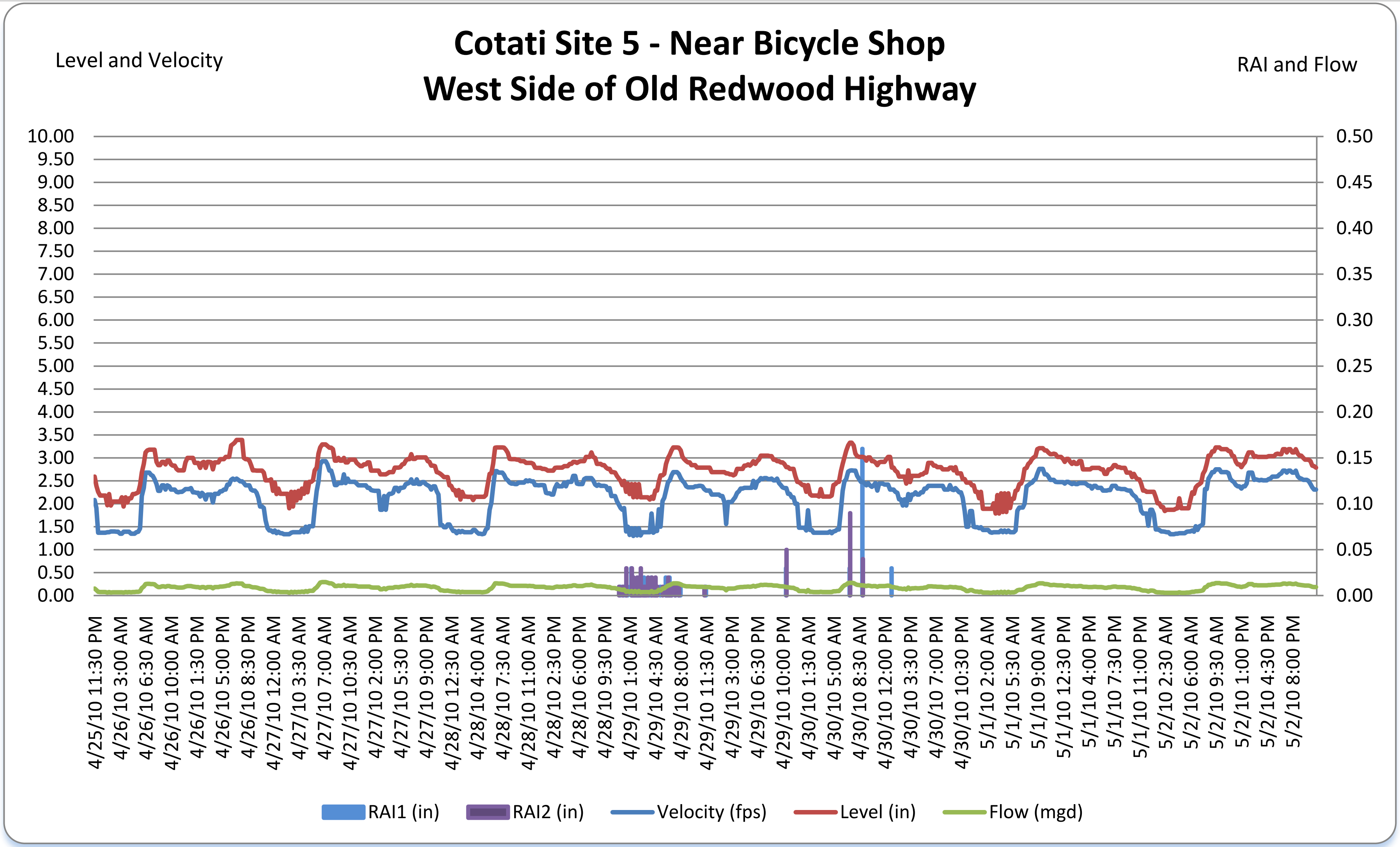
Total Rain Averaged between Both Gauges	Inches
	0.84

Week 7 4/19/2010 to 4/25/2010



	Velocity (fps)	Level (in)	Flow (mgd)	Total Rain Averaged between Both Gauges	Inches
Average	2.14	2.73	0.17		
Maximum	2.86	3.43	0.30		0.26
Minimum	1.32	1.91	0.06		

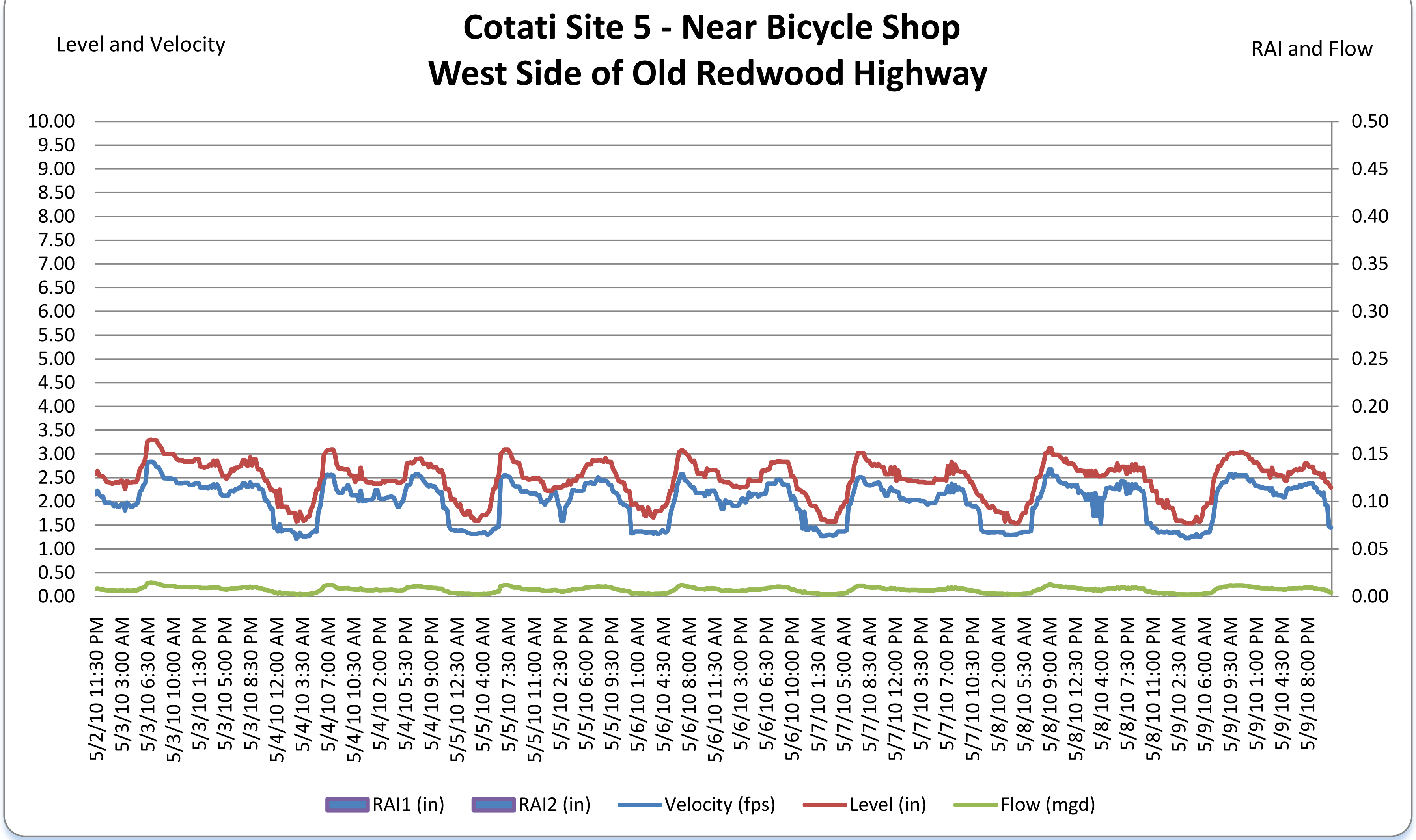
Week 8 4/26/2010 to 5/2/2010



	Velocity (fps)	Level (in)	Flow (mgd)
Average	2.13	2.70	0.17
Maximum	2.93	3.39	0.30
Minimum	1.30	1.79	0.06

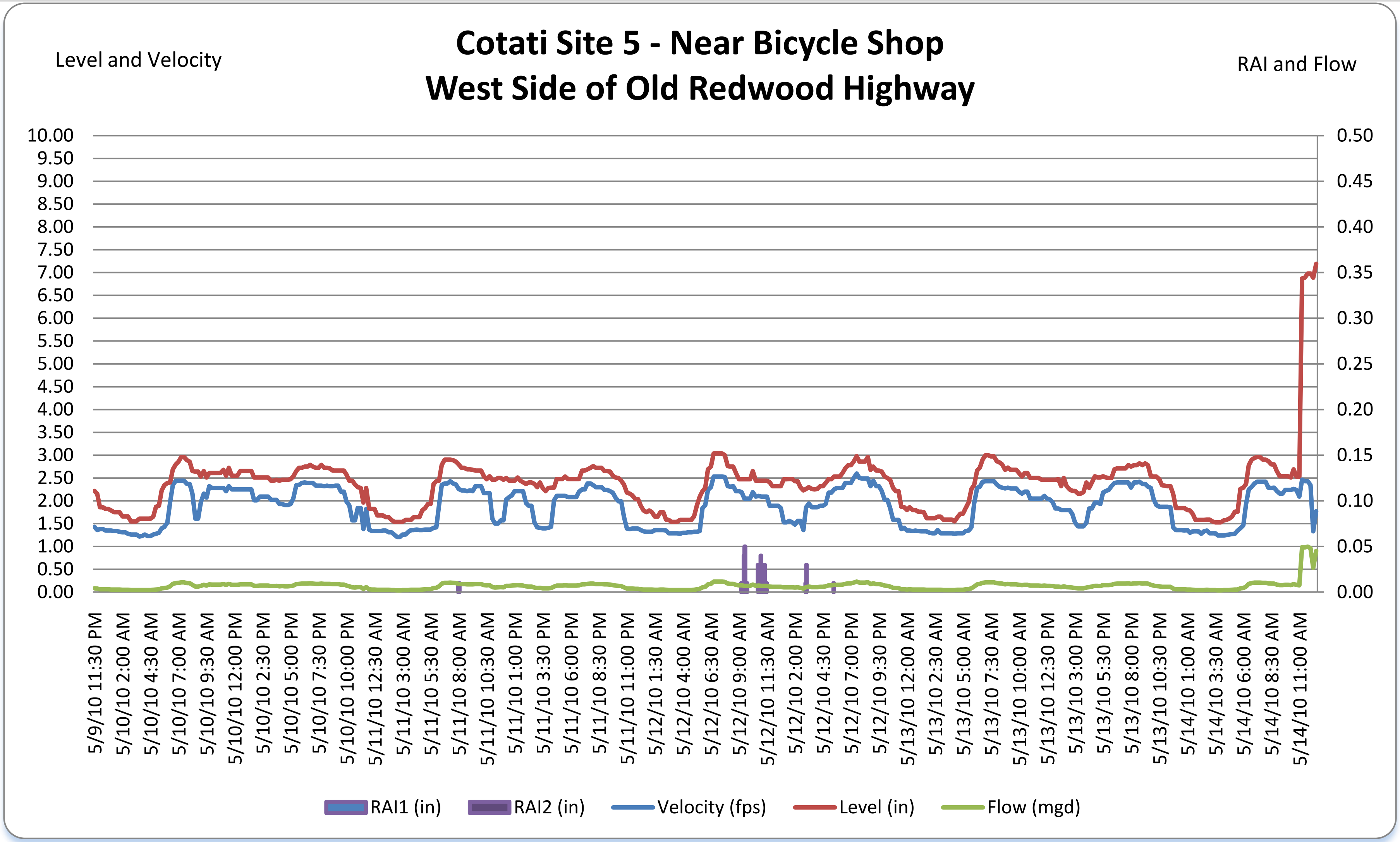
Total Rain Averaged between Both Gauges	Inches
	0.29

Week 9 5/3/2010 to 5/9/2010



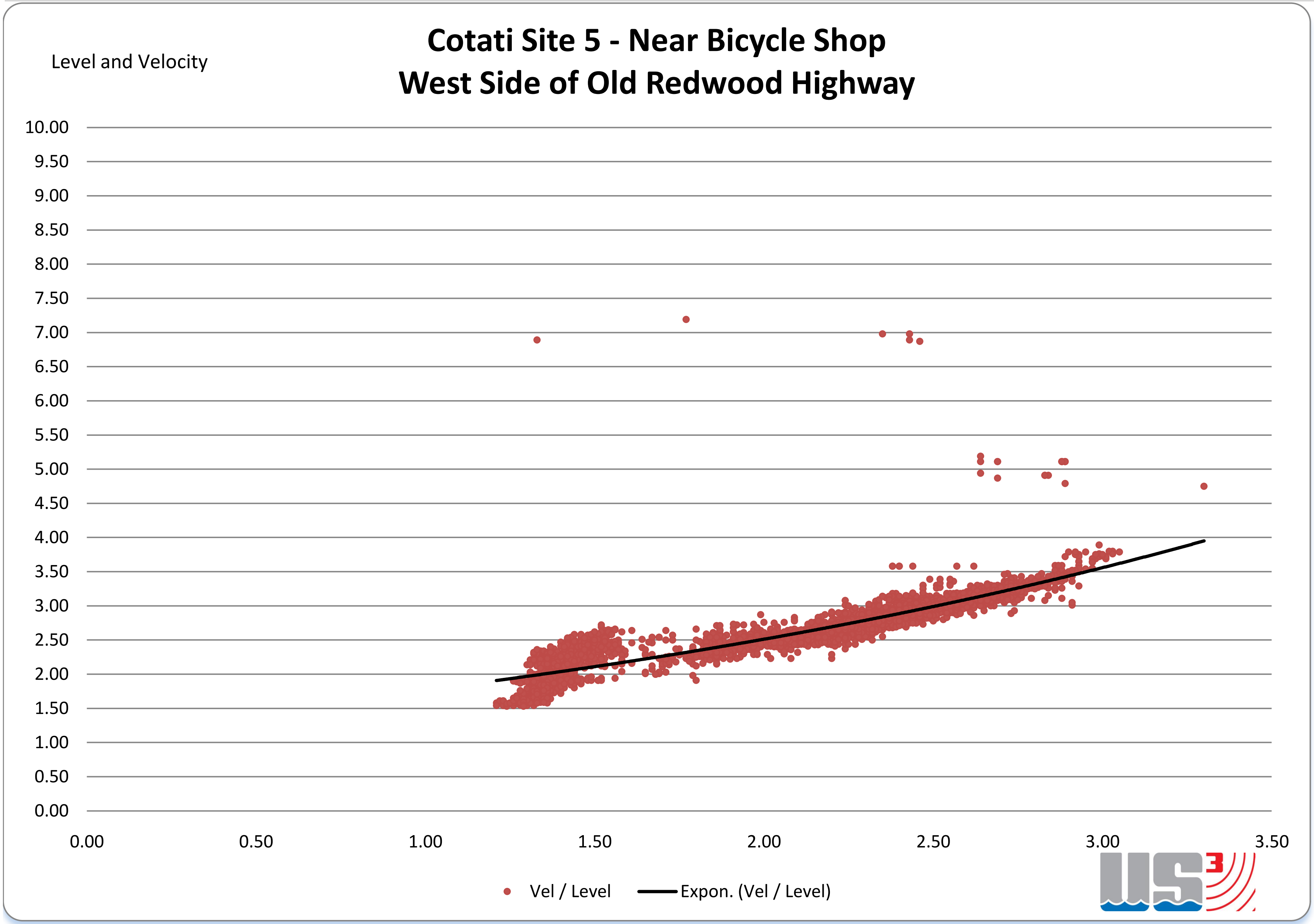
	Velocity (fps)	Level (in)	Flow (mgd)		
Average	2.01	2.45	0.14	Total Rain Averaged between Both Gauges	Inches
Maximum	2.83	3.30	0.29		0.00
Minimum	1.21	1.54	0.04		

Week 10 5/10/2010 to 5/14/2010



	Velocity (fps)	Level (in)	Flow (mgd)
Average	1.87	2.39	0.13
Maximum	2.60	7.19	1.00
Minimum	1.21	1.53	0.04

Total Rain Averaged between Both Gauges	Inches
	0.10


Cotati Site 5 - Near Bicycle Shop
West Side of Old Redwood Highway
Level and Velocity
10.00
9.50
9.00
8.50
8.00
7.50
7.00
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
Vel / Level
Expon. (Vel / Level)

Daily Report

West Side of Old Redwood Highway

Average Daily MGD					Minimum Daily MGD				Maximum Daily MGD		
Date	Velocity	Level	Flow		Velocity	Level	Flow		Velocity	Level	Flow
3/10/2010	2.38	2.82	0.19		2.01	2.51	0.14		2.65	3.02	0.24
3/11/2010	2.11	2.66	0.16		1.31	1.93	0.06		2.73	3.25	0.27
3/12/2010	2.24	2.80	0.19		1.32	1.93	0.06		2.77	3.29	0.28
3/13/2010	2.35	2.87	0.20		1.48	2.37	0.09		2.81	3.40	0.30
3/14/2010	2.27	2.83	0.19		1.39	2.30	0.09		2.79	3.37	0.29
3/15/2010	2.22	2.67	0.17		1.42	2.01	0.07		2.56	3.02	0.23
3/16/2010	2.14	2.62	0.16		1.35	1.87	0.06		2.64	3.15	0.25
3/17/2010	2.13	2.60	0.16		1.35	1.80	0.06		2.68	3.14	0.25
3/18/2010	2.08	2.60	0.16		1.33	1.89	0.06		2.56	3.14	0.24
3/19/2010	2.07	2.56	0.15		1.35	1.89	0.06		2.55	3.00	0.23
3/20/2010	2.09	2.56	0.16		1.34	1.83	0.06		2.66	3.18	0.26
3/21/2010	2.10	2.57	0.16		1.36	1.72	0.06		2.60	3.16	0.25
3/22/2010	2.04	2.51	0.15		1.34	1.76	0.06		2.58	3.01	0.23
3/23/2010	2.01	2.49	0.14		1.31	1.73	0.06		2.53	2.98	0.22
3/24/2010	2.04	2.53	0.15		1.31	1.72	0.05		2.65	3.00	0.23
3/25/2010	2.11	2.57	0.16		1.44	1.86	0.07		2.58	3.04	0.23
3/26/2010	2.01	2.51	0.15		1.30	1.69	0.05		2.47	2.98	0.22
3/27/2010	2.02	2.54	0.15		1.29	1.59	0.05		2.76	3.30	0.28
3/28/2010	2.09	2.56	0.16		1.29	1.62	0.05		2.72	3.22	0.27
3/29/2010	2.08	2.60	0.16		1.35	1.84	0.05		2.61	3.08	0.24
3/30/2010	2.06	2.66	0.16		1.36	1.94	0.07		2.58	3.12	0.24
3/31/2010	2.33	2.87	0.19		1.42	2.12	0.07		2.87	3.47	0.31
4/1/2010	2.34	2.82	0.19		1.47	2.46	0.10		2.83	3.14	0.26
4/2/2010	2.31	2.83	0.20		1.39	2.12	0.08		2.74	3.23	0.27
4/3/2010	2.38	2.90	0.21		1.67	2.29	0.10		2.79	3.41	0.30
4/4/2010	2.31	2.90	0.21		1.40	2.16	0.08		2.77	3.39	0.29
4/5/2010	2.41	2.92	0.21		1.94	2.41	0.13		2.74	3.30	0.28
4/6/2010	2.16	2.75	0.17		1.42	2.22	0.09		2.53	3.08	0.23
4/7/2010	2.12	2.72	0.17		1.34	2.14	0.07		2.58	3.14	0.24
4/8/2010	2.14	2.68	0.17		1.35	2.00	0.07		2.51	3.12	0.24
4/9/2010	2.13	2.73	0.17		1.34	2.14	0.08		2.62	3.58	0.30
4/10/2010	2.10	2.63	0.16		1.26	1.87	0.06		2.64	3.18	0.25
4/11/2010	2.38	3.30	0.27		1.28	1.90	0.06		3.30	5.19	0.54
4/12/2010	2.75	3.31	0.28		2.30	2.87	0.19		3.00	3.79	0.36
4/13/2010	2.52	2.98	0.22		2.14	2.64	0.16		2.91	3.44	0.31
4/14/2010	2.32	2.83	0.19		1.46	2.30	0.09		2.80	3.25	0.28
4/15/2010	2.21	2.85	0.19		1.40	2.25	0.08		2.73	3.18	0.26
4/16/2010	2.19	2.85	0.19		1.43	2.28	0.09		2.72	3.47	0.30
4/17/2010	2.17	2.74	0.18		1.38	2.11	0.08		2.88	3.26	0.29
4/18/2010	2.19	2.78	0.18		1.38	2.08	0.07		2.89	3.41	0.31
4/19/2010	2.09	2.69	0.16		1.36	2.12	0.08		2.69	3.19	0.26
4/20/2010	2.23	2.82	0.19		1.34	2.23	0.08		2.86	3.34	0.30
4/21/2010	2.18	2.76	0.18		1.35	2.16	0.08		2.66	3.23	0.26
4/22/2010	2.09	2.72	0.17		1.34	2.16	0.08		2.67	3.23	0.26
4/23/2010	2.11	2.67	0.17		1.34	1.91	0.06		2.70	3.22	0.26
4/24/2010	2.14	2.74	0.18		1.34	1.96	0.07		2.71	3.30	0.28
4/25/2010	2.16	2.75	0.18		1.32	1.91	0.06		2.84	3.43	0.30
4/26/2010	2.07	2.72	0.17		1.35	1.94	0.07		2.68	3.39	0.27
4/27/2010	2.13	2.74	0.17		1.34	1.90	0.06		2.93	3.29	0.30

Daily Report

West Side of Old Redwood Highway

Average Daily MGD					**Minimum Daily MGD**				**Maximum Daily MGD**		
Date	Velocity	Level	Flow		Velocity	Level	Flow		Velocity	Level	Flow
4/28/2010	2.16	2.72	0.17		1.34	2.08	0.07		2.71	3.23	0.27
4/29/2010	2.14	2.72	0.17		1.30	2.09	0.07		2.69	3.23	0.27
4/30/2010	2.10	2.69	0.17		1.36	2.16	0.08		2.73	3.33	0.28
5/1/2010	2.11	2.63	0.16		1.37	1.79	0.06		2.76	3.21	0.27
5/2/2010	2.18	2.71	0.18		1.34	1.84	0.06		2.75	3.23	0.27
5/3/2010	2.26	2.73	0.18		1.81	2.25	0.11		2.83	3.30	0.29
5/4/2010	1.99	2.42	0.14		1.21	1.58	0.04		2.58	3.09	0.24
5/5/2010	1.97	2.39	0.13		1.30	1.59	0.05		2.55	3.09	0.24
5/6/2010	1.97	2.42	0.14		1.32	1.66	0.05		2.57	3.07	0.24
5/7/2010	1.95	2.38	0.13		1.27	1.58	0.05		2.51	3.02	0.23
5/8/2010	1.94	2.41	0.13		1.29	1.54	0.04		2.68	3.12	0.25
5/9/2010	1.97	2.40	0.14		1.23	1.54	0.04		2.57	3.04	0.23
5/10/2010	1.93	2.39	0.13		1.22	1.55	0.04		2.44	2.96	0.21
5/11/2010	1.84	2.32	0.12		1.21	1.54	0.04		2.43	2.90	0.21
5/12/2010	1.89	2.34	0.13		1.28	1.54	0.04		2.60	3.04	0.23
5/13/2010	1.89	2.35	0.13		1.28	1.55	0.04		2.43	3.00	0.22
5/14/2010	1.78	2.70	0.20		1.24	1.53	0.04		2.46	7.19	1.00

Temporary Flow Study

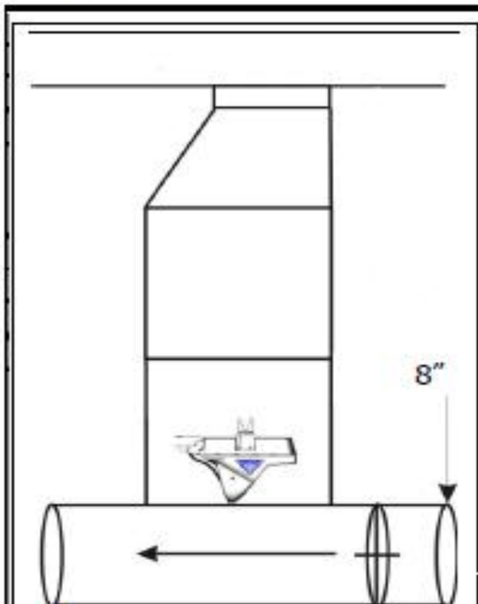
Cotati Site 6 - Across From the Biscycle shop
East Side of Old Redwood Highway

Utility Systems, Science, and Software
2101 E. 4th Street
Santa Ana, Ca 92705

From		To
3/10/2010 11:30		5/14/2010 11:30

METERING SITE DOCUMENT

City:	**Cotati**
Site Name:	**Site 6**
Location:	**Across the street from bicycle shop**
Access:	**Sidewalk**
GPS:	**N +38° 19' 47.60", W -122° 42' 32.60"**
Install Date:	**3/10/2010**



Pipe Size (inch):	8
Pipe Condition:	Good

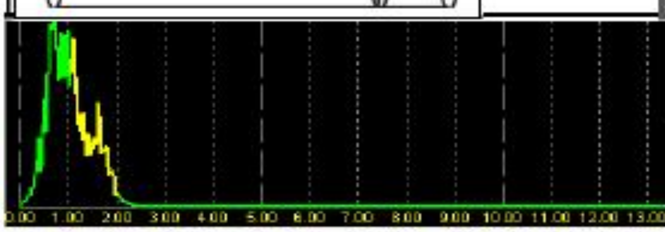
Hydraulics:

Multiplier = 1.00

Gas

O_2	Good
HS_2	Good

Manhole Comments:



Traffic Safety Required:

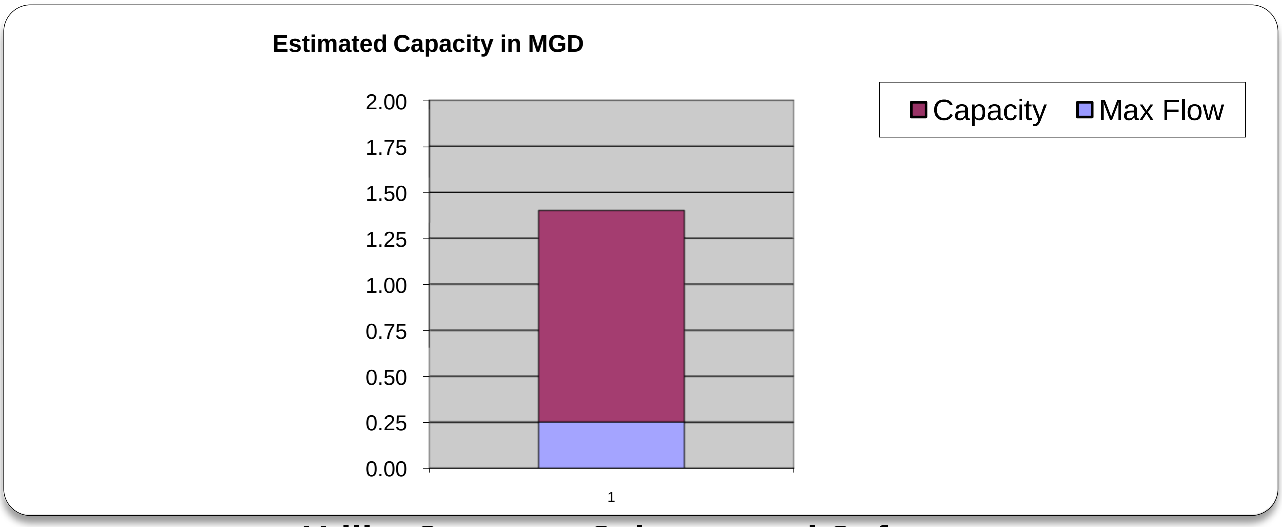
Cones for pedestrians

Site Pictures

Meter site 6
Temporary Flow Study

Cotati, CA

Meter Start Date		**From**	**3/10/2010 11:30**
Meter Stop Date		**To**	**5/14/2010 11:30**
	Velocity (fps)	**Level (in)**	**Flow (MGD)**
Average	**1.07**	**2.11**	**0.05**
Maximum	**1.83**	**4.79**	**0.25**
Minimum	**0.44**	**0.68**	**0.00**
	Pipe Size	**8**	
	Estimated Capacity	**21.79%**	
	Sensor Used	**Hach - FloDar**	
	Comment		



Utility Systems, Science, and Software
2101 E. 4th Street
Santa Ana, Ca 92705

Flo-Dar incorporates a Doppler Radar Velocity Sensor and Ultrasonic Depth Transducer for use in Open Channel Applications. It is available with a Permanent Flo-Station. The Flo-Station is available with or without a display and is powered with 120/240 VAC, or 12 VDC. The Flo-Station requires Flo-Ware software, which is included on some models, and a customer supplied PC. Flo-Station with display shows flow rate, total flow, velocity and level. Both Flo-Station's have four outputs one each for level, velocity, flow rate, surcharge level, and a contact closure. Instruction manuals are included. Mounting Hardware is ordered separately.

Flo-Dar Sensor
Enclosure
Material: Polystyrene
Dimensions: 6.9" W x 16.65" L x 11.7" D
(17.5 cm x 42.3 cm x 29.7 cm)
Weight: 10.5 lbs. (4.8 kg)

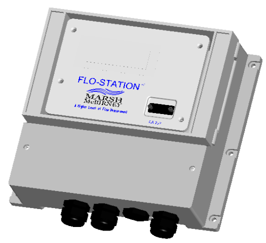
Temperature
Operating Range: 14° F to 122°F
(-10° C to 50° C)
Storage Range: -40° F to 140° F
(-40° C to 60° C)

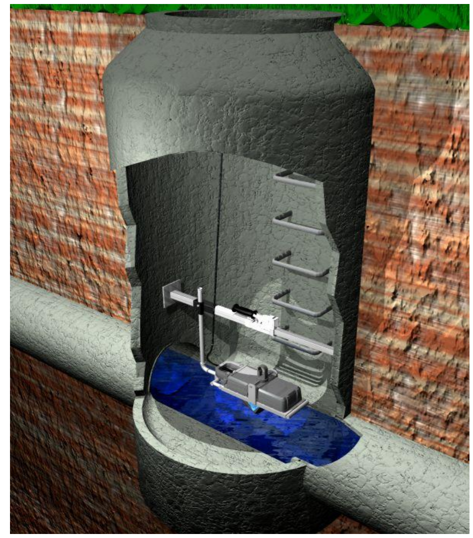
Velocity Measurement
Method: Radar
Range: 0.75 to 20 ft/s (0.23 m/s to 6.10 m/s)
Accuracy: ±0.5%; ±0.1 ft/s (±0.03 m/s)

Level Measurement
Method: Ultrasonic
Standard Operating Range:
0.25 to 60 in. (0.634 to 152.4 cm)
Optional Operating Range: 0 (0 cm) to 240" (6.1 m)
(with 18" dead band)
Temperature Compensated
Accuracy: ±0.1 in. (±0.25 cm)
1% Accuracy

Surcharge Conditions Level/Velocity
Level
Method: Piezo-resistive pressure transducer
Maximum Range: 138 inches (3.5 meters)
Velocity
Method: Electromagnetic
Range: -5 to +20 ft/s (-1.5 to +6.1 m/s)

Flow Measurement
Based on Continuity Equation.
Accuracy: ±5.0% of reading typical where flow is in a channel with uniform flow conditions and is not surcharged.





Flo-Station Monitor
Data Storage
64K (16K cycles of velocity/level data)
Local Terminal
RS232C at 19.2K baud

Timebase Accuracy: 1 second per day

Outputs: Four 4-20 mA outputs; system-isolated, up to 600Ω load. Each output is selectable between FLOW, LEVEL, VELOCITY OR SURCHARGE LEVEL.

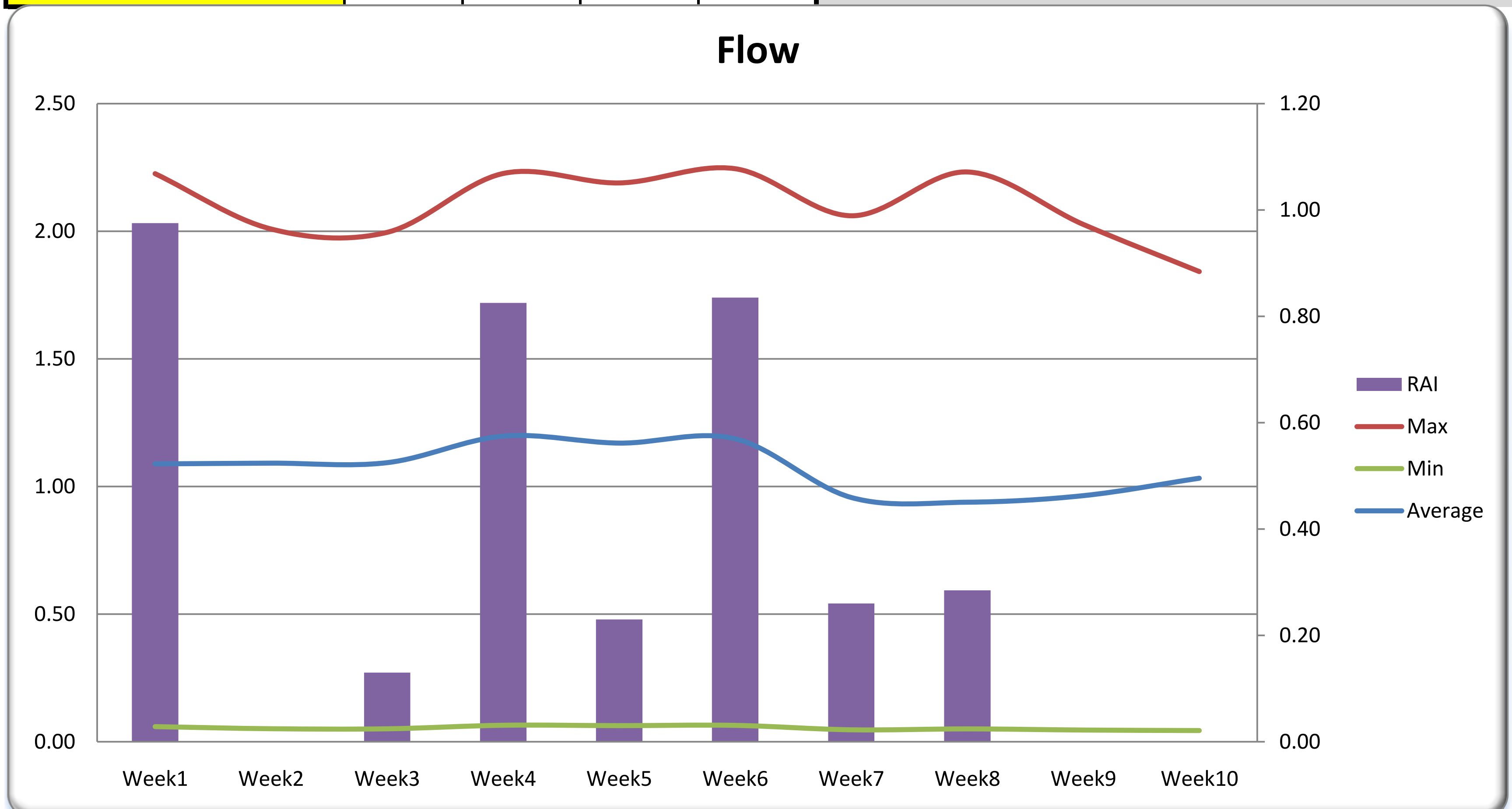
Power Requirements
AC: 85-264 VAC, 47-63 Hz. 32 watts
DC: 12 VDC for Flo-Station without Display or Flo-Station with Display (Backlight Off)
180 mA (2.1 watts) with (1) 4-20 mA utilized.

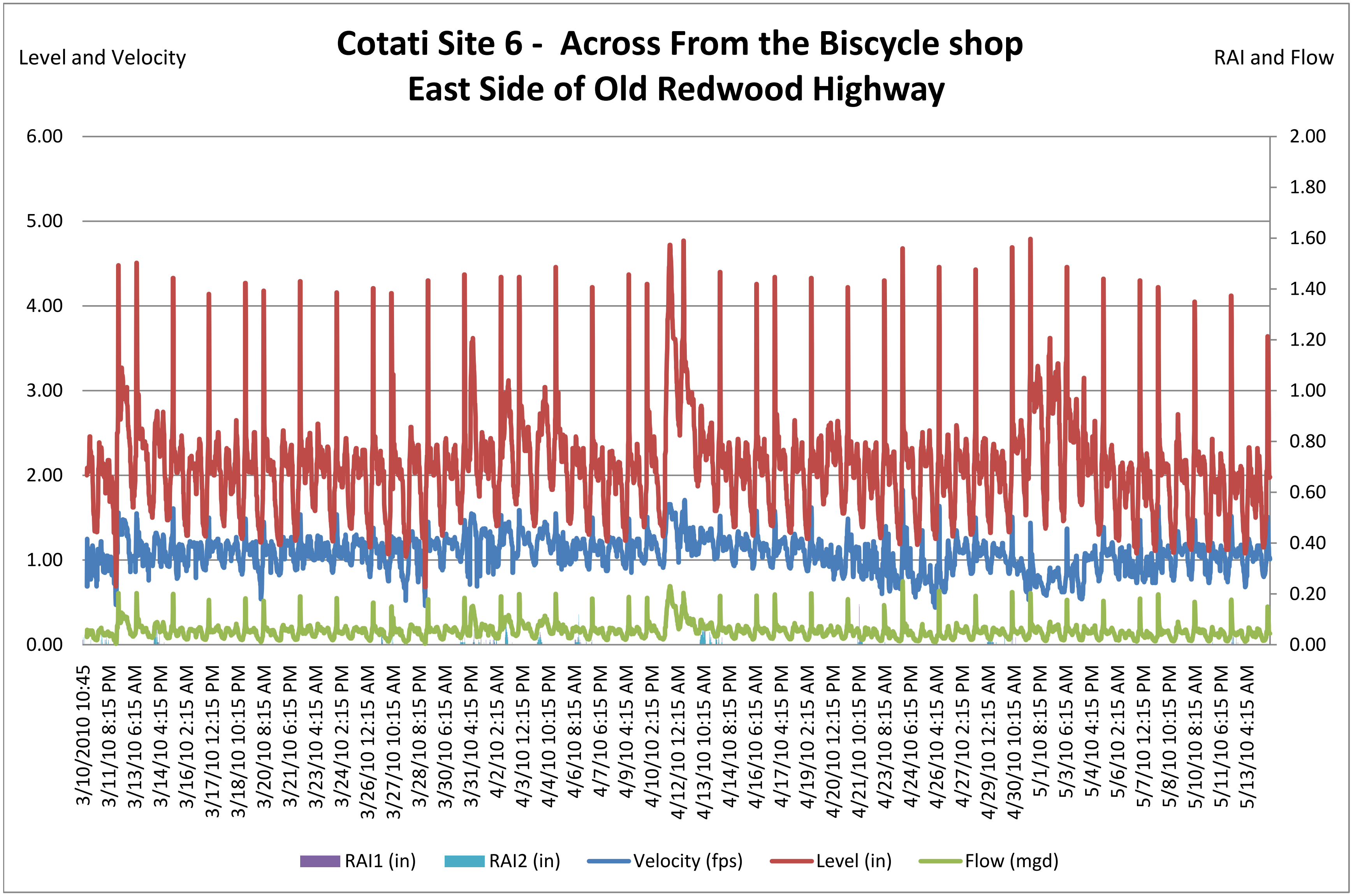
Housing
Material: ABS Plastic, NEMA 4
Dimensions: 10.2" W x 9.3" H x 4" D
(25.9 cm W x 23.6 cm H x 10.2 cm D)
Weight: 5 lbs.
Temperature Operating Range: 14° F to 122° F
(-10° C to 50° C)
Temperature Storage Range:
(without display) -40°F to 140°F (-40°C to 60°C)
(with display) 4°F to 140°F (-20°C to 60°C) w/Display

Flow Review

	Average	Max	Min	RAI
Week1	1.09	2.22	0.06	0.98
Week2	1.09	2.01	0.05	0.00
Week3	1.09	2.00	0.05	0.13
Week4	1.20	2.23	0.06	0.83
Week5	1.17	2.19	0.06	0.23
Week6	1.19	2.24	0.06	0.84
Week7	0.96	2.06	0.05	0.26
Week8	0.94	2.23	0.05	0.29
Week9	0.96	2.03	0.05	0.00
Week10	1.03	1.84	0.04	0.00

Cotati Site 6 - Across From the Biscycle shop
East Side of Old Redwood Highway





Cotati Site 6 - Across From the Biscycle shop
East Side of Old Redwood Highway
Level and Velocity
RAI and Flow
6.00
5.00
4.00
3.00
2.00
1.00
0.00
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
3/10/2010 10:45
3/11/10 8:15 PM
3/13/10 6:15 AM
3/14/10 4:15 PM
3/16/10 2:15 AM
3/17/10 12:15 PM
3/18/10 10:15 PM
3/20/10 8:15 AM
3/21/10 6:15 PM
3/23/10 4:15 AM
3/24/10 2:15 PM
3/26/10 12:15 AM
3/27/10 10:15 AM
3/28/10 8:15 PM
3/30/10 6:15 AM
3/31/10 4:15 PM
4/2/10 2:15 AM
4/3/10 12:15 PM
4/4/10 10:15 PM
4/6/10 8:15 AM
4/7/10 6:15 PM
4/9/10 4:15 AM
4/10/10 2:15 PM
4/12/10 12:15 AM
4/13/10 10:15 AM
4/14/10 8:15 PM
4/16/10 6:15 AM
4/17/10 4:15 PM
4/19/10 2:15 AM
4/20/10 12:15 PM
4/21/10 10:15 PM
4/23/10 8:15 AM
4/24/10 6:15 PM
4/26/10 4:15 AM
4/27/10 2:15 PM
4/29/10 12:15 AM
4/30/10 10:15 AM
5/1/10 8:15 PM
5/3/10 6:15 AM
5/4/10 4:15 PM
5/6/10 2:15 AM
5/7/10 12:15 PM
5/8/10 10:15 PM
5/10/10 8:15 AM
5/11/10 6:15 PM
5/13/10 4:15 AM
RAI1 (in)
RAI2 (in)
Velocity (fps)
Level (in)
Flow (mgd)

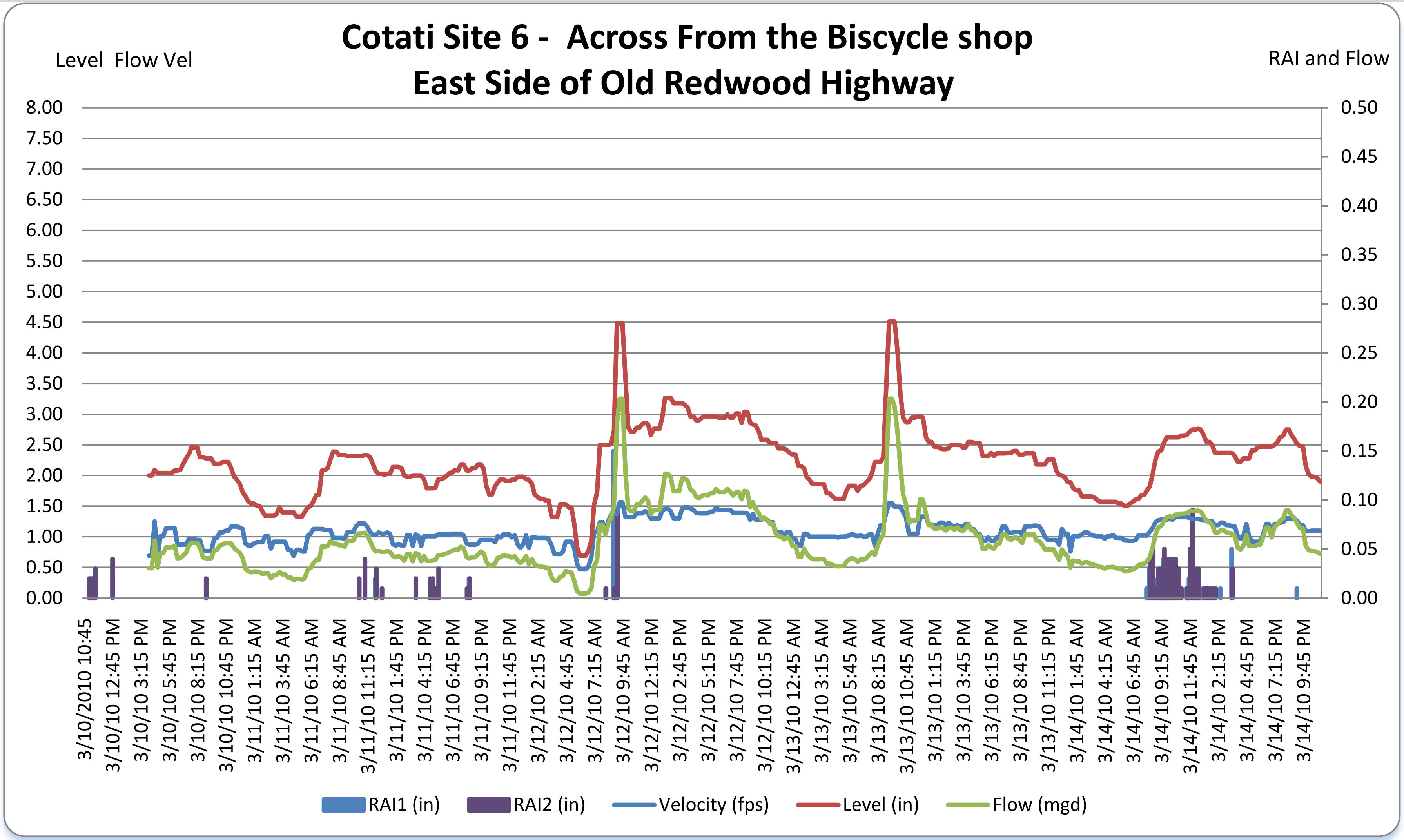
Rainlog Rainfall Report		By Day Report
City Hall Site	**Total**	**6.10**
	Max	**1.37**
	Average	**0.09**
Date	***Rainfall***	***Comments***
3/8/10 0:00	0.04	
3/9/10 0:00	0.04	
3/10/10 0:00	0.15	
3/11/10 0:00	0.00	
3/12/10 0:00	0.55	
3/13/10 0:00	0.00	
3/14/10 0:00	0.00	
3/15/10 0:00	0.00	
3/16/10 0:00	0.00	
3/17/10 0:00	0.00	
3/18/10 0:00	0.00	
3/19/10 0:00	0.00	
3/20/10 0:00	0.00	
3/21/10 0:00	0.00	
3/22/10 0:00	0.00	
3/23/10 0:00	0.00	
3/24/10 0:00	0.25	
3/25/10 0:00	0.01	
3/26/10 0:00	0.00	
3/27/10 0:00	0.00	
3/28/10 0:00	0.00	
3/29/10 0:00	0.23	
3/30/10 0:00	0.34	
3/31/10 0:00	0.69	
4/1/10 0:00	0.00	
4/2/10 0:00	0.39	
4/3/10 0:00	0.00	
4/4/10 0:00	0.41	
4/5/10 0:00	0.05	
4/6/10 0:00	0.00	
4/7/10 0:00	0.00	
4/8/10 0:00	0.00	
4/9/10 0:00	0.00	
4/10/10 0:00	0.00	
4/11/10 0:00	1.37	
4/12/10 0:00	0.30	
4/13/10 0:00	0.00	
4/14/10 0:00	0.00	
4/15/10 0:00	0.00	
4/16/10 0:00	0.00	
4/17/10 0:00	0.00	
4/18/10 0:00	0.00	
4/19/10 0:00	0.21	
4/20/10 0:00	0.30	
4/21/10 0:00	0.01	
4/22/10 0:00	0.00	
4/23/10 0:00	0.00	
4/24/10 0:00	0.00	

Rainlog Rainfall Report		By Day Report
City Hall Site	**Total**	**6.10**
	Max	**1.37**
	Average	**0.09**
Date	***Rainfall***	***Comments***
4/25/10 0:00	0.00	
4/26/10 0:00	0.00	
4/27/10 0:00	0.35	
4/28/10 0:00	0.22	
4/29/10 0:00	0.00	
4/30/10 0:00	0.00	
5/1/10 0:00	0.00	
5/2/10 0:00	0.00	
5/3/10 0:00	0.00	
5/4/10 0:00	0.00	
5/5/10 0:00	0.00	
5/6/10 0:00	0.00	
5/7/10 0:00	0.00	
5/8/10 0:00	0.00	
5/9/10 0:00	0.01	
5/10/10 0:00	0.18	
5/11/10 0:00	0.00	
5/12/10 0:00	0.00	
5/13/10 0:00	0.00	
5/14/10 0:00	0.00	

Rainlog Rainfall Report		By Day Report
North Pump Station	**Total**	**6.82**
	Max	**1.58**
	Average	**0.10**
Date	***Rainfall***	***Comments***
3/8/10 0:00	0.13	
3/9/10 0:00	0.23	
3/10/10 0:00	0.11	
3/11/10 0:00	0.00	
3/12/10 0:00	0.70	
3/13/10 0:00	0.00	
3/14/10 0:00	0.00	
3/15/10 0:00	0.00	
3/16/10 0:00	0.00	
3/17/10 0:00	0.00	
3/18/10 0:00	0.00	
3/19/10 0:00	0.00	
3/20/10 0:00	0.00	
3/21/10 0:00	0.00	
3/22/10 0:00	0.00	
3/23/10 0:00	0.00	
3/24/10 0:00	0.23	
3/25/10 0:00	0.13	
3/26/10 0:00	0.00	
3/27/10 0:00	0.00	
3/28/10 0:00	0.00	
3/29/10 0:00	0.29	
3/30/10 0:00	0.20	
3/31/10 0:00	0.75	
4/1/10 0:00	0.00	
4/2/10 0:00	0.48	
4/3/10 0:00	0.00	
4/4/10 0:00	0.47	
4/5/10 0:00	0.02	
4/6/10 0:00	0.00	
4/7/10 0:00	0.00	
4/8/10 0:00	0.00	
4/9/10 0:00	0.00	
4/10/10 0:00	0.00	
4/11/10 0:00	1.58	
4/12/10 0:00	0.27	
4/13/10 0:00	0.00	
4/14/10 0:00	0.00	
4/15/10 0:00	0.00	
4/16/10 0:00	0.00	
4/17/10 0:00	0.00	
4/18/10 0:00	0.00	
4/19/10 0:00	0.21	
4/20/10 0:00	0.26	
4/21/10 0:00	0.01	
4/22/10 0:00	0.00	
4/23/10 0:00	0.00	
4/24/10 0:00	0.00	

Rainlog Rainfall Report		By Day Report
North Pump Station	Total	6.82
	Max	1.58
	Average	0.10
Date	*Rainfall*	*Comments*
4/25/10 0:00	0.00	
4/26/10 0:00	0.01	
4/27/10 0:00	0.42	
4/28/10 0:00	0.13	
4/29/10 0:00	0.00	
4/30/10 0:00	0.00	
5/1/10 0:00	0.00	
5/2/10 0:00	0.00	
5/3/10 0:00	0.00	
5/4/10 0:00	0.00	
5/5/10 0:00	0.00	
5/6/10 0:00	0.00	
5/7/10 0:00	0.00	
5/8/10 0:00	0.00	
5/9/10 0:00	0.01	
5/10/10 0:00	0.16	
5/11/10 0:00	0.00	
5/12/10 0:00	0.00	
5/13/10 0:00	0.02	
5/14/10 0:00	0.00	

Week 1 3/10/2010 to 3/14/2010

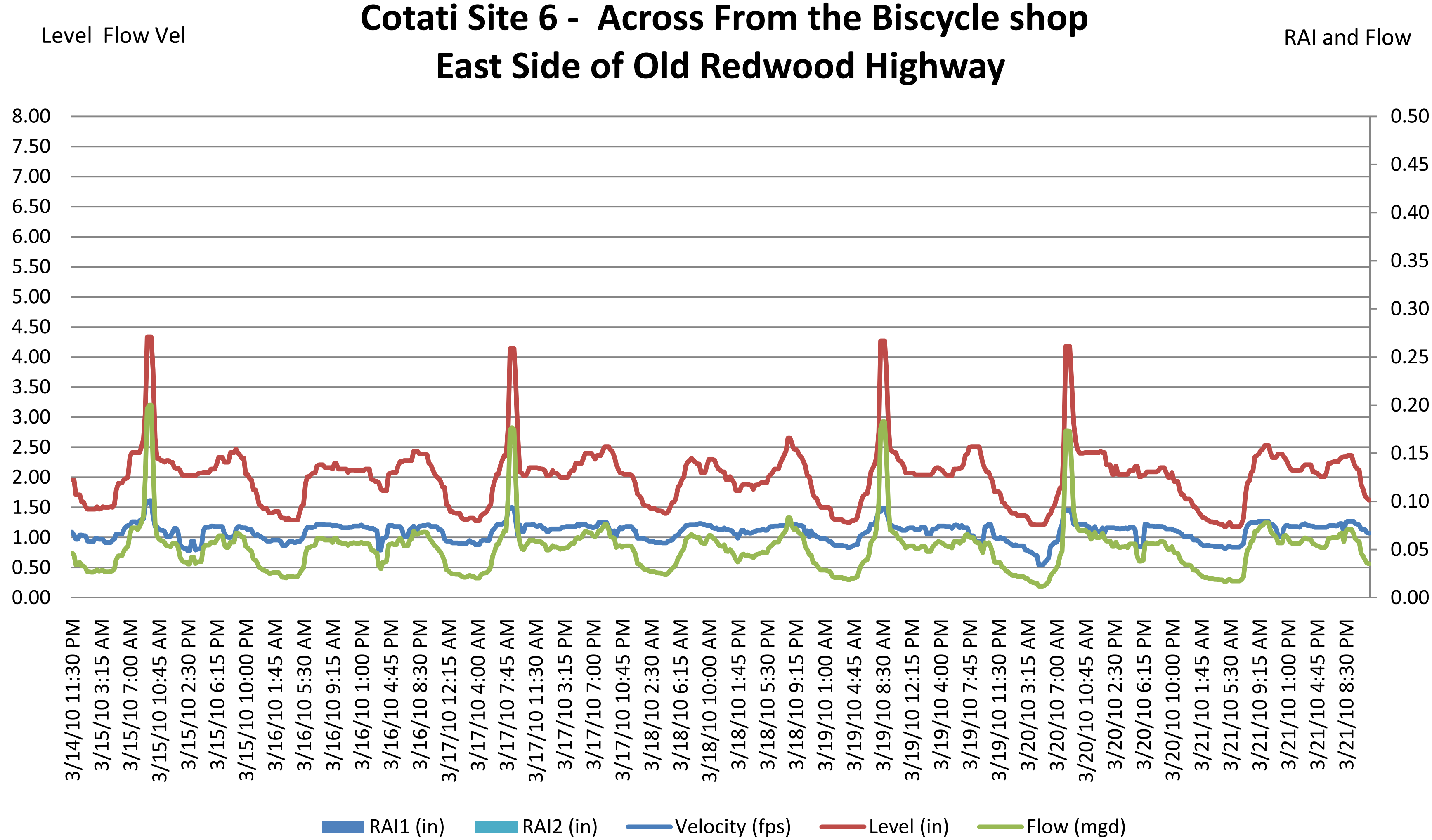


	Velocity (fps)	Level (in)	Flow (mgd)
Average	1.09	2.22	0.06
Maximum	1.56	4.51	0.20
Minimum	0.47	0.69	0.00

Total Rain Averaged between Both Gauges	Inches
	0.98

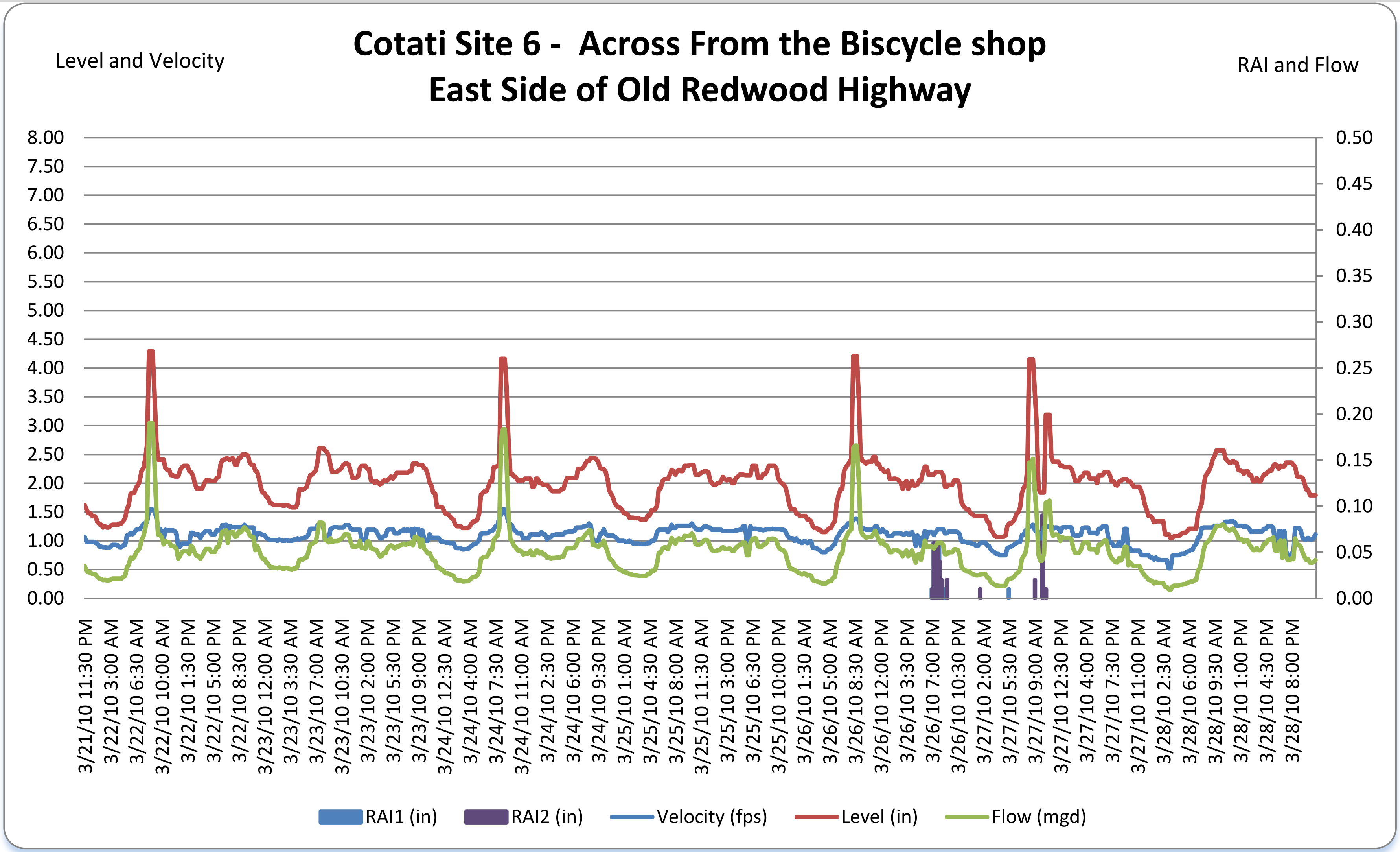
Week 2 3/15/2010 to 3/21/2010

Cotati Site 6 - Across From the Biscycle shop
East Side of Old Redwood Highway



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.09	2.01	0.05	**Total Rain Averaged between Both Gauges**	**Inches**
Maximum	1.61	4.33	0.20		**0.00**
Minimum	0.54	1.18	0.01		

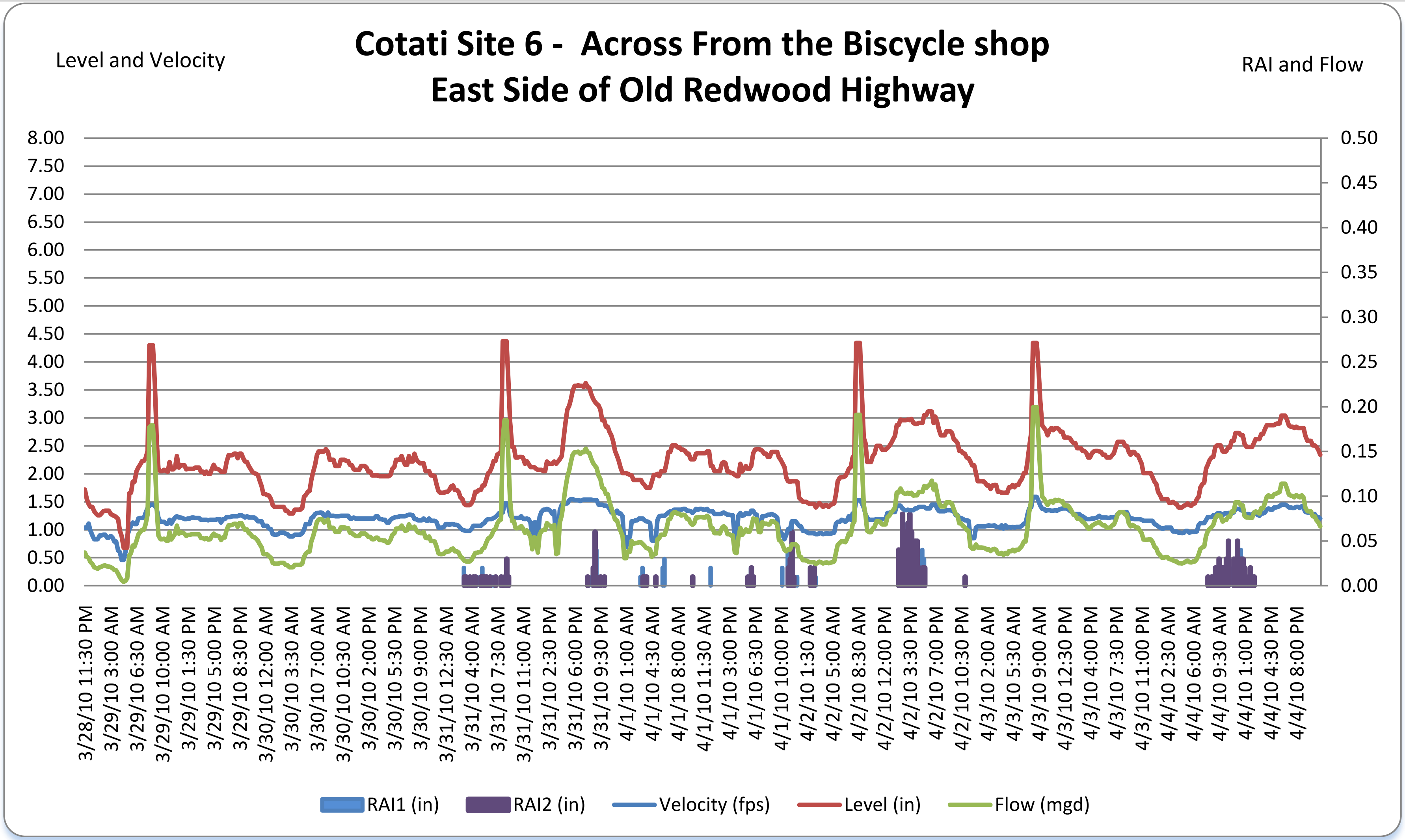
Week 3 3/22/2010 to 3/28/2010



	Velocity (fps)	Level (in)	Flow (mgd)
Average	1.09	2.00	0.05
Maximum	1.54	4.29	0.19
Minimum	0.52	1.04	0.01

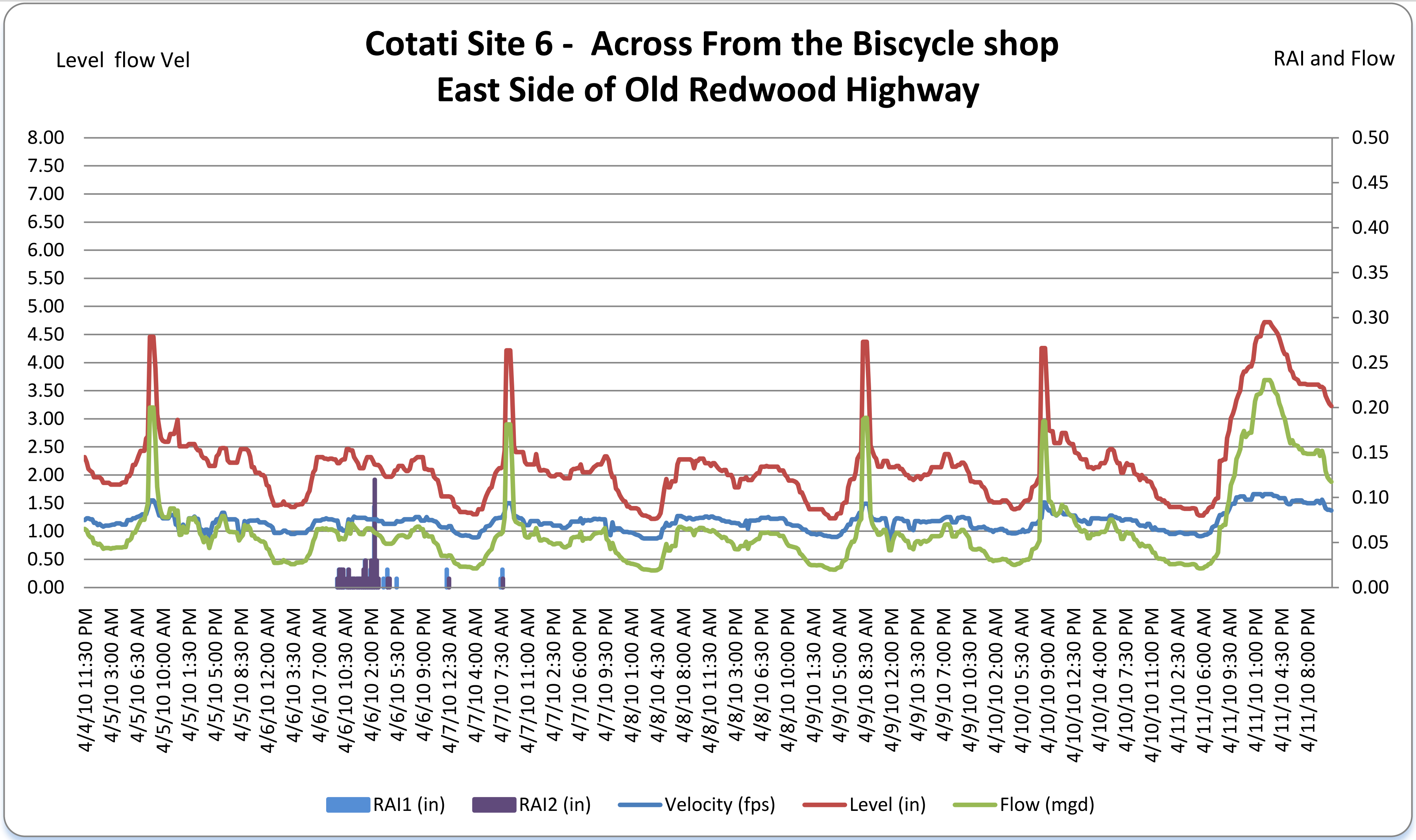
Total Rain Averaged between Both Gauges	Inches
	0.13

Week 4 3/29/2010 to 4/4/2010



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.20	2.23	0.06	Total Rain Averaged between Both Gauges	Inches
Maximum	1.59	4.37	0.20		0.83
Minimum	0.46	0.68	0.00		

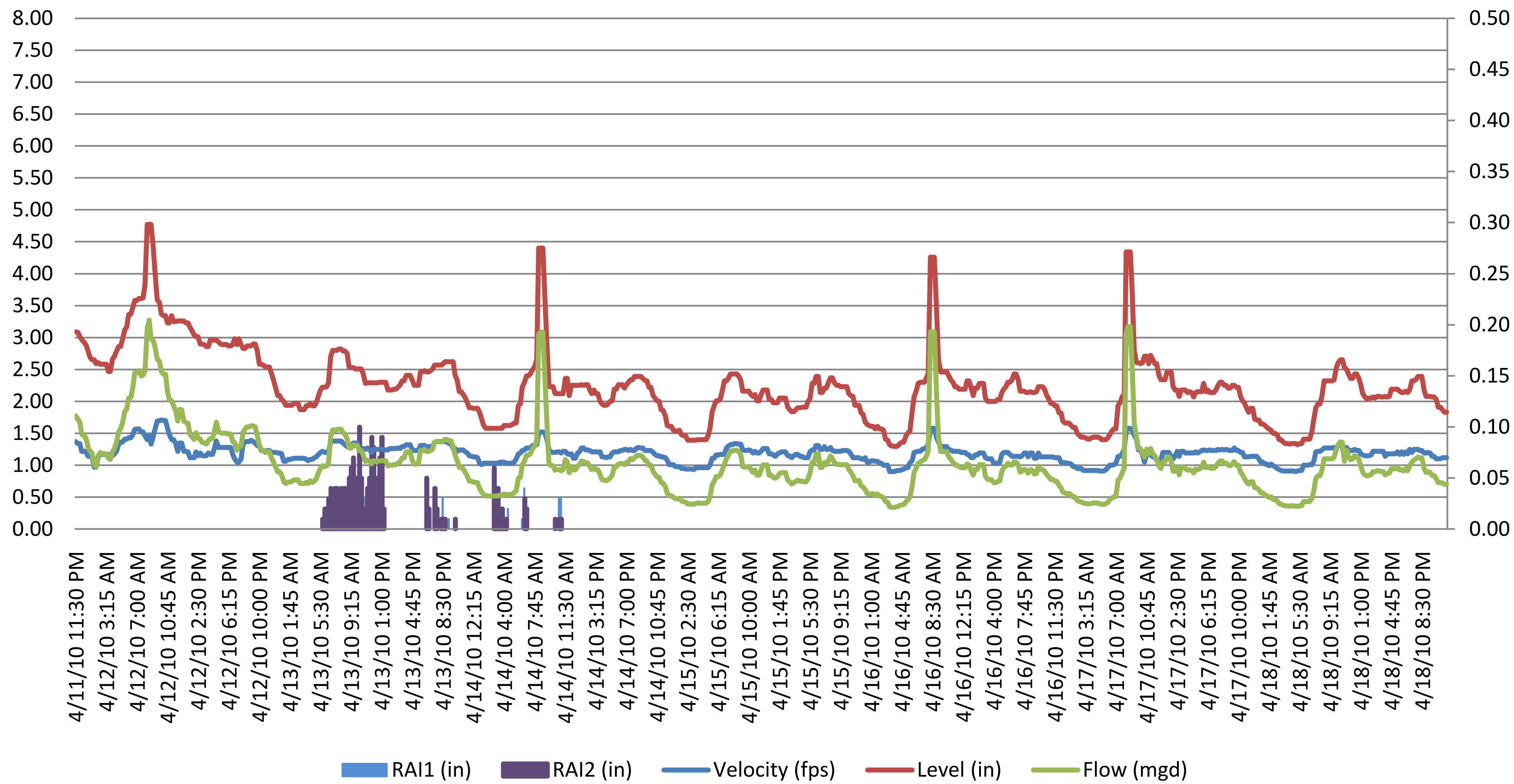
Week 5 4/4/2010 to 4/11/2010



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.17	2.19	0.06	Total Rain Averaged between Both Gauges	Inches
Maximum	1.66	4.72	0.23		0.23
Minimum	0.85	1.22	0.02		

Week 6 **4/12/2010** **to** **4/18/2010**

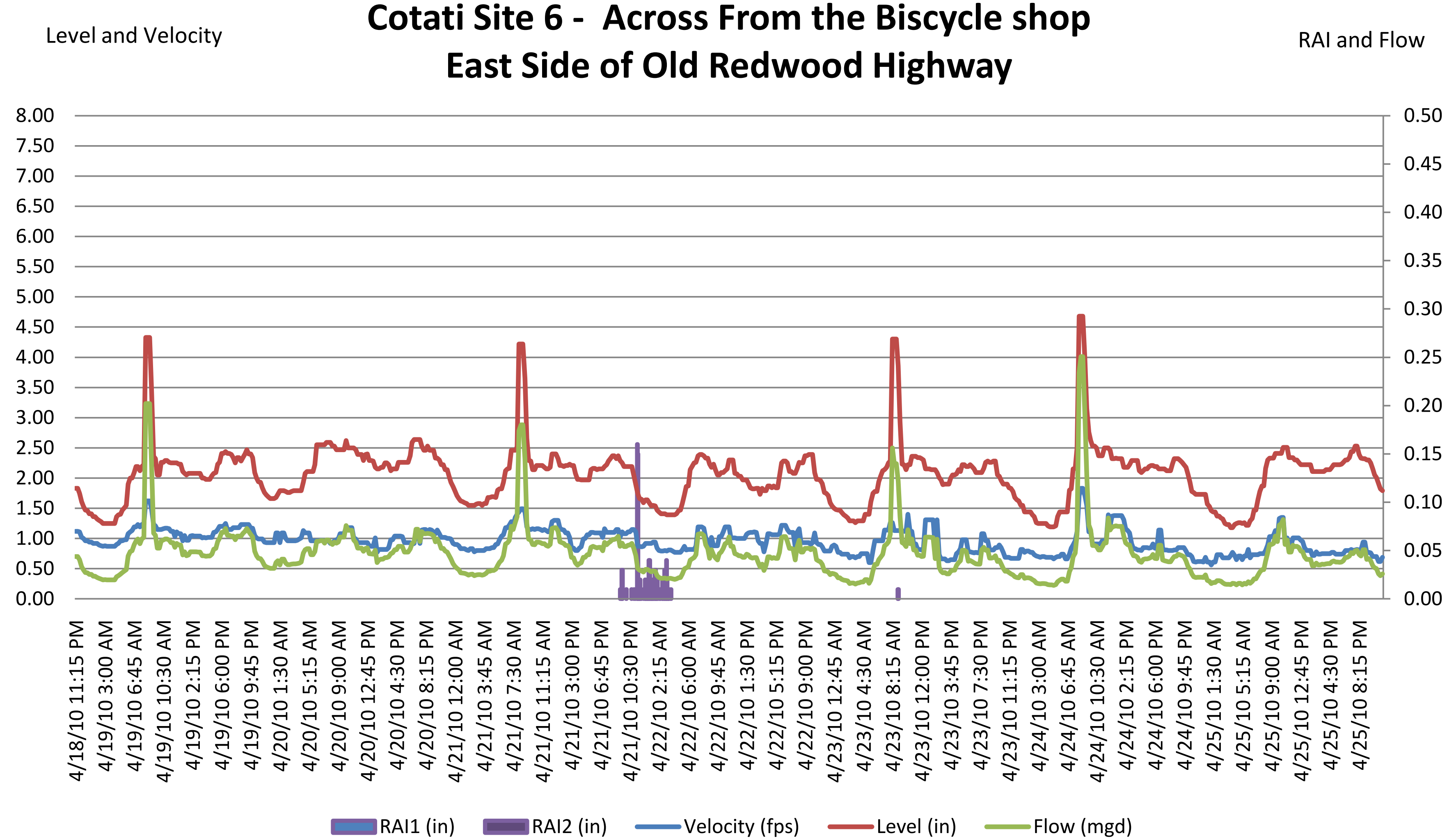
Cotati Site 6 - Across From the Biscycle shop
East Side of Old Redwood Highway



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.19	2.24	0.06	Total Rain Averaged between Both Gauges	Inches
Maximum	1.71	4.77	0.20		0.84
Minimum	0.90	1.29	0.02		

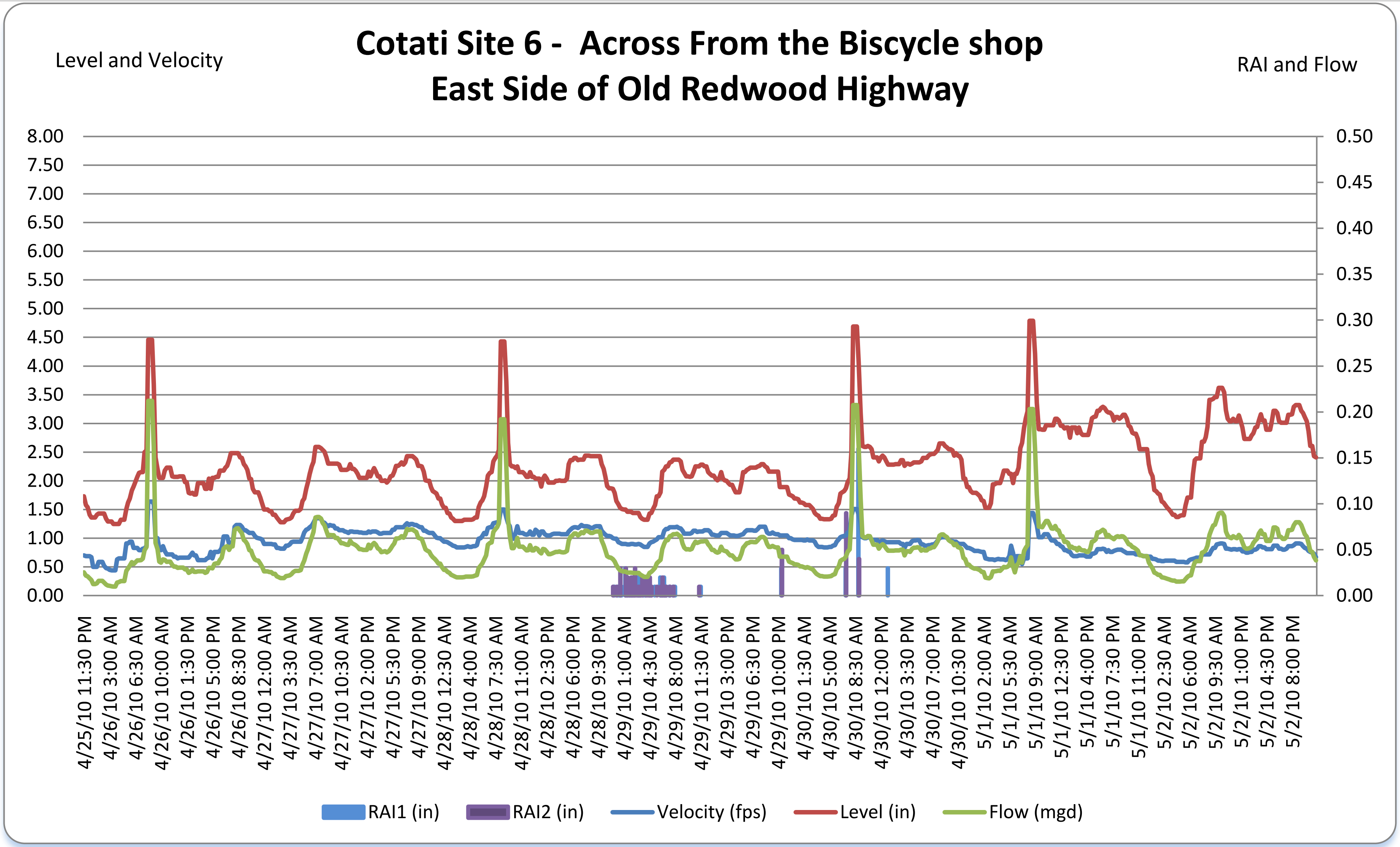
Week 7 4/19/2010 to 4/25/2010

Cotati Site 6 - Across From the Biscycle shop
East Side of Old Redwood Highway



	Velocity (fps)	Level (in)	Flow (mgd)	Total Rain Averaged between Both Gauges	Inches
Average	0.96	2.06	0.05		
Maximum	1.83	4.68	0.25		0.26
Minimum	0.56	1.18	0.01		

Week 8 4/26/2010 to 5/2/2010

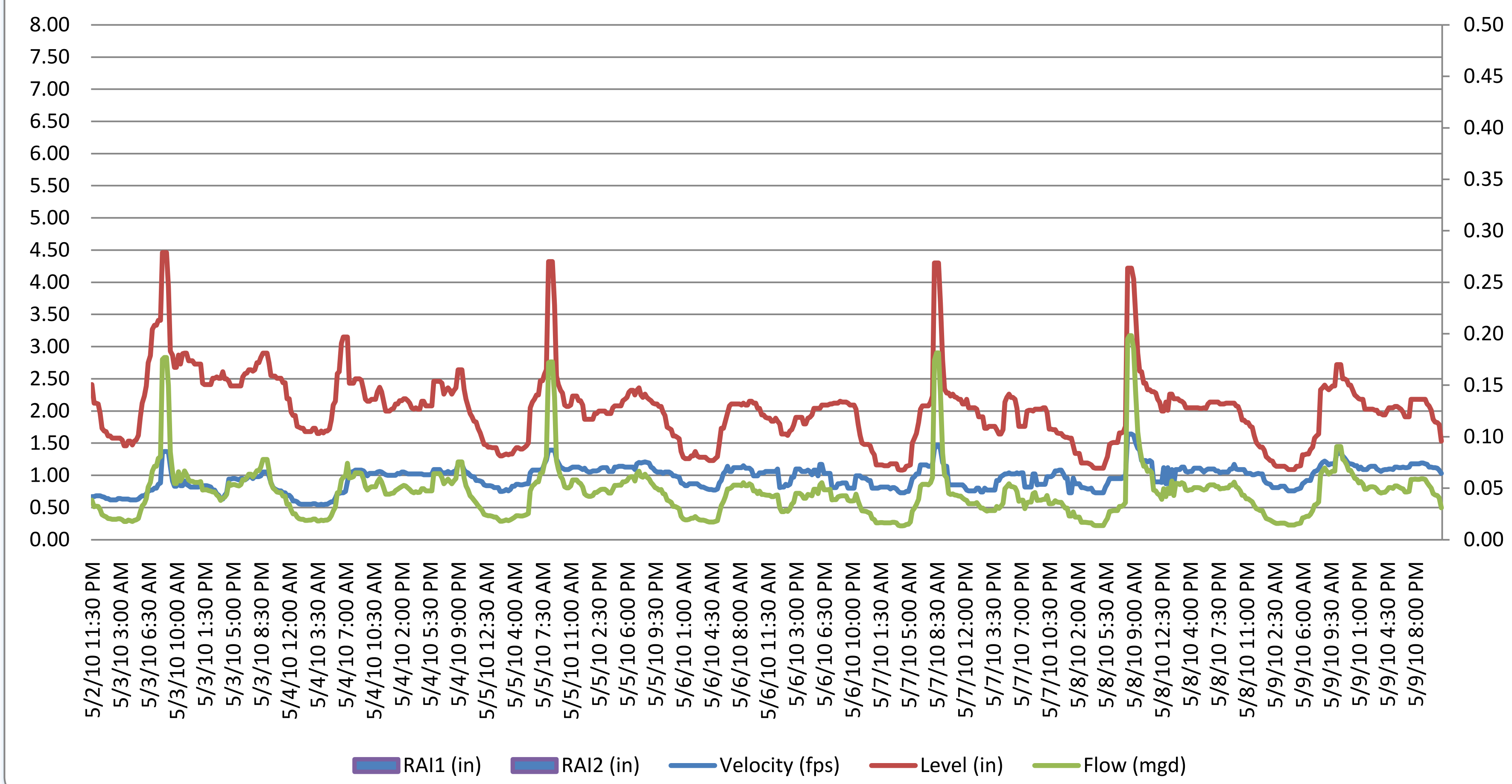


	Velocity (fps)	Level (in)	Flow (mgd)
Average	0.94	2.23	0.05
Maximum	1.64	4.79	0.21
Minimum	0.44	1.25	0.01

Total Rain Averaged between Both Gauges	Inches
	0.29

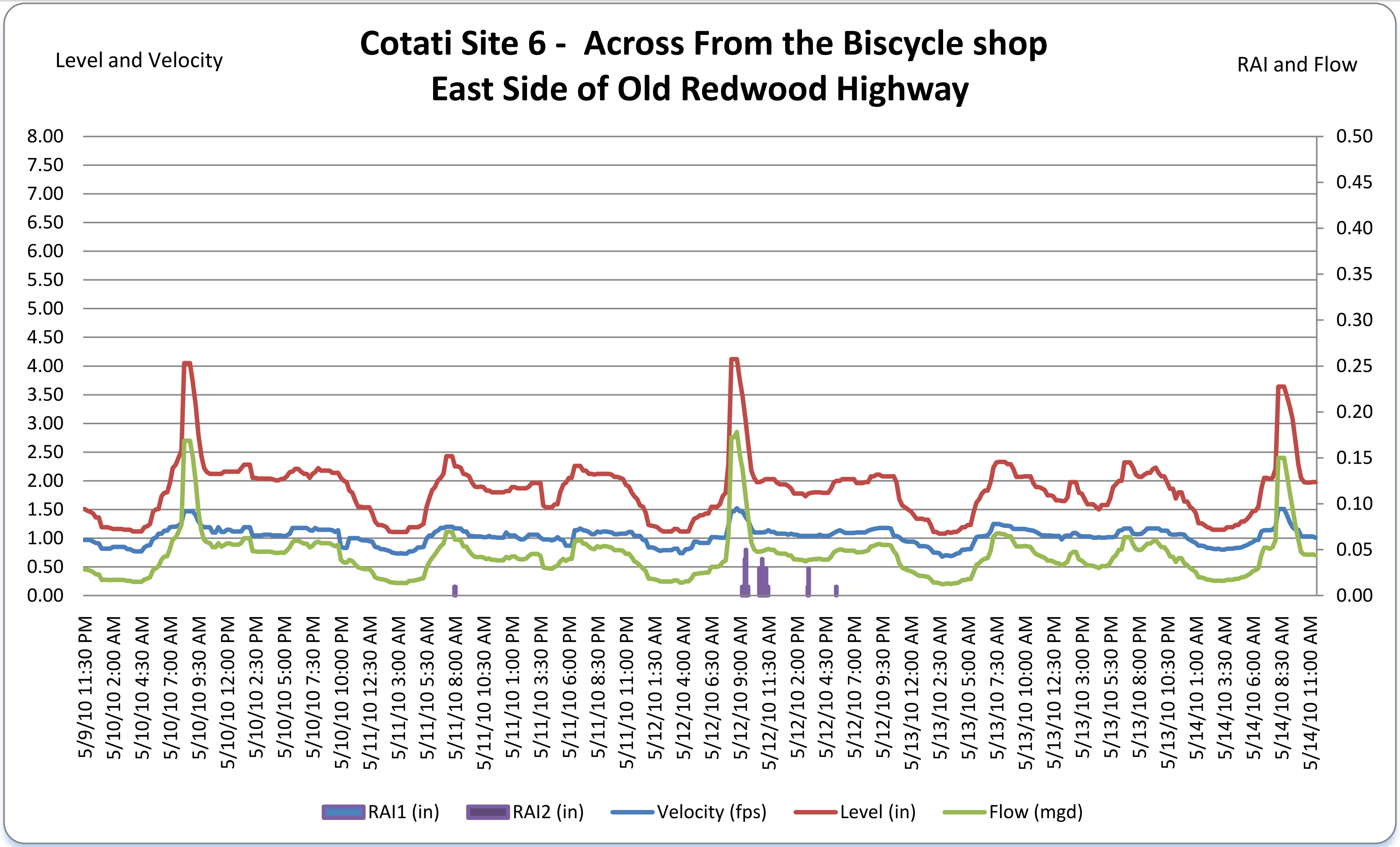
Week 9 5/3/2010 to 5/9/2010

Cotati Site 6 - Across From the Biscycle shop
East Side of Old Redwood Highway

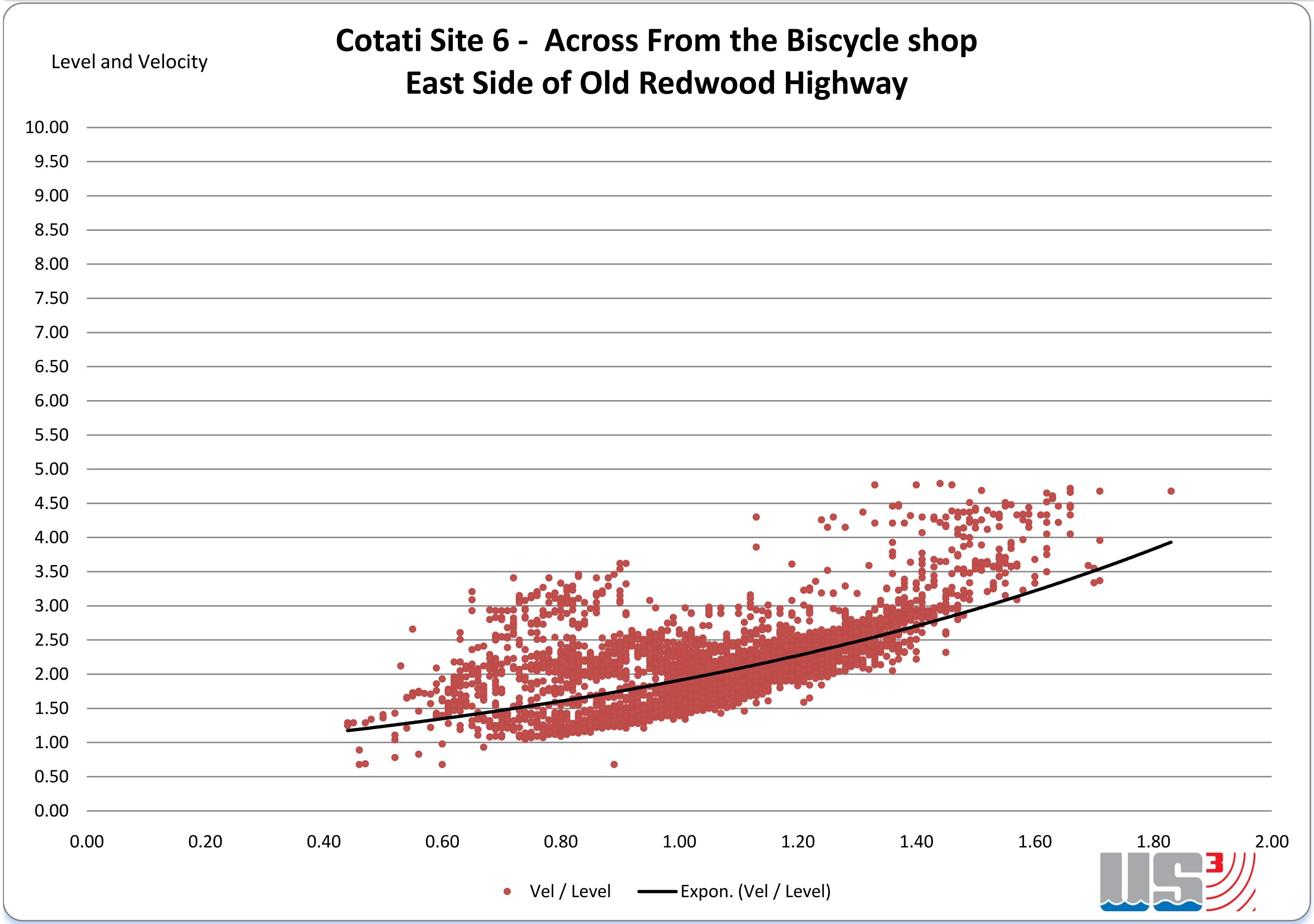


	Velocity (fps)	Level (in)	Flow (mgd)		
Average	0.96	2.03	0.05	Total Rain Averaged between Both Gauges	Inches
Maximum	1.64	4.46	0.20		0.00
Minimum	0.54	1.08	0.01		

Week 10 5/10/2010 to 5/14/2010



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	1.03	1.84	0.04	Total Rain Averaged between Both Gauges	Inches
Maximum	1.52	4.12	0.18		0.00
Minimum	0.68	1.08	0.01		


Cotati Site 6 - Across From the Biscycle shop
East Side of Old Redwood Highway
Level and Velocity
10.00
9.50
9.00
8.50
8.00
7.50
7.00
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
2.00
Vel / Level
Expon. (Vel / Level)

Daily Report

East Side of Old Redwood Highway

Average Daily MGD					Minimum Daily MGD				Maximum Daily MGD		
Date	Velocity	Level	Flow		Velocity	Level	Flow		Velocity	Level	Flow
3/10/2010	0.96	2.18	0.05		0.69	2.00	0.03		1.25	2.46	0.06
3/11/2010	0.99	1.90	0.04		0.69	1.33	0.02		1.22	2.39	0.07
3/12/2010	1.19	2.45	0.08		0.47	0.69	0.00		1.56	4.48	0.20
3/13/2010	1.11	2.38	0.07		0.86	1.62	0.03		1.55	4.51	0.20
3/14/2010	1.12	2.18	0.06		0.76	1.50	0.03		1.32	2.76	0.09
3/15/2010	1.08	2.13	0.05		0.78	1.47	0.03		1.61	4.33	0.20
3/16/2010	1.10	1.94	0.05		0.79	1.29	0.02		1.22	2.43	0.07
3/17/2010	1.12	2.06	0.05		0.88	1.28	0.02		1.50	4.14	0.18
3/18/2010	1.11	1.98	0.05		0.91	1.40	0.02		1.27	2.65	0.08
3/19/2010	1.09	2.04	0.05		0.83	1.25	0.02		1.49	4.27	0.18
3/20/2010	1.04	2.00	0.05		0.54	1.21	0.01		1.45	4.18	0.17
3/21/2010	1.09	1.91	0.05		0.82	1.18	0.02		1.27	2.53	0.08
3/22/2010	1.12	2.08	0.06		0.88	1.23	0.02		1.54	4.29	0.19
3/23/2010	1.12	2.07	0.05		1.00	1.58	0.03		1.29	2.61	0.08
3/24/2010	1.11	2.00	0.05		0.85	1.22	0.02		1.54	4.16	0.18
3/25/2010	1.15	1.97	0.05		0.94	1.37	0.02		1.30	2.32	0.07
3/26/2010	1.09	1.98	0.05		0.80	1.15	0.02		1.38	4.21	0.17
3/27/2010	1.01	1.97	0.05		0.66	1.07	0.01		1.28	4.15	0.15
3/28/2010	1.05	1.88	0.04		0.52	1.04	0.01		1.34	2.57	0.08
3/29/2010	1.12	1.99	0.05		0.46	0.68	0.00		1.45	4.30	0.18
3/30/2010	1.16	1.98	0.05		0.88	1.29	0.02		1.31	2.44	0.07
3/31/2010	1.26	2.50	0.08		0.69	1.47	0.03		1.55	4.37	0.18
4/1/2010	1.21	2.17	0.06		0.69	1.75	0.03		1.37	2.51	0.08
4/2/2010	1.23	2.39	0.07		0.92	1.40	0.02		1.53	4.34	0.19
4/3/2010	1.21	2.36	0.07		0.85	1.66	0.03		1.59	4.34	0.20
4/4/2010	1.23	2.29	0.07		0.94	1.40	0.03		1.45	3.04	0.11
4/5/2010	1.18	2.37	0.07		0.89	1.83	0.04		1.55	4.46	0.20
4/6/2010	1.13	2.02	0.05		0.95	1.43	0.03		1.26	2.46	0.07
4/7/2010	1.12	2.01	0.05		0.89	1.30	0.02		1.50	4.22	0.18
4/8/2010	1.13	1.89	0.05		0.87	1.22	0.02		1.27	2.29	0.07
4/9/2010	1.13	2.01	0.05		0.85	1.23	0.02		1.49	4.37	0.19
4/10/2010	1.16	2.11	0.06		0.96	1.39	0.03		1.51	4.26	0.18
4/11/2010	1.33	2.91	0.11		0.91	1.28	0.02		1.66	4.72	0.23
4/12/2010	1.30	3.07	0.11		0.97	2.47	0.06		1.71	4.77	0.20
4/13/2010	1.25	2.32	0.07		1.06	1.87	0.04		1.38	2.82	0.10
4/14/2010	1.19	2.17	0.06		1.01	1.58	0.03		1.52	4.40	0.19
4/15/2010	1.15	1.97	0.05		0.93	1.39	0.02		1.34	2.43	0.08
4/16/2010	1.14	2.10	0.06		0.90	1.29	0.02		1.58	4.26	0.19
4/17/2010	1.14	2.12	0.06		0.91	1.40	0.02		1.58	4.34	0.20
4/18/2010	1.13	1.97	0.05		0.90	1.32	0.02		1.31	2.65	0.09
4/19/2010	1.09	2.05	0.05		0.87	1.25	0.02		1.62	4.33	0.20
4/20/2010	0.99	2.23	0.05		0.77	1.66	0.03		1.18	2.64	0.08
4/21/2010	1.05	2.13	0.05		0.78	1.55	0.02		1.49	4.22	0.18
4/22/2010	0.97	1.94	0.04		0.77	1.39	0.02		1.22	2.39	0.07
4/23/2010	0.88	2.03	0.04		0.60	1.26	0.02		1.40	4.30	0.16
4/24/2010	0.92	2.08	0.05		0.61	1.19	0.01		1.83	4.68	0.25
4/25/2010	0.79	1.95	0.04		0.56	1.18	0.01		1.35	2.53	0.08
4/26/2010	0.81	2.00	0.04		0.44	1.25	0.01		1.64	4.46	0.21
4/27/2010	1.10	2.01	0.05		0.82	1.28	0.02		1.35	2.59	0.09

Daily Report

East Side of Old Redwood Highway

Average Daily MGD					Minimum Daily MGD				Maximum Daily MGD		
Date	Velocity	Level	Flow		Velocity	Level	Flow		Velocity	Level	Flow
4/28/2010	1.08	2.07	0.05		0.84	1.30	0.02		1.50	4.43	0.19
4/29/2010	1.06	1.96	0.05		0.85	1.32	0.02		1.20	2.37	0.07
4/30/2010	0.97	2.22	0.05		0.83	1.33	0.02		1.51	4.69	0.21
5/1/2010	0.80	2.72	0.06		0.53	1.53	0.02		1.44	4.79	0.20
5/2/2010	0.75	2.65	0.05		0.58	1.37	0.02		0.91	3.62	0.09
5/3/2010	0.82	2.48	0.05		0.62	1.46	0.02		1.37	4.46	0.18
5/4/2010	0.90	2.16	0.05		0.54	1.65	0.02		1.17	3.15	0.08
5/5/2010	1.05	2.03	0.05		0.75	1.30	0.02		1.39	4.32	0.17
5/6/2010	0.97	1.80	0.04		0.77	1.23	0.02		1.17	2.15	0.06
5/7/2010	0.92	1.88	0.04		0.73	1.08	0.01		1.47	4.30	0.18
5/8/2010	1.03	1.97	0.05		0.73	1.11	0.01		1.64	4.22	0.20
5/9/2010	1.06	1.85	0.04		0.76	1.09	0.01		1.34	2.72	0.09
5/10/2010	1.07	1.97	0.05		0.77	1.12	0.01		1.47	4.05	0.17
5/11/2010	1.00	1.79	0.04		0.73	1.11	0.01		1.20	2.43	0.07
5/12/2010	1.05	1.86	0.05		0.74	1.12	0.01		1.52	4.12	0.18
5/13/2010	1.02	1.76	0.04		0.68	1.08	0.01		1.25	2.33	0.07
5/14/2010	1.01	1.82	0.04		0.80	1.15	0.02		1.51	3.64	0.15

Temporary Flow Study

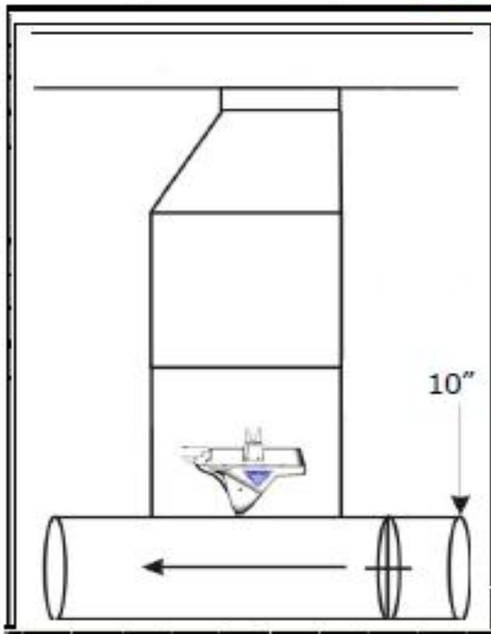
Cotati Site 7 - In front of Lowes

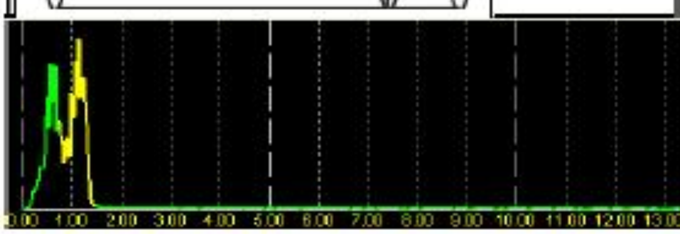
Utility Systems, Science, and Software
2101 E. 4th Street
Santa Ana, Ca 92705

From		To
3/10/2010 11:30		5/14/2010 13:15

METERING SITE DOCUMENT

City:	Cotati
Site Name:	Site 7
Location:	In front of Lowes
Access:	Road
GPS:	N +38° 19' 59.30", W -122° 42' 49.80"
Install Date:	3/10/2010





Pipe Size (inch):	10
Pipe Condition:	Good

Hydraulics:

Multiplier = 1.00

Gas

O_2	Good
HS_2	Good

Manhole Comments:

Traffic Safety Required:

Moderate traffic, cones

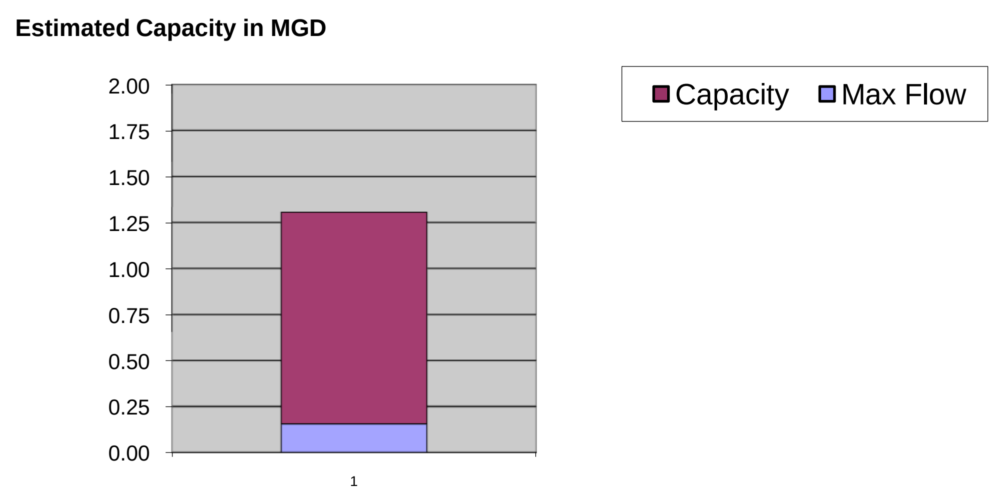
METERING SITE DOCUMENT

Site Pictures

Meter site 7
Temporary Flow Study

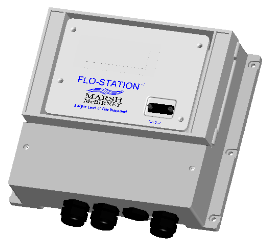
Cotati, CA

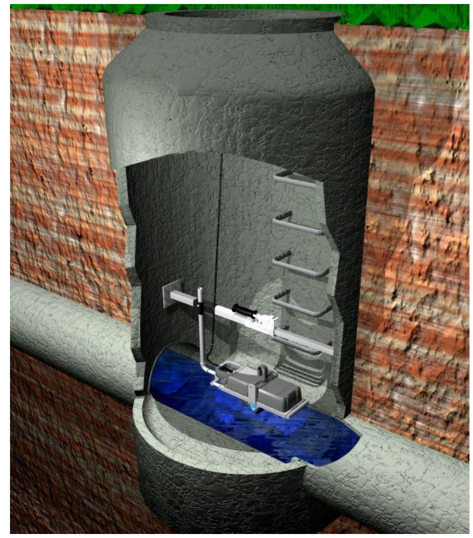
Meter Start Date		From	3/10/2010 11:30
Meter Stop Date		To	5/14/2010 13:15
	Velocity (fps)	Level (in)	Flow (MGD)
Average	0.80	1.91	0.04
Maximum	2.03	3.26	0.16
Minimum	0.41	1.15	0.01
Pipe Size		10	
Estimated Capacity		13.51%	
Sensor Used		Hach - FloDar	
Comment			



Utility Systems, Science, and Software
2101 E. 4th Street
Santa Ana, Ca 92705

Flo-Dar incorporates a Doppler Radar Velocity Sensor and Ultrasonic Depth Transducer for use in Open Channel Applications. It is available with a Permanent Flo-Station. The Flo-Station is available with or without a display and is powered with 120/240 VAC, or 12 VDC. The Flo-Station requires Flo-Ware software, which is included on some models, and a customer supplied PC. Flo-Station with display shows flow rate, total flow, velocity and level. Both Flo-Station's have four outputs one each for level, velocity, flow rate, surcharge level, and a contact closure. Instruction manuals are included. Mounting Hardware is ordered separately.





Flo-Dar Sensor
Enclosure
Material: Polystyrene
Dimensions: 6.9" W x 16.65" L x 11.7" D
(17.5 cm x 42.3 cm x 29.7 cm)
Weight: 10.5 lbs. (4.8 kg)

Temperature
Operating Range: 14° F to 122°F
(-10° C to 50° C)
Storage Range: -40° F to 140° F
(-40° C to 60° C)

Velocity Measurement
Method: Radar
Range: 0.75 to 20 ft/s (0.23 m/s to 6.10 m/s)
Accuracy: ±0.5%; ±0.1 ft/s (±0.03 m/s)

Level Measurement
Method: Ultrasonic
Standard Operating Range:
0.25 to 60 in. (0.634 to 152.4 cm)
Optional Operating Range: 0 (0 cm) to 240" (6.1 m)
(with 18" dead band)
Temperature Compensated
Accuracy: ±0.1 in. (±0.25 cm)
1% Accuracy

Surcharge Conditions Level/Velocity
Level
Method: Piezo-resistive pressure transducer
Maximum Range: 138 inches (3.5 meters)
Velocity
Method: Electromagnetic
Range: -5 to +20 ft/s (-1.5 to +6.1 m/s)

Flow Measurement
Based on Continuity Equation.
Accuracy: ±5.0% of reading typical where flow is in a channel with uniform flow conditions and is not surcharged.

Flo-Station Monitor
Data Storage
64K (16K cycles of velocity/level data)
Local Terminal
RS232C at 19.2K baud

Timebase Accuracy: 1 second per day

Outputs: Four 4-20 mA outputs; system-isolated, up to 600Ω load. Each output is selectable between FLOW, LEVEL, VELOCITY OR SURCHARGE LEVEL.

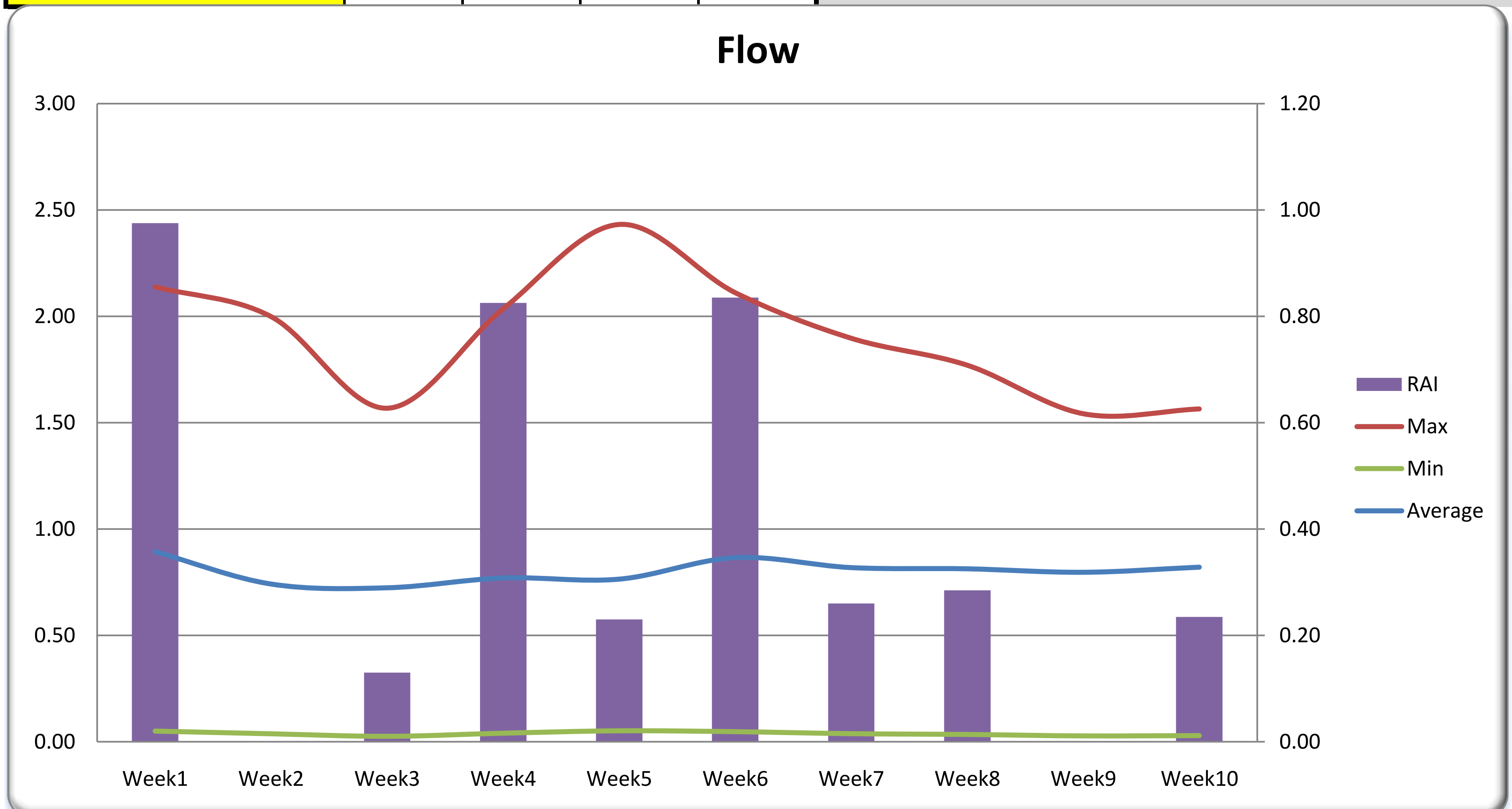
Power Requirements
AC: 85-264 VAC, 47-63 Hz. 32 watts
DC: 12 VDC for Flo-Station without Display or Flo-Station with Display (Backlight Off)
180 mA (2.1 watts) with (1) 4-20 mA utilized.

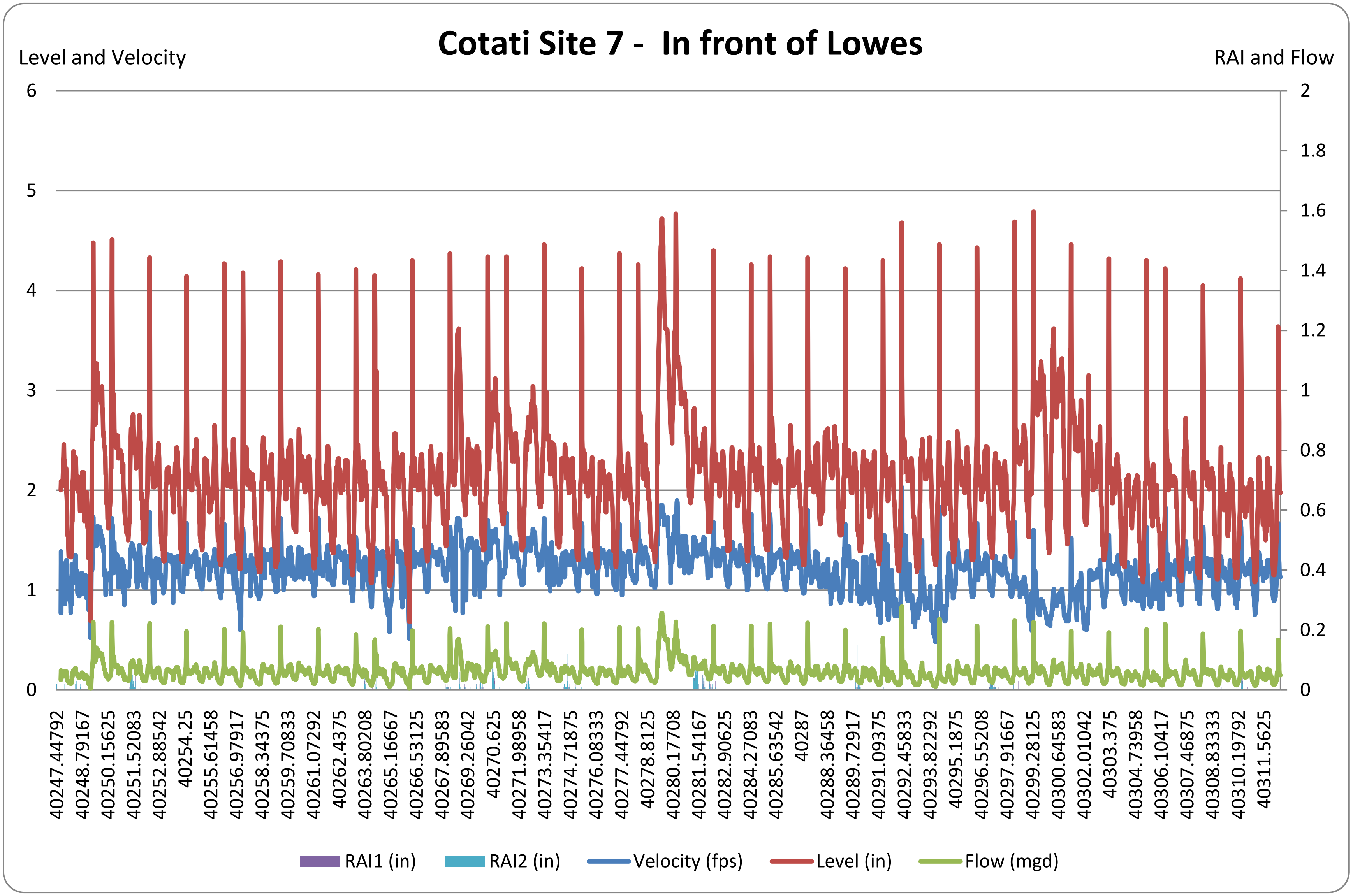
Housing
Material: ABS Plastic, NEMA 4
Dimensions: 10.2" W x 9.3" H x 4" D
(25.9 cm W x 23.6 cm H x 10.2 cm D)
Weight: 5 lbs.
Temperature Operating Range: 14° F to 122° F
(-10° C to 50° C)
Temperature Storage Range:
(without display) -40°F to 140°F (-40°C to 60°C)
(with display) 4°F to 140°F (-20°C to 60°C) w/Display

Flow Review

Cotati Site 7 - In front of Lowes

	Average	Max	Min	RAI
Week1	0.89	2.14	0.05	0.98
Week2	0.74	2.00	0.04	0.00
Week3	0.72	1.57	0.03	0.13
Week4	0.77	2.04	0.04	0.83
Week5	0.76	2.43	0.05	0.23
Week6	0.87	2.11	0.05	0.84
Week7	0.82	1.90	0.04	0.26
Week8	0.81	1.77	0.03	0.29
Week9	0.80	1.54	0.03	0.00
Week10	0.82	1.56	0.03	0.24





Cotati Site 7 - In front of Lowes
Level and Velocity
RAI and Flow
6
5
4
3
2
1
0
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
40247.44792
40248.79167
40250.15625
40251.52083
40252.88542
40254.25
40255.61458
40256.97917
40258.34375
40259.70833
40261.07292
40262.4375
40263.80208
40265.16667
40266.53125
40267.89583
40269.26042
40270.625
40271.98958
40273.35417
40274.71875
40276.08333
40277.44792
40278.8125
40280.17708
40281.54167
40282.90625
40284.27083
40285.63542
40287
40288.36458
40289.72917
40291.09375
40292.45833
40293.82292
40295.1875
40296.55208
40297.91667
40299.28125
40300.64583
40302.01042
40303.375
40304.73958
40306.10417
40307.46875
40308.83333
40310.19792
40311.5625
RAI1 (in)
RAI2 (in)
Velocity (fps)
Level (in)
Flow (mgd)

Rainlog Rainfall Report		By Day Report
City Hall Site	**Total**	**6.10**
	Max	**1.37**
	Average	**0.09**
Date	*Rainfall*	*Comments*
3/8/10 0:00	0.04	
3/9/10 0:00	0.04	
3/10/10 0:00	0.15	
3/11/10 0:00	0.00	
3/12/10 0:00	0.55	
3/13/10 0:00	0.00	
3/14/10 0:00	0.00	
3/15/10 0:00	0.00	
3/16/10 0:00	0.00	
3/17/10 0:00	0.00	
3/18/10 0:00	0.00	
3/19/10 0:00	0.00	
3/20/10 0:00	0.00	
3/21/10 0:00	0.00	
3/22/10 0:00	0.00	
3/23/10 0:00	0.00	
3/24/10 0:00	0.25	
3/25/10 0:00	0.01	
3/26/10 0:00	0.00	
3/27/10 0:00	0.00	
3/28/10 0:00	0.00	
3/29/10 0:00	0.23	
3/30/10 0:00	0.34	
3/31/10 0:00	0.69	
4/1/10 0:00	0.00	
4/2/10 0:00	0.39	
4/3/10 0:00	0.00	
4/4/10 0:00	0.41	
4/5/10 0:00	0.05	
4/6/10 0:00	0.00	
4/7/10 0:00	0.00	
4/8/10 0:00	0.00	
4/9/10 0:00	0.00	
4/10/10 0:00	0.00	
4/11/10 0:00	1.37	
4/12/10 0:00	0.30	
4/13/10 0:00	0.00	
4/14/10 0:00	0.00	
4/15/10 0:00	0.00	
4/16/10 0:00	0.00	
4/17/10 0:00	0.00	
4/18/10 0:00	0.00	
4/19/10 0:00	0.21	
4/20/10 0:00	0.30	
4/21/10 0:00	0.01	
4/22/10 0:00	0.00	
4/23/10 0:00	0.00	
4/24/10 0:00	0.00	

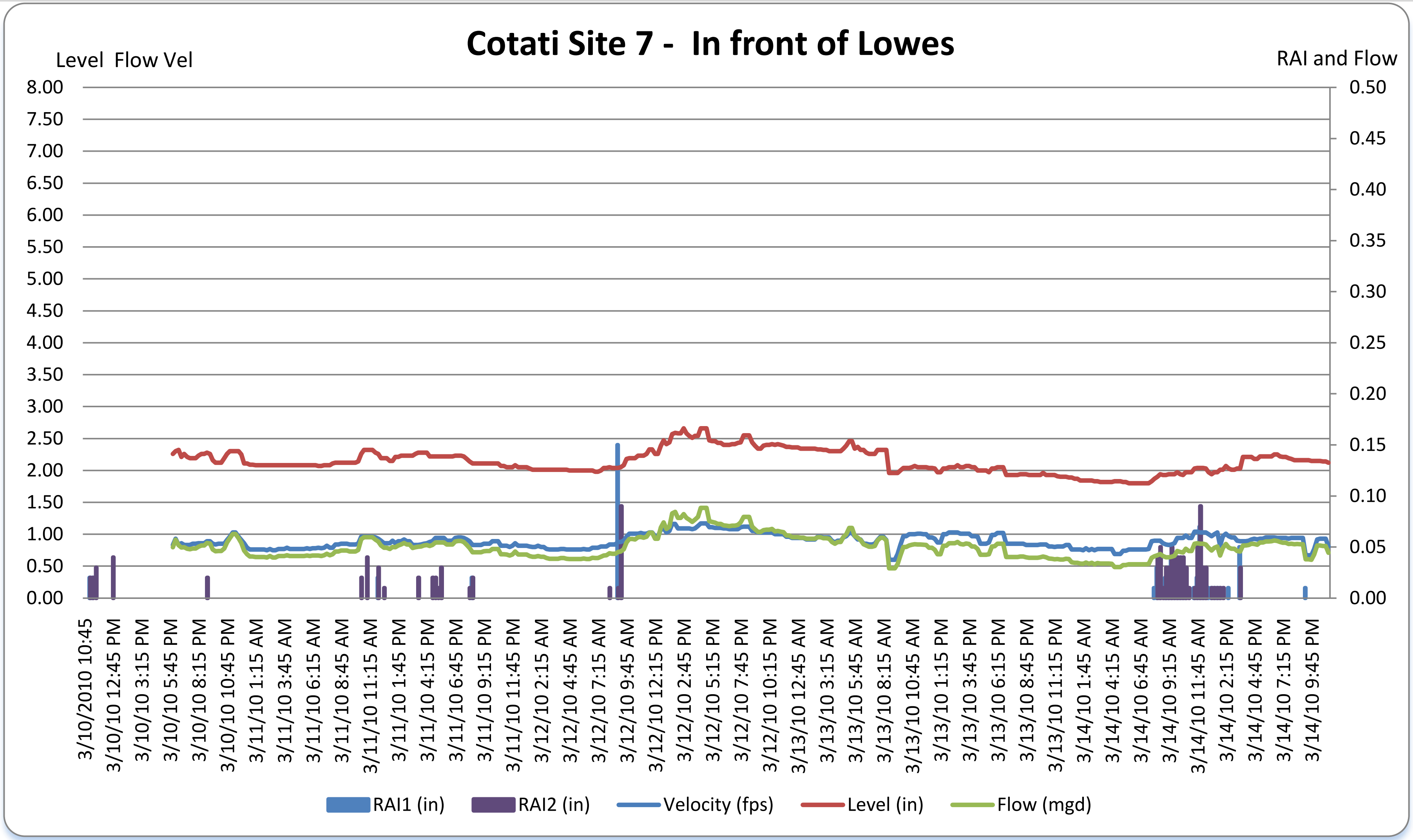
Rainlog Rainfall Report		By Day Report
City Hall Site	**Total**	**6.10**
	Max	**1.37**
	Average	**0.09**
Date	***Rainfall***	***Comments***
4/25/10 0:00	0.00	
4/26/10 0:00	0.00	
4/27/10 0:00	0.35	
4/28/10 0:00	0.22	
4/29/10 0:00	0.00	
4/30/10 0:00	0.00	
5/1/10 0:00	0.00	
5/2/10 0:00	0.00	
5/3/10 0:00	0.00	
5/4/10 0:00	0.00	
5/5/10 0:00	0.00	
5/6/10 0:00	0.00	
5/7/10 0:00	0.00	
5/8/10 0:00	0.00	
5/9/10 0:00	0.01	
5/10/10 0:00	0.18	
5/11/10 0:00	0.00	
5/12/10 0:00	0.00	
5/13/10 0:00	0.00	
5/14/10 0:00	0.00	

Rainlog Rainfall Report		By Day Report
North Pump Station	**Total**	**6.82**
	Max	**1.58**
	Average	**0.10**
Date	***Rainfall***	***Comments***
3/8/10 0:00	0.13	
3/9/10 0:00	0.23	
3/10/10 0:00	0.11	
3/11/10 0:00	0.00	
3/12/10 0:00	0.70	
3/13/10 0:00	0.00	
3/14/10 0:00	0.00	
3/15/10 0:00	0.00	
3/16/10 0:00	0.00	
3/17/10 0:00	0.00	
3/18/10 0:00	0.00	
3/19/10 0:00	0.00	
3/20/10 0:00	0.00	
3/21/10 0:00	0.00	
3/22/10 0:00	0.00	
3/23/10 0:00	0.00	
3/24/10 0:00	0.23	
3/25/10 0:00	0.13	
3/26/10 0:00	0.00	
3/27/10 0:00	0.00	
3/28/10 0:00	0.00	
3/29/10 0:00	0.29	
3/30/10 0:00	0.20	
3/31/10 0:00	0.75	
4/1/10 0:00	0.00	
4/2/10 0:00	0.48	
4/3/10 0:00	0.00	
4/4/10 0:00	0.47	
4/5/10 0:00	0.02	
4/6/10 0:00	0.00	
4/7/10 0:00	0.00	
4/8/10 0:00	0.00	
4/9/10 0:00	0.00	
4/10/10 0:00	0.00	
4/11/10 0:00	1.58	
4/12/10 0:00	0.27	
4/13/10 0:00	0.00	
4/14/10 0:00	0.00	
4/15/10 0:00	0.00	
4/16/10 0:00	0.00	
4/17/10 0:00	0.00	
4/18/10 0:00	0.00	
4/19/10 0:00	0.21	
4/20/10 0:00	0.26	
4/21/10 0:00	0.01	
4/22/10 0:00	0.00	
4/23/10 0:00	0.00	
4/24/10 0:00	0.00	

Rainlog Rainfall Report

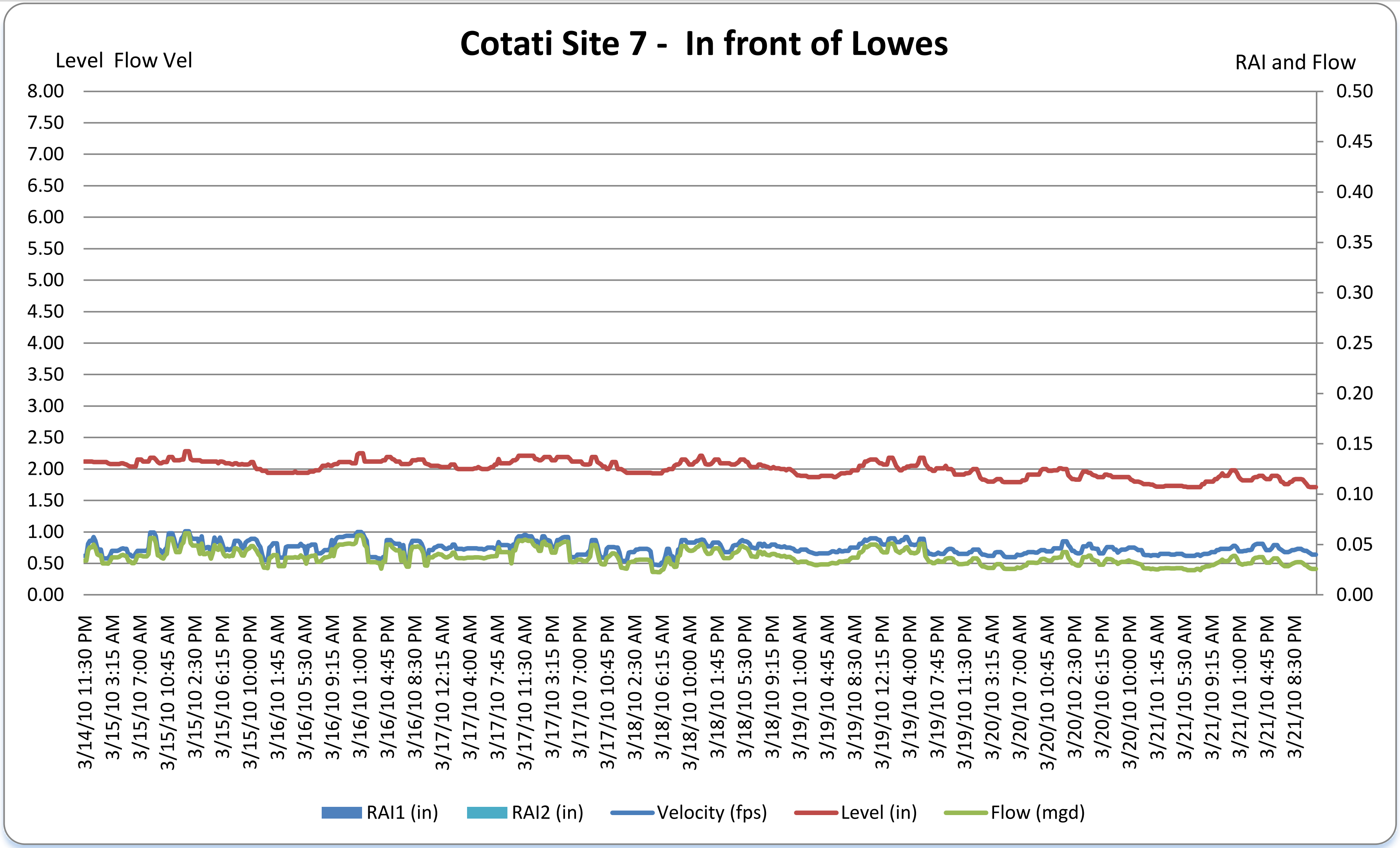
Rainlog Rainfall Report		By Day Report
North Pump Station	Total	6.82
	Max	1.58
	Average	0.10
Date	*Rainfall*	*Comments*
4/25/10 0:00	0.00	
4/26/10 0:00	0.01	
4/27/10 0:00	0.42	
4/28/10 0:00	0.13	
4/29/10 0:00	0.00	
4/30/10 0:00	0.00	
5/1/10 0:00	0.00	
5/2/10 0:00	0.00	
5/3/10 0:00	0.00	
5/4/10 0:00	0.00	
5/5/10 0:00	0.00	
5/6/10 0:00	0.00	
5/7/10 0:00	0.00	
5/8/10 0:00	0.00	
5/9/10 0:00	0.01	
5/10/10 0:00	0.16	
5/11/10 0:00	0.00	
5/12/10 0:00	0.00	
5/13/10 0:00	0.02	
5/14/10 0:00	0.00	

Week 1 3/10/2010 to 3/14/2010



	Velocity (fps)	Level (in)	Flow (mgd)	Total Rain Averaged between Both Gauges	Inches
Average	0.89	2.14	0.05		
Maximum	1.17	2.66	0.09		0.98
Minimum	0.60	1.80	0.03		

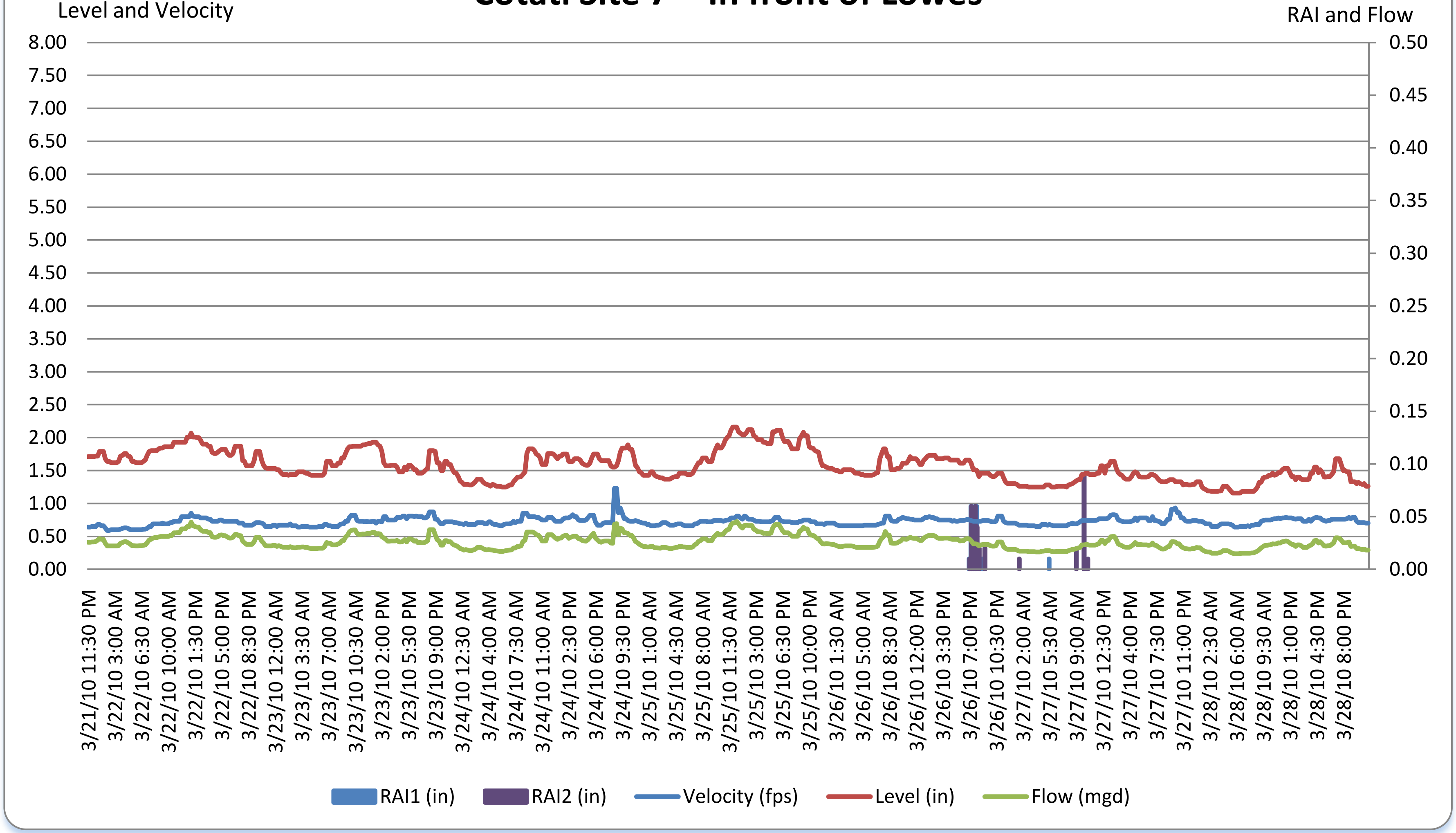
Week 2 3/15/2010 to 3/21/2010



	Velocity (fps)	Level (in)	Flow (mgd)		
				Total Rain Averaged between Both Gauges	**Inches**
Average	0.74	2.00	0.04		
Maximum	1.01	2.28	0.06		
Minimum	0.47	1.71	0.02		**0.00**

Week 3 3/22/2010 to 3/28/2010

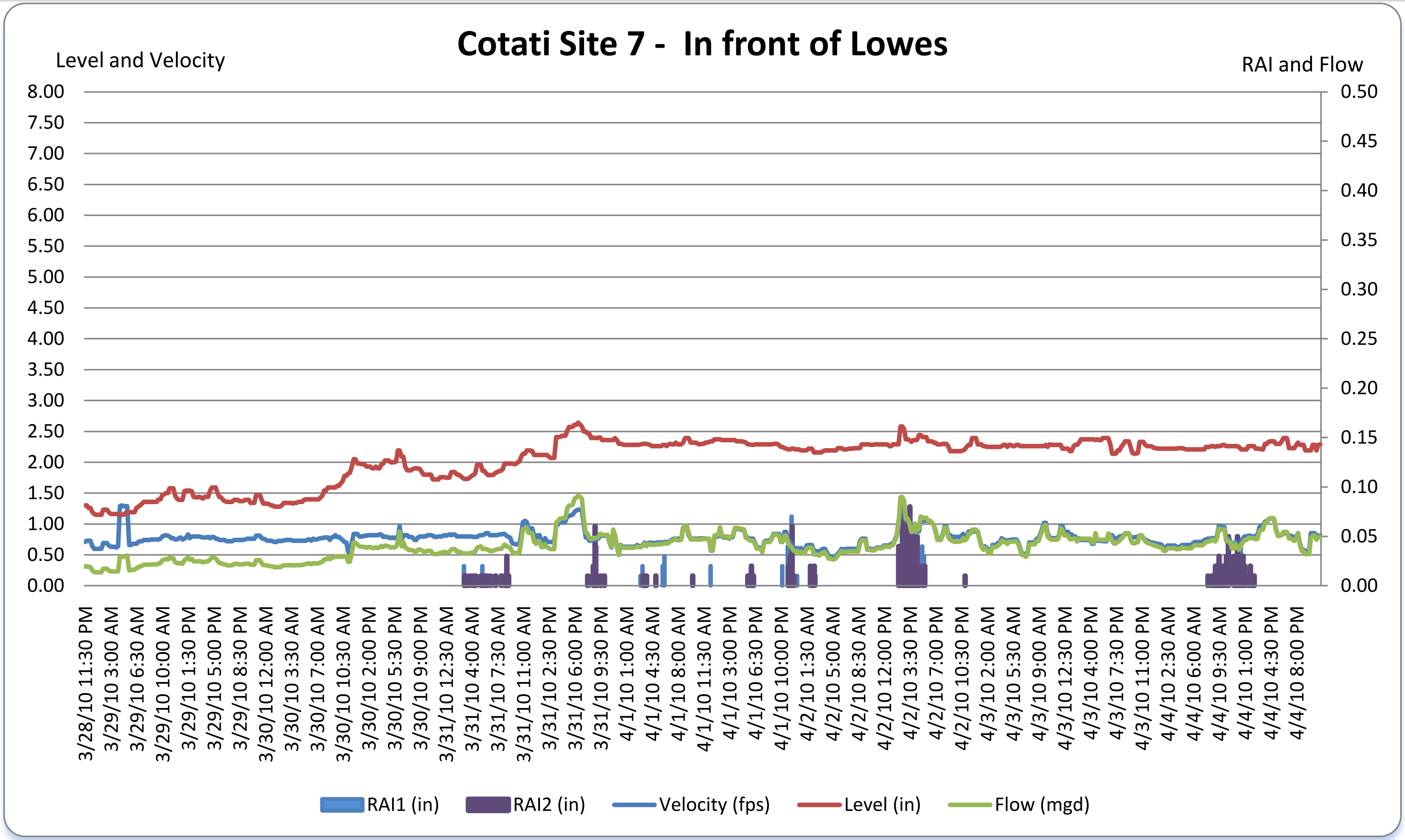
Cotati Site 7 - In front of Lowes



	Velocity (fps)	Level (in)	Flow (mgd)
Average	0.72	1.57	0.03
Maximum	1.23	2.16	0.05
Minimum	0.59	1.16	0.01

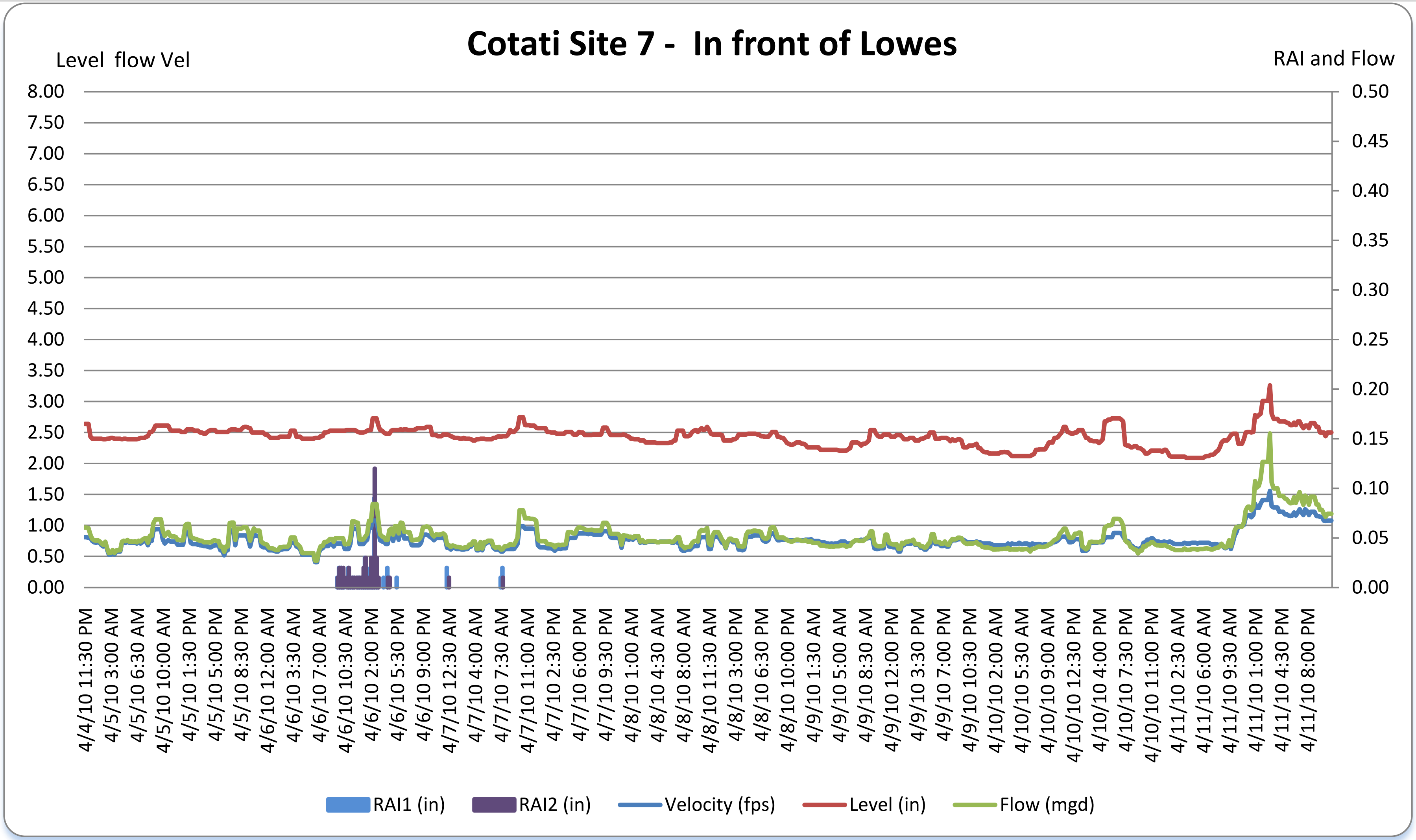
Total Rain Averaged between Both Gauges	Inches
	0.13

Week 4 3/29/2010 to 4/4/2010



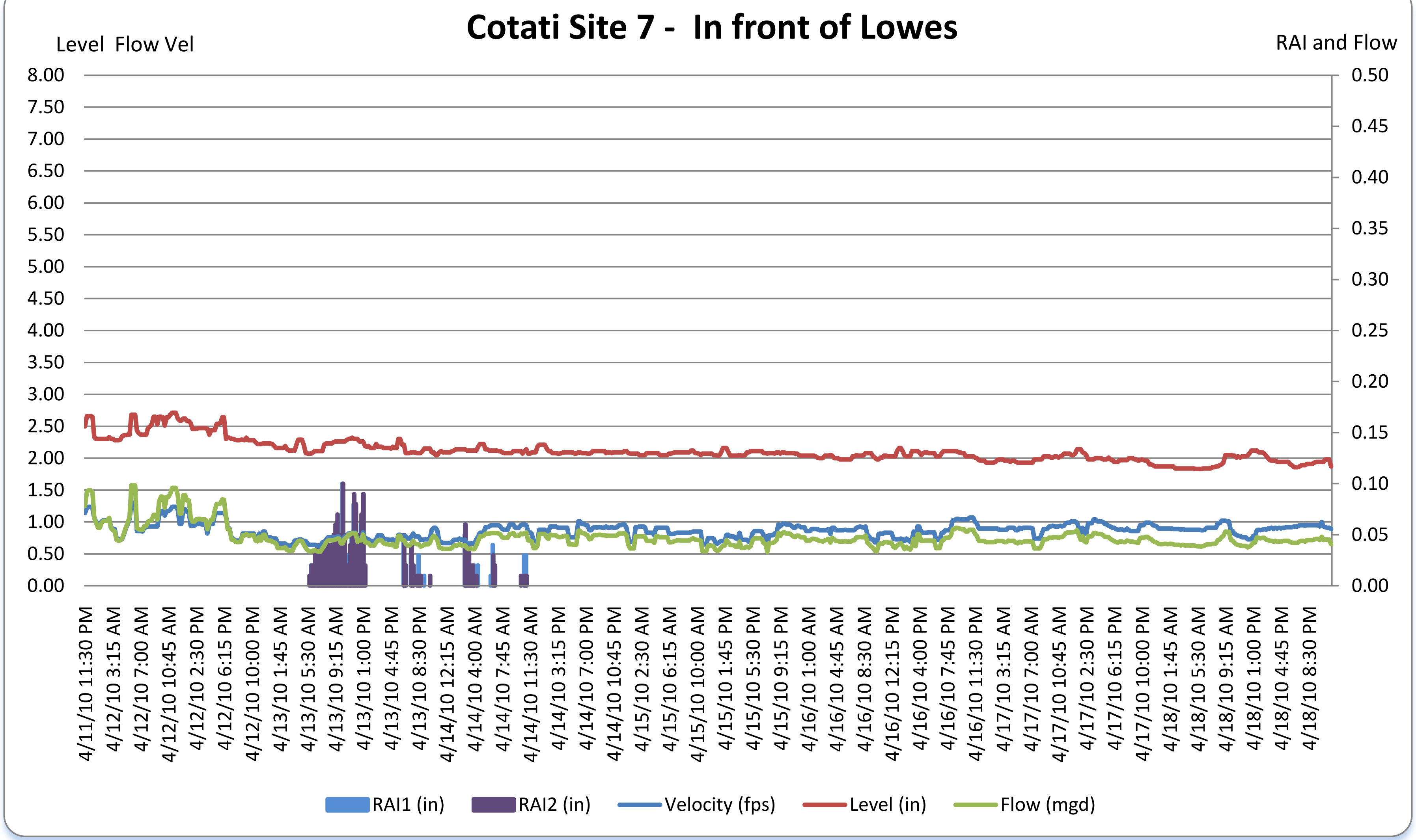
	Velocity (fps)	Level (in)	Flow (mgd)		
Average	0.77	2.04	0.04	Total Rain Averaged between Both Gauges	Inches
Maximum	1.30	2.64	0.09		0.83
Minimum	0.47	1.15	0.01		

Week 5 4/4/2010 to 4/11/2010



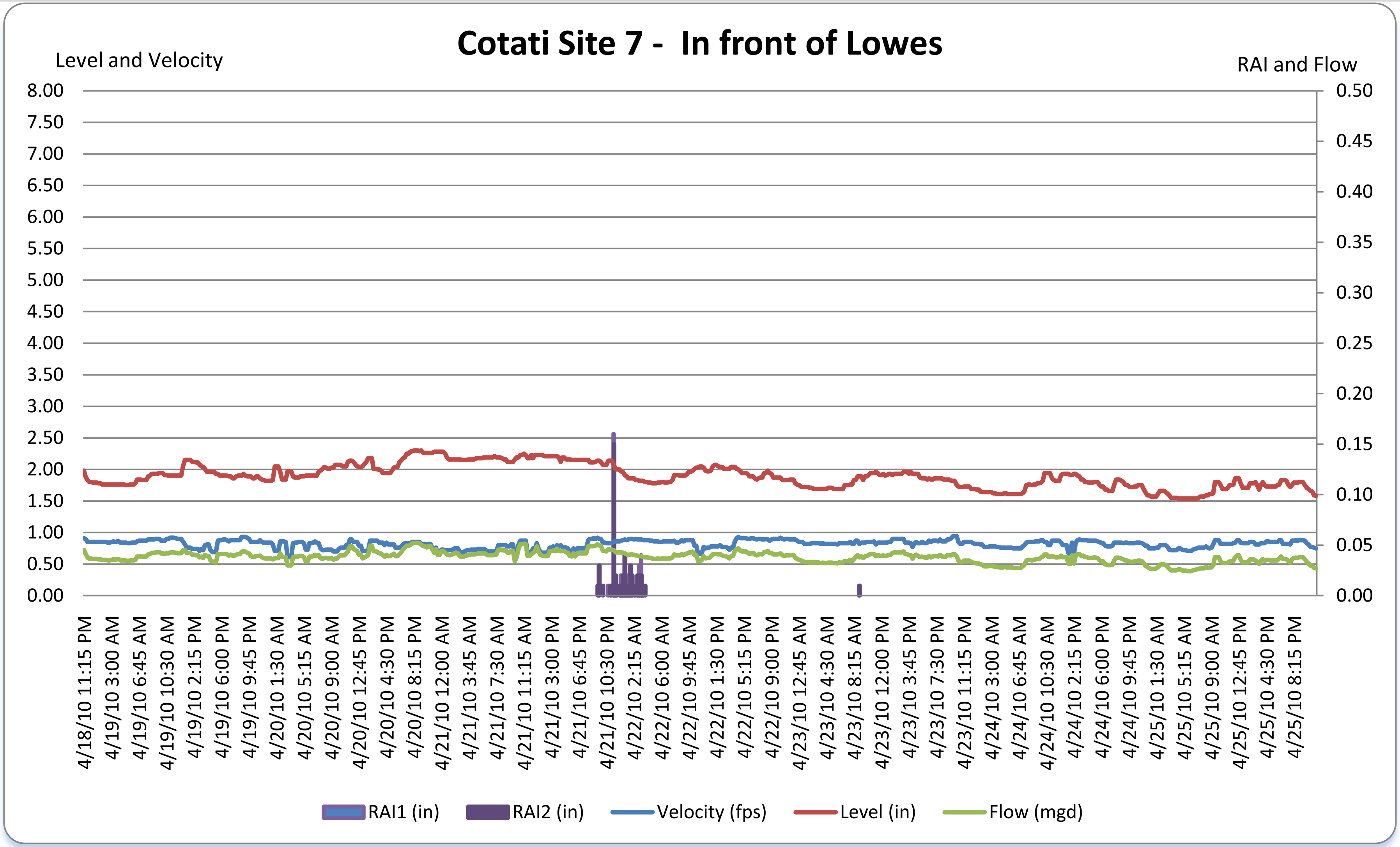
	Velocity (fps)	Level (in)	Flow (mgd)		
Average	0.76	2.43	0.05	Total Rain Averaged between Both Gauges	Inches
Maximum	1.56	3.26	0.16		0.23
Minimum	0.41	2.09	0.03		

Week 6 4/12/2010 to 4/18/2010



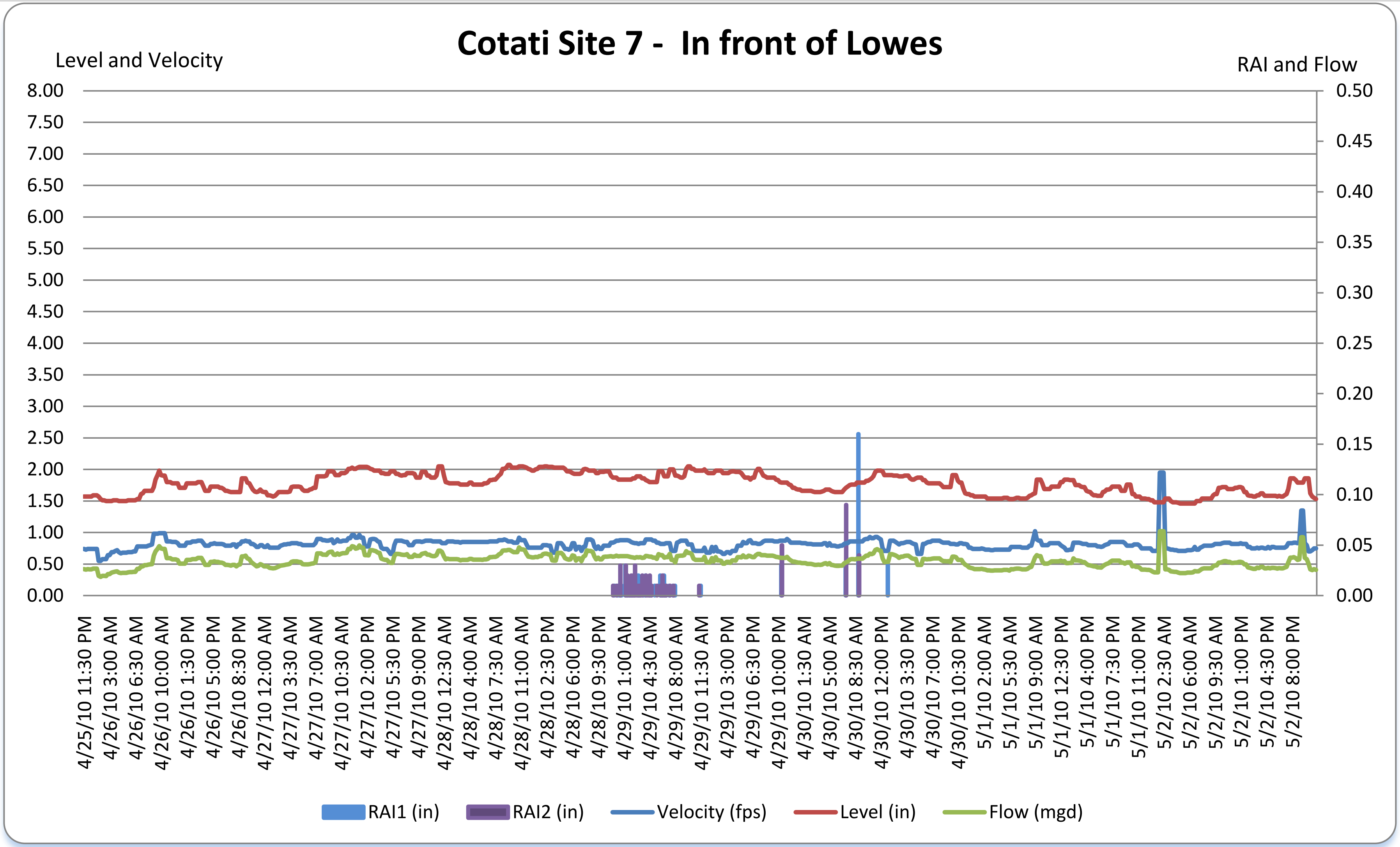
	Velocity (fps)	Level (in)	Flow (mgd)		
Average	0.87	2.11	0.05	Total Rain Averaged between Both Gauges	Inches
Maximum	1.30	2.71	0.10		0.84
Minimum	0.62	1.83	0.03		

Week 7 4/19/2010 to 4/25/2010



	Velocity (fps)	Level (in)	Flow (mgd)	Total Rain Averaged between Both Gauges	Inches
Average	0.82	1.90	0.04		
Maximum	0.94	2.30	0.05		
Minimum	0.61	1.54	0.02		0.26

Week 8 4/26/2010 to 5/2/2010

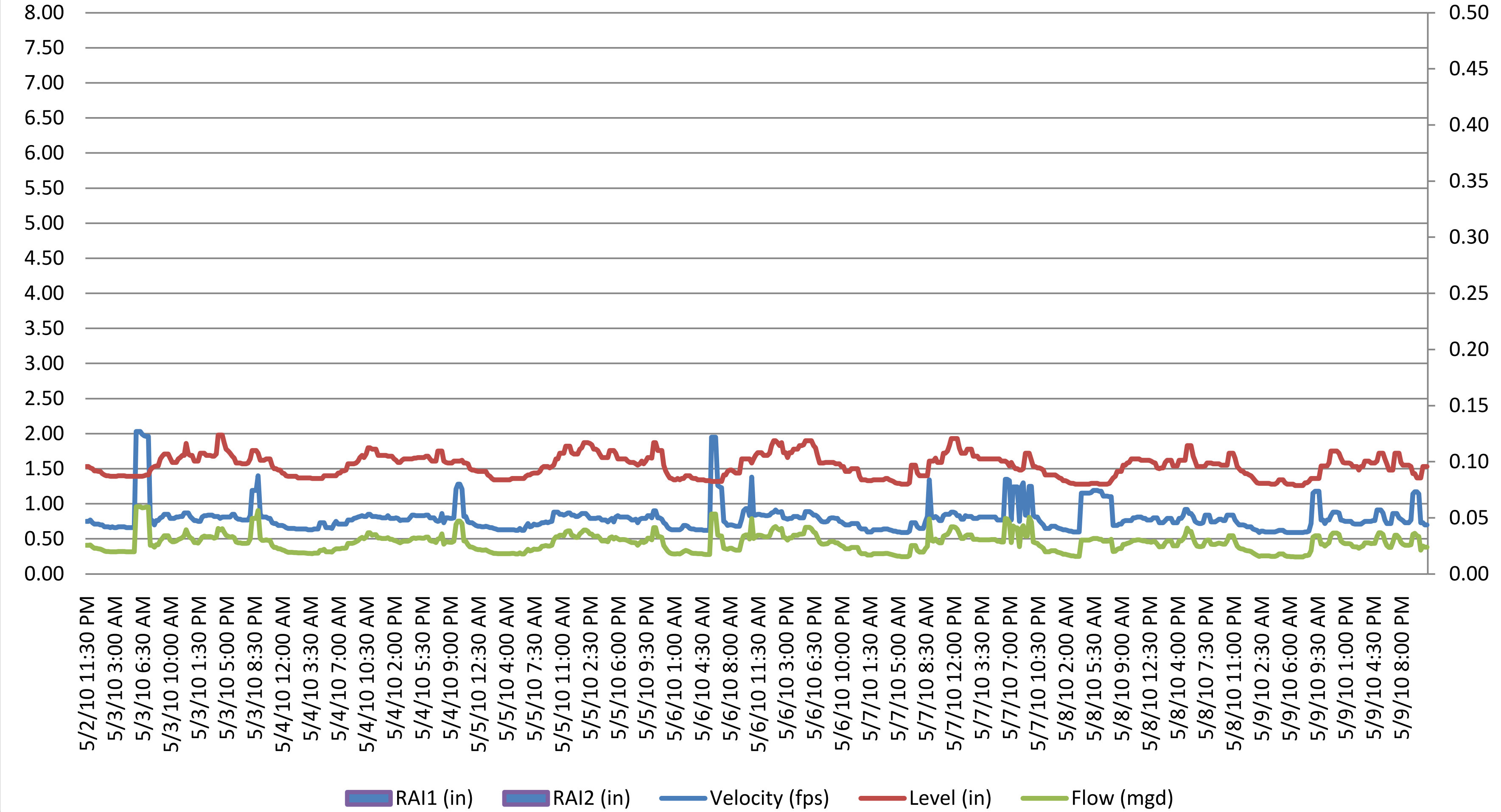


	Velocity (fps)	Level (in)	Flow (mgd)
Average	0.81	1.77	0.03
Maximum	1.95	2.07	0.06
Minimum	0.55	1.46	0.02

Total Rain Averaged between Both Gauges	Inches
	0.29

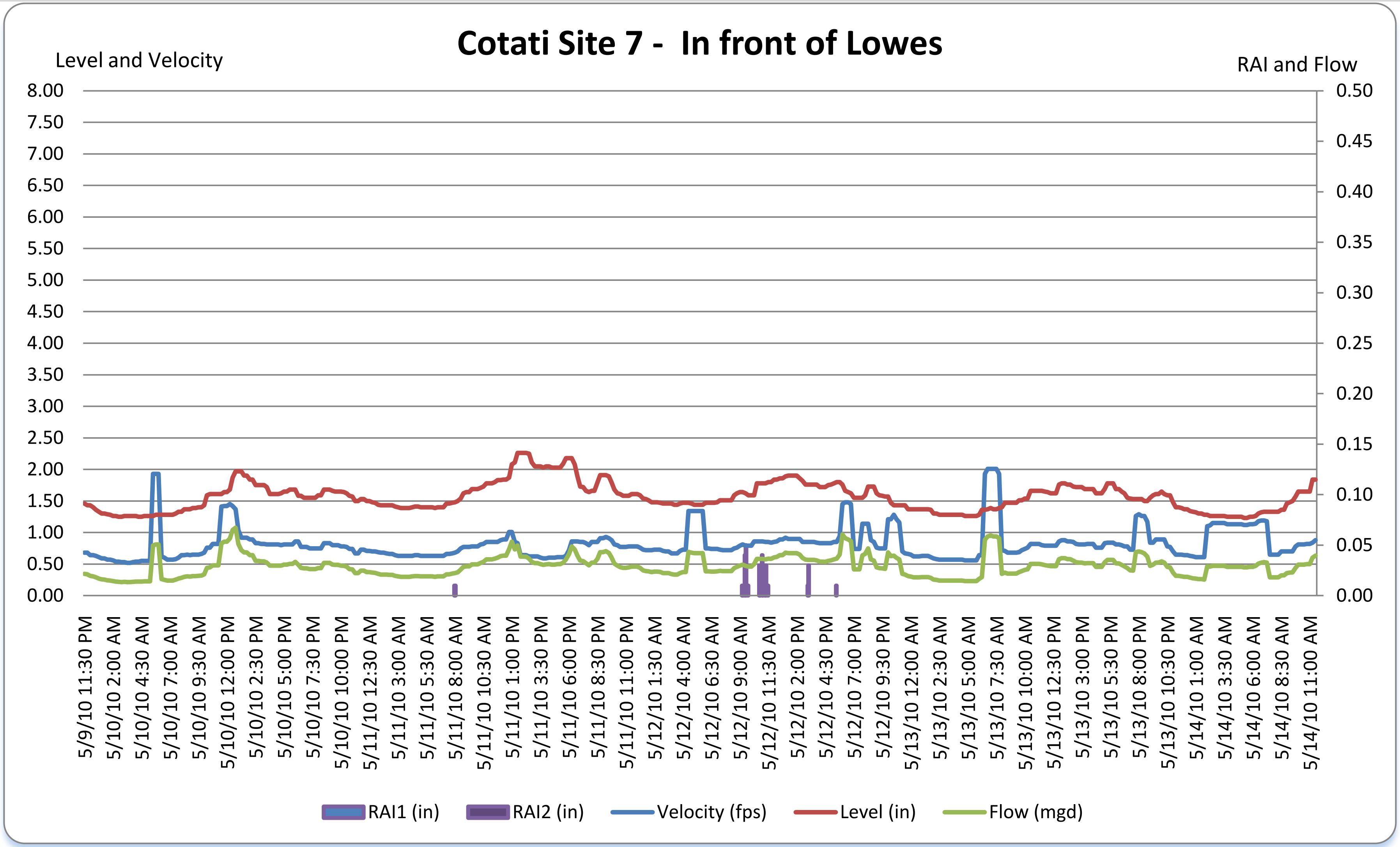
Week 9 5/3/2010 to 5/9/2010

Cotati Site 7 - In front of Lowes

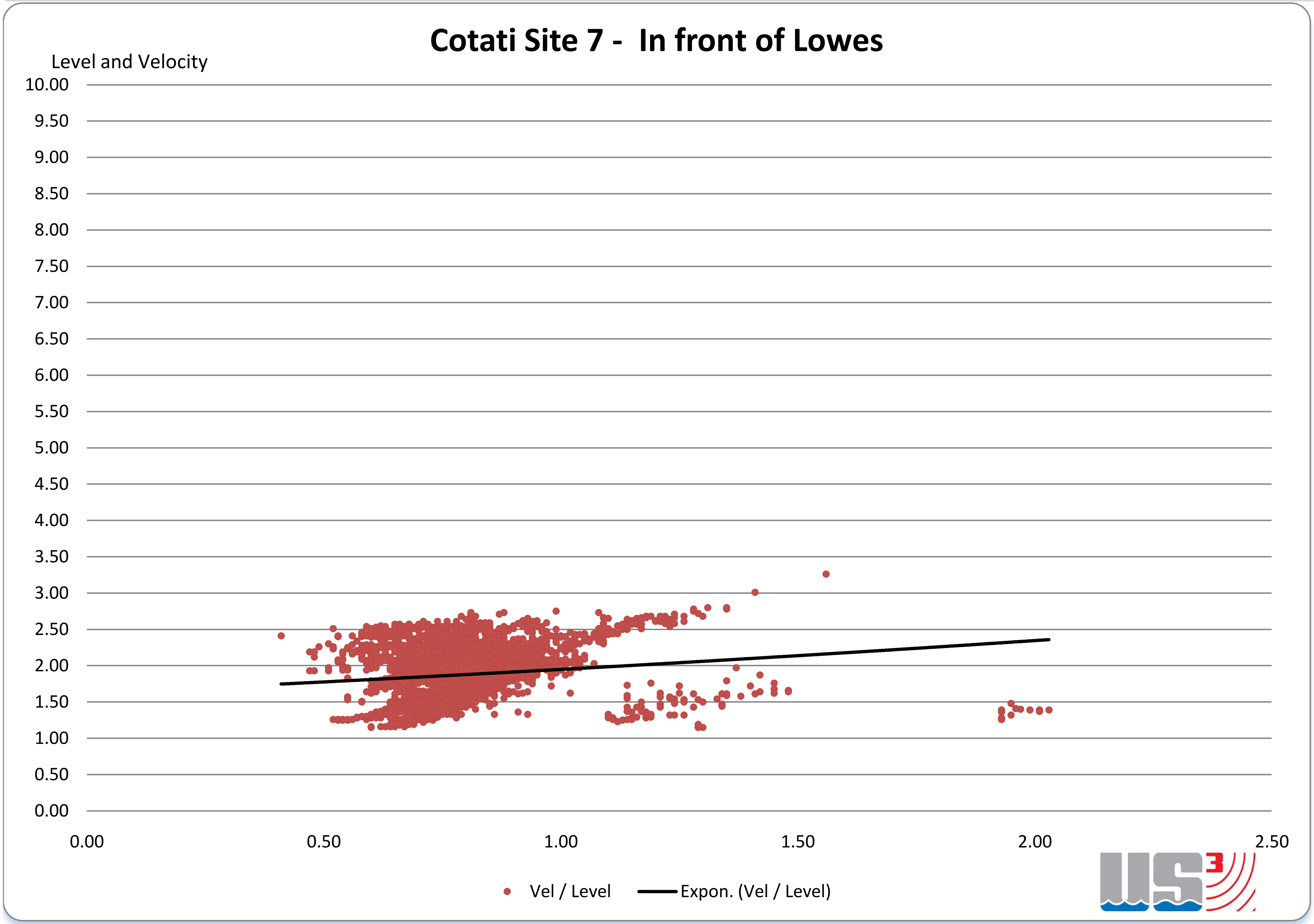


	Velocity (fps)	Level (in)	Flow (mgd)		
Average	0.80	1.54	0.03	Total Rain Averaged between Both Gauges	Inches
Maximum	2.03	1.98	0.06		0.00
Minimum	0.59	1.26	0.02		

Week 10 5/10/2010 to 5/14/2010



	Velocity (fps)	Level (in)	Flow (mgd)		
Average	0.82	1.56	0.03	Total Rain Averaged between Both Gauges	Inches
Maximum	2.01	2.26	0.07		0.24
Minimum	0.52	1.23	0.01		


Cotati Site 7 - In front of Lowes
Level and Velocity
10.00
9.50
9.00
8.50
8.00
7.50
7.00
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
0.50
1.00
1.50
2.00
2.50
Vel / Level
Expon. (Vel / Level)

Daily Report Cotati Site 7 - In front of Lowes

Average Daily MGD					Minimum Daily MGD				Maximum Daily MGD		
Date	Velocity	Level	Flow		Velocity	Level	Flow		Velocity	Level	Flow
3/10/2010	0.87	2.23	0.05		0.83	2.12	0.05		1.03	2.32	0.06
3/11/2010	0.85	2.16	0.05		0.75	2.05	0.04		1.03	2.32	0.06
3/12/2010	0.95	2.25	0.06		0.76	1.98	0.04		1.17	2.66	0.09
3/13/2010	0.91	2.13	0.05		0.60	1.93	0.03		1.03	2.46	0.07
3/14/2010	0.87	2.00	0.04		0.67	1.80	0.03		1.04	2.25	0.06
3/15/2010	0.79	2.11	0.04		0.58	2.00	0.03		1.01	2.28	0.06
3/16/2010	0.76	2.06	0.04		0.48	1.94	0.03		1.00	2.25	0.06
3/17/2010	0.77	2.10	0.04		0.58	2.00	0.03		0.95	2.21	0.05
3/18/2010	0.73	2.04	0.04		0.47	1.93	0.02		0.88	2.21	0.05
3/19/2010	0.75	2.00	0.04		0.64	1.87	0.03		0.92	2.18	0.05
3/20/2010	0.70	1.89	0.03		0.60	1.79	0.03		0.85	2.01	0.04
3/21/2010	0.69	1.80	0.03		0.62	1.71	0.02		0.81	1.98	0.04
3/22/2010	0.69	1.77	0.03		0.59	1.53	0.02		0.85	2.07	0.04
3/23/2010	0.72	1.61	0.03		0.64	1.43	0.02		0.87	1.93	0.04
3/24/2010	0.75	1.55	0.03		0.66	1.25	0.02		1.23	1.89	0.04
3/25/2010	0.72	1.77	0.03		0.66	1.37	0.02		0.81	2.16	0.05
3/26/2010	0.73	1.53	0.03		0.66	1.25	0.02		0.81	1.83	0.04
3/27/2010	0.73	1.36	0.02		0.65	1.18	0.02		0.93	1.64	0.03
3/28/2010	0.72	1.34	0.02		0.60	1.15	0.01		0.79	1.68	0.03
3/29/2010	0.78	1.38	0.02		0.62	1.15	0.01		1.30	1.59	0.03
3/30/2010	0.78	1.76	0.03		0.55	1.33	0.02		0.96	2.19	0.05
3/31/2010	0.82	2.20	0.05		0.51	1.78	0.03		1.23	2.64	0.09
4/1/2010	0.74	2.30	0.05		0.51	2.21	0.03		0.94	2.39	0.06
4/2/2010	0.74	2.27	0.04		0.47	2.16	0.03		1.24	2.58	0.09
4/3/2010	0.76	2.28	0.05		0.49	2.14	0.03		1.02	2.39	0.06
4/4/2010	0.77	2.25	0.05		0.56	2.19	0.03		1.09	2.39	0.07
4/5/2010	0.73	2.50	0.05		0.52	2.39	0.03		0.94	2.64	0.07
4/6/2010	0.72	2.50	0.05		0.41	2.40	0.03		1.08	2.73	0.08
4/7/2010	0.74	2.48	0.05		0.58	2.37	0.04		0.99	2.75	0.08
4/8/2010	0.74	2.43	0.05		0.59	2.30	0.04		0.87	2.59	0.06
4/9/2010	0.72	2.35	0.05		0.58	2.21	0.04		0.80	2.54	0.06
4/10/2010	0.73	2.33	0.05		0.58	2.12	0.03		0.88	2.73	0.07
4/11/2010	0.98	2.43	0.07		0.62	2.09	0.04		1.56	3.26	0.16
4/12/2010	0.98	2.45	0.07		0.71	2.22	0.04		1.30	2.71	0.10
4/13/2010	0.74	2.18	0.04		0.62	2.05	0.03		0.91	2.32	0.05
4/14/2010	0.85	2.11	0.05		0.66	2.07	0.04		1.01	2.22	0.05
4/15/2010	0.82	2.08	0.04		0.63	2.04	0.03		0.98	2.16	0.05
4/16/2010	0.86	2.05	0.04		0.68	1.98	0.03		1.07	2.16	0.06
4/17/2010	0.91	1.99	0.05		0.74	1.90	0.04		1.04	2.14	0.05
4/18/2010	0.90	1.93	0.04		0.73	1.83	0.04		1.02	2.12	0.05
4/19/2010	0.85	1.89	0.04		0.69	1.75	0.03		0.93	2.15	0.05
4/20/2010	0.80	2.04	0.04		0.61	1.82	0.03		0.89	2.30	0.05
4/21/2010	0.76	2.17	0.04		0.61	2.07	0.03		0.92	2.28	0.05
4/22/2010	0.85	1.92	0.04		0.66	1.78	0.03		0.93	2.07	0.05
4/23/2010	0.85	1.82	0.04		0.77	1.69	0.03		0.94	1.96	0.04
4/24/2010	0.82	1.75	0.03		0.67	1.61	0.03		0.89	1.94	0.04
4/25/2010	0.80	1.68	0.03		0.71	1.54	0.02		0.88	1.86	0.04
4/26/2010	0.79	1.67	0.03		0.55	1.50	0.02		0.99	1.98	0.05
4/27/2010	0.84	1.86	0.04		0.66	1.57	0.03		0.96	2.04	0.05

Daily Report

Cotati Site 7 - In front of Lowes

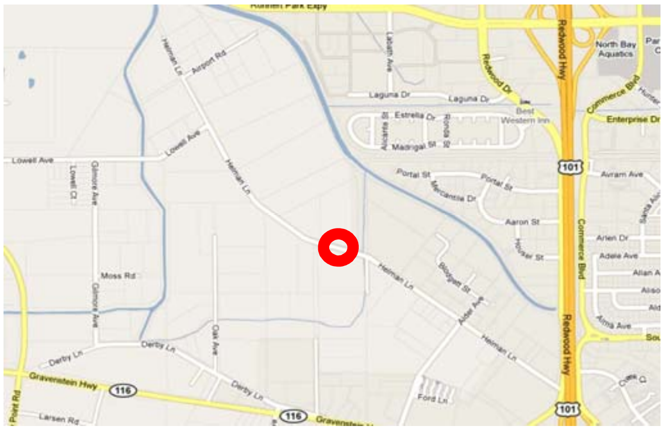
Average Daily MGD					Minimum Daily MGD				Maximum Daily MGD		
Date	Velocity	Level	Flow		Velocity	Level	Flow		Velocity	Level	Flow
4/28/2010	0.82	1.93	0.04		0.68	1.76	0.03		0.92	2.07	0.05
4/29/2010	0.81	1.91	0.04		0.66	1.79	0.03		0.90	2.05	0.04
4/30/2010	0.83	1.78	0.04		0.66	1.64	0.03		0.93	1.98	0.05
5/1/2010	0.79	1.65	0.03		0.72	1.53	0.02		1.02	1.84	0.04
5/2/2010	0.82	1.60	0.03		0.70	1.46	0.02		1.95	1.86	0.06
5/3/2010	0.88	1.58	0.03		0.66	1.39	0.02		2.03	1.98	0.06
5/4/2010	0.77	1.56	0.03		0.63	1.36	0.02		1.28	1.80	0.05
5/5/2010	0.75	1.58	0.03		0.62	1.34	0.02		0.90	1.87	0.04
5/6/2010	0.82	1.57	0.03		0.62	1.32	0.02		1.95	1.90	0.05
5/7/2010	0.80	1.54	0.03		0.59	1.28	0.02		1.35	1.93	0.05
5/8/2010	0.81	1.49	0.03		0.60	1.28	0.02		1.19	1.83	0.04
5/9/2010	0.75	1.47	0.02		0.59	1.26	0.02		1.18	1.75	0.04
5/10/2010	0.79	1.51	0.03		0.52	1.25	0.01		1.93	1.97	0.07
5/11/2010	0.73	1.71	0.03		0.59	1.39	0.02		1.01	2.26	0.05
5/12/2010	0.89	1.62	0.03		0.67	1.43	0.02		1.48	1.90	0.06
5/13/2010	0.83	1.51	0.03		0.56	1.26	0.01		2.01	1.78	0.06
5/14/2010	0.89	1.42	0.03		0.61	1.23	0.02		1.19	1.84	0.04

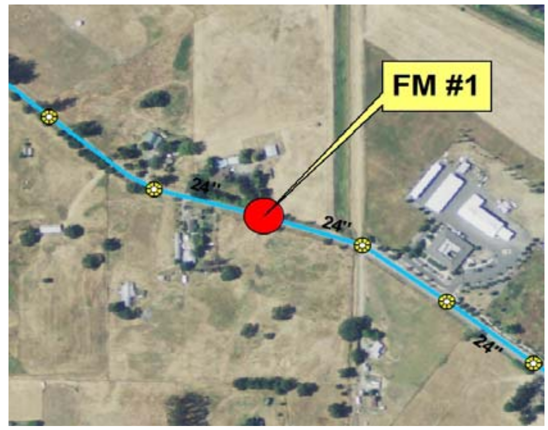
APPENDIX B – DRY WEATHER FLOW AND I/I ANALYSIS SUMMARY

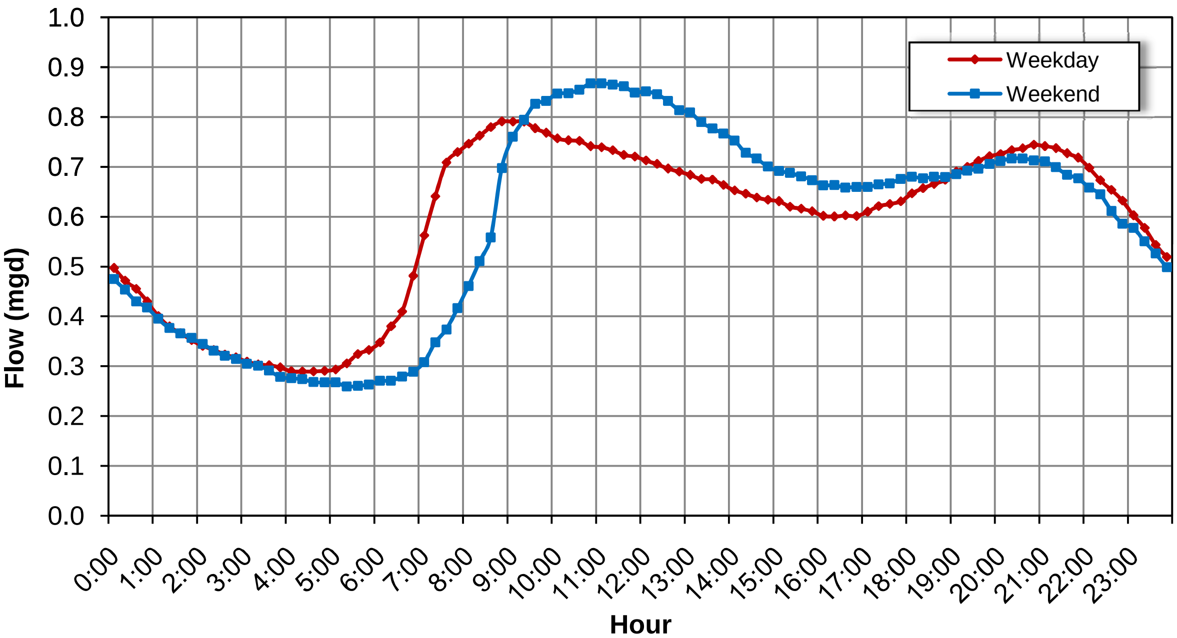
City of Cotati
Flow Monitoring Report

DRY WEATHER FLOW SUMMARY

Flow Monitoring Site: Site 1
Pipe Diameter: 24-inches
Location: Helman Lane approximately 1 mile west of Highway 101







Dry Weather Flow Days: March 15-24, April 6-10, April 15-19, and April 29-May 9, 2010.

Flow Condition	Weekday	Weekend	Avg.
ADWF (mgd)[1]	0.587	0.583	0.586
PDWF (mgd)[2]	0.929	0.951	0.951
PDWF/ADWF	1.58	1.63	1.62

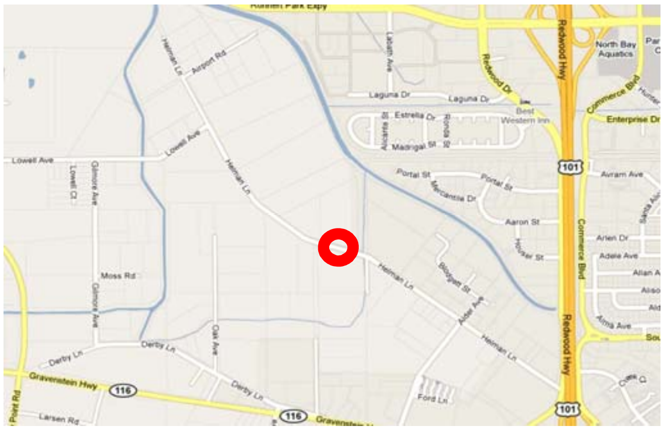
(1) Average Dry Weather Flow (ADWF) represents the average flow during the dry weather days

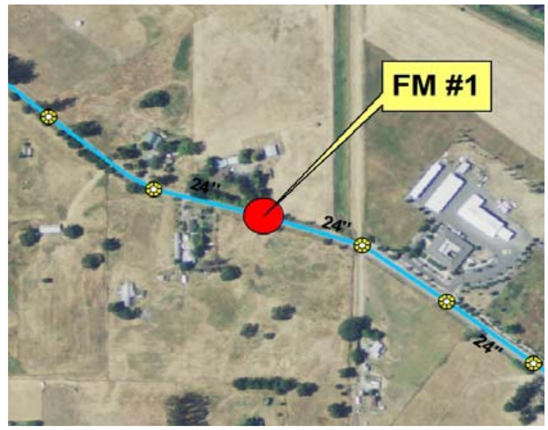
(2) Peak Dry Weather Flow (PDWF) is the 15-minute peak measured during the dry weather days.

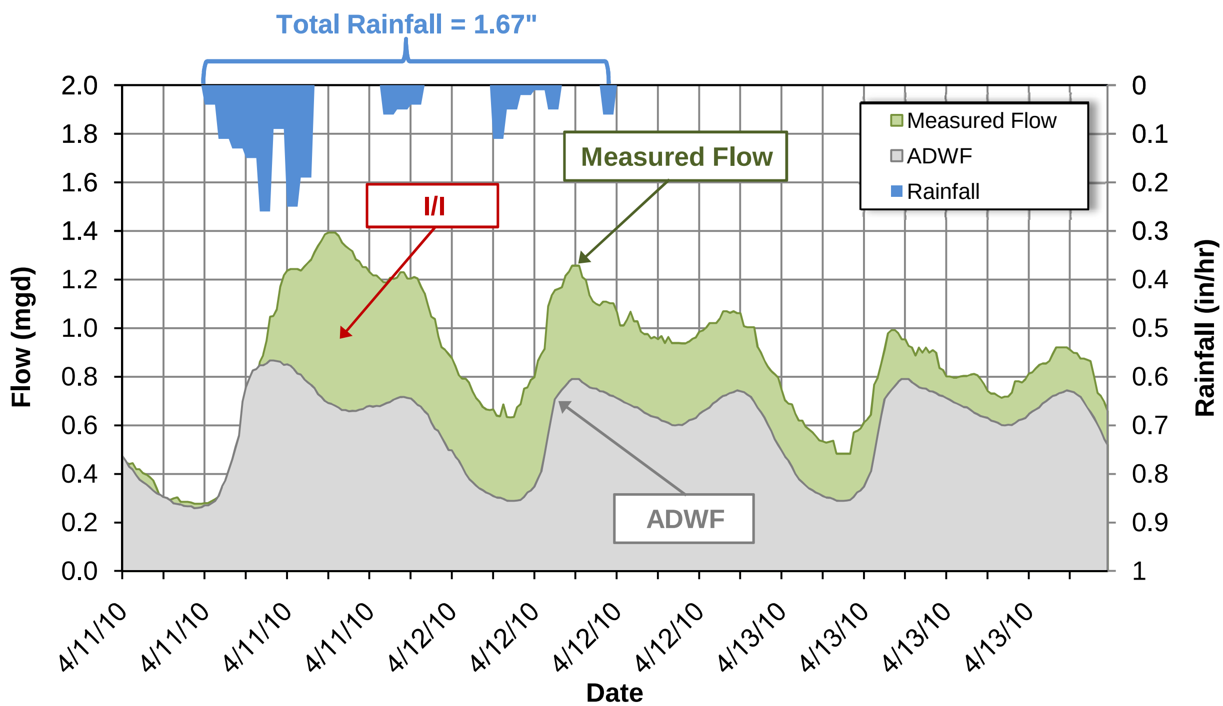
City of Cotati
Flow Monitoring Report

I/I ANALYSIS SUMMARY

Flow Monitoring Site: Site 1
Pipe Diameter: 24-inches
Location: Helman Lane approximately 1 mile west of Highway 101







Wet Weather Analysis Period: April 11-13, 2010

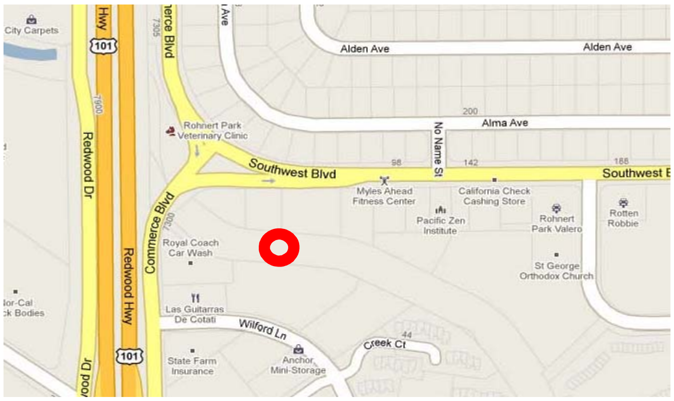
I/I Analysis

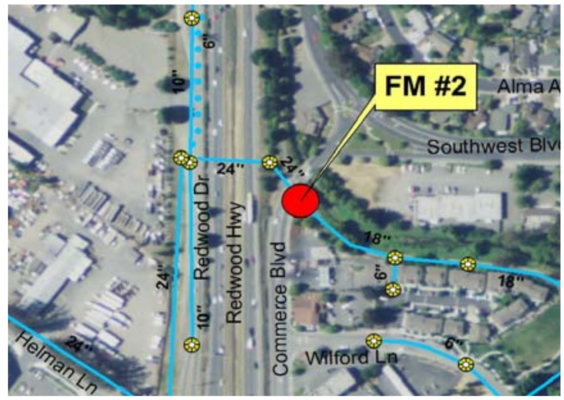
Rainfall:	1.67	inches
Peak I/I Rate:	0.71	mgd
Peak I/I:ADWF Ratio:	1.20	
Combined I/I Volume:	824,000	gallons
R-Value:	1.59%	

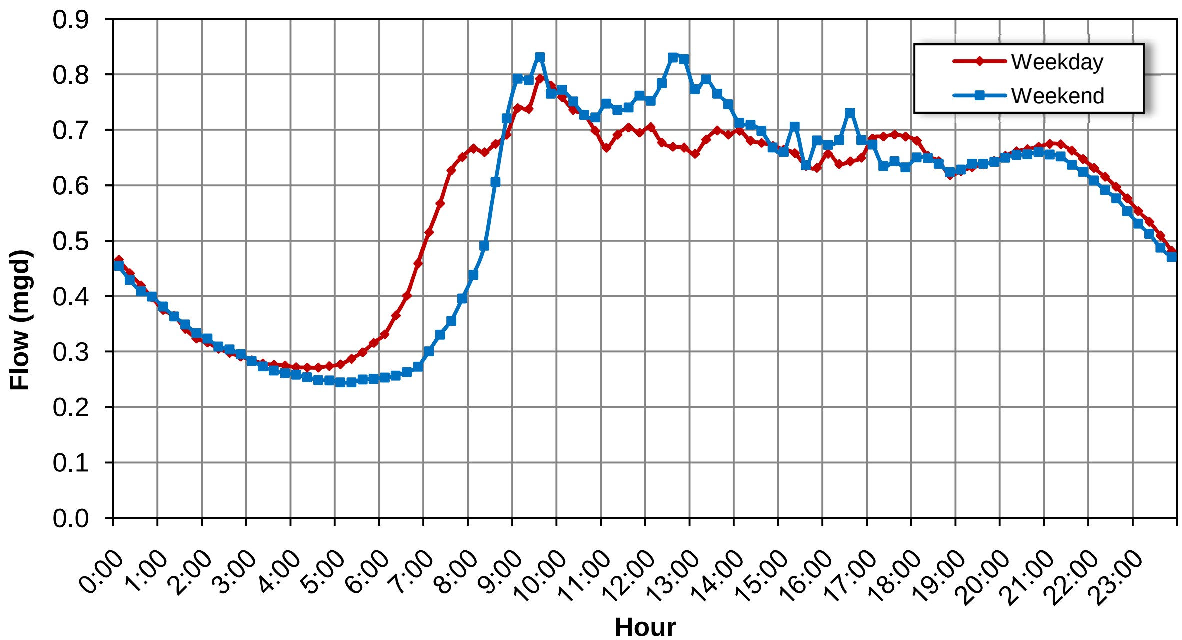
City of Cotati
Flow Monitoring Report

DRY WEATHER FLOW SUMMARY

Flow Monitoring Site: Site 2
Pipe Diameter: 18-inches
Location: Manhole east of the Intersection of Commerce Blvd and the Laguna







Dry Weather Flow Days: March 15-24, April 6-10, April 15-19, and April 29-May 9, 2010.

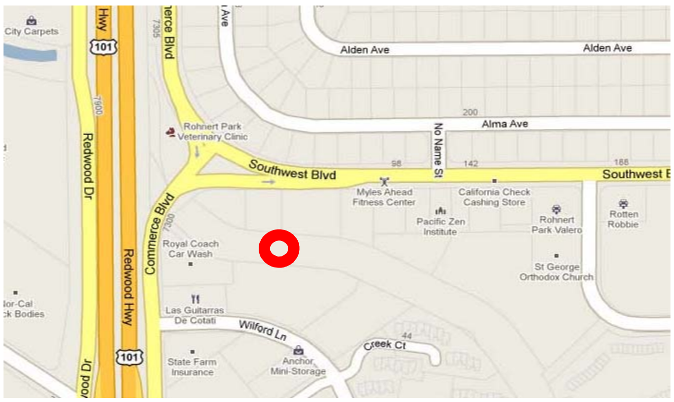
Flow Condition	Weekday	Weekend	Avg.
ADWF (mgd)(1)	0.563	0.552	0.560
PDWF (mgd)(2)	0.961	1.027	1.027
PDWF/ADWF	1.71	1.86	1.83

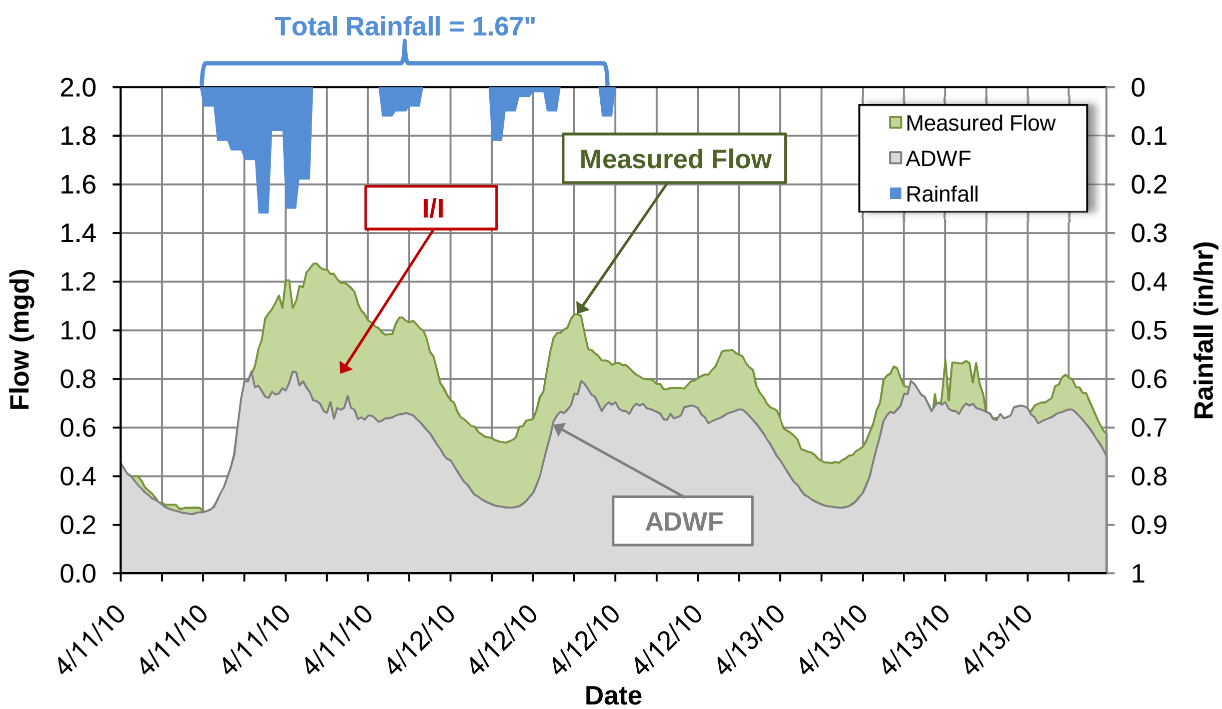
(1) Average Dry Weather Flow (ADWF) represents the average flow during the dry weather days

(2) Peak Dry Weather Flow (PDWF) is the 15-minute peak measured during the dry weather days.

City of Cotati
Flow Monitoring Report
I/I ANALYSIS SUMMARY

Flow Monitoring Site: Site 2
Pipe Diameter: 18-inches
Location: Manhole east of the Intersection of Commerce Blvd and the Laguna





Wet Weather Analysis Period: April 11-13, 2010

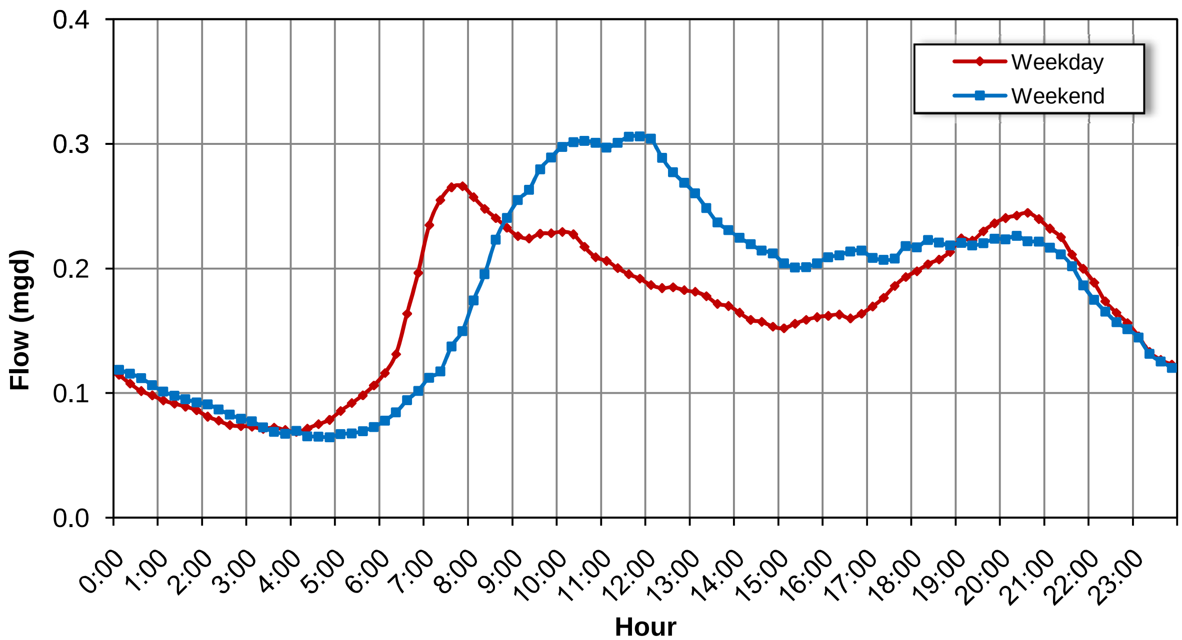
I/I Analysis

Rainfall:	1.67	inches
Peak I/I Rate:	0.60	mgd
Peak I/I:ADWF Ratio:	1.07	
Combined I/I Volume:	569,000	gallons
R-Value:	2.00%	

City of Cotati
Flow Monitoring Report

DRY WEATHER FLOW SUMMARY

Flow Monitoring Site: Site 3
Pipe Diameter: 12-inches
Location: West of Falleti park near intersection of Gravenstein Way and Village Court



Dry Weather Flow Days: March 15-24, April 6-10, April 15-19, and April 29-May 9, 2010.

Flow Condition	Weekday	Weekend	Avg.
ADWF (mgd)[1]	0.168	0.181	0.171
PDWF (mgd)[2]	0.446	0.393	0.446
PDWF/ADWF	2.66	2.18	2.60

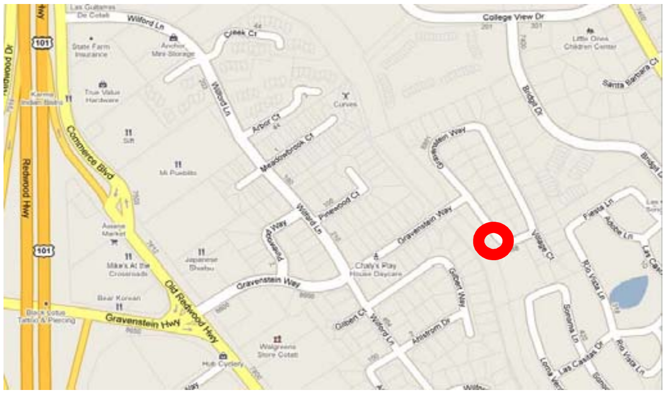
(1) Average Dry Weather Flow (ADWF) represents the average flow during the dry weather days

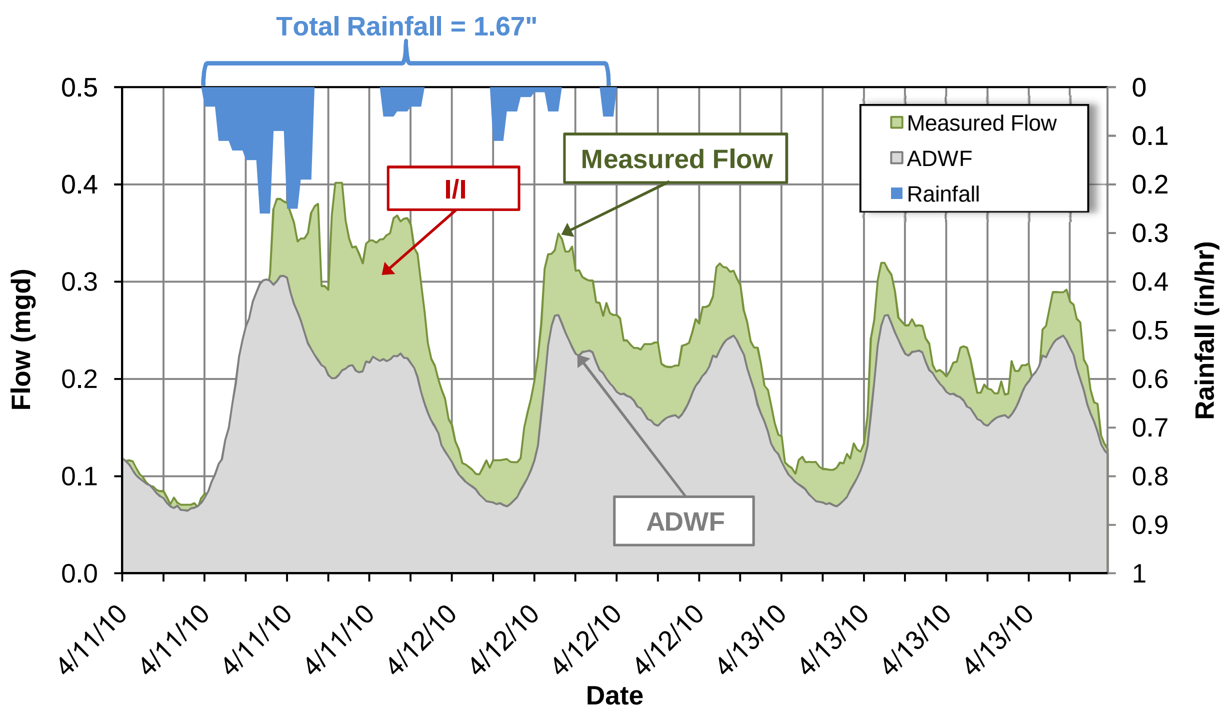
(2) Peak Dry Weather Flow (PDWF) is the 15-minute peak measured during the dry weather days.

City of Cotati
Flow Monitoring Report

I/I ANALYSIS SUMMARY

<u>Flow Monitoring Site</u>: Site 3
<u>Pipe Diameter</u>: 12-inches
<u>Location</u>: West of Falleti park near intersection of Gravenstein Way and Village Court





<u>Wet Weather Analysis Period:</u> April 11-13, 2010

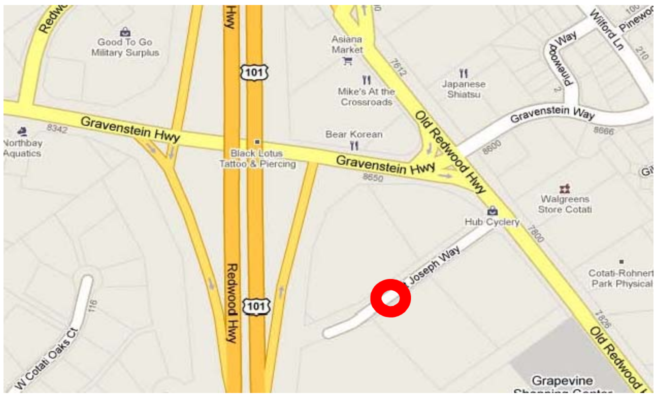
<u>I/I Analysis</u>

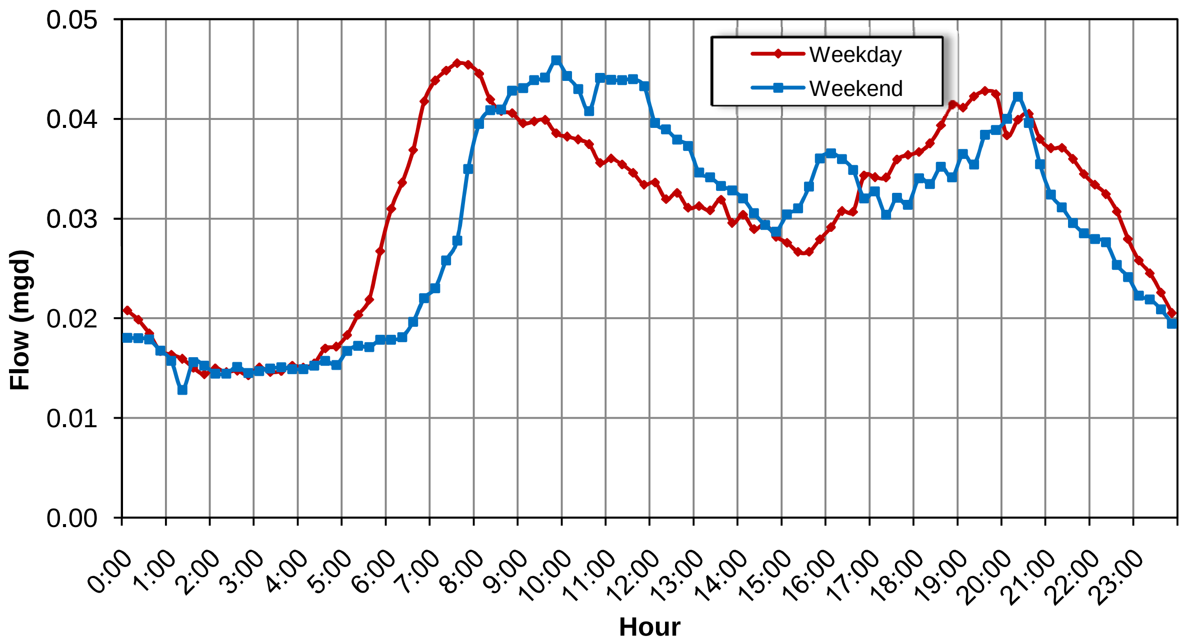
Rainfall:	1.67	inches
Peak I/I Rate:	0.20	mgd
Peak I/I:ADWF Ratio:	1.18	
Combined I/I Volume:	155,000	gallons
R-Value:	1.44%	

City of Cotati
Flow Monitoring Report

DRY WEATHER FLOW SUMMARY

Flow Monitoring Site: Site 4
Pipe Diameter: 6-inches
Location: Saint Josephs Way between the Park and Ride and the Baseball Field





Dry Weather Flow Days: March 15-24, April 6-10, April 15-19, and April 29-May 9, 2010.

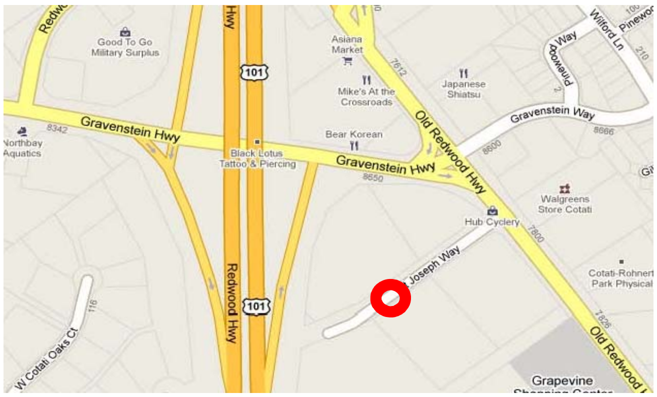
Flow Condition	Weekday	Weekend	Avg.
ADWF (mgd)(1)	0.031	0.029	0.030
PDWF (mgd)(2)	0.066	0.066	0.066
PDWF/ADWF	2.15	2.25	2.19

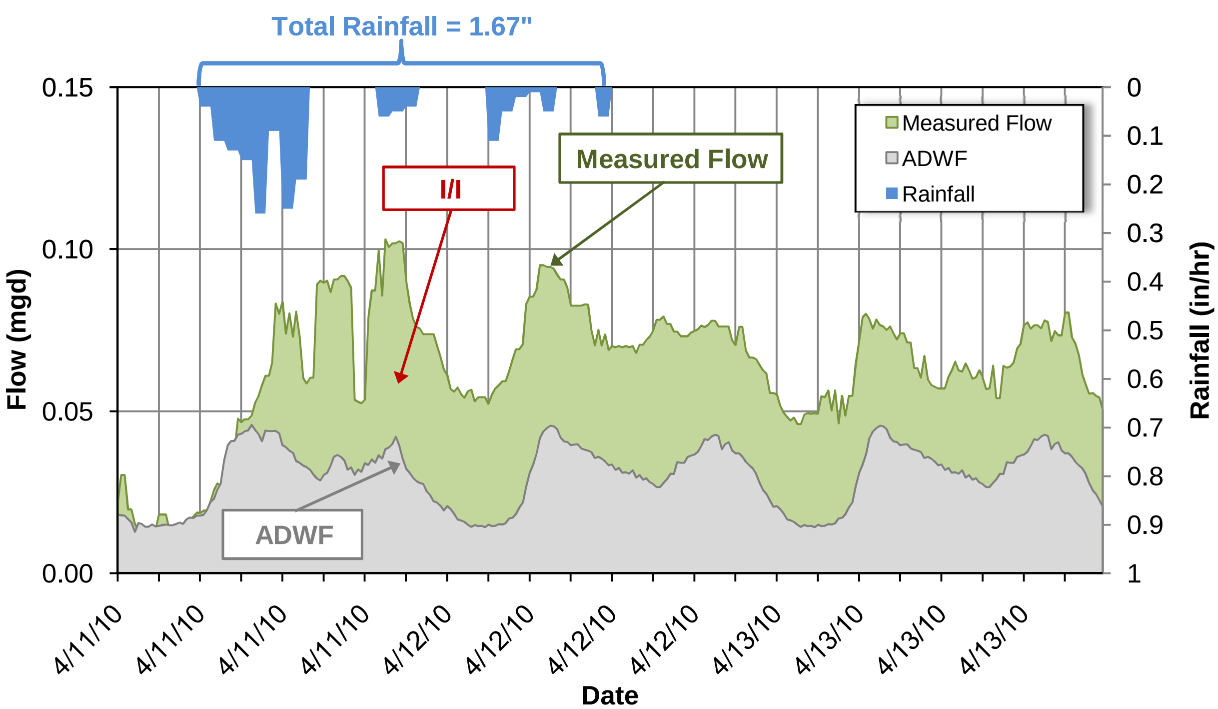
(1) Average Dry Weather Flow (ADWF) represents the average flow during the dry weather days

(2) Peak Dry Weather Flow (PDWF) is the 15-minute peak measured during the dry weather days.

City of Cotati
Flow Monitoring Report
I/I ANALYSIS SUMMARY

<u>Flow Monitoring Site</u>: Site 4
<u>Pipe Diameter</u>: 6-inches
<u>Location</u>: Saint Josephs Way between the Park and Ride and the Baseball Field





<u>Wet Weather Analysis Period:</u> April 11-13, 2010

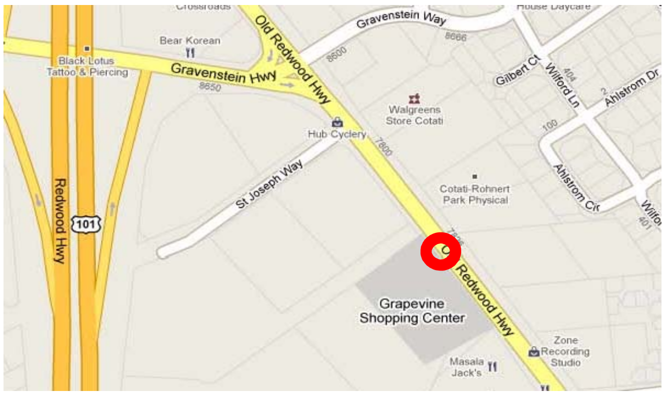
<u>I/I Analysis</u>

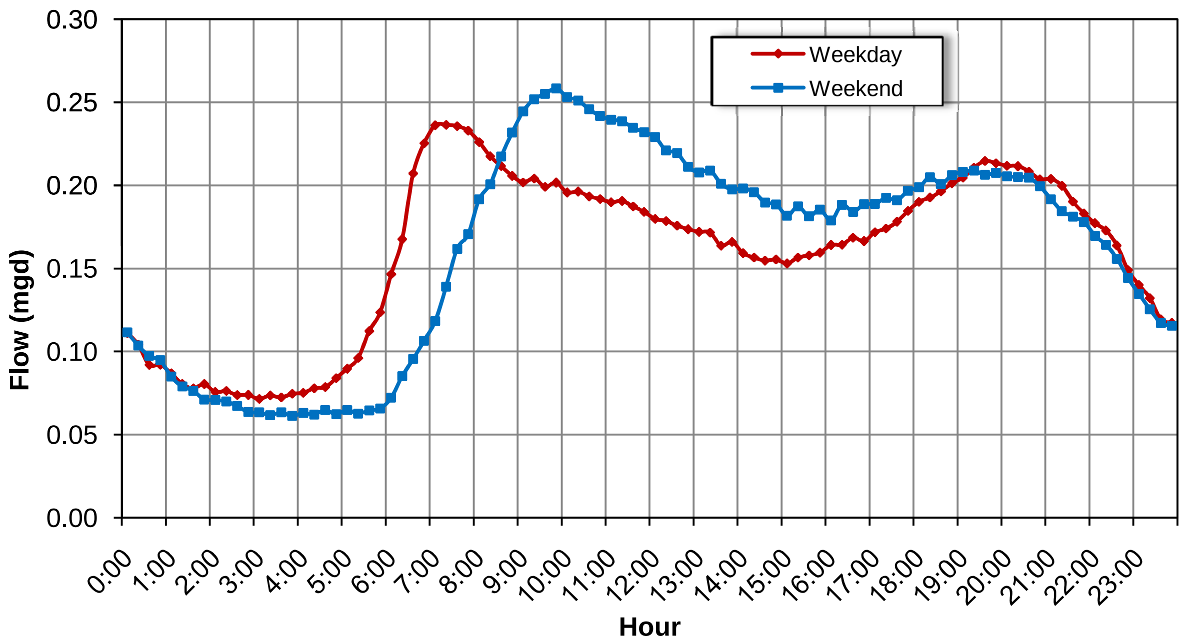
Rainfall:	1.67	inches
Peak I/I Rate:	0.07	mgd
Peak I/I:ADWF Ratio:	2.33	
Combined I/I Volume:	101,000	gallons
R-Value:	2.23%	

City of Cotati
Flow Monitoring Report

DRY WEATHER FLOW SUMMARY

Flow Monitoring Site: Site 5
Pipe Diameter: 10-inches
Location: West side of Old Redwood Highway near Grapevine Shopping Center





Dry Weather Flow Days: March 15-24, April 6-10, April 15-19, and April 29-May 9, 2010.

Flow Condition	Weekday	Weekend	Avg.
ADWF (mgd)(1)	0.160	0.162	0.160
PDWF (mgd)(2)	0.298	0.308	0.308
PDWF/ADWF	1.86	1.90	1.92

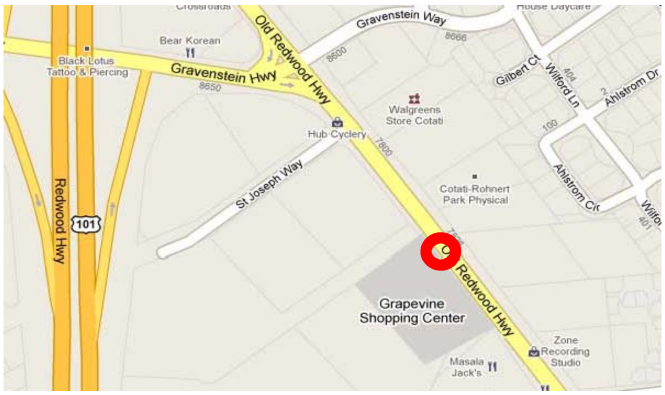
(1) Average Dry Weather Flow (ADWF) represents the average flow during the dry weather days

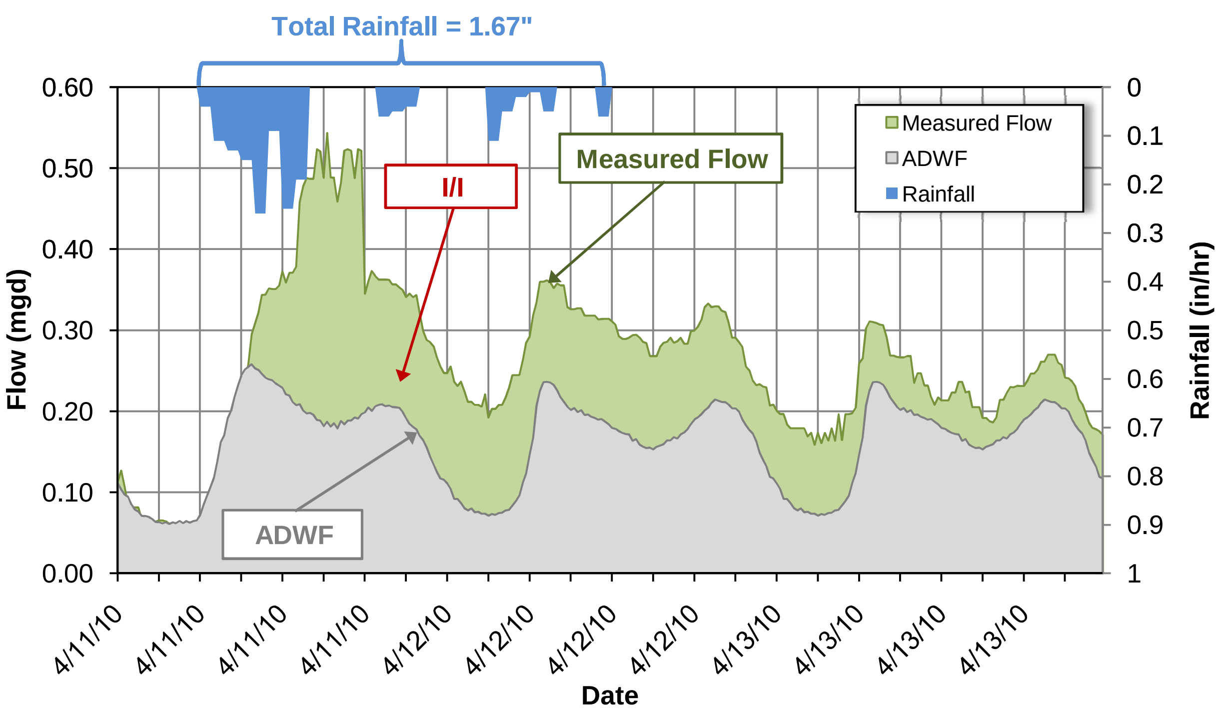
(2) Peak Dry Weather Flow (PDWF) is the 15-minute peak measured during the dry weather days.

City of Cotati
Flow Monitoring Report

I/I ANALYSIS SUMMARY

Flow Monitoring Site: Site 5
Pipe Diameter: 10-inches
Location: West side of Old Redwood Highway near Grapevine Shopping Center





Wet Weather Analysis Period: April 11-13, 2010

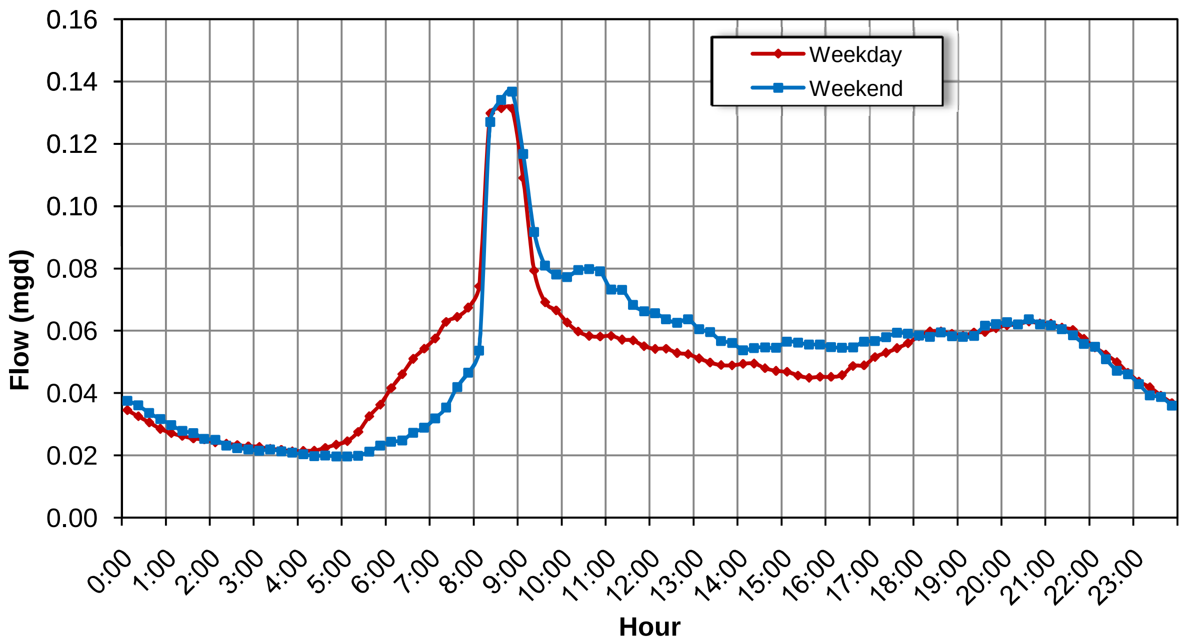
I/I Analysis

Rainfall:	1.67	inches
Peak I/I Rate:	0.36	mgd
Peak I/I:ADWF Ratio:	2.25	
Combined I/I Volume:	301,000	gallons
R-Value:	1.83%	

City of Cotati
Flow Monitoring Report

DRY WEATHER FLOW SUMMARY

Flow Monitoring Site:	Site 6
Pipe Diameter:	8-inches
Location:	East side of Old Redwood Highway across from Grapevine Shopping Center



Dry Weather Flow Days: March 15-24, April 6-10, April 15-19, and April 29-May 9, 2010.

Flow Condition	Weekday	Weekend	Avg.
ADWF (mgd)(1)	0.051	0.052	0.051
PDWF (mgd)(2)	0.208	0.202	0.208
PDWF/ADWF	4.11	3.91	4.08

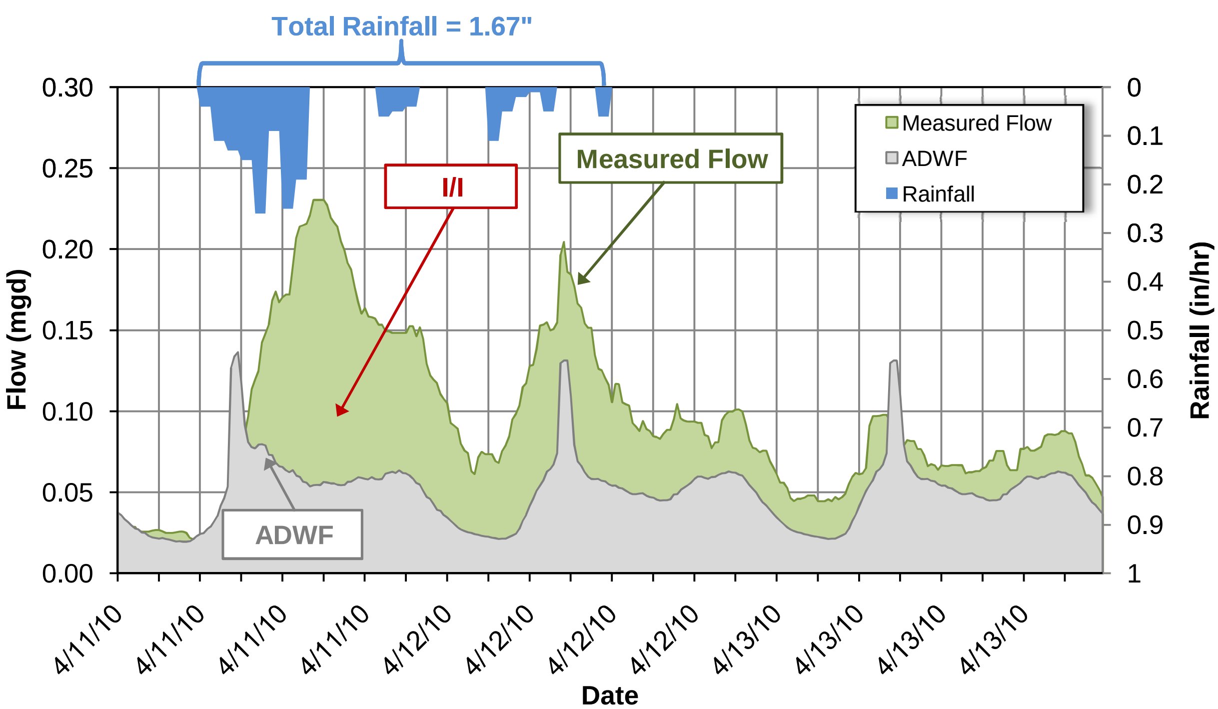
(1) Average Dry Weather Flow (ADWF) represents the average flow during the dry weather days

(2) Peak Dry Weather Flow (PDWF) is the 15-minute peak measured during the dry weather days.

City of Cotati
Flow Monitoring Report

I/I ANALYSIS SUMMARY

Flow Monitoring Site:	Site 6
Pipe Diameter:	8-inches
Location:	East side of Old Redwood Highway across from Grapevine Shopping Center



Wet Weather Analysis Period: April 11-13, 2010

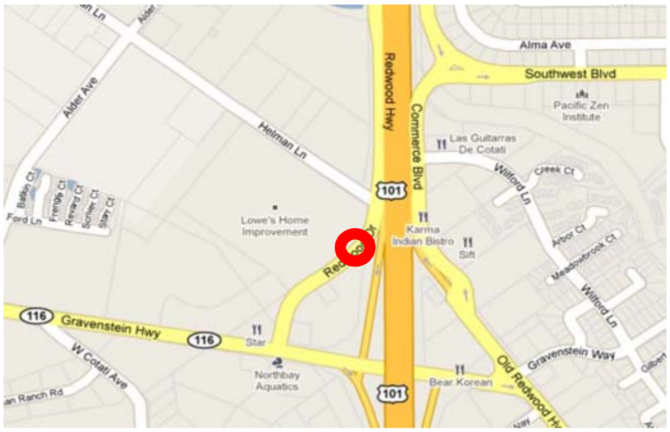
I/I Analysis

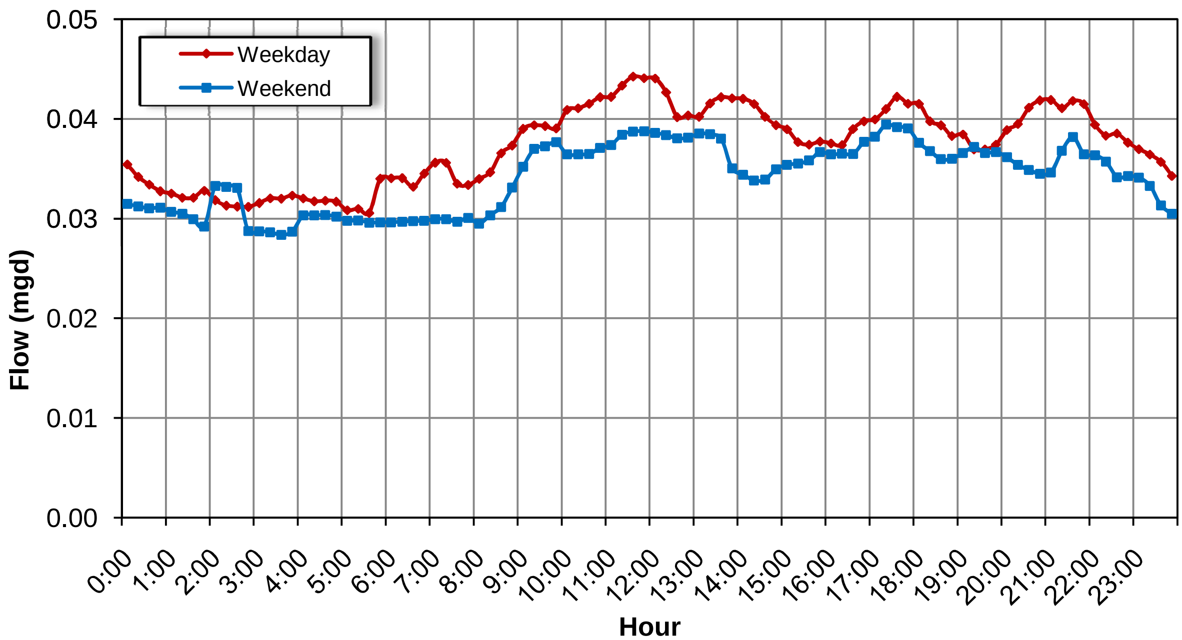
Rainfall:	1.67	inches
Peak I/I Rate:	0.18	mgd
Peak I/I:ADWF Ratio:	3.60	
Combined I/I Volume:	139,000	gallons
R-Value:	4.64%	

City of Cotati
Flow Monitoring Report

DRY WEATHER FLOW SUMMARY

Flow Monitoring Site: Site 7
Pipe Diameter: 10-inches
Location: Redwood Drive in front of Lowe's Home Improvement Store





Dry Weather Flow Days: March 15-24, April 6-10, April 15-19, and April 29-May 9, 2010.

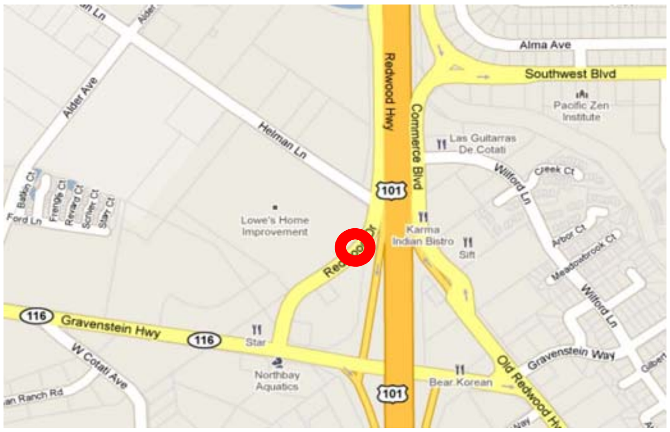
Flow Condition	Weekday	Weekend	Avg.
ADWF (mgd)(1)	0.037	0.034	0.036
PDWF (mgd)(2)	0.084	0.069	0.084
PDWF/ADWF	2.25	2.03	2.31

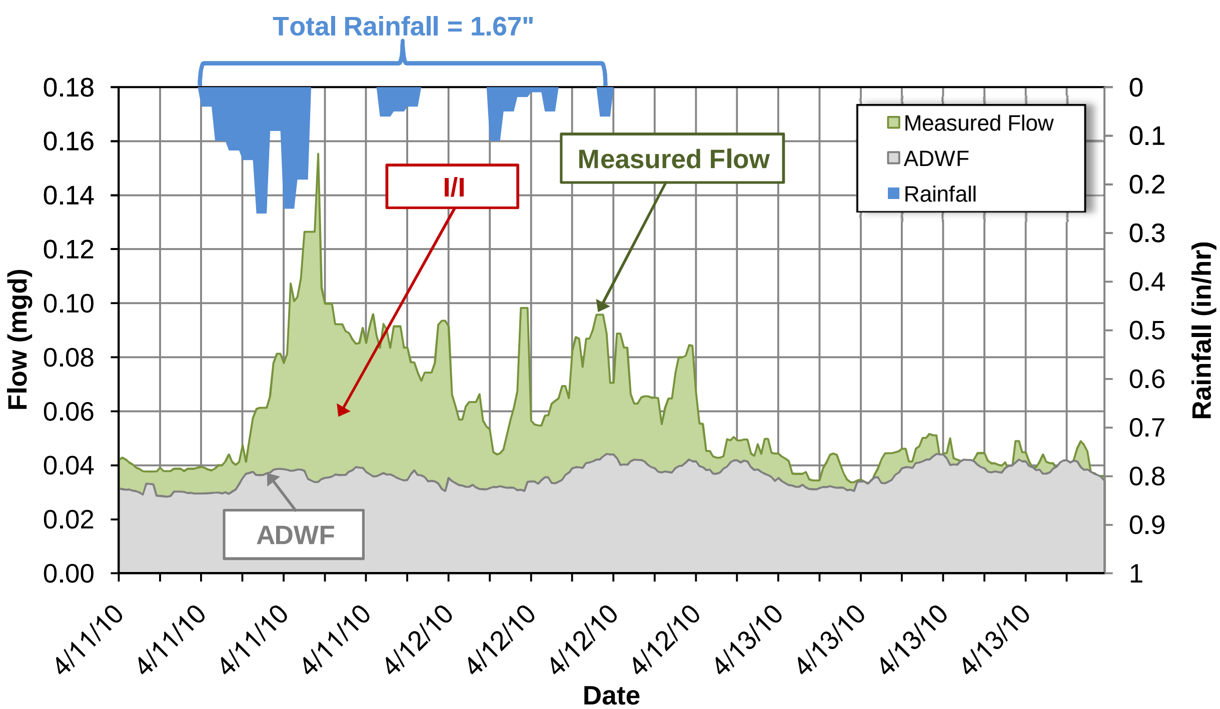
(1) Average Dry Weather Flow (ADWF) represents the average flow during the dry weather days

(2) Peak Dry Weather Flow (PDWF) is the 15-minute peak measured during the dry weather days.

City of Cotati
Flow Monitoring Report
I/I ANALYSIS SUMMARY

Flow Monitoring Site: Site 7
Pipe Diameter: 10-inches
Location: Redwood Drive in front of Lowe's Home Improvement Store





Wet Weather Analysis Period: April 11-13, 2010

I/I Analysis

Rainfall:	1.67	inches
Peak I/I Rate:	0.12	mgd
Peak I/I:ADWF Ratio:	3.00	
Combined I/I Volume:	67,000	gallons
R-Value:	1.33%	

APPENDIX C – PUMP STATION MONITORING DATA, GRAPHS, AND INFORMATION

Pump Station Report

3/10/2010 to 5/16/2010

Myrtle Station

Eagle Station

Redwood Station Report
Manual Data

Utility Systems Science and Software
2101 East 4th Street Suite 130 A
Santa Ana, California 92705

Myrtle Station Data					
Date	Starts Pump 1	Starts Pump 2		Run Time Pump 1	Run Time Pump 2
10-Mar	19	19		24	29
11-Mar	38	38		56	55
12-Mar	36	38		50	60
13-Mar	39	38		54	54
14-Mar	42	42		60	62
15-Mar	59	58		95	94
16-Mar	46	44		64	61
17-Mar	49	51		77	80
18-Mar	46	46		57	61
19-Mar	49	48		58	58
20-Mar	49	49		60	58
21-Mar	45	46		56	64
22-Mar	37	35		74	68
23-Mar	50	49		61	57
24-Mar	46	46		50	52
25-Mar	36	45		38	66
26-Mar	27	51		38	78
27-Mar	42	43		56	55
28-Mar	44	45		56	63
29-Mar	40	41		53	60
30-Mar	38	38		51	53
31-Mar	45	44		64	62
1-Apr	43	42		63	59
2-Apr	46	46		66	64
3-Apr	46	47		63	66
4-Apr	46	46		62	70
5-Apr	44	44		63	64
6-Apr	43	43		62	62
7-Apr	41	41		57	55
8-Apr	42	41		54	63
9-Apr	40	41		52	58
10-Apr	42	42		63	55
11-Apr	58	57		85	85
12-Apr	55	56		67	69
13-Apr	47	47		63	63
14-Apr	48	47		73	71
15-Apr	44	44		68	68
16-Apr	45	45		58	58
17-Apr	44	44		59	59
18-Apr	46	46		66	66
19-Apr	42	43		62	64
20-Apr	44	43		63	61
21-Apr	43	43		54	54

Myrtle Station Data					
Date	Starts Pump 1	Starts Pump 2		Run Time Pump 1	Run Time Pump 2
22-Apr	42	43		63	64
23-Apr	43	41		59	59
24-Apr	42	42		59	59
25-Apr	44	44		60	60
26-Apr	42	42		59	59
27-Apr	41	41		56	56
28-Apr	42	43		57	58
29-Apr	53	52		76	75
30-Apr	40	40		54	54
1-May	40	40		56	56
2-May	44	44		57	57
3-May	36	40		51	56
4-May	40	40		59	59
5-May	58	38		88	50
6-May	45	40		67	54
7-May	57	39		87	51
8-May	41	42		56	52
9-May	45	45		54	58
10-May	49	55		58	85
11-May	47	41		59	56
12-May	34	45		71	56
13-May	48	49		61	57
14-May	51	46		55	64
15-May	46	48		50	87
16-May	47	47		50	54

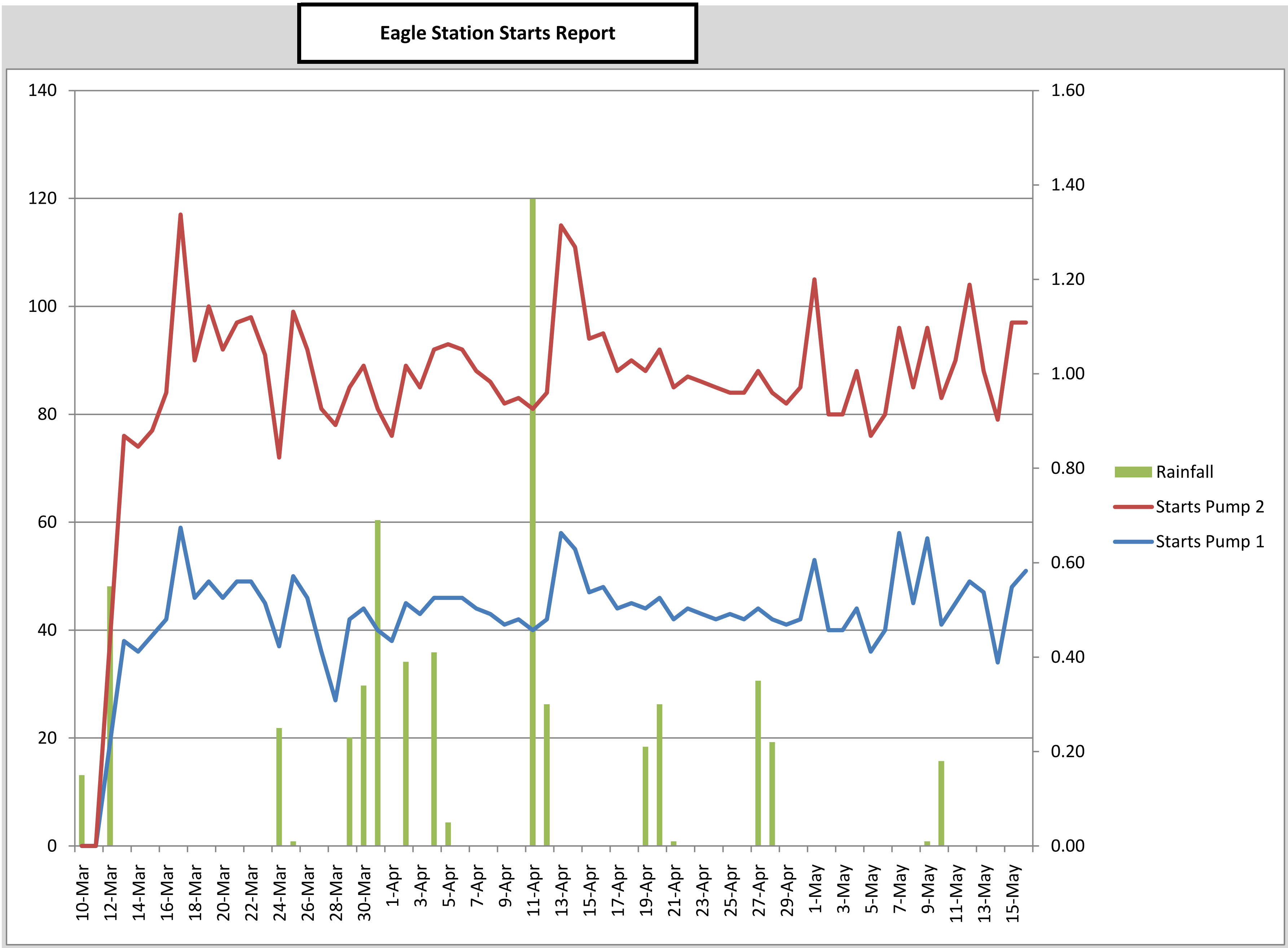
Eagle Station Data					
Date	**Starts Pump 1**	**Starts Pump 2**		**Run Time Pump 1**	**Run Time Pump 2**
10-Mar	19	19		24	29
11-Mar	38	38		56	55
12-Mar	36	38		50	60
13-Mar	39	38		54	54
14-Mar	42	42		60	62
15-Mar	2	2		1176	3
16-Mar	0	0		1440	0
17-Mar	0	0		1440	0
18-Mar	22	22		863	30
19-Mar	49	48		58	58
20-Mar	49	49		60	58
21-Mar	45	46		56	64
22-Mar	37	35		74	68
23-Mar	50	49		61	57
24-Mar	46	46		50	52
25-Mar	36	45		38	66
26-Mar	27	51		38	78
27-Mar	42	43		56	55
28-Mar	44	45		56	63
29-Mar	40	41		53	60
30-Mar	38	38		51	53
31-Mar	45	44		64	62
1-Apr	43	42		63	59
2-Apr	46	46		66	64
3-Apr	46	47		63	66
4-Apr	46	46		62	70
5-Apr	44	44		63	64
6-Apr	43	43		62	62
7-Apr	41	41		57	55
8-Apr	42	41		54	63
9-Apr	40	41		52	58
10-Apr	42	42		63	55
11-Apr	58	57		85	88
12-Apr	55	56		67	77
13-Apr	47	47		63	66
14-Apr	48	47		73	69
15-Apr	44	45		68	67
16-Apr	45	45		58	66
17-Apr	44	44		59	71
18-Apr	46	47		66	71
19-Apr	42	42		62	62
20-Apr	44	43		63	61
21-Apr	43	43		54	68

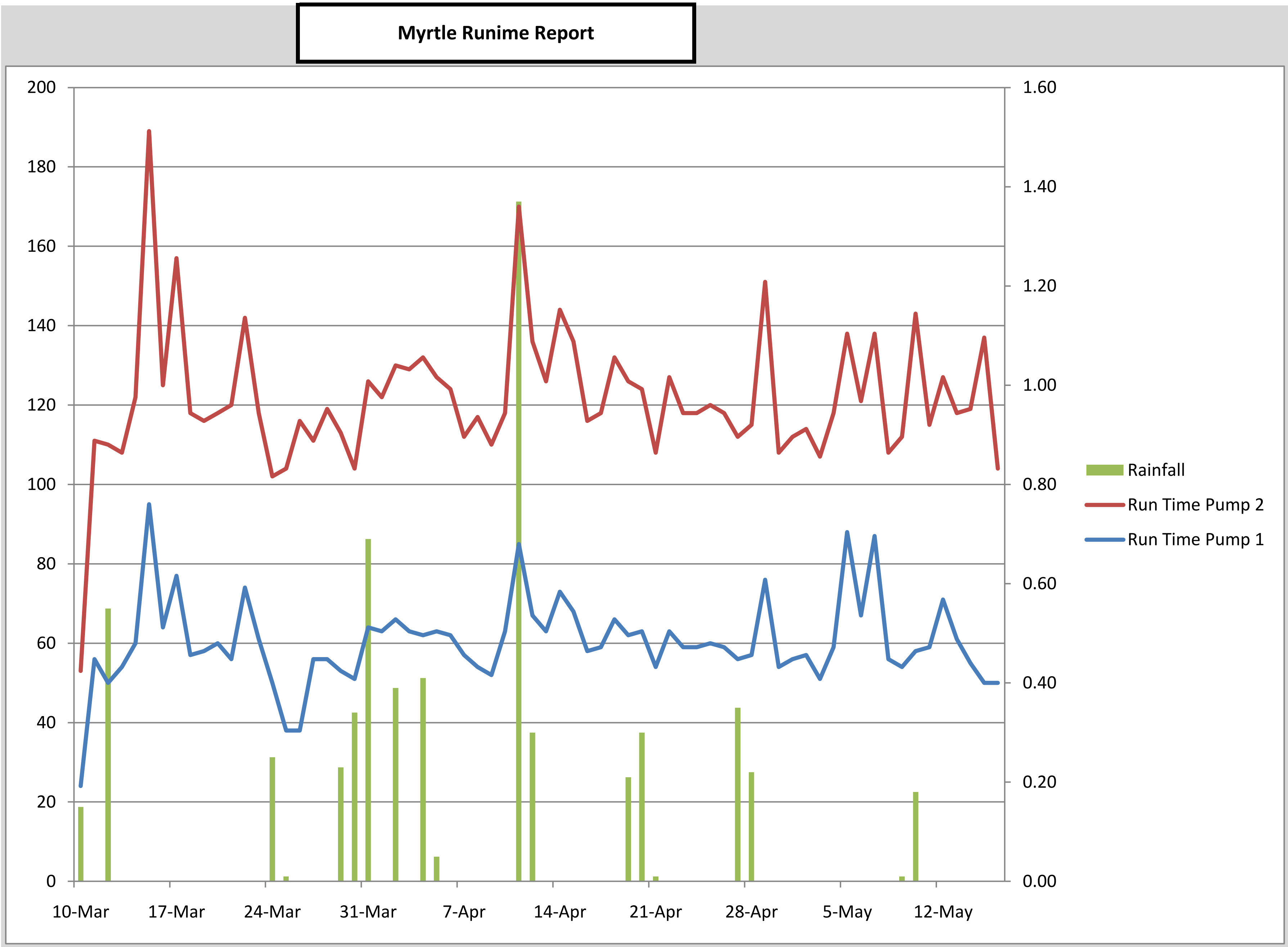
Eagle Station Data					
Date	Starts Pump 1	Starts Pump 2		Run Time Pump 1	Run Time Pump 2
22-Apr	42	42		63	65
23-Apr	43	41		59	58
24-Apr	42	42		59	62
25-Apr	44	45		60	73
26-Apr	42	42		59	64
27-Apr	41	41		56	62
28-Apr	42	42		57	56
29-Apr	53	52		76	75
30-Apr	40	40		54	52
1-May	40	40		56	58
2-May	44	44		57	63
3-May	40	40		56	56
4-May	40	40		59	56
5-May	38	38		50	53
6-May	39	39		53	51
7-May	40	40		52	55
8-May	42	41		52	56
9-May	43	43		57	69
10-May	41	41		56	59
11-May	38	38		54	52
12-May	40	40		55	60
13-May	38	38		50	56
14-May	39	39		52	56
15-May	39	39		53	58
16-May	43	43		65	64

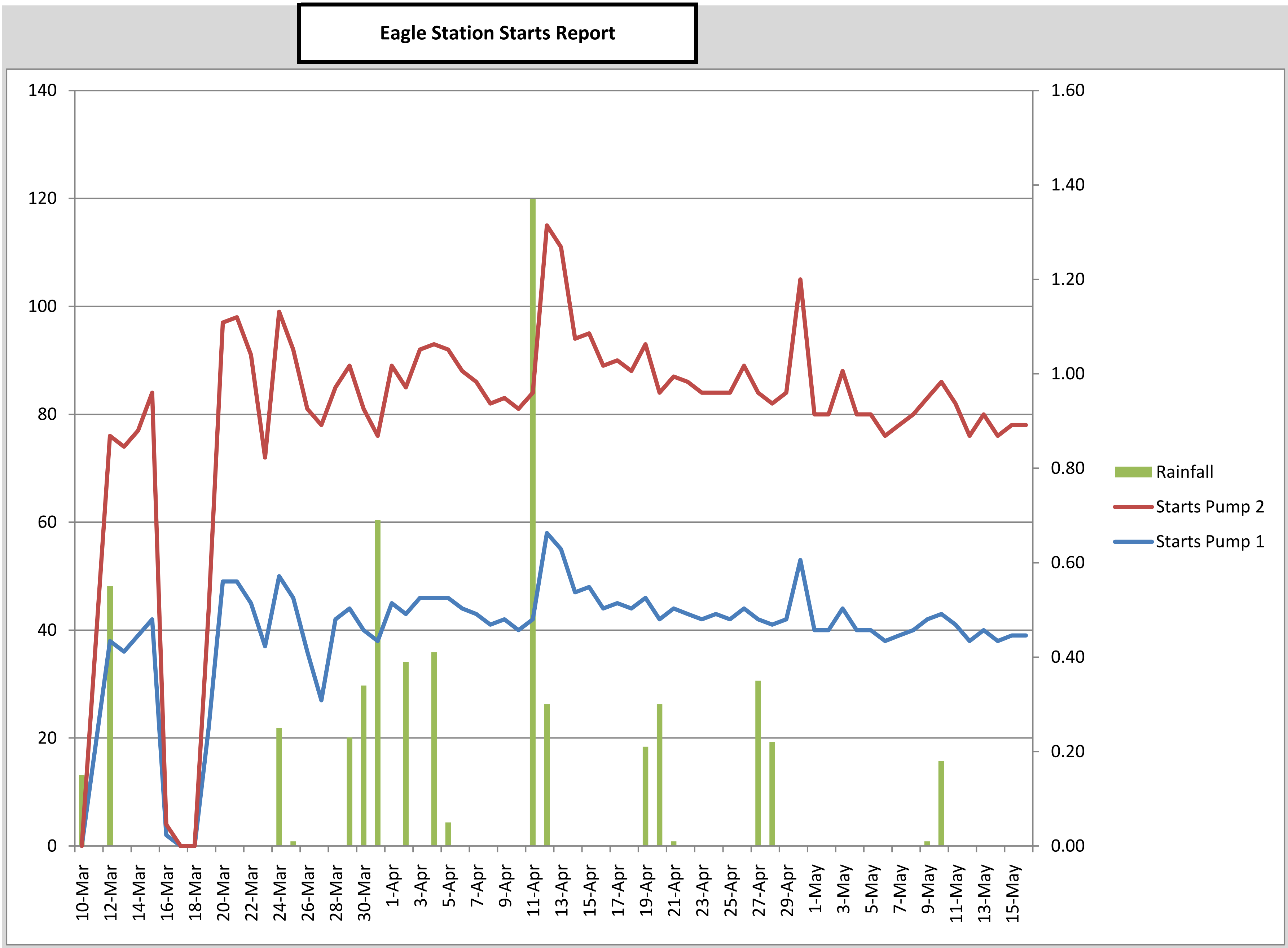
Redwood Station					
Date	Meter Pump 1	Meter Pump 2		Run Time Pump 1	Run Tie Pump 2
10-Mar	2900.87	1768.67		0.63	0.63
11-Mar	2901.5	1769.3		0.63	0.63
12-Mar	2902.13	1769.93		0.63	0.63
13-Mar	2902.76	1770.56		0.63	0.63
14-Mar	2903.39	1771.19		0.63	0.63
15-Mar	2903.5	1771.2		0.11	0.01
16-Mar	2904.52	1772.3		1.02	1.1
17-Mar	2905.52	1773.3		1	1
18-Mar	2905.7	1773.4		0.18	0.1
19-Mar	2906.35	1774.05		0.65	0.65
20-Mar	2907	1774.7		0.65	0.65
21-Mar	2907.65	1775.35		0.65	0.65
22-Mar	2908.3	1776		0.65	0.65
23-Mar	2908.95	1776.65		0.65	0.65
24-Mar	2909.6	1777.28		0.65	0.63
25-Mar	2909.8	1777.3		0.2	0.02
26-Mar	2910.38	1777.88		0.58	0.58
27-Mar	2910.96	1778.46		0.58	0.58
28-Mar	2911.54	1779.04		0.58	0.58
29-Mar	2912.12	1779.62		0.58	0.58
30-Mar	2912.7	1780.2		0.58	0.58
31-Mar	2913.28	1780.78		0.58	0.58
1-Apr	2913.5	1780.8		0.22	0.02
2-Apr	2914.15	1781.45		0.65	0.65
3-Apr	2914.8	1782.1		0.65	0.65
4-Apr	2915.45	1782.75		0.65	0.65
5-Apr	2916.1	1783.4		0.65	0.65
6-Apr	2916.75	1784.05		0.65	0.65
7-Apr	2917.4	1784.68		0.65	0.63
8-Apr	2917.5	1784.7		0.1	0.02
9-Apr	2918.24	1785.44		0.74	0.74
10-Apr	2918.98	1786.18		0.74	0.74
11-Apr	2919.72	1786.92		0.74	0.74
12-Apr	2920.46	1787.66		0.74	0.74
13-Apr	2921.2	1788.4		0.74	0.74
14-Apr	2921.94	1789.14		0.74	0.74
15-Apr	2922.68	1789.88		0.74	0.74
16-Apr	2923.42	1790.62		0.74	0.74
17-Apr	2924.16	1791.36		0.74	0.74
18-Apr	2924.9	1792.1		0.74	0.74
19-Apr	2924.4	1792.2		-0.5	0.1
20-Apr	2924.93	1792.73		0.53	0.53
21-Apr	2925.46	1793.26		0.53	0.53

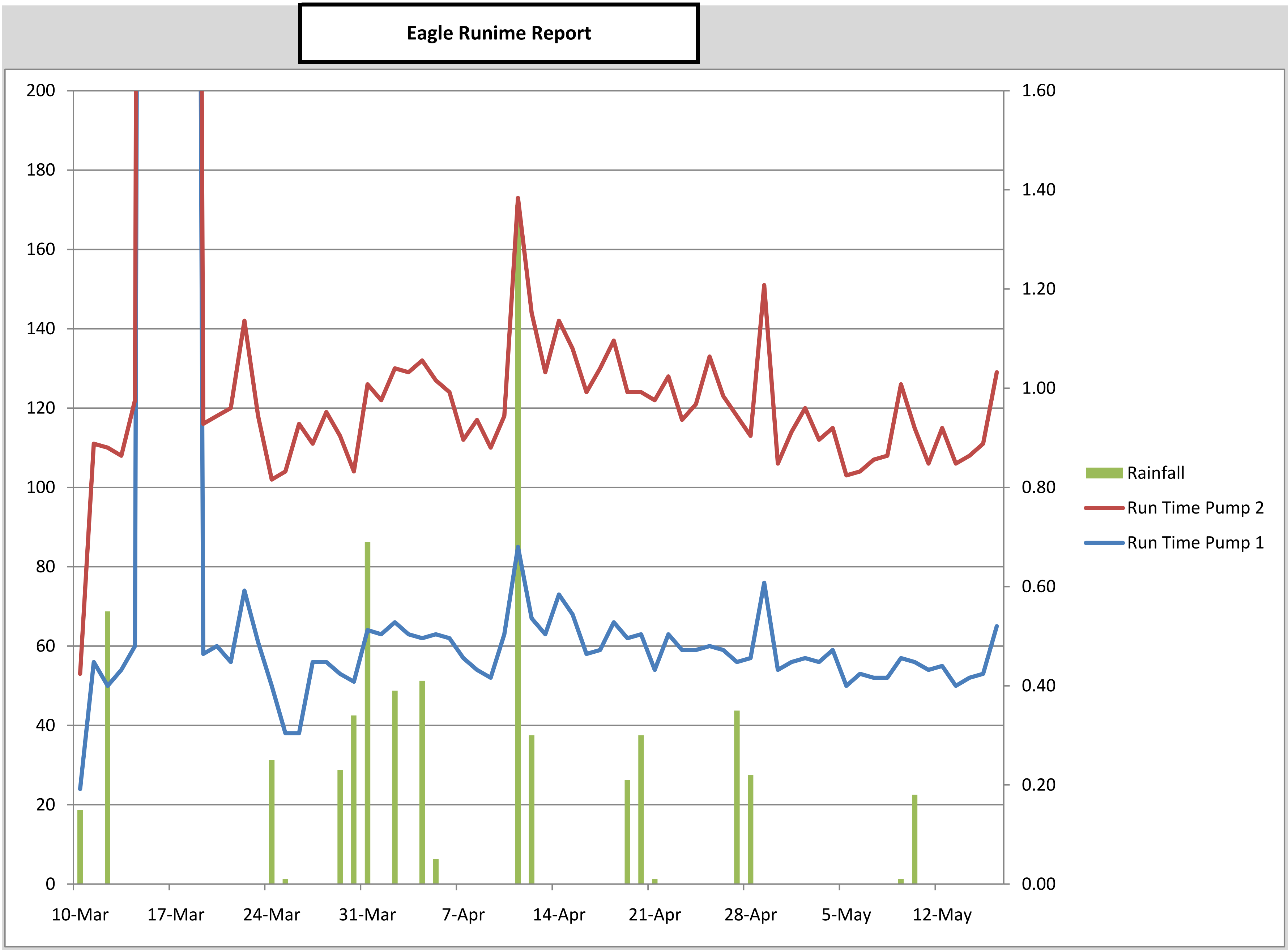
Red Data is Manually Read Data - other Data is interpolated Data

Redwood Station					
Date	Meter Pump 1	Meter Pump 2		Run Time Pump 1	Run Tie Pump 2
22-Apr	2927.1	1793.8		1.64	0.54
23-Apr	2927.72	1794.42		0.62	0.62
24-Apr	2928.34	1795.04		0.62	0.62
25-Apr	2928.96	1795.66		0.62	0.62
26-Apr	2929.58	1796.28		0.62	0.62
27-Apr	2930.2	1796.9		0.62	0.62
28-Apr	2930.82	1797.52		0.62	0.62
29-Apr	2931.6	1798.2		0.78	0.68
30-Apr	2932.44	1799.04		0.84	0.84
1-May	2933.28	1799.88		0.84	0.84
2-May	2934.12	1800.72		0.84	0.84
3-May	2934.96	1801.56		0.84	0.84
4-May	2937.5	1802.4		2.54	0.84
5-May	2939.95	1804.85		2.45	2.45
6-May	2942	1807.3		2.05	2.45
7-May	2942.55	1807.85		0.55	0.55
8-May	2943.1	1808.4		0.55	0.55
9-May	2943.65	1808.95		0.55	0.55
10-May	2944.2	1809.5		0.55	0.55
11-May	2944.75	1810.05		0.55	0.55
12-May	2945.3	1810.6		0.55	0.55
13-May	2946.1	1811.2		0.8	0.6
14-May	2946.7	1811.8		0.6	0.6
15-May	2947.3	1812.4		0.6	0.6
16-May	2947.9	1813		0.6	0.6

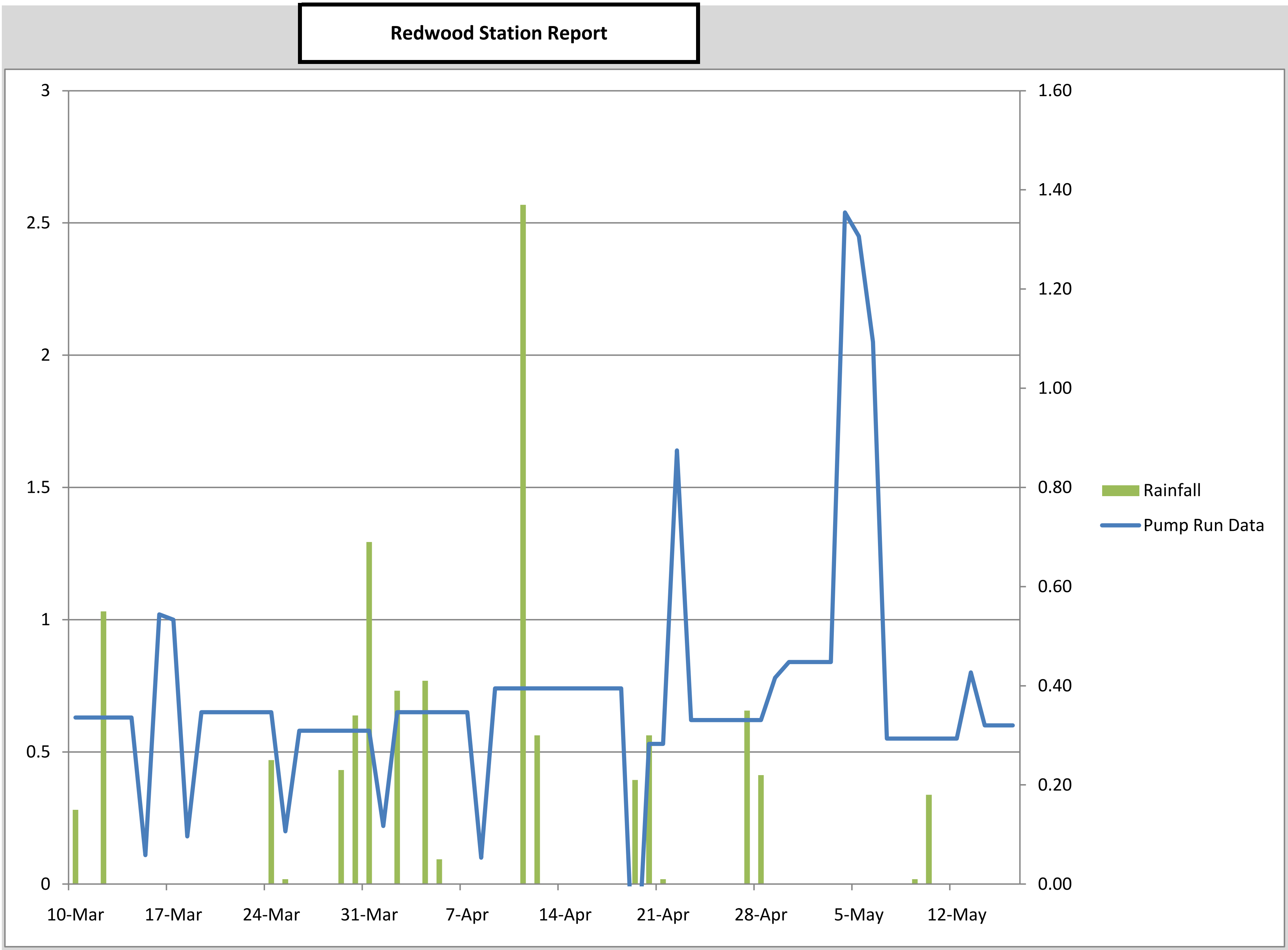

Eagle Station Starts Report
140
120
100
80
60
40
20
0
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
10-Mar
12-Mar
14-Mar
16-Mar
18-Mar
20-Mar
22-Mar
24-Mar
26-Mar
28-Mar
30-Mar
1-Apr
3-Apr
5-Apr
7-Apr
9-Apr
11-Apr
13-Apr
15-Apr
17-Apr
19-Apr
21-Apr
23-Apr
25-Apr
27-Apr
29-Apr
1-May
3-May
5-May
7-May
9-May
11-May
13-May
15-May
Rainfall
Starts Pump 2
Starts Pump 1


Myrtle Runime Report
200
180
160
140
120
100
80
60
40
20
0
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
10-Mar
17-Mar
24-Mar
31-Mar
7-Apr
14-Apr
21-Apr
28-Apr
5-May
12-May
Rainfall
Run Time Pump 2
Run Time Pump 1


Eagle Station Starts Report
140
120
100
80
60
40
20
0
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Rainfall
Starts Pump 2
Starts Pump 1
10-Mar
12-Mar
14-Mar
16-Mar
18-Mar
20-Mar
22-Mar
24-Mar
26-Mar
28-Mar
30-Mar
1-Apr
3-Apr
5-Apr
7-Apr
9-Apr
11-Apr
13-Apr
15-Apr
17-Apr
19-Apr
21-Apr
23-Apr
25-Apr
27-Apr
29-Apr
1-May
3-May
5-May
7-May
9-May
11-May
13-May
15-May



Eagle Runime Report
200
180
160
140
120
100
80
60
40
20
0
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
10-Mar
17-Mar
24-Mar
31-Mar
7-Apr
14-Apr
21-Apr
28-Apr
5-May
12-May
Rainfall
Run Time Pump 2
Run Time Pump 1



Redwood Station Report
3
2.5
2
1.5
1
0.5
0
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
10-Mar
17-Mar
24-Mar
31-Mar
7-Apr
14-Apr
21-Apr
28-Apr
5-May
12-May
Rainfall
Pump Run Data

APPENDIX B – DRY WEATHER FLOW CALIBRATION PLOTS

Table 1 Dry Weather Calibration Summary
Sewer Collection System Master Plan
City of Cotati

Meter Site	Metered DWF Flow(2) Average (mgd)	Metered DWF Flow(2) Max. (mgd)	Metered DWF Flow(2) Min. (mgd)	Modeled Average Flow Average (mgd)	Modeled Average Flow Max. (mgd)	Modeled Average Flow Min. (mgd)	Percent Difference(3) Average (%)	Percent Difference(3) Max. (%)	Percent Difference(3) Min. (%)
1	0.585	0.861	0.263	0.599	0.938	0.265	2.4%	8.9%	1.0%
2	0.558	0.799	0.247	0.538	0.848	0.236	-3.5%	6.1%	-4.7%
3	0.174	0.302	0.066	0.169	0.306	0.064	-2.9%	1.2%	-3.4%
4	0.030	0.045	0.015	0.030	0.044	0.015	0.0%	-3.1%	0.9%
5	0.161	0.252	0.062	0.161	0.247	0.054	0.4%	-2.2%	-14.3%
6	0.051	0.117	0.020	0.050	0.116	0.020	-1.4%	-0.8%	1.0%
7	0.036	0.043	0.029	0.036	0.042	0.030	-0.1%	-2.9%	3.8%

Notes:
1. Source: City of Cotati Flow Monitoring Study
2. Average flow calculated from weekday/weekend dry weather flow monitoring data. Maximum and minimum values are hourly averages.
3. Percent difference between meter collected and model derived results.

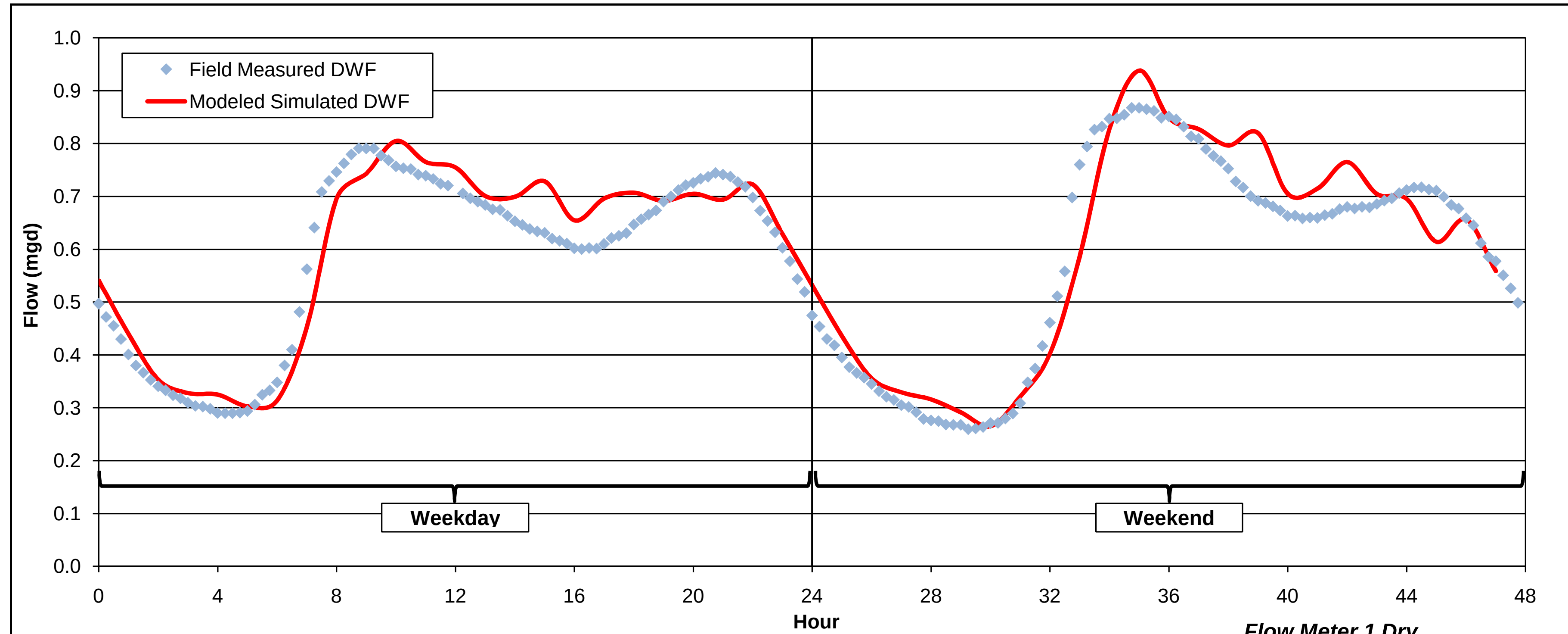
City of Cotati
Sewer System Master Plan

FLOW METER 1 DWF CALIBRATION SUMMARY

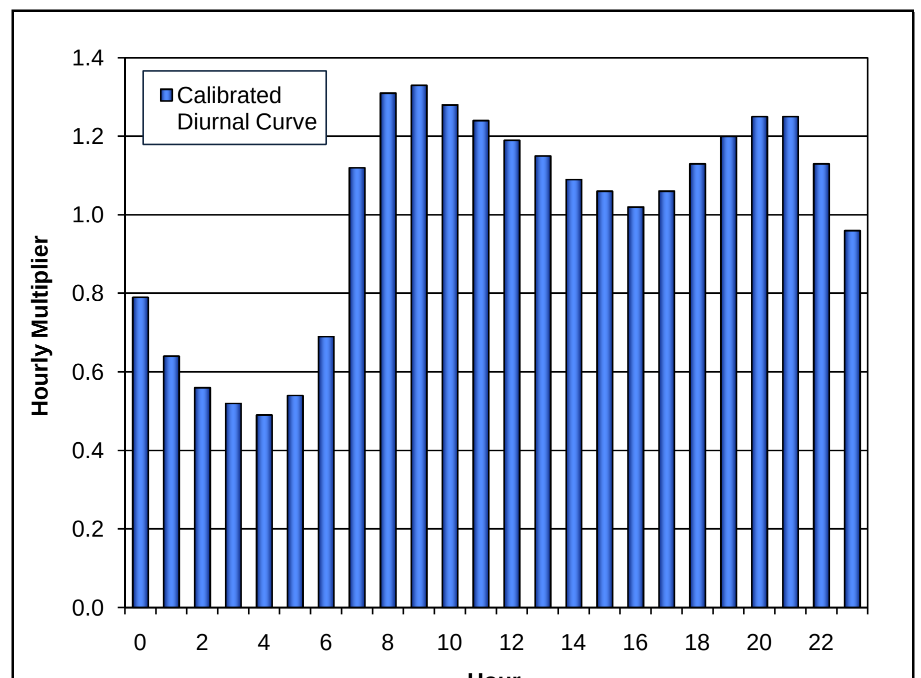
DWF Calibration Details

	Hour	Measured DWF[(1)] (mgd)	Modeled DWF (mgd)	Diurnal Curve Details: Initial Curve	Modified Curve	Final Curve
Weekday	0	0.464	0.540	0.79	0.79	0.79
	1	0.375	0.440	0.64	0.64	0.64
	2	0.329	0.353	0.56	0.56	0.56
	3	0.303	0.328	0.52	0.52	0.52
	4	0.290	0.325	0.49	0.49	0.49
	5	0.314	0.303	0.54	0.54	0.54
	6	0.405	0.314	0.69	0.69	0.69
	7	0.660	0.453	1.12	1.12	1.12
	8	0.770	0.696	1.31	1.31	1.31
	9	0.782	0.743	1.33	1.33	1.33
	10	0.751	0.805	1.28	1.28	1.28
	11	0.729	0.765	1.24	1.24	1.24
	12	0.701	0.755	1.19	1.19	1.19
	13	0.674	0.701	1.15	1.15	1.15
	14	0.643	0.699	1.09	1.09	1.09
	15	0.619	0.728	1.06	1.06	1.06
	16	0.601	0.655	1.02	1.02	1.02
	17	0.622	0.696	1.06	1.06	1.06
	18	0.661	0.707	1.13	1.13	1.13
	19	0.706	0.691	1.20	1.20	1.20
	20	0.735	0.705	1.25	1.25	1.25
	21	0.731	0.694	1.25	1.25	1.25
	22	0.664	0.722	1.13	1.13	1.13
	23	0.561	0.629	0.96	0.96	0.96
Weekend	24	0.444	0.532	0.96	0.96	0.76
	25	0.374	0.436	1.00	1.00	0.64
	26	0.328	0.356	1.00	0.95	0.53
	27	0.294	0.329	0.97	0.90	0.47
	28	0.272	0.316	0.94	0.85	0.42
	29	0.263	0.291	0.84	0.75	0.41
	30	0.278	0.265	0.69	0.60	0.41
	31	0.362	0.322	0.55	0.55	0.62
	32	0.557	0.403	0.72	0.72	0.94
	33	0.803	0.587	1.03	1.03	1.37
	34	0.854	0.828	1.14	1.14	1.46
	35	0.861	0.938	1.18	1.18	1.46
	36	0.836	0.848	1.19	1.19	1.42
	37	0.786	0.827	1.16	1.16	1.33
	38	0.725	0.796	1.13	1.13	1.23
	39	0.683	0.820	1.10	1.10	1.17
	40	0.661	0.705	1.10	1.10	1.12
	41	0.667	0.715	1.07	1.07	1.13
	42	0.679	0.765	1.03	1.03	1.16
	43	0.695	0.704	0.98	0.98	1.18
	44	0.715	0.695	0.97	0.97	1.21
	45	0.693	0.614	0.95	0.95	1.19
	46	0.625	0.657	0.94	0.94	1.06
	47	0.538	0.559	0.96	0.96	0.92
Average		0.585	0.599	1.00	1.00	1.00
% Error			2.4%			

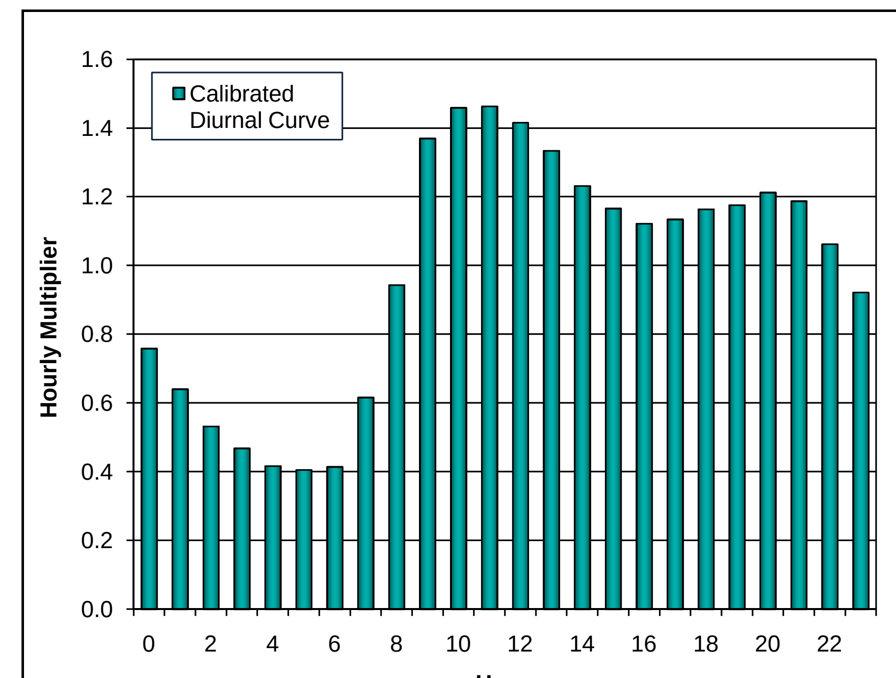
Notes:
(1) DWF is for weekday flows from the dry weather days during the flow monitoring period (based on 3/15-3/24, 4/6-4/10, 4/15-4/19, and 4/29-5/9, 2010 flow data)



Flow Meter 1 Dry Weather Flow Calibration Plot



Flow Meter 1 Weekday DWF Diurnal Pattern



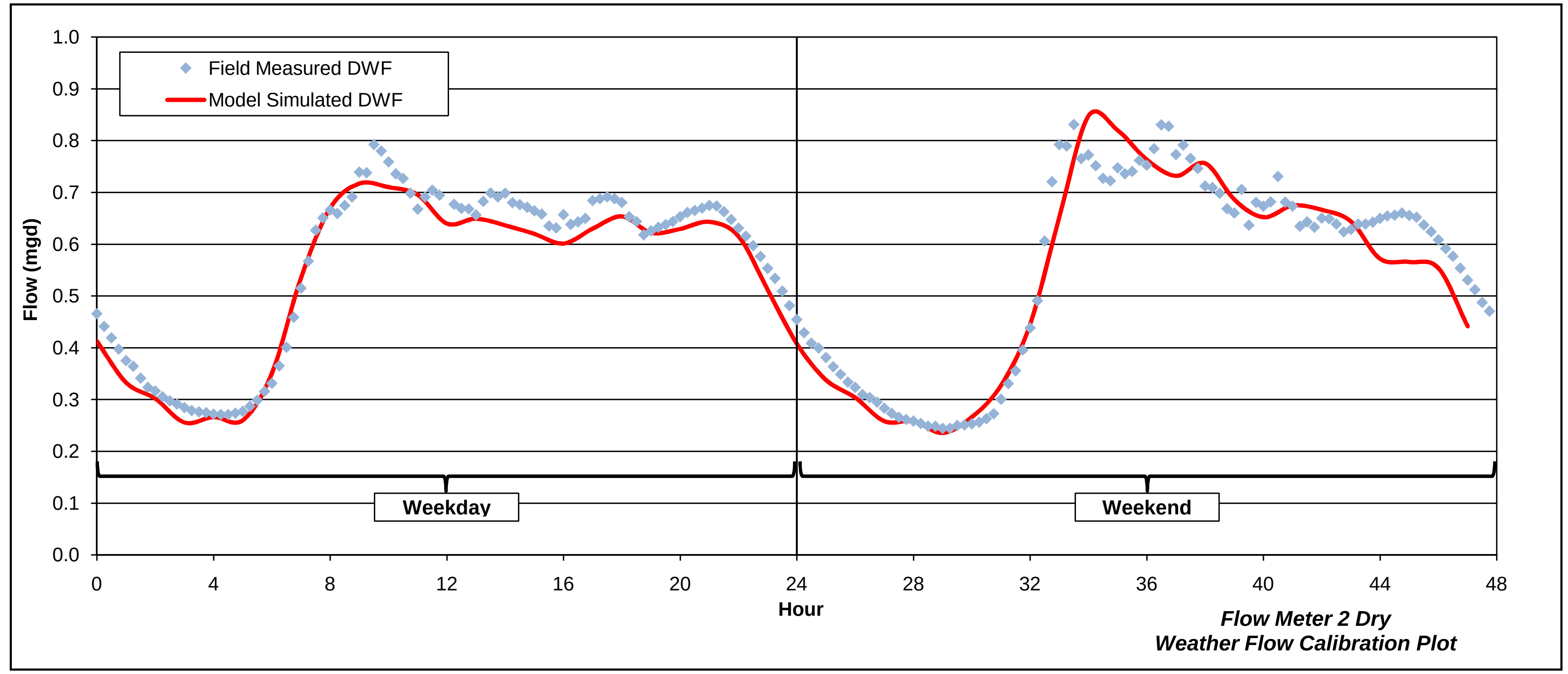
Flow Meter 1 Weekend DWF Diurnal Pattern

FLOW METER 2 DWF CALIBRATION SUMMARY

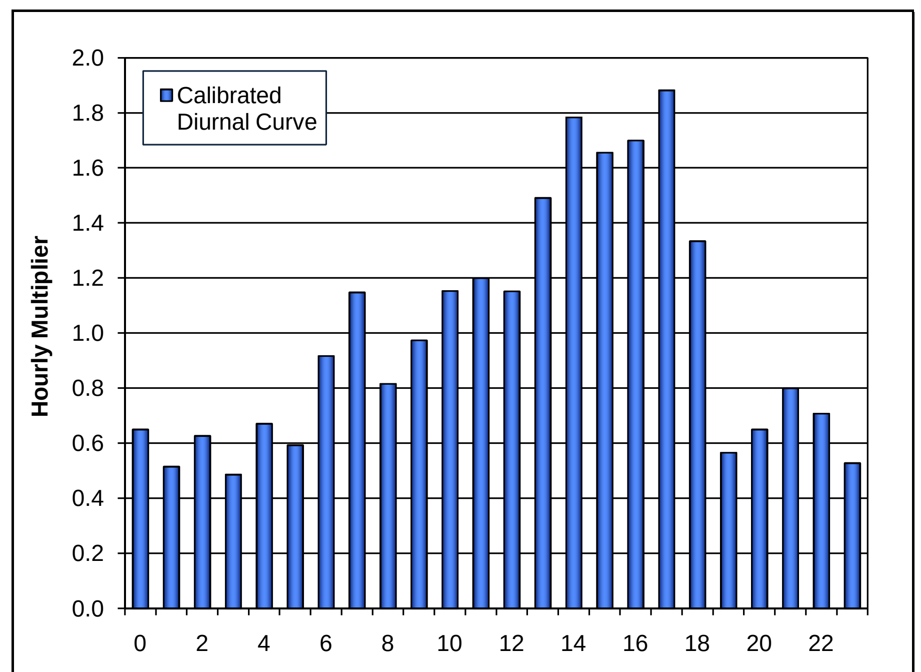
DWF Calibration Details

	Hour	Measured DWF[1] (mgd)	Modeled DWF (mgd)	Diurnal Curve Details: Initial Curve	Modified Curve	Final Curve
Weekday	0	0.431	0.412	0.76	0.65	0.65
	1	0.351	0.333	0.62	0.52	0.52
	2	0.303	0.302	0.54	0.63	0.63
	3	0.279	0.256	0.49	0.49	0.49
	4	0.272	0.266	0.48	0.67	0.67
	5	0.295	0.260	0.52	0.59	0.59
	6	0.389	0.351	0.69	0.92	0.92
	7	0.590	0.536	1.05	1.15	1.15
	8	0.673	0.670	1.19	0.82	0.82
	9	0.762	0.717	1.35	0.97	0.97
	10	0.730	0.710	1.30	1.15	1.15
	11	0.689	0.695	1.22	1.20	1.20
	12	0.680	0.640	1.21	1.15	1.15
	13	0.682	0.649	1.21	1.49	1.49
	14	0.682	0.636	1.21	1.78	1.78
	15	0.647	0.620	1.15	1.66	1.66
	16	0.647	0.601	1.15	1.70	1.70
	17	0.688	0.630	1.22	1.88	1.88
	18	0.649	0.654	1.15	1.33	1.33
	19	0.635	0.622	1.13	0.57	0.57
	20	0.662	0.630	1.18	0.65	0.65
	21	0.665	0.643	1.18	0.80	0.80
	22	0.605	0.615	1.07	0.71	0.71
	23	0.519	0.512	0.92	0.53	0.53
Weekend	24	0.423	0.408	0.98	1.10	0.72
	25	0.357	0.338	1.02	0.97	0.50
	26	0.308	0.304	1.02	1.08	0.68
	27	0.271	0.258	0.97	0.99	0.48
	28	0.252	0.258	0.93	0.95	0.64
	29	0.247	0.236	0.84	0.90	0.53
	30	0.261	0.267	0.67	0.85	0.78
	31	0.346	0.328	0.59	0.65	0.75
	32	0.564	0.446	0.84	0.55	0.44
	33	0.795	0.653	1.04	0.85	0.83
	34	0.743	0.848	1.02	1.10	1.27
	35	0.746	0.820	1.08	0.85	1.02
	36	0.799	0.763	1.18	0.90	1.04
	37	0.769	0.732	1.13	0.83	1.24
	38	0.697	0.756	1.02	0.82	1.46
	39	0.671	0.686	1.04	0.75	1.24
	40	0.692	0.652	1.07	0.77	1.31
	41	0.646	0.675	0.94	0.82	1.54
	42	0.640	0.666	0.99	0.83	1.11
	43	0.637	0.644	1.00	0.85	0.48
	44	0.655	0.572	0.99	0.88	0.57
	45	0.642	0.566	0.97	0.95	0.76
	46	0.583	0.554	0.96	1.09	0.77
	47	0.500	0.442	0.96	0.84	0.45
Average		0.558	0.538	1.00	1.00	1.00
% Error			-3.5%			

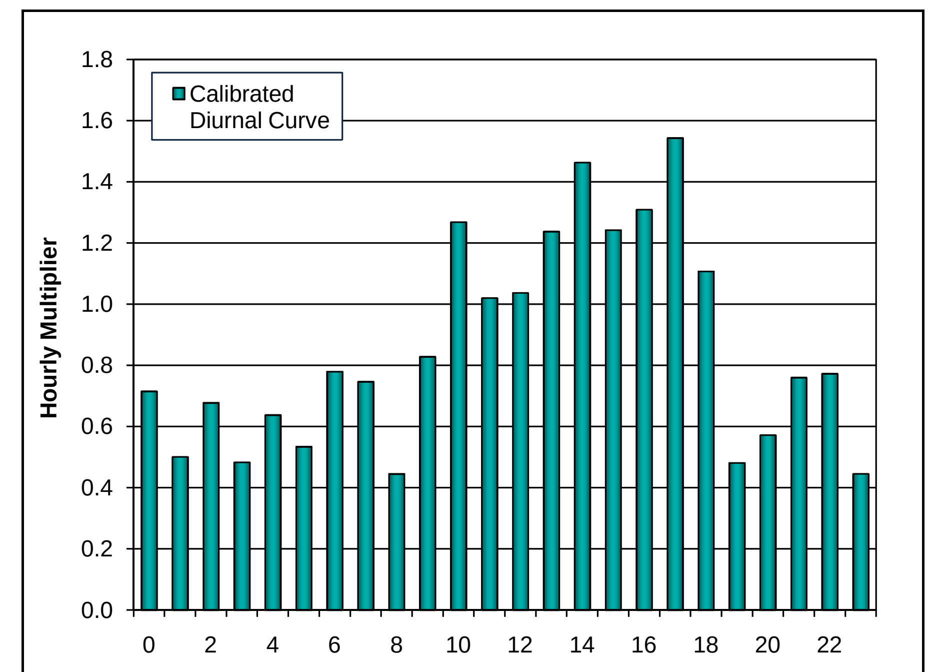
Notes:
(1) DWF is for weekday flows from the dry weather days during the flow monitoring period (based on 3/15-3/24, 4/6-4/10, 4/15-4/19, and 4/29-5/9, 2010 flow data)



Flow Meter 2 Dry Weather Flow Calibration Plot



Flow Meter 2 Weekday DWF Diurnal Pattern



Flow Meter 2 Weekend DWF Diurnal Pattern

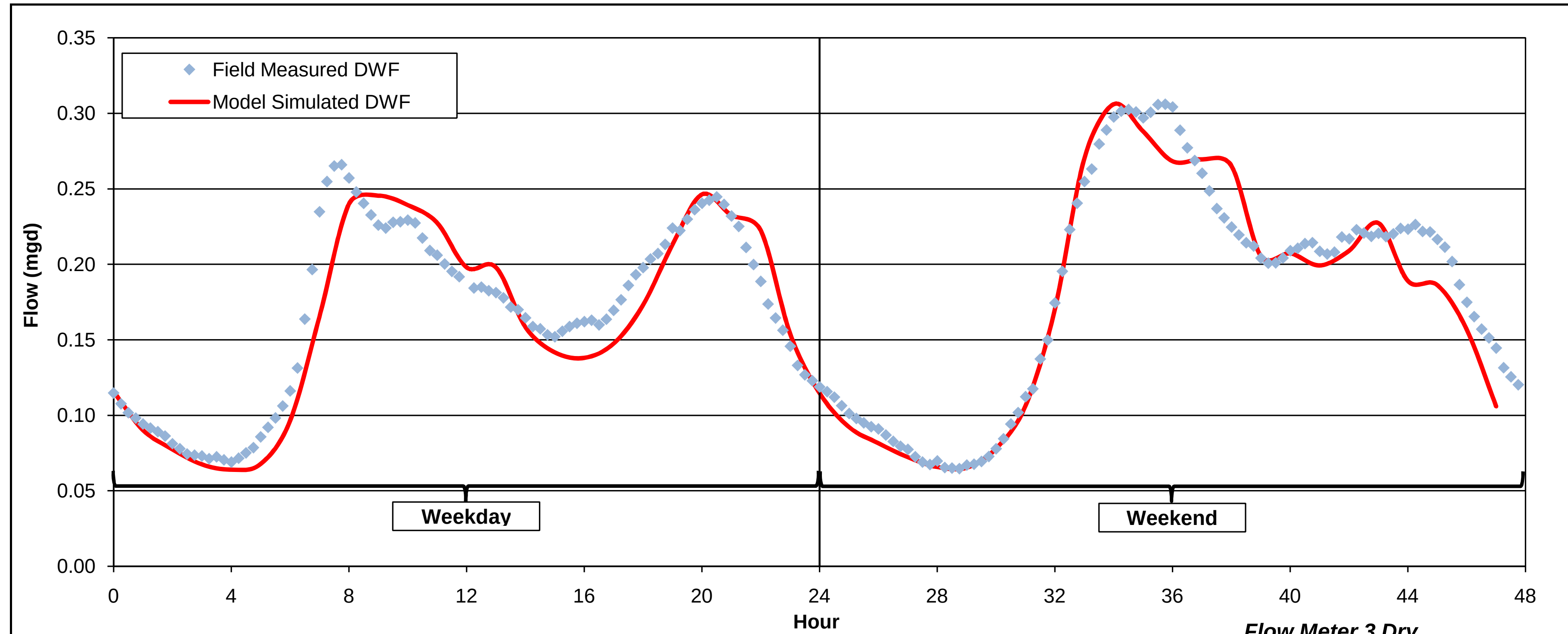
City of Cotati
Sewer System Master Plan

FLOW METER 3 DWF CALIBRATION SUMMARY

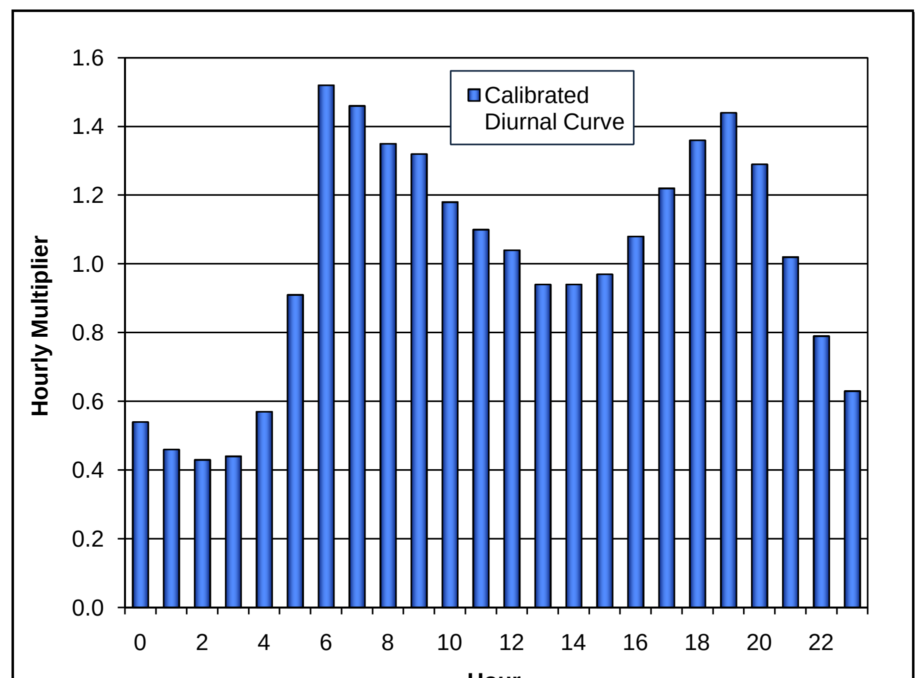
DWF Calibration Details

	Hour	Measured DWF[(1)] (mgd)	Modeled DWF (mgd)	Diurnal Curve Details: Initial Curve	Modified Curve	Final Curve
Weekday	0	0.106	0.116	0.63	0.54	0.54
	1	0.090	0.090	0.54	0.46	0.46
	2	0.077	0.078	0.46	0.43	0.43
	3	0.072	0.068	0.43	0.44	0.44
	4	0.074	0.064	0.44	0.57	0.57
	5	0.096	0.068	0.57	0.91	0.91
	6	0.152	0.096	0.91	1.52	1.52
	7	0.255	0.165	1.52	1.46	1.46
	8	0.245	0.240	1.46	1.35	1.35
	9	0.227	0.246	1.35	1.32	1.32
	10	0.221	0.239	1.32	1.18	1.18
	11	0.198	0.228	1.18	1.10	1.10
	12	0.185	0.198	1.10	1.04	1.04
	13	0.175	0.198	1.04	0.94	0.94
	14	0.158	0.159	0.94	0.94	0.94
	15	0.157	0.142	0.94	0.97	0.97
	16	0.162	0.138	0.97	1.08	1.08
	17	0.181	0.148	1.08	1.22	1.22
	18	0.205	0.173	1.22	1.36	1.36
	19	0.228	0.213	1.36	1.44	1.44
	20	0.242	0.246	1.44	1.29	1.29
	21	0.217	0.233	1.29	1.02	1.02
	22	0.171	0.223	1.02	0.79	0.79
	23	0.132	0.154	0.79	0.63	0.63
Weekend	24	0.113	0.115	1.07	1.07	0.58
	25	0.097	0.092	1.07	1.11	0.51
	26	0.085	0.082	1.11	1.00	0.43
	27	0.072	0.072	1.00	1.00	0.44
	28	0.066	0.066	0.90	0.90	0.51
	29	0.069	0.065	0.72	0.75	0.68
	30	0.090	0.078	0.59	0.60	0.91
	31	0.129	0.106	0.51	1.04	1.52
	32	0.208	0.170	0.85	1.37	1.85
	33	0.272	0.270	1.20	1.41	1.86
	34	0.301	0.306	1.36	1.53	1.81
	35	0.302	0.288	1.52	1.45	1.60
	36	0.285	0.268	1.54	1.40	1.46
	37	0.244	0.270	1.39	1.30	1.22
	38	0.218	0.265	1.37	1.28	1.20
	39	0.202	0.206	1.29	1.30	1.26
	40	0.212	0.207	1.31	1.20	1.30
	41	0.210	0.199	1.16	1.05	1.28
	42	0.220	0.209	1.07	0.92	1.25
	43	0.221	0.227	0.97	0.81	1.17
	44	0.223	0.189	0.92	0.80	1.03
	45	0.204	0.186	0.94	0.77	0.79
	46	0.162	0.157	0.95	0.62	0.49
	47	0.130	0.106	0.99	0.77	0.49
Average		0.174	0.169	1.00	1.00	1.00
% Error			-2.9%			

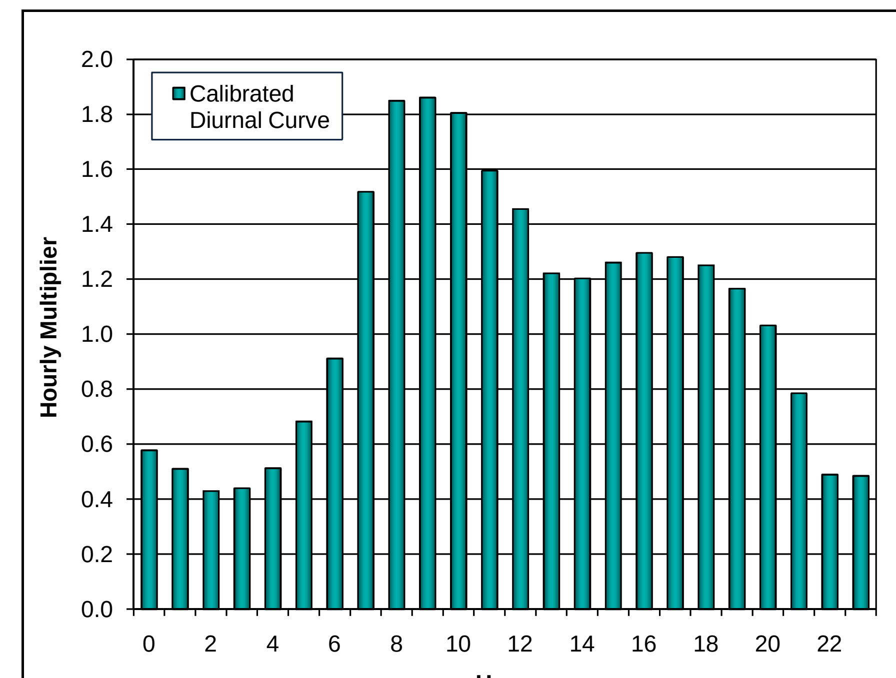
Notes:
(1) DWF is for weekday flows from the dry weather days during the flow monitoring period (based on 3/15-3/24, 4/6-4/10, 4/15-4/19, and 4/29-5/9, 2010 flow data)



Flow Meter 3 Dry Weather Flow Calibration Plot



Flow Meter 3 Weekday DWF Diurnal Pattern



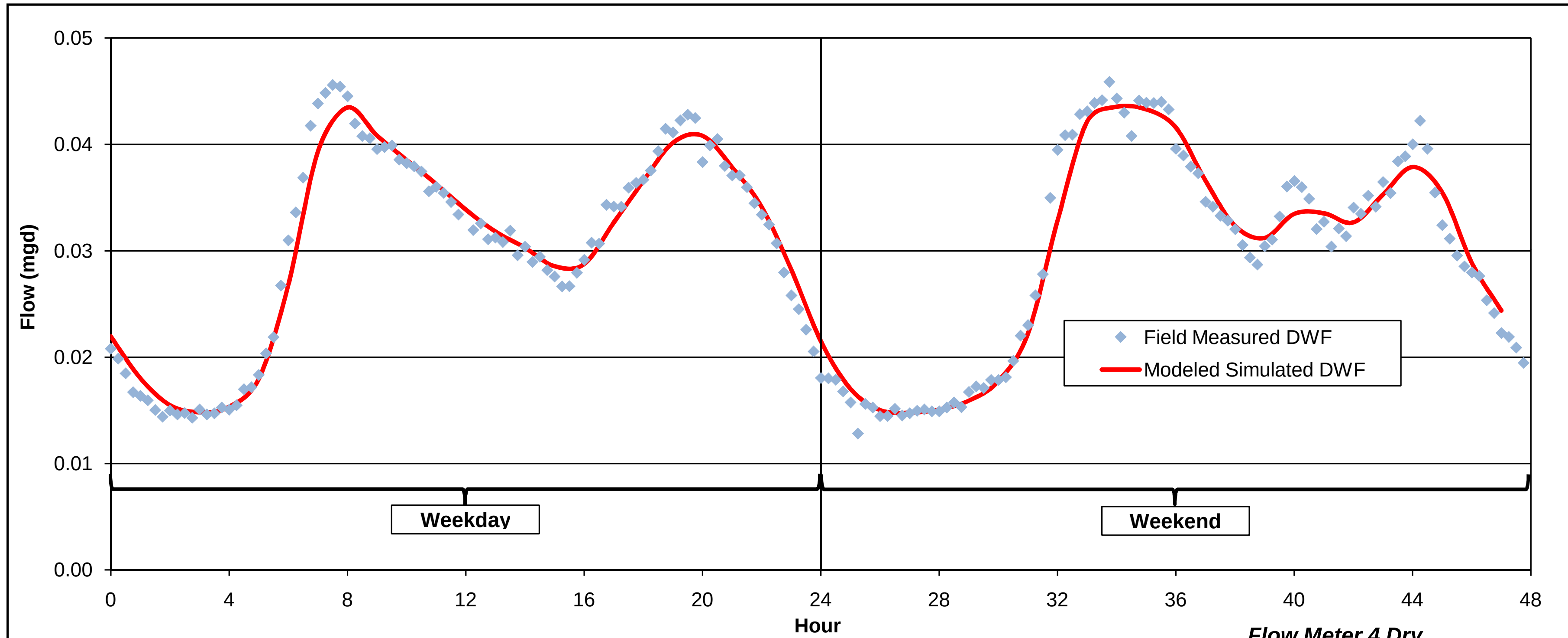
Flow Meter 3 Weekend DWF Diurnal Pattern

City of Cotati
Sewer System Master Plan

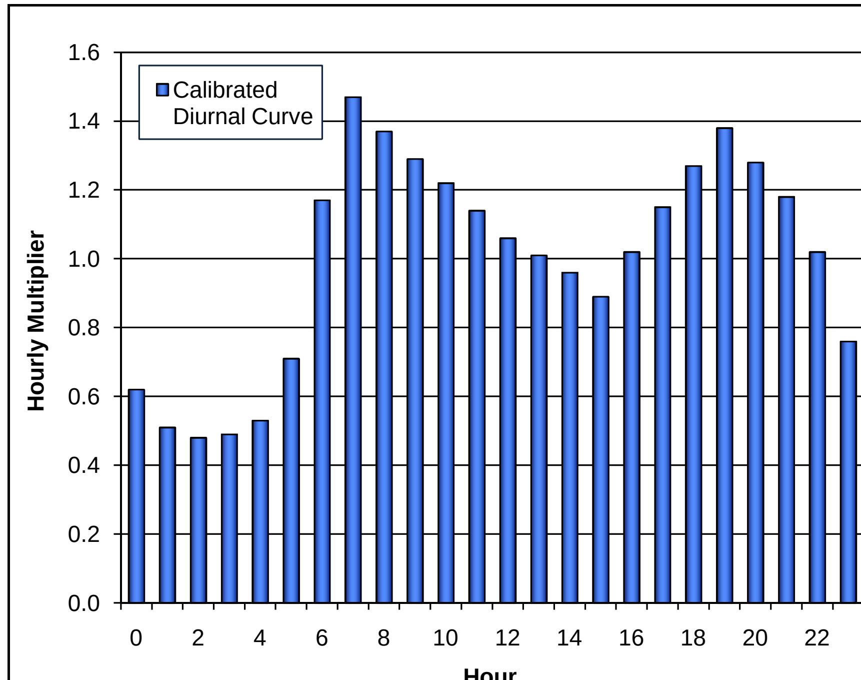
FLOW METER 4 DWF CALIBRATION SUMMARY

DWF Calibration Details						
	Hour	Measured DWF[1] (mgd)	Modeled DWF (mgd)	Diurnal Curve Details: Initial Curve	Modified Curve	Final Curve
Weekday	0	0.019	0.022	0.62	0.62	0.62
	1	0.015	0.018	0.51	0.51	0.51
	2	0.015	0.015	0.48	0.48	0.48
	3	0.015	0.015	0.49	0.49	0.49
	4	0.016	0.015	0.53	0.53	0.53
	5	0.022	0.018	0.71	0.71	0.71
	6	0.036	0.027	1.17	1.17	1.17
	7	0.045	0.039	1.47	1.47	1.47
	8	0.042	0.043	1.37	1.37	1.37
	9	0.039	0.041	1.29	1.29	1.29
	10	0.037	0.039	1.22	1.22	1.22
	11	0.035	0.036	1.14	1.14	1.14
	12	0.032	0.034	1.06	1.06	1.06
	13	0.031	0.032	1.01	1.01	1.01
	14	0.029	0.030	0.96	0.96	0.96
	15	0.027	0.029	0.89	0.89	0.89
	16	0.031	0.029	1.02	1.02	1.02
	17	0.035	0.033	1.15	1.15	1.15
	18	0.039	0.037	1.27	1.27	1.27
	19	0.042	0.040	1.38	1.38	1.38
	20	0.039	0.041	1.28	1.28	1.28
	21	0.036	0.038	1.18	1.18	1.18
	22	0.031	0.034	1.02	1.02	1.02
	23	0.023	0.028	0.76	0.76	0.76
Weekend	24	0.018	0.022	0.93	0.93	0.58
	25	0.015	0.017	0.96	0.96	0.49
	26	0.015	0.015	1.00	1.00	0.48
	27	0.015	0.015	1.00	1.00	0.49
	28	0.015	0.015	0.95	0.95	0.50
	29	0.017	0.016	0.79	0.79	0.56
	30	0.019	0.018	0.54	0.54	0.63
	31	0.028	0.022	0.62	0.62	0.91
	32	0.041	0.033	0.98	0.98	1.34
	33	0.044	0.042	1.12	1.12	1.44
	34	0.043	0.044	1.15	1.15	1.40
	35	0.044	0.043	1.26	1.26	1.44
	36	0.038	0.042	1.19	1.19	1.26
	37	0.034	0.037	1.09	1.09	1.10
	38	0.030	0.032	1.03	1.03	0.99
	39	0.033	0.031	1.20	1.20	1.07
	40	0.035	0.033	1.12	1.12	1.14
	41	0.032	0.034	0.90	0.90	1.04
	42	0.034	0.033	0.88	0.88	1.12
	43	0.037	0.035	0.88	0.88	1.21
	44	0.039	0.038	1.00	1.00	1.28
	45	0.030	0.035	0.84	0.84	0.99
	46	0.026	0.029	0.84	0.84	0.86
	47	0.021	0.024	0.90	0.90	0.68
Average		0.030	0.030	1.00	1.00	1.00
% Error			0.0%			

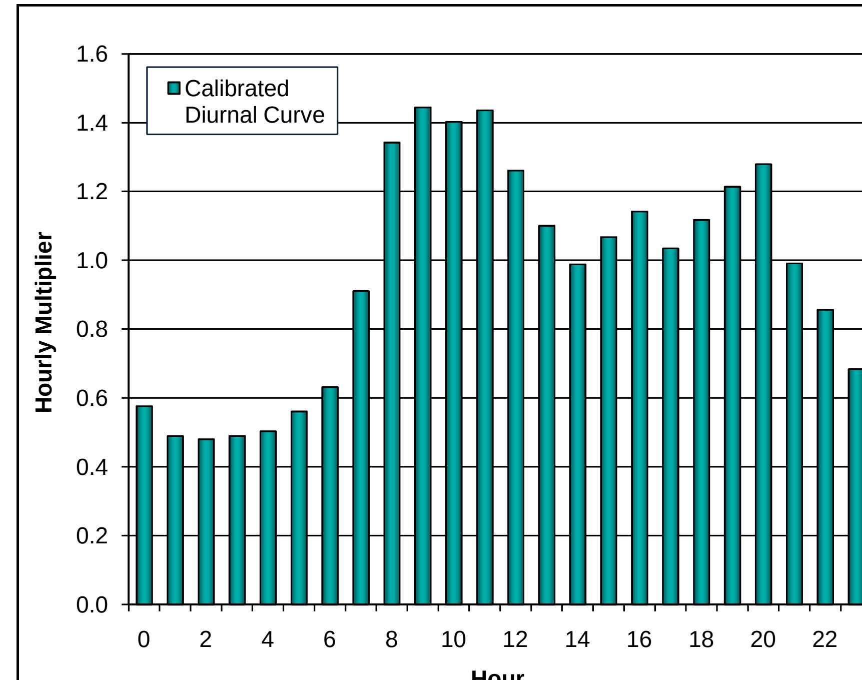
Notes:
(1) DWF is for weekday flows from the dry weather days during the flow monitoring period (based on 3/15-3/24, 4/6-4/10, 4/15-4/19, and 4/29-5/9, 2010 flow data)



Flow Meter 4 Dry Weather Flow Calibration Plot



Flow Meter 4 Weekday DWF Diurnal Pattern



Flow Meter 4 Weekend DWF Diurnal Pattern

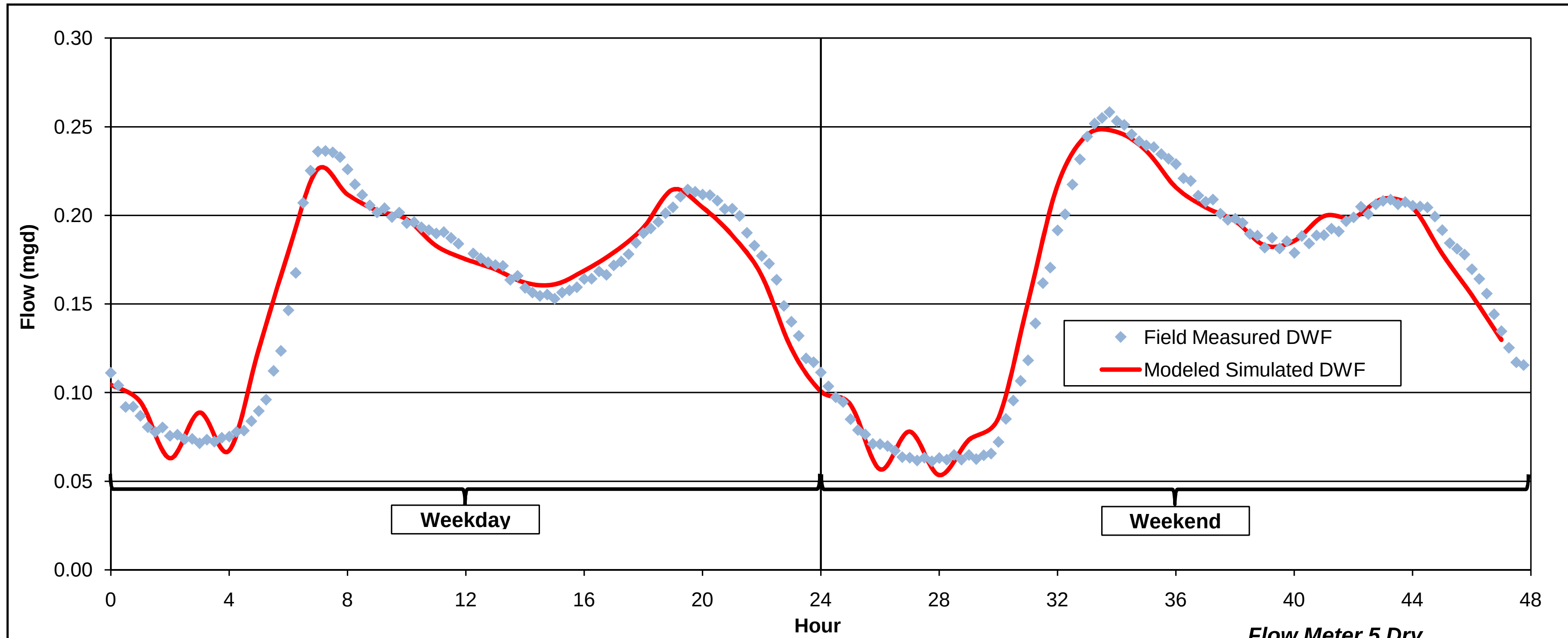
City of Cotati
Sewer System Master Plan

FLOW METER 5 DWF CALIBRATION SUMMARY

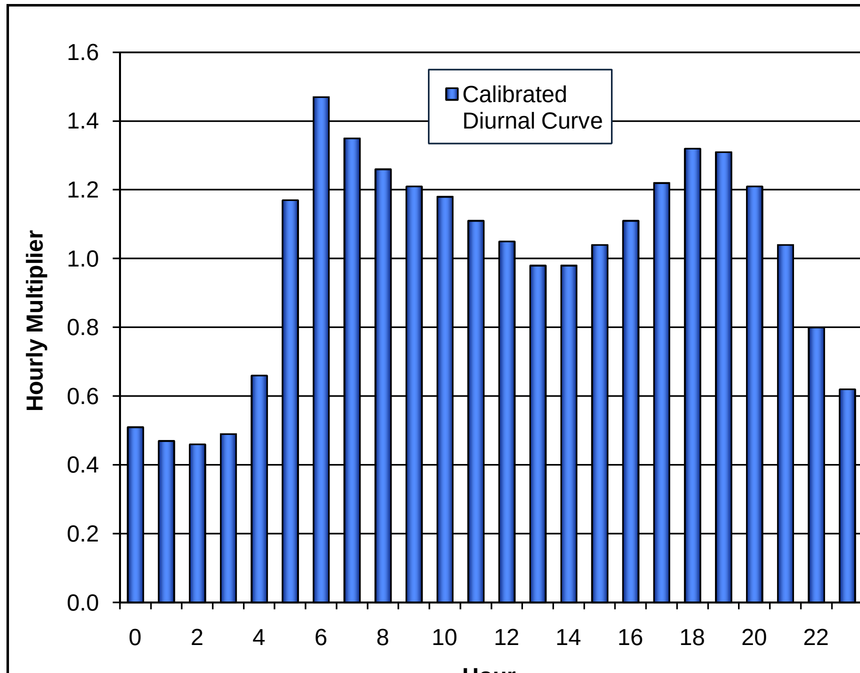
ADWF Calibration Details

	Hour	Measured DWF[(1)] (mgd)	Modeled DWF (mgd)	Diurnal Curve Details: Initial Curve	Diurnal Curve Details: Modified Curve	Diurnal Curve Details: Final Curve
Weekday	0	0.100	0.105	0.62	0.51	0.51
	1	0.081	0.095	0.51	0.47	0.47
	2	0.075	0.063	0.47	0.46	0.46
	3	0.073	0.089	0.46	0.49	0.49
	4	0.079	0.067	0.49	0.66	0.66
	5	0.105	0.124	0.66	1.17	1.17
	6	0.187	0.179	1.17	1.47	1.47
	7	0.235	0.226	1.47	1.35	1.35
	8	0.215	0.212	1.35	1.26	1.26
	9	0.202	0.203	1.26	1.21	1.21
	10	0.194	0.198	1.21	1.18	1.18
	11	0.188	0.183	1.18	1.11	1.11
	12	0.177	0.175	1.11	1.05	1.05
	13	0.168	0.170	1.05	0.98	0.98
	14	0.156	0.162	0.98	0.98	0.98
	15	0.157	0.161	0.98	1.04	1.04
	16	0.166	0.169	1.04	1.11	1.11
	17	0.177	0.179	1.11	1.22	1.22
	18	0.195	0.193	1.22	1.32	1.32
	19	0.211	0.215	1.32	1.31	1.31
	20	0.209	0.205	1.31	1.21	1.21
	21	0.194	0.189	1.21	1.04	1.04
	22	0.166	0.166	1.04	0.80	0.80
	23	0.127	0.125	0.80	0.62	0.62
Weekend	24	0.102	0.101	1.02	0.96	0.49
	25	0.078	0.093	0.96	0.91	0.43
	26	0.068	0.057	0.91	0.86	0.40
	27	0.062	0.078	0.86	0.80	0.39
	28	0.063	0.054	0.80	0.61	0.40
	29	0.064	0.073	0.61	0.48	0.56
	30	0.090	0.086	0.48	0.63	0.93
	31	0.147	0.151	0.63	0.98	1.32
	32	0.210	0.217	0.98	1.25	1.58
	33	0.252	0.245	1.25	1.28	1.55
	34	0.248	0.247	1.28	1.26	1.49
	35	0.236	0.236	1.26	1.24	1.38
	36	0.220	0.216	1.24	1.21	1.27
	37	0.204	0.205	1.21	1.23	1.21
	38	0.193	0.197	1.23	1.17	1.15
	39	0.184	0.183	1.17	1.12	1.16
	40	0.185	0.186	1.12	1.09	1.21
	41	0.192	0.200	1.09	1.04	1.27
	42	0.203	0.199	1.04	0.99	1.31
	43	0.208	0.209	0.99	0.98	1.28
	44	0.204	0.204	0.98	0.95	1.15
	45	0.184	0.178	0.95	0.96	1.00
	46	0.158	0.155	0.96	0.97	0.78
	47	0.123	0.130	0.97	1.02	0.63
Average		0.161	0.161	1.00	1.00	1.00
% Error			0.4%			

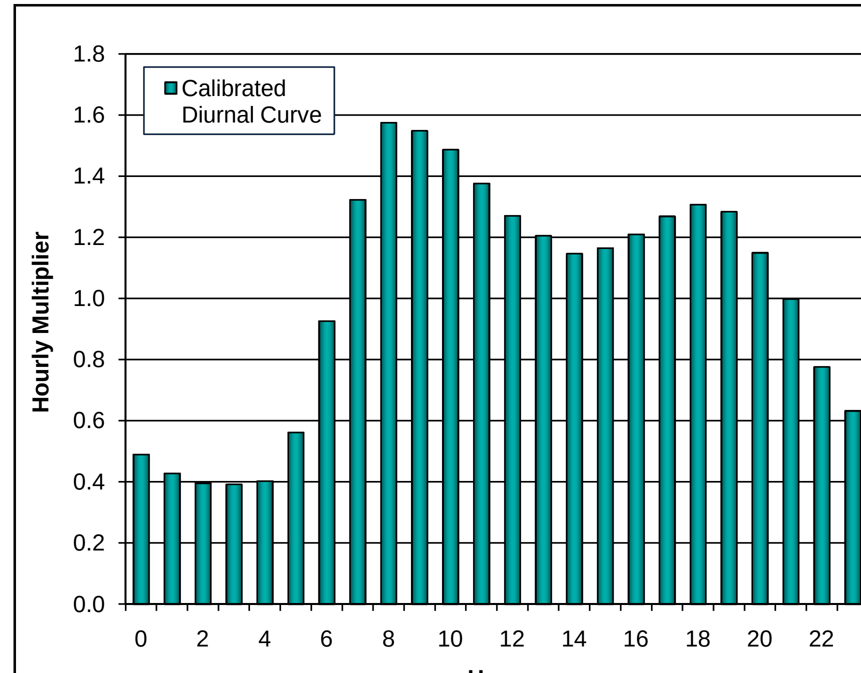
Notes:
(1) DWF is for weekday flows from the dry weather days during the flow monitoring period (based on 3/15-3/24, 4/6-4/10, 4/15-4/19, and 4/29-5/9, 2010 flow data)



Flow Meter 5 Dry Weather Flow Calibration Plot



Flow Meter 5 Weekday DWF Diurnal Pattern



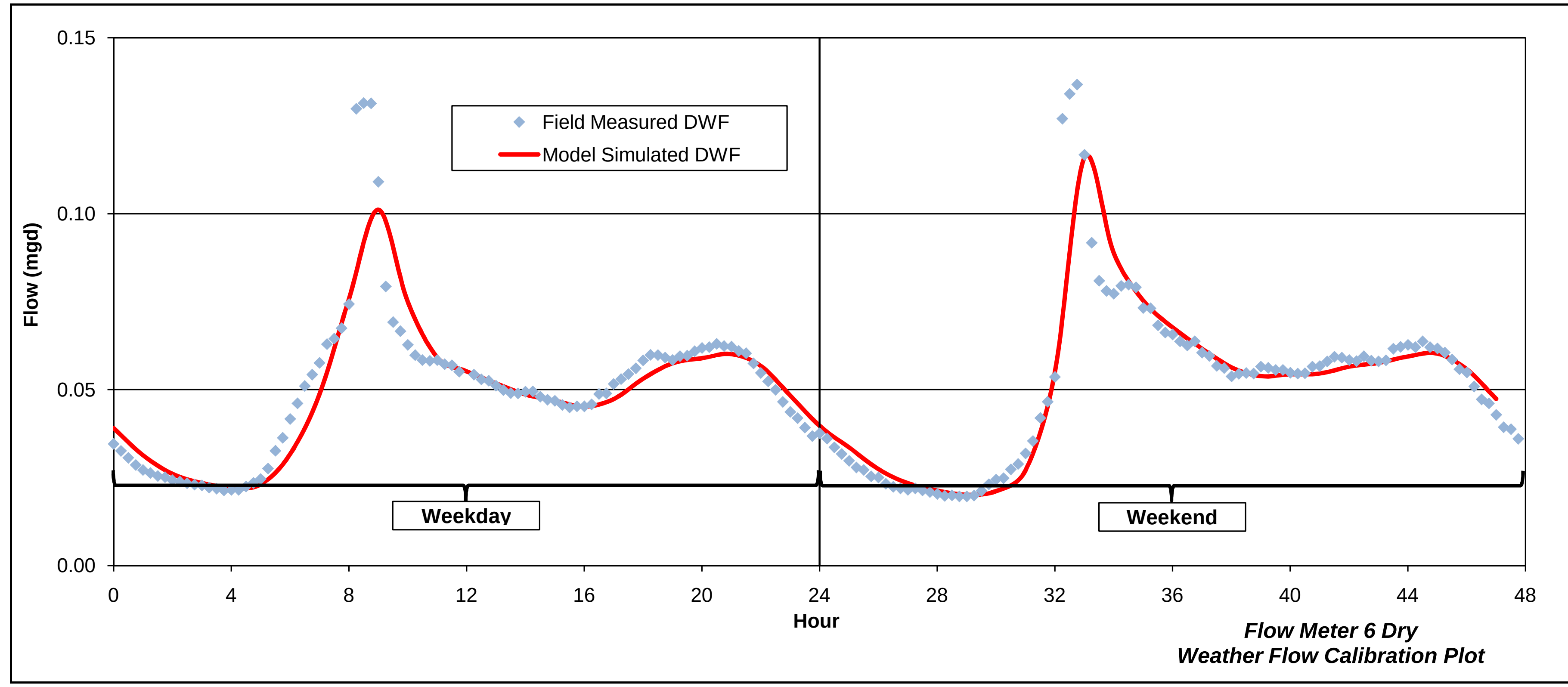
Flow Meter 5 Weekend DWF Diurnal Pattern

City of Cotati
Sewer System Master Plan

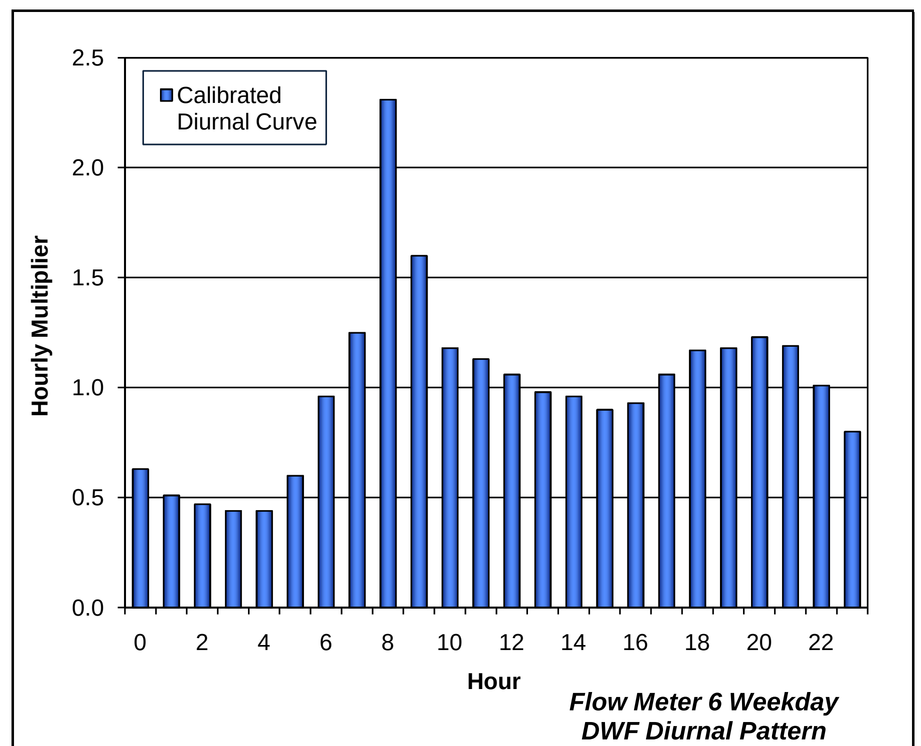
FLOW METER 6 DWF CALIBRATION SUMMARY

	Hour	Measured DWF[(1)] (mgd)	Modeled DWF (mgd)	Initial Curve	Modified Curve	Final Curve
	DWF Calibration Details			**Diurnal Curve Details**		
Weekday	0	0.032	0.039	0.63	0.63	0.63
	1	0.026	0.031	0.51	0.51	0.51
	2	0.024	0.026	0.47	0.47	0.47
	3	0.022	0.023	0.44	0.44	0.44
	4	0.022	0.022	0.44	0.44	0.44
	5	0.030	0.023	0.60	0.60	0.60
	6	0.048	0.032	0.96	0.96	0.96
	7	0.063	0.049	1.25	1.25	1.25
	8	0.117	0.076	2.31	2.31	2.31
	9	0.081	0.101	1.60	1.60	1.60
	10	0.060	0.075	1.18	1.18	1.18
	11	0.057	0.059	1.13	1.13	1.13
	12	0.053	0.055	1.06	1.06	1.06
	13	0.050	0.052	0.98	0.98	0.98
	14	0.049	0.049	0.96	0.96	0.96
	15	0.046	0.047	0.90	0.90	0.90
	16	0.047	0.045	0.93	0.93	0.93
	17	0.054	0.047	1.06	1.06	1.06
	18	0.059	0.053	1.17	1.17	1.17
	19	0.060	0.057	1.18	1.18	1.18
	20	0.062	0.059	1.23	1.23	1.23
	21	0.060	0.060	1.19	1.19	1.19
	22	0.051	0.057	1.01	1.01	1.01
	23	0.040	0.048	0.80	0.80	0.80
Weekend	24	0.035	0.040	1.10	1.10	0.69
	25	0.028	0.034	1.06	1.06	0.54
	26	0.023	0.027	0.98	0.98	0.46
	27	0.021	0.023	0.97	0.97	0.43
	28	0.020	0.021	0.90	0.90	0.40
	29	0.021	0.020	0.69	0.69	0.41
	30	0.026	0.021	0.55	0.55	0.53
	31	0.039	0.027	0.62	0.62	0.78
	32	0.113	0.055	0.97	0.97	2.24
	33	0.092	0.116	1.13	1.13	1.81
	34	0.079	0.089	1.32	1.32	1.56
	35	0.070	0.075	1.23	1.23	1.39
	36	0.064	0.068	1.20	1.20	1.27
	37	0.058	0.062	1.17	1.17	1.15
	38	0.054	0.056	1.12	1.12	1.08
	39	0.056	0.054	1.23	1.23	1.11
	40	0.055	0.054	1.17	1.17	1.09
	41	0.058	0.055	1.08	1.08	1.14
	42	0.059	0.057	0.99	0.99	1.16
	43	0.060	0.058	1.01	1.01	1.19
	44	0.063	0.059	1.01	1.01	1.24
	45	0.059	0.060	0.98	0.98	1.17
	46	0.050	0.056	0.98	0.98	0.99
	47	0.039	0.047	0.97	0.97	0.78
	Average	0.051	0.050	1.00	1.00	1.00
	% Error		-1.4%			

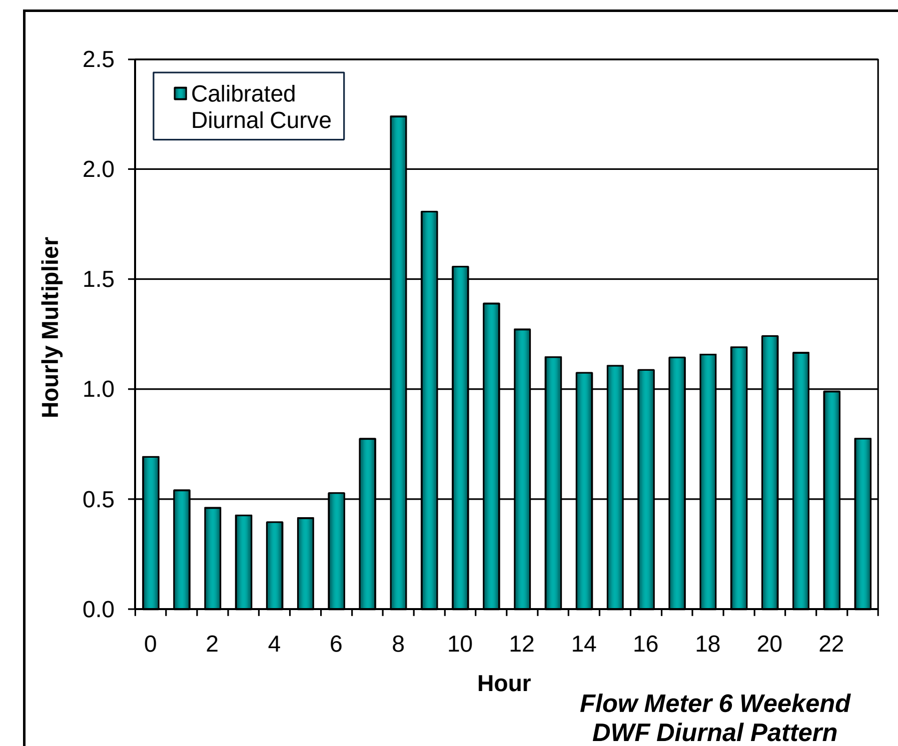
Notes:
(1) DWF is for weekday flows from the dry weather days during the flow monitoring period (based on 3/15-3/24, 4/6-4/10, 4/15-4/19, and 4/29-5/9, 2010 flow data)



Flow Meter 6 Dry Weather Flow Calibration Plot



Flow Meter 6 Weekday DWF Diurnal Pattern



Flow Meter 6 Weekend DWF Diurnal Pattern

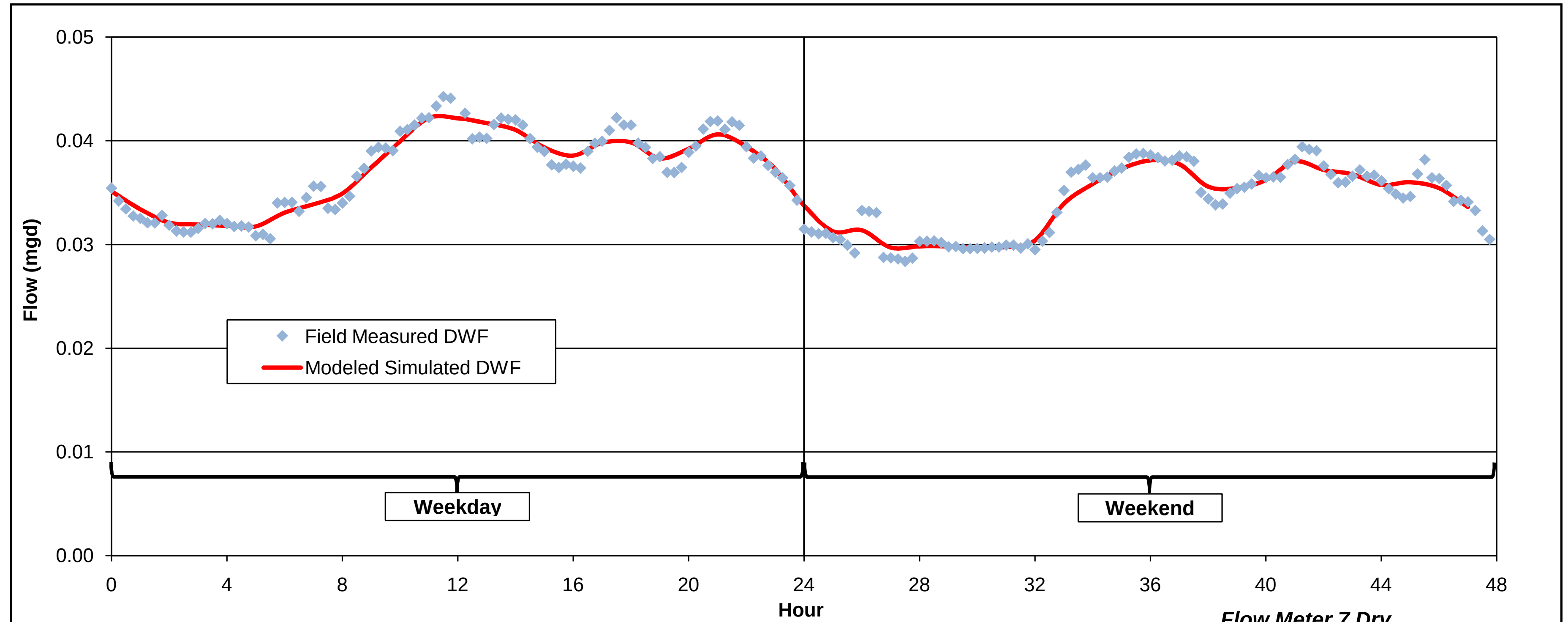
City of Cotati
Sewer System Master Plan

FLOW METER 7 DWF CALIBRATION SUMMARY

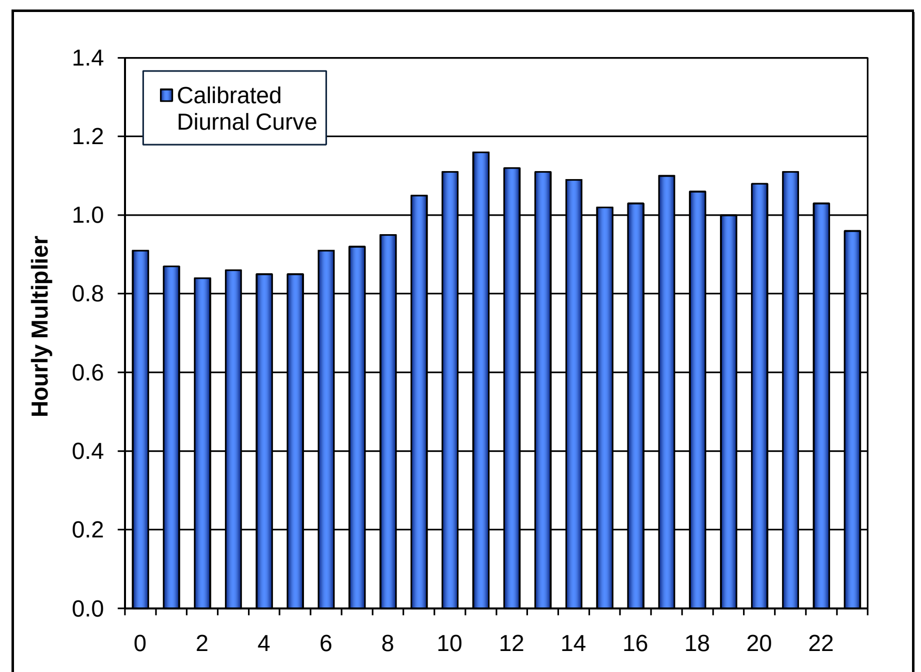
ADWF Calibration Details

	Hour	Measured DWF[(1)] (mgd)	Modeled DWF (mgd)	Diurnal Curve Details: Initial Curve	Diurnal Curve Details: Modified Curve	Diurnal Curve Details: Final Curve
Weekday	0	0.034	0.035	0.91	0.91	0.91
	1	0.032	0.033	0.87	0.87	0.87
	2	0.031	0.032	0.84	0.84	0.84
	3	0.032	0.032	0.86	0.86	0.86
	4	0.032	0.032	0.85	0.85	0.85
	5	0.032	0.032	0.85	0.85	0.85
	6	0.034	0.033	0.91	0.91	0.91
	7	0.035	0.034	0.92	0.92	0.92
	8	0.036	0.035	0.95	0.95	0.95
	9	0.039	0.037	1.05	1.05	1.05
	10	0.041	0.040	1.11	1.11	1.11
	11	0.043	0.042	1.16	1.16	1.16
	12	0.042	0.042	1.12	1.12	1.12
	13	0.042	0.042	1.11	1.11	1.11
	14	0.041	0.041	1.09	1.09	1.09
	15	0.038	0.039	1.02	1.02	1.02
	16	0.038	0.039	1.03	1.03	1.03
	17	0.041	0.040	1.10	1.10	1.10
	18	0.040	0.040	1.06	1.06	1.06
	19	0.037	0.038	1.00	1.00	1.00
	20	0.040	0.039	1.08	1.08	1.08
	21	0.042	0.041	1.11	1.11	1.11
	22	0.038	0.039	1.03	1.03	1.03
	23	0.036	0.037	0.96	0.96	0.96
Weekend	24	0.031	0.034	0.92	0.92	0.84
	25	0.030	0.031	0.93	0.93	0.81
	26	0.032	0.031	1.02	1.02	0.86
	27	0.029	0.030	0.89	0.89	0.77
	28	0.030	0.030	0.95	0.95	0.81
	29	0.030	0.030	0.94	0.94	0.80
	30	0.030	0.030	0.87	0.87	0.79
	31	0.030	0.030	0.87	0.87	0.80
	32	0.031	0.030	0.87	0.87	0.83
	33	0.037	0.034	0.94	0.94	0.99
	34	0.037	0.036	0.88	0.88	0.98
	35	0.038	0.037	0.88	0.88	1.02
	36	0.038	0.038	0.92	0.92	1.03
	37	0.038	0.038	0.90	0.90	1.00
	38	0.034	0.036	0.84	0.84	0.92
	39	0.036	0.035	0.94	0.94	0.96
	40	0.037	0.036	0.96	0.96	0.99
	41	0.039	0.038	0.95	0.95	1.05
	42	0.037	0.037	0.92	0.92	0.98
	43	0.037	0.037	0.98	0.98	0.98
	44	0.035	0.036	0.87	0.87	0.94
	45	0.037	0.036	0.88	0.88	0.98
	46	0.035	0.035	0.91	0.91	0.94
	47	0.032	0.034	0.90	0.90	0.86
Average		0.036	0.036	1.00	1.00	1.00
% Error			-0.1%			

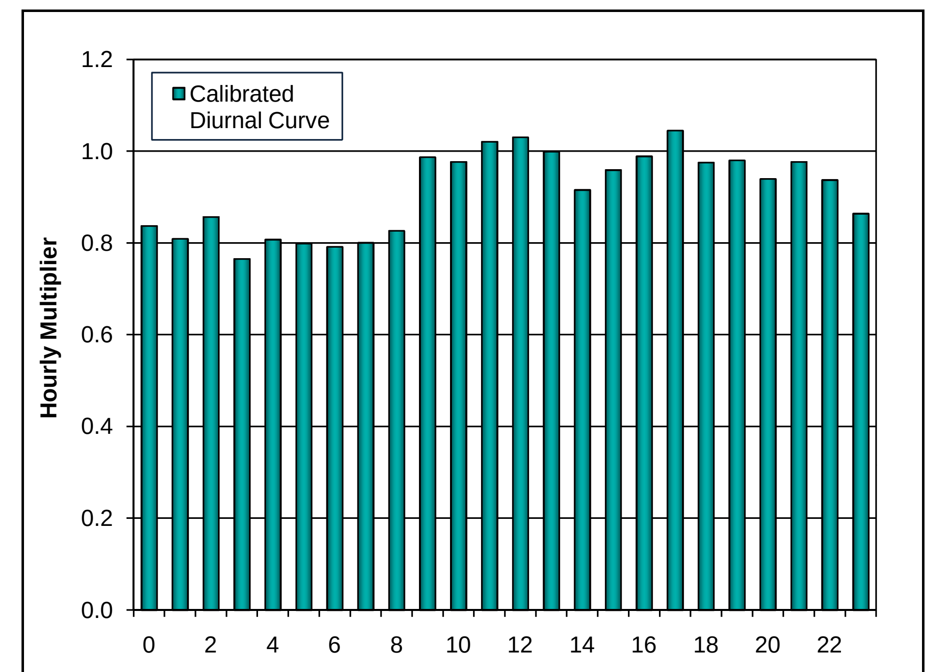
Notes:
(1) DWF is for weekday flows from the dry weather days during the flow monitoring period (based on 3/15-3/24, 4/6-4/10, 4/15-4/19, and 4/29-5/9, 2010 flow data)



Flow Meter 7 Dry Weather Flow Calibration Plot



Flow Meter 7 Weekday DWF Diurnal Pattern



Flow Meter 7 Weekend DWF Diurnal Pattern

APPENDIX C – WET WEATHER FLOW CALIBRATION PLOTS

Table 1 Wet Weather Flow Calibration Summary
Sewer System Master Plan
City of Cotati

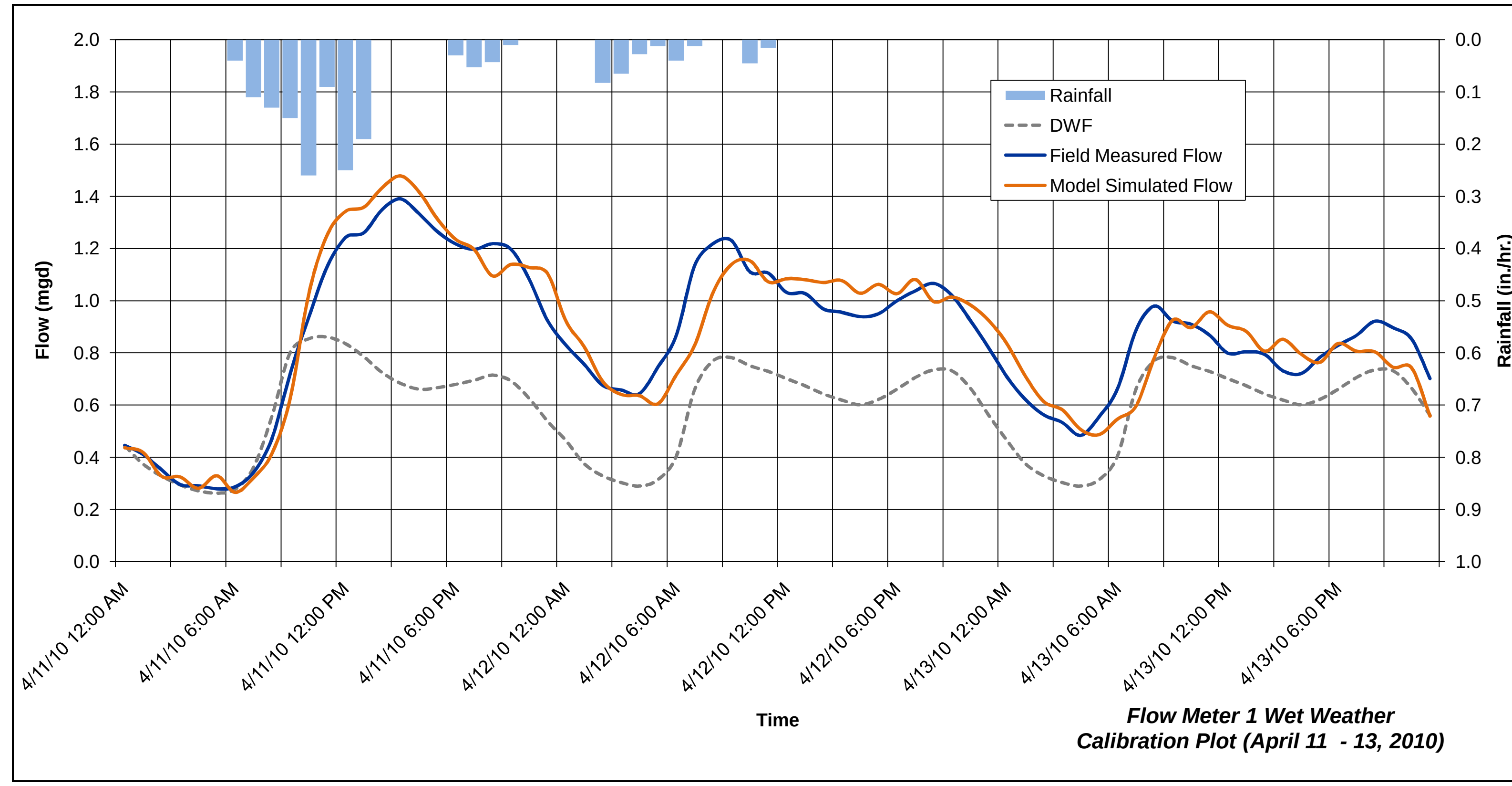
Meter Site	Wet Weather Event	Field Measured Flow(1),(2) Average (mgd)	Field Measured Flow(1),(2) Peak (mgd)	Model Simulated Flow(2) Average (mgd)	Model Simulated Flow(2) Peak (mgd)	Percent Difference(3) Average (%)	Percent Difference(3) Peak (%)
1	April 11 - 13, 2010	0.858	1.390	0.859	1.478	0%	6%
	March 31 - April 1, 2010	0.683	1.034	0.697	1.090	2%	5%
2	April 11 - 13, 2010	0.747	1.265	0.772	1.315	3%	4%
	March 31 - April 1, 2010	0.632	0.913	0.624	0.978	-1%	7%
3	April 11 - 13, 2010	0.223	0.382	0.225	0.358	1%	-6%
	March 31 - April 1, 2010	0.183	0.309	0.187	0.337	2%	9%
4	April 11 - 13, 2010	0.064	0.102	0.062	0.098	-3%	-4%
	March 31 - April 1, 2010	0.047	0.079	0.046	0.074	-3%	-7%
5	April 11 - 13, 2010	0.261	0.514	0.251	0.466	-4%	-9%
	March 31 - April 1, 2010	0.194	0.300	0.181	0.320	-6%	7%
6	April 11 - 13, 2010	0.096	0.228	0.097	0.218	1%	-4%
	March 31 - April 1, 2010	0.070	0.152	0.070	0.147	0%	-4%
7	April 11 - 13, 2010	0.059	0.129	0.056	0.116	-4%	-10%
	March 31 - April 1, 2010	0.047	0.089	0.048	0.091	1%	3%

Notes:
1. Source: City of Cotati Flow Monitoring Study
2. Average flows are measured over the duration of the storm event. Peak flows represent hourly average peak flows.
3. Percent difference between meter collected and model derived results.

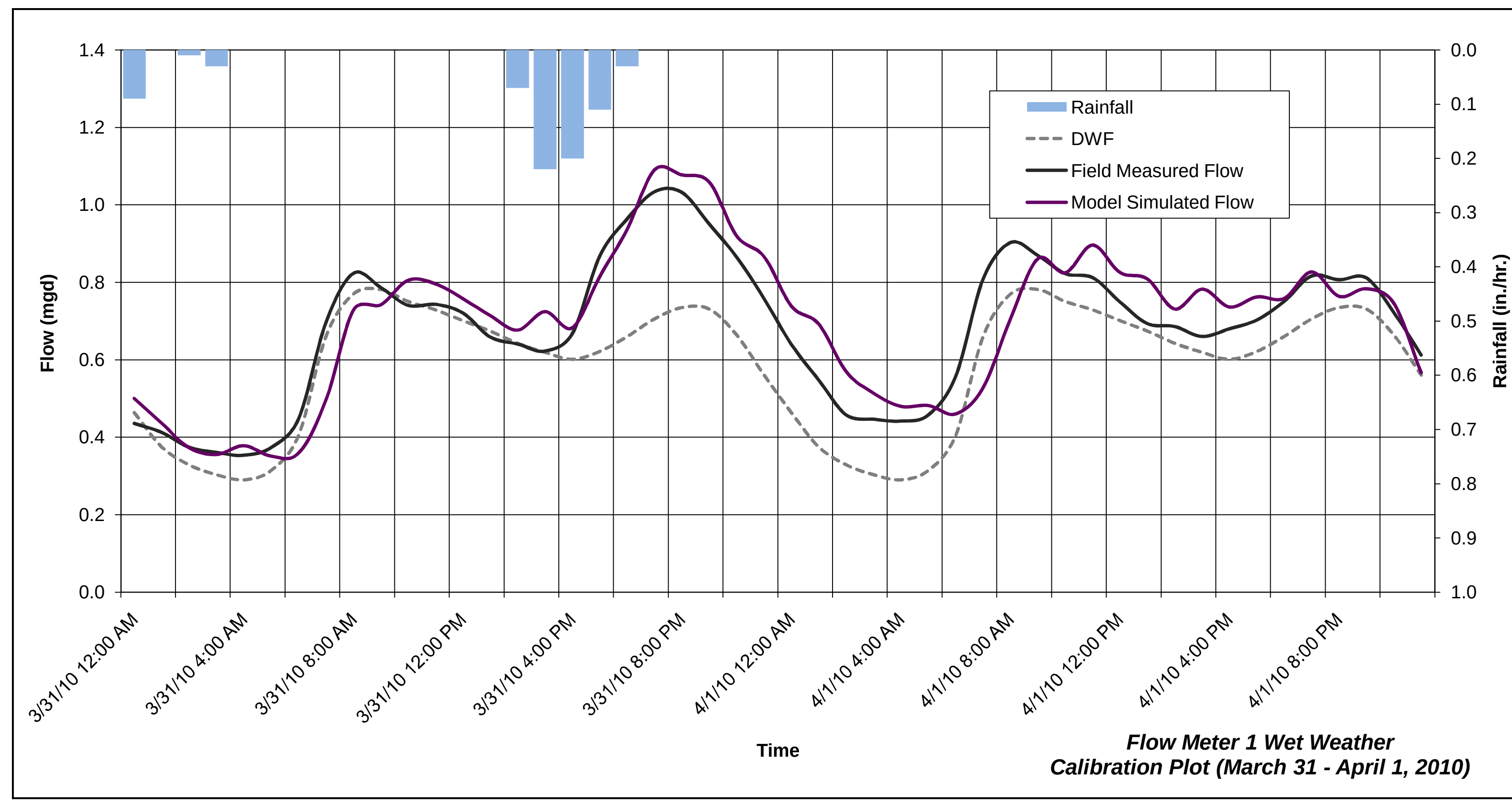
FLOW METER 1 WET WEATHER FLOW CALIBRATION SUMMARY

WWF Calibration Details

April 11 - 13, 2010 Event					March 31 - April 1, 2010 Event				
Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)	Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)
4/11/2010 0:00	0.444	0.00	0.446	0.437	3/31/2010 0:00	0.464	0.09	0.436	0.500
4/11/2010 1:00	0.374	0.00	0.411	0.418	3/31/2010 1:00	0.375	0.00	0.413	0.436
4/11/2010 2:00	0.328	0.00	0.352	0.327	3/31/2010 2:00	0.329	0.01	0.374	0.373
4/11/2010 3:00	0.294	0.00	0.296	0.325	3/31/2010 3:00	0.303	0.03	0.361	0.356
4/11/2010 4:00	0.272	0.00	0.290	0.281	3/31/2010 4:00	0.290	0.00	0.354	0.378
4/11/2010 5:00	0.263	0.00	0.279	0.329	3/31/2010 5:00	0.314	0.00	0.373	0.351
4/11/2010 6:00	0.278	0.04	0.287	0.266	3/31/2010 6:00	0.405	0.00	0.448	0.359
4/11/2010 7:00	0.362	0.11	0.342	0.322	3/31/2010 7:00	0.660	0.00	0.696	0.496
4/11/2010 8:00	0.557	0.13	0.472	0.414	3/31/2010 8:00	0.770	0.00	0.823	0.728
4/11/2010 9:00	0.803	0.15	0.722	0.627	3/31/2010 9:00	0.782	0.00	0.786	0.742
4/11/2010 10:00	0.854	0.26	0.936	1.024	3/31/2010 10:00	0.751	0.00	0.740	0.805
4/11/2010 11:00	0.861	0.09	1.129	1.251	3/31/2010 11:00	0.729	0.00	0.743	0.796
4/11/2010 12:00	0.836	0.25	1.242	1.342	3/31/2010 12:00	0.701	0.00	0.721	0.758
4/11/2010 13:00	0.786	0.19	1.261	1.358	3/31/2010 13:00	0.674	0.00	0.659	0.714
4/11/2010 14:00	0.725	0.00	1.350	1.433	3/31/2010 14:00	0.643	0.07	0.641	0.677
4/11/2010 15:00	0.683	0.00	1.390	1.478	3/31/2010 15:00	0.619	0.22	0.623	0.724
4/11/2010 16:00	0.661	0.00	1.334	1.417	3/31/2010 16:00	0.601	0.20	0.668	0.683
4/11/2010 17:00	0.667	0.00	1.265	1.313	3/31/2010 17:00	0.622	0.11	0.867	0.815
4/11/2010 18:00	0.680	0.03	1.218	1.235	3/31/2010 18:00	0.660	0.03	0.963	0.937
4/11/2010 19:00	0.695	0.05	1.197	1.196	3/31/2010 19:00	0.706	0.00	1.034	1.090
4/11/2010 20:00	0.715	0.04	1.218	1.095	3/31/2010 20:00	0.735	0.00	1.032	1.077
4/11/2010 21:00	0.693	0.01	1.198	1.139	3/31/2010 21:00	0.731	0.00	0.950	1.059
4/11/2010 22:00	0.625	0.00	1.082	1.127	3/31/2010 22:00	0.664	0.00	0.865	0.920
4/11/2010 23:00	0.538	0.00	0.923	1.104	3/31/2010 23:00	0.561	0.00	0.758	0.867
4/12/2010 0:00	0.464	0.00	0.830	0.921	4/1/2010 0:00	0.464	0.00	0.640	0.739
4/12/2010 1:00	0.375	0.00	0.755	0.822	4/1/2010 1:00	0.375	0.00	0.547	0.692
4/12/2010 2:00	0.329	0.08	0.675	0.690	4/1/2010 2:00	0.329	0.00	0.458	0.569
4/12/2010 3:00	0.303	0.07	0.658	0.641	4/1/2010 3:00	0.303	0.00	0.447	0.514
4/12/2010 4:00	0.290	0.03	0.644	0.636	4/1/2010 4:00	0.290	0.00	0.442	0.480
4/12/2010 5:00	0.314	0.01	0.746	0.605	4/1/2010 5:00	0.314	0.00	0.458	0.482
4/12/2010 6:00	0.405	0.04	0.868	0.716	4/1/2010 6:00	0.405	0.00	0.557	0.460
4/12/2010 7:00	0.660	0.01	1.136	0.830	4/1/2010 7:00	0.660	0.00	0.808	0.528
4/12/2010 8:00	0.770	0.00	1.218	1.032	4/1/2010 8:00	0.770	0.00	0.902	0.706
4/12/2010 9:00	0.782	0.00	1.231	1.139	4/1/2010 9:00	0.782	0.00	0.869	0.861
4/12/2010 10:00	0.751	0.05	1.111	1.153	4/1/2010 10:00	0.751	0.00	0.822	0.825
4/12/2010 11:00	0.729	0.02	1.106	1.072	4/1/2010 11:00	0.729	0.00	0.812	0.896
4/12/2010 12:00	0.701	0.00	1.032	1.084	4/1/2010 12:00	0.701	0.00	0.749	0.825
4/12/2010 13:00	0.674	0.00	1.028	1.081	4/1/2010 13:00	0.674	0.00	0.693	0.809
4/12/2010 14:00	0.643	0.00	0.969	1.070	4/1/2010 14:00	0.643	0.00	0.686	0.731
4/12/2010 15:00	0.619	0.00	0.956	1.077	4/1/2010 15:00	0.619	0.00	0.660	0.782
4/12/2010 16:00	0.601	0.00	0.939	1.028	4/1/2010 16:00	0.601	0.00	0.680	0.736
4/12/2010 17:00	0.622	0.00	0.950	1.062	4/1/2010 17:00	0.622	0.00	0.703	0.762
4/12/2010 18:00	0.661	0.00	1.000	1.027	4/1/2010 18:00	0.661	0.00	0.751	0.759
4/12/2010 19:00	0.706	0.00	1.038	1.081	4/1/2010 19:00	0.706	0.00	0.816	0.827
4/12/2010 20:00	0.735	0.00	1.067	0.997	4/1/2010 20:00	0.735	0.00	0.807	0.764
4/12/2010 21:00	0.731	0.00	1.020	1.014	4/1/2010 21:00	0.731	0.00	0.811	0.783
4/12/2010 22:00	0.664	0.00	0.924	0.984	4/1/2010 22:00	0.664	0.00	0.722	0.746
4/12/2010 23:00	0.561	0.00	0.819	0.923	4/1/2010 23:00	0.561	0.00	0.612	0.567
4/13/2010 0:00	0.464	0.00	0.706	0.833					
4/13/2010 1:00	0.375	0.00	0.621	0.709					
4/13/2010 2:00	0.329	0.00	0.562	0.613					
4/13/2010 3:00	0.303	0.00	0.533	0.582					
4/13/2010 4:00	0.290	0.00	0.484	0.506					
4/13/2010 5:00	0.314	0.00	0.555	0.487					
4/13/2010 6:00	0.405	0.00	0.663	0.547					
4/13/2010 7:00	0.660	0.00	0.886	0.595					
4/13/2010 8:00	0.770	0.00	0.980	0.781					
4/13/2010 9:00	0.782	0.00	0.922	0.926					
4/13/2010 10:00	0.751	0.00	0.910	0.897					
4/13/2010 11:00	0.729	0.00	0.868	0.957					
4/13/2010 12:00	0.701	0.00	0.799	0.906					
4/13/2010 13:00	0.674	0.00	0.804	0.883					
4/13/2010 14:00	0.643	0.00	0.794	0.807					
4/13/2010 15:00	0.619	0.00	0.731	0.852					
4/13/2010 16:00	0.601	0.00	0.721	0.794					
4/13/2010 17:00	0.622	0.00	0.782	0.764					
4/13/2010 18:00	0.661	0.00	0.829	0.836					
4/13/2010 19:00	0.706	0.00	0.867	0.806					
4/13/2010 20:00	0.735	0.00	0.921	0.804					
4/13/2010 21:00	0.731	0.00	0.896	0.744					
4/13/2010 22:00	0.664	0.00	0.853	0.743					
4/13/2010 23:00	0.561	0.00	0.702	0.558					



Flow Meter 1 Wet Weather Calibration Plot (April 11 - 13, 2010)



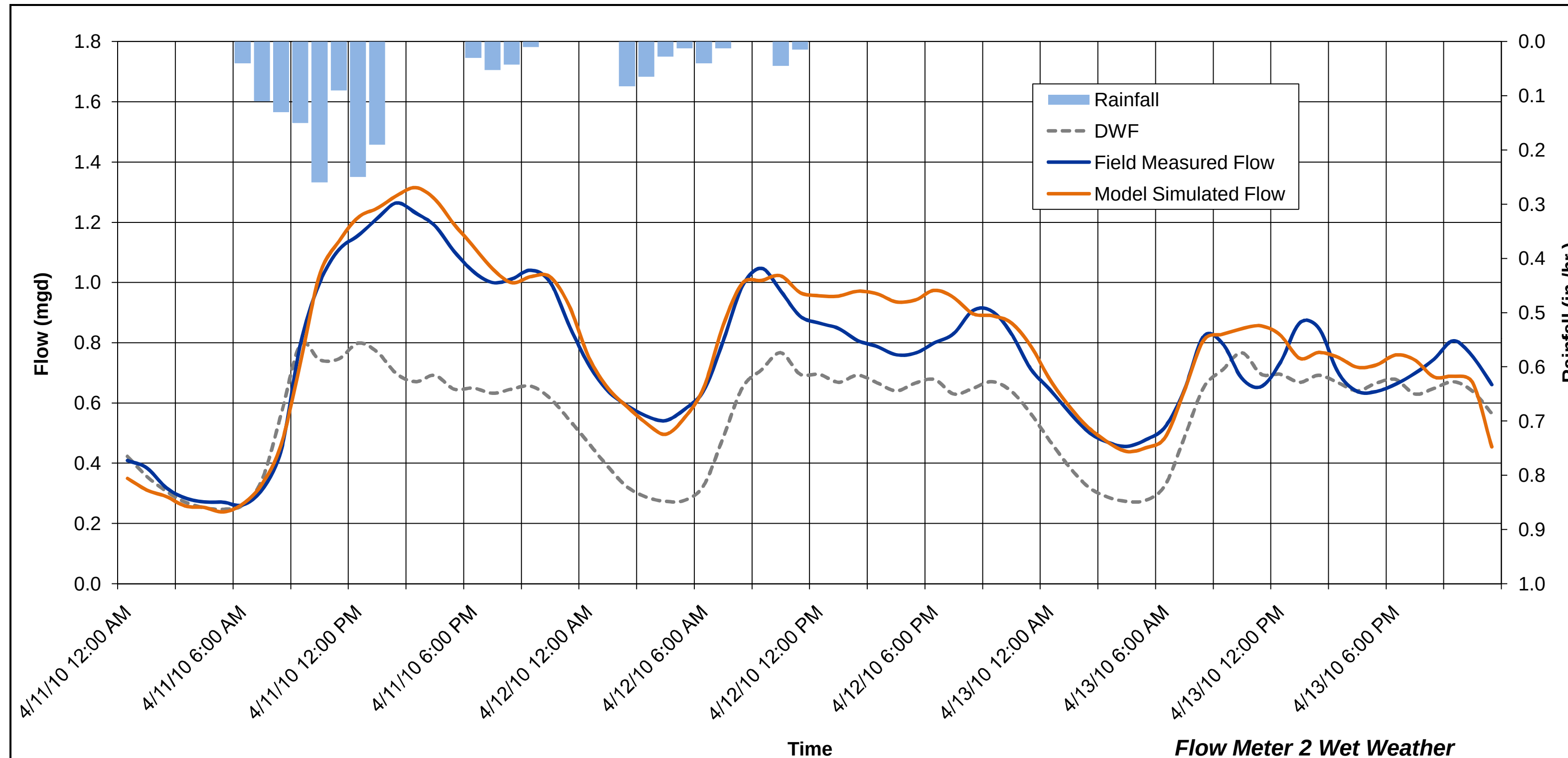
Flow Meter 1 Wet Weather Calibration Plot (March 31 - April 1, 2010)

City of Cotati
Sewer System Master Plan

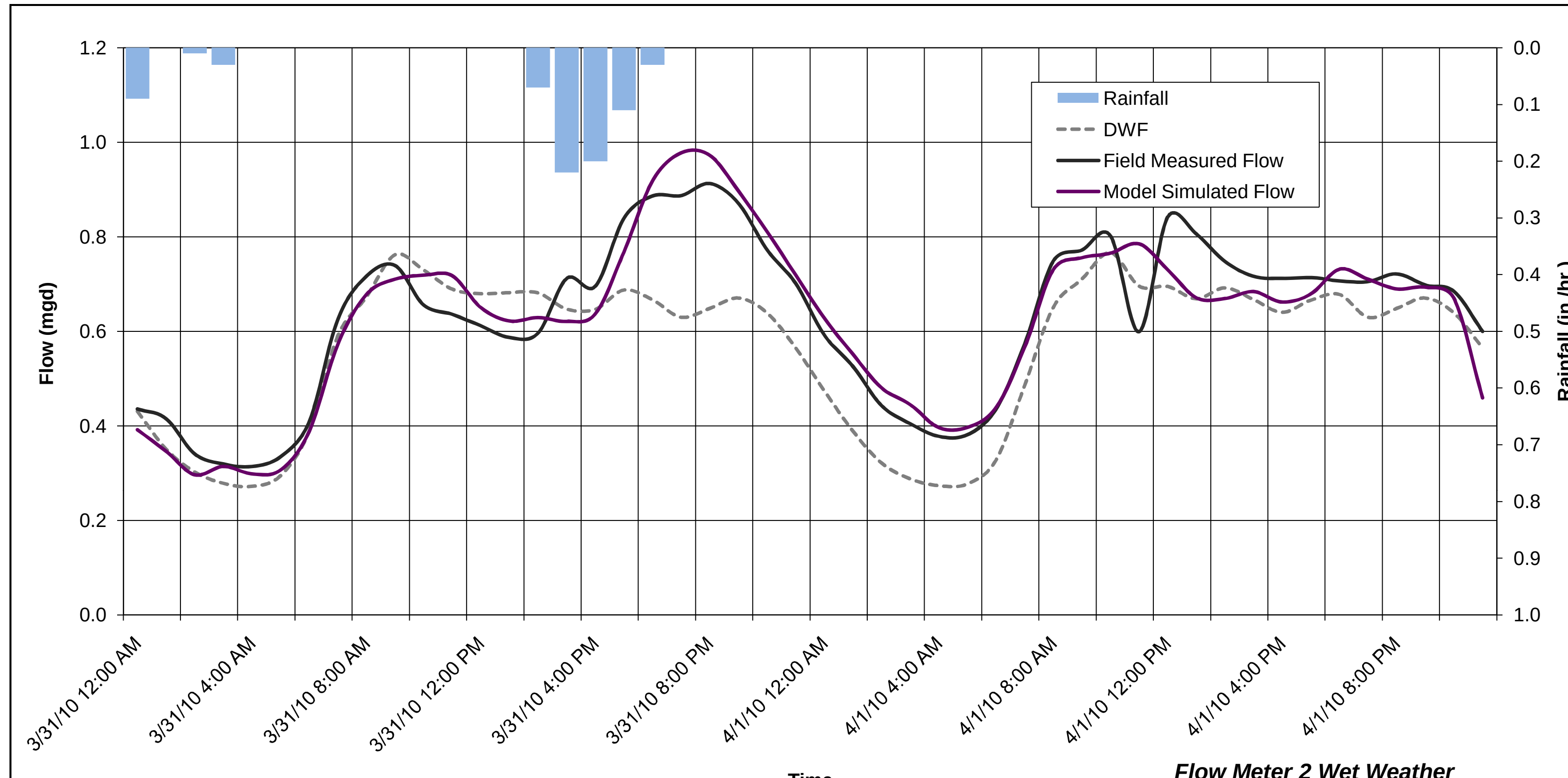
FLOW METER 2 WET WEATHER FLOW CALIBRATION SUMMARY

WWF Calibration Details

April 11 - 13, 2010 Event					March 31 - April 1, 2010 Event				
Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)	Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)
4/11/2010 0:00	0.423	0.00	0.409	0.349	3/31/2010 0:00	0.431	0.09	0.436	0.392
4/11/2010 1:00	0.357	0.00	0.385	0.310	3/31/2010 1:00	0.351	0.00	0.415	0.346
4/11/2010 2:00	0.308	0.00	0.320	0.289	3/31/2010 2:00	0.303	0.01	0.341	0.296
4/11/2010 3:00	0.271	0.00	0.285	0.258	3/31/2010 3:00	0.279	0.03	0.319	0.314
4/11/2010 4:00	0.252	0.00	0.272	0.252	3/31/2010 4:00	0.272	0.00	0.314	0.298
4/11/2010 5:00	0.247	0.00	0.271	0.238	3/31/2010 5:00	0.295	0.00	0.334	0.306
4/11/2010 6:00	0.261	0.04	0.261	0.264	3/31/2010 6:00	0.389	0.00	0.408	0.388
4/11/2010 7:00	0.346	0.11	0.313	0.330	3/31/2010 7:00	0.590	0.00	0.625	0.572
4/11/2010 8:00	0.564	0.13	0.444	0.462	3/31/2010 8:00	0.673	0.00	0.716	0.678
4/11/2010 9:00	0.795	0.15	0.796	0.734	3/31/2010 9:00	0.762	0.00	0.739	0.710
4/11/2010 10:00	0.743	0.26	1.000	1.026	3/31/2010 10:00	0.730	0.00	0.656	0.719
4/11/2010 11:00	0.746	0.09	1.109	1.137	3/31/2010 11:00	0.689	0.00	0.636	0.718
4/11/2010 12:00	0.799	0.25	1.156	1.216	3/31/2010 12:00	0.680	0.00	0.611	0.650
4/11/2010 13:00	0.769	0.19	1.213	1.247	3/31/2010 13:00	0.682	0.00	0.587	0.622
4/11/2010 14:00	0.697	0.00	1.265	1.288	3/31/2010 14:00	0.682	0.07	0.596	0.629
4/11/2010 15:00	0.671	0.00	1.231	1.315	3/31/2010 15:00	0.647	0.22	0.712	0.621
4/11/2010 16:00	0.692	0.00	1.189	1.276	3/31/2010 16:00	0.647	0.20	0.695	0.637
4/11/2010 17:00	0.646	0.00	1.104	1.193	3/31/2010 17:00	0.688	0.11	0.839	0.768
4/11/2010 18:00	0.650	0.03	1.037	1.120	3/31/2010 18:00	0.667	0.03	0.886	0.919
4/11/2010 19:00	0.632	0.05	1.000	1.045	3/31/2010 19:00	0.630	0.00	0.887	0.978
4/11/2010 20:00	0.646	0.04	1.012	0.999	3/31/2010 20:00	0.649	0.00	0.913	0.973
4/11/2010 21:00	0.656	0.01	1.041	1.020	3/31/2010 21:00	0.671	0.00	0.871	0.897
4/11/2010 22:00	0.615	0.00	1.001	1.019	3/31/2010 22:00	0.639	0.00	0.773	0.811
4/11/2010 23:00	0.543	0.00	0.856	0.921	3/31/2010 23:00	0.565	0.00	0.701	0.719
4/12/2010 0:00	0.466	0.00	0.728	0.753	4/1/2010 0:00	0.474	0.00	0.592	0.628
4/12/2010 1:00	0.389	0.00	0.640	0.649	4/1/2010 1:00	0.389	0.00	0.526	0.552
4/12/2010 2:00	0.322	0.08	0.591	0.588	4/1/2010 2:00	0.322	0.00	0.443	0.480
4/12/2010 3:00	0.288	0.07	0.557	0.532	4/1/2010 3:00	0.288	0.00	0.405	0.445
4/12/2010 4:00	0.273	0.03	0.542	0.496	4/1/2010 4:00	0.273	0.00	0.378	0.396
4/12/2010 5:00	0.277	0.01	0.580	0.551	4/1/2010 5:00	0.277	0.00	0.381	0.397
4/12/2010 6:00	0.328	0.04	0.643	0.652	4/1/2010 6:00	0.328	0.00	0.435	0.439
4/12/2010 7:00	0.486	0.01	0.806	0.857	4/1/2010 7:00	0.486	0.00	0.573	0.566
4/12/2010 8:00	0.651	0.00	0.988	0.998	4/1/2010 8:00	0.651	0.00	0.748	0.730
4/12/2010 9:00	0.711	0.00	1.047	1.007	4/1/2010 9:00	0.711	0.00	0.772	0.756
4/12/2010 10:00	0.767	0.05	0.972	1.022	4/1/2010 10:00	0.767	0.00	0.802	0.765
4/12/2010 11:00	0.696	0.02	0.889	0.967	4/1/2010 11:00	0.696	0.00	0.599	0.785
4/12/2010 12:00	0.695	0.00	0.865	0.956	4/1/2010 12:00	0.695	0.00	0.842	0.730
4/12/2010 13:00	0.669	0.00	0.848	0.955	4/1/2010 13:00	0.669	0.00	0.806	0.671
4/12/2010 14:00	0.692	0.00	0.807	0.971	4/1/2010 14:00	0.692	0.00	0.748	0.669
4/12/2010 15:00	0.667	0.00	0.788	0.963	4/1/2010 15:00	0.667	0.00	0.716	0.684
4/12/2010 16:00	0.640	0.00	0.761	0.936	4/1/2010 16:00	0.640	0.00	0.712	0.662
4/12/2010 17:00	0.666	0.00	0.766	0.942	4/1/2010 17:00	0.666	0.00	0.714	0.679
4/12/2010 18:00	0.678	0.00	0.800	0.974	4/1/2010 18:00	0.678	0.00	0.707	0.732
4/12/2010 19:00	0.630	0.00	0.831	0.950	4/1/2010 19:00	0.630	0.00	0.705	0.710
4/12/2010 20:00	0.649	0.00	0.907	0.896	4/1/2010 20:00	0.649	0.00	0.721	0.690
4/12/2010 21:00	0.671	0.00	0.905	0.890	4/1/2010 21:00	0.671	0.00	0.698	0.693
4/12/2010 22:00	0.639	0.00	0.830	0.866	4/1/2010 22:00	0.639	0.00	0.684	0.670
4/12/2010 23:00	0.565	0.00	0.714	0.790	4/1/2010 23:00	0.565	0.00	0.600	0.459
4/13/2010 0:00	0.474	0.00	0.645	0.678					
4/13/2010 1:00	0.389	0.00	0.571	0.589					
4/13/2010 2:00	0.322	0.00	0.504	0.519					
4/13/2010 3:00	0.288	0.00	0.470	0.470					
4/13/2010 4:00	0.273	0.00	0.456	0.438					
4/13/2010 5:00	0.277	0.00	0.478	0.451					
4/13/2010 6:00	0.328	0.00	0.521	0.485					
4/13/2010 7:00	0.486	0.00	0.643	0.640					
4/13/2010 8:00	0.651	0.00	0.821	0.808					
4/13/2010 9:00	0.711	0.00	0.797	0.828					
4/13/2010 10:00	0.767	0.00	0.682	0.847					
4/13/2010 11:00	0.696	0.00	0.655	0.856					
4/13/2010 12:00	0.695	0.00	0.735	0.825					
4/13/2010 13:00	0.669	0.00	0.866	0.748					
4/13/2010 14:00	0.692	0.00	0.848	0.768					
4/13/2010 15:00	0.667	0.00	0.702	0.751					
4/13/2010 16:00	0.640	0.00	0.638	0.719					
4/13/2010 17:00	0.666	0.00	0.639	0.726					
4/13/2010 18:00	0.678	0.00	0.662	0.759					
4/13/2010 19:00	0.630	0.00	0.699	0.742					
4/13/2010 20:00	0.649	0.00	0.746	0.686					
4/13/2010 21:00	0.671	0.00	0.807	0.688					
4/13/2010 22:00	0.639	0.00	0.755	0.667					
4/13/2010 23:00	0.565	0.00	0.661	0.454					



Flow Meter 2 Wet Weather Calibration Plot (April 11 - 13, 2010)



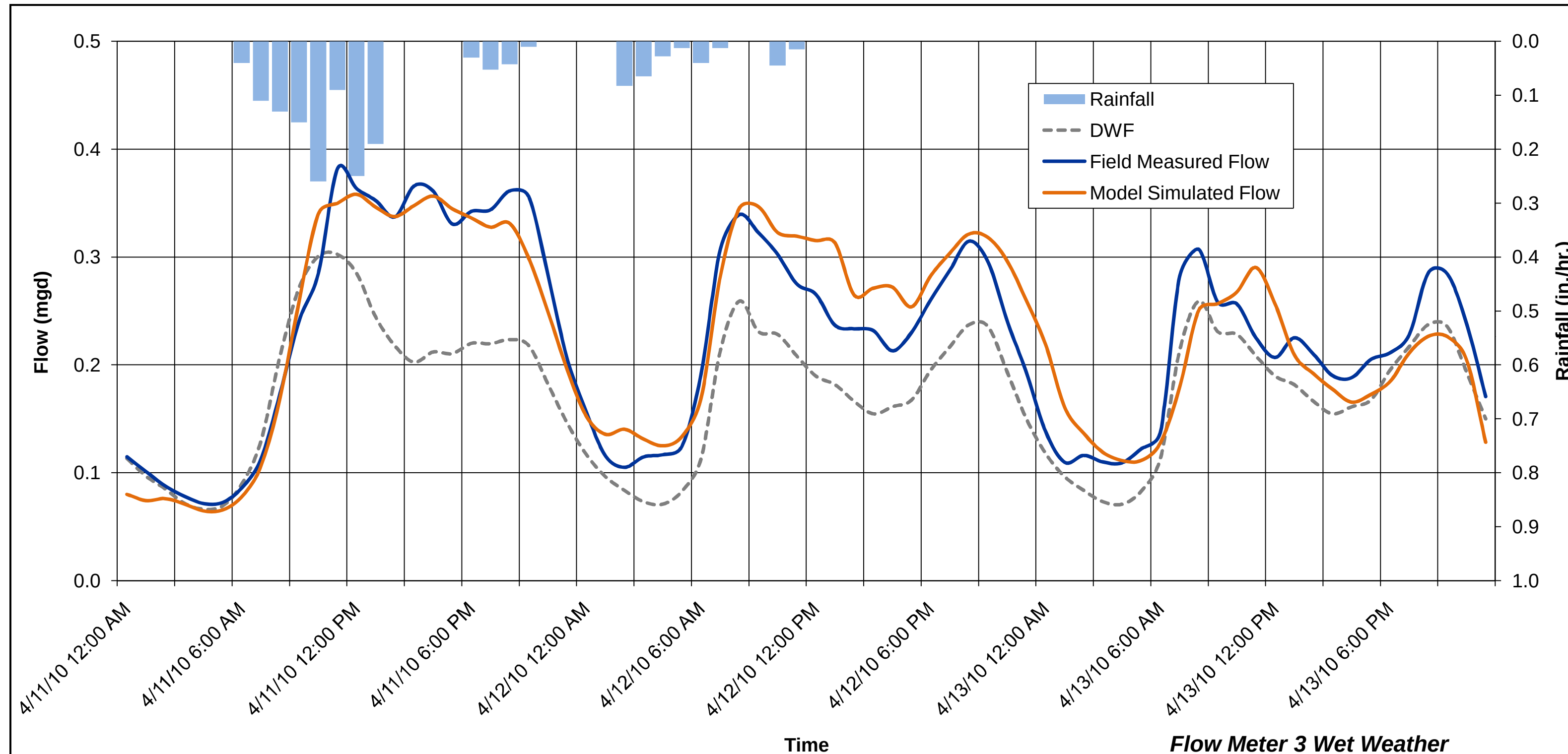
Flow Meter 2 Wet Weather Calibration Plot (March 31 - April 1, 2010)

City of Cotati
Sewer System Master Plan

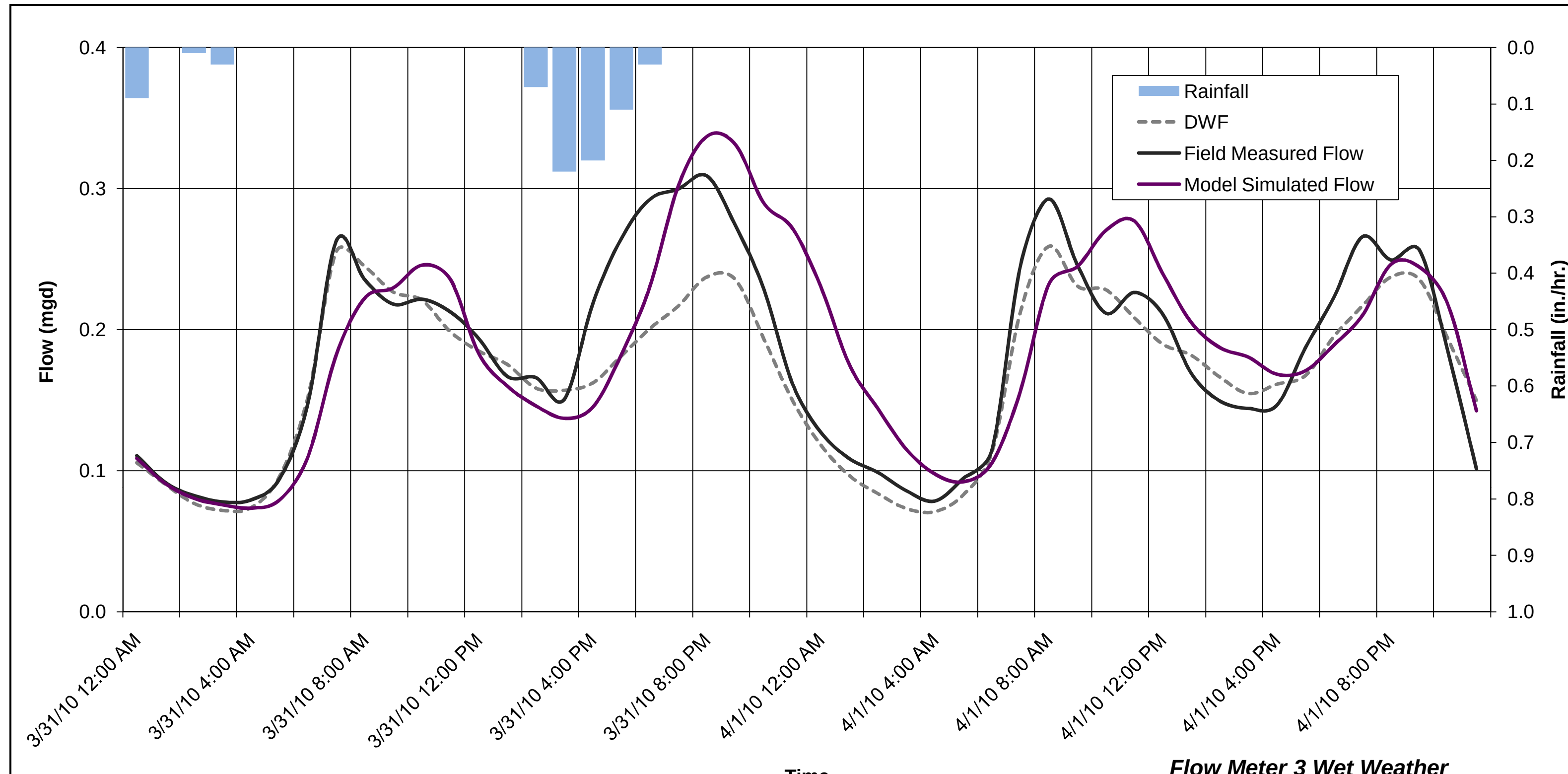
FLOW METER 3 WET WEATHER FLOW CALIBRATION SUMMARY

WWF Calibration Details

April 11 - 13, 2010 Event					March 31 - April 1, 2010 Event				
Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)	Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)
4/11/2010 0:00	0.113	0.00	0.115	0.080	3/31/2010 0:00	0.106	0.09	0.111	0.109
4/11/2010 1:00	0.097	0.00	0.101	0.074	3/31/2010 1:00	0.090	0.00	0.092	0.091
4/11/2010 2:00	0.085	0.00	0.088	0.076	3/31/2010 2:00	0.077	0.01	0.082	0.080
4/11/2010 3:00	0.072	0.00	0.078	0.071	3/31/2010 3:00	0.072	0.03	0.078	0.076
4/11/2010 4:00	0.066	0.00	0.071	0.065	3/31/2010 4:00	0.074	0.00	0.079	0.074
4/11/2010 5:00	0.069	0.00	0.072	0.065	3/31/2010 5:00	0.096	0.00	0.094	0.079
4/11/2010 6:00	0.090	0.04	0.086	0.078	3/31/2010 6:00	0.152	0.00	0.147	0.110
4/11/2010 7:00	0.129	0.11	0.113	0.106	3/31/2010 7:00	0.255	0.00	0.263	0.182
4/11/2010 8:00	0.208	0.13	0.174	0.170	3/31/2010 8:00	0.245	0.00	0.235	0.222
4/11/2010 9:00	0.272	0.15	0.241	0.260	3/31/2010 9:00	0.227	0.00	0.218	0.230
4/11/2010 10:00	0.301	0.26	0.285	0.340	3/31/2010 10:00	0.221	0.00	0.222	0.246
4/11/2010 11:00	0.302	0.09	0.382	0.350	3/31/2010 11:00	0.198	0.00	0.213	0.236
4/11/2010 12:00	0.285	0.25	0.363	0.358	3/31/2010 12:00	0.185	0.00	0.194	0.183
4/11/2010 13:00	0.244	0.19	0.352	0.346	3/31/2010 13:00	0.175	0.00	0.167	0.160
4/11/2010 14:00	0.218	0.00	0.337	0.338	3/31/2010 14:00	0.158	0.07	0.166	0.146
4/11/2010 15:00	0.202	0.00	0.366	0.348	3/31/2010 15:00	0.157	0.22	0.151	0.137
4/11/2010 16:00	0.212	0.00	0.361	0.356	3/31/2010 16:00	0.162	0.20	0.219	0.145
4/11/2010 17:00	0.210	0.00	0.331	0.345	3/31/2010 17:00	0.181	0.11	0.265	0.182
4/11/2010 18:00	0.220	0.03	0.342	0.336	3/31/2010 18:00	0.201	0.03	0.293	0.230
4/11/2010 19:00	0.220	0.05	0.344	0.328	3/31/2010 19:00	0.217	0.00	0.300	0.302
4/11/2010 20:00	0.223	0.04	0.361	0.331	3/31/2010 20:00	0.237	0.00	0.309	0.337
4/11/2010 21:00	0.218	0.01	0.356	0.299	3/31/2010 21:00	0.235	0.00	0.274	0.331
4/11/2010 22:00	0.182	0.00	0.283	0.249	3/31/2010 22:00	0.193	0.00	0.229	0.290
4/11/2010 23:00	0.146	0.00	0.206	0.196	3/31/2010 23:00	0.150	0.00	0.162	0.272
4/12/2010 0:00	0.117	0.00	0.157	0.153	4/1/2010 0:00	0.118	0.00	0.127	0.230
4/12/2010 1:00	0.096	0.00	0.116	0.136	4/1/2010 1:00	0.096	0.00	0.109	0.175
4/12/2010 2:00	0.084	0.08	0.105	0.140	4/1/2010 2:00	0.084	0.00	0.099	0.144
4/12/2010 3:00	0.073	0.07	0.115	0.131	4/1/2010 3:00	0.073	0.00	0.086	0.115
4/12/2010 4:00	0.071	0.03	0.117	0.125	4/1/2010 4:00	0.071	0.00	0.078	0.098
4/12/2010 5:00	0.083	0.01	0.124	0.134	4/1/2010 5:00	0.083	0.00	0.095	0.092
4/12/2010 6:00	0.113	0.04	0.192	0.169	4/1/2010 6:00	0.113	0.00	0.115	0.106
4/12/2010 7:00	0.212	0.01	0.307	0.282	4/1/2010 7:00	0.212	0.00	0.245	0.157
4/12/2010 8:00	0.259	0.00	0.339	0.345	4/1/2010 8:00	0.259	0.00	0.293	0.232
4/12/2010 9:00	0.231	0.00	0.323	0.347	4/1/2010 9:00	0.231	0.00	0.246	0.245
4/12/2010 10:00	0.228	0.05	0.303	0.323	4/1/2010 10:00	0.228	0.00	0.212	0.270
4/12/2010 11:00	0.208	0.02	0.275	0.319	4/1/2010 11:00	0.208	0.00	0.226	0.277
4/12/2010 12:00	0.190	0.00	0.265	0.315	4/1/2010 12:00	0.190	0.00	0.211	0.239
4/12/2010 13:00	0.182	0.00	0.237	0.313	4/1/2010 13:00	0.182	0.00	0.169	0.205
4/12/2010 14:00	0.166	0.00	0.233	0.265	4/1/2010 14:00	0.166	0.00	0.149	0.187
4/12/2010 15:00	0.155	0.00	0.232	0.271	4/1/2010 15:00	0.155	0.00	0.144	0.180
4/12/2010 16:00	0.161	0.00	0.213	0.272	4/1/2010 16:00	0.161	0.00	0.146	0.168
4/12/2010 17:00	0.167	0.00	0.230	0.254	4/1/2010 17:00	0.167	0.00	0.187	0.171
4/12/2010 18:00	0.195	0.00	0.260	0.283	4/1/2010 18:00	0.195	0.00	0.223	0.189
4/12/2010 19:00	0.217	0.00	0.288	0.304	4/1/2010 19:00	0.217	0.00	0.266	0.210
4/12/2010 20:00	0.237	0.00	0.315	0.321	4/1/2010 20:00	0.237	0.00	0.249	0.246
4/12/2010 21:00	0.235	0.00	0.295	0.318	4/1/2010 21:00	0.235	0.00	0.256	0.244
4/12/2010 22:00	0.193	0.00	0.241	0.296	4/1/2010 22:00	0.193	0.00	0.184	0.218
4/12/2010 23:00	0.150	0.00	0.193	0.260	4/1/2010 23:00	0.150	0.00	0.101	0.142
4/13/2010 0:00	0.118	0.00	0.138	0.219					
4/13/2010 1:00	0.096	0.00	0.110	0.161					
4/13/2010 2:00	0.084	0.00	0.116	0.136					
4/13/2010 3:00	0.073	0.00	0.110	0.119					
4/13/2010 4:00	0.071	0.00	0.109	0.111					
4/13/2010 5:00	0.083	0.00	0.122	0.111					
4/13/2010 6:00	0.113	0.00	0.137	0.128					
4/13/2010 7:00	0.212	0.00	0.281	0.178					
4/13/2010 8:00	0.259	0.00	0.307	0.250					
4/13/2010 9:00	0.231	0.00	0.258	0.257					
4/13/2010 10:00	0.228	0.00	0.257	0.268					
4/13/2010 11:00	0.208	0.00	0.225	0.290					
4/13/2010 12:00	0.190	0.00	0.207	0.256					
4/13/2010 13:00	0.182	0.00	0.225	0.209					
4/13/2010 14:00	0.166	0.00	0.210	0.192					
4/13/2010 15:00	0.155	0.00	0.190	0.177					
4/13/2010 16:00	0.161	0.00	0.188	0.165					
4/13/2010 17:00	0.167	0.00	0.205	0.173					
4/13/2010 18:00	0.195	0.00	0.211	0.184					
4/13/2010 19:00	0.217	0.00	0.228	0.211					
4/13/2010 20:00	0.237	0.00	0.285	0.226					
4/13/2010 21:00	0.235	0.00	0.284	0.226					
4/13/2010 22:00	0.193	0.00	0.238	0.205					
4/13/2010 23:00	0.150	0.00	0.171	0.128					



Flow Meter 3 Wet Weather Calibration Plot (April 11 - 13, 2010)

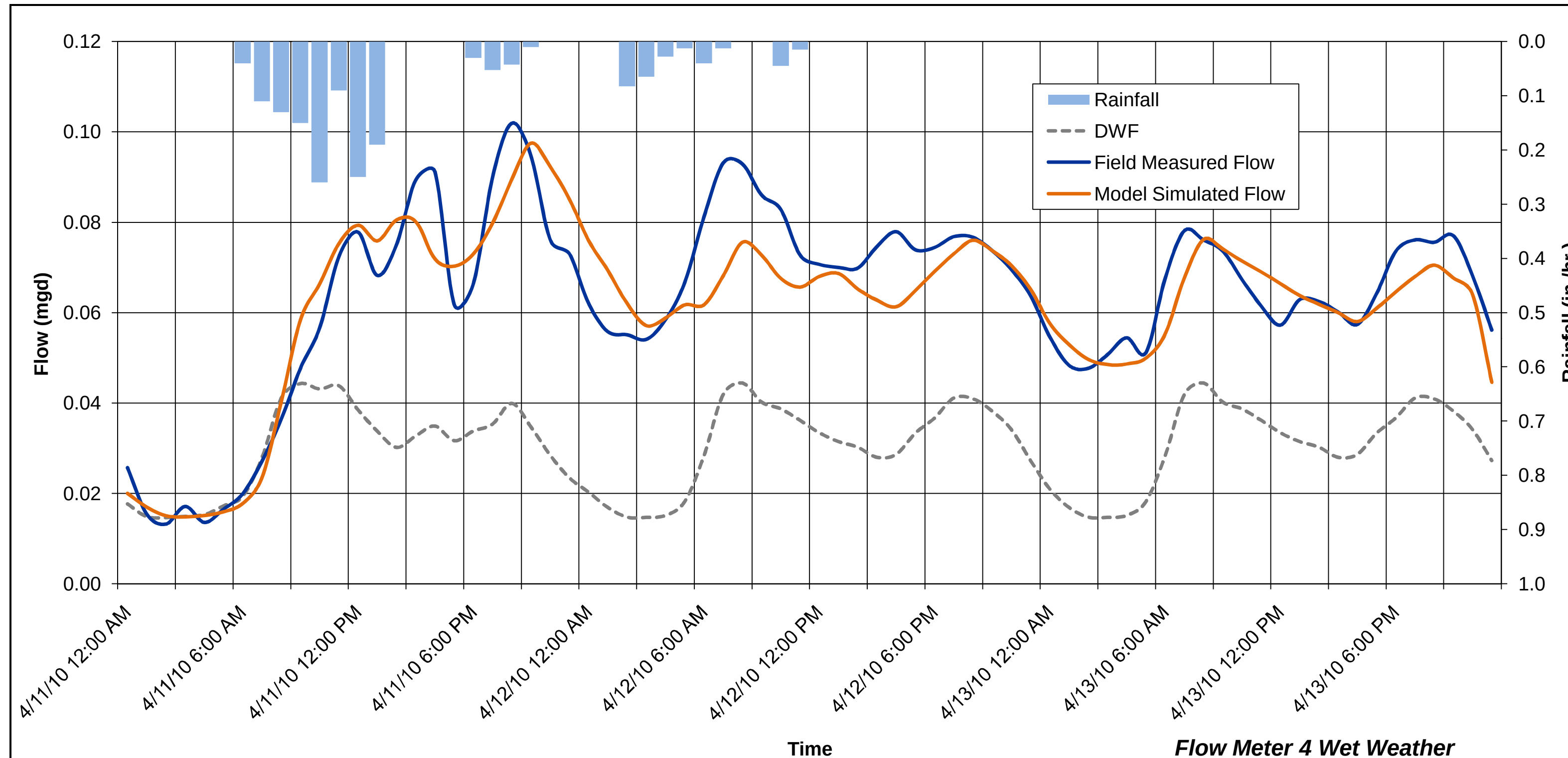


Flow Meter 3 Wet Weather Calibration Plot (March 31 - April 1, 2010)

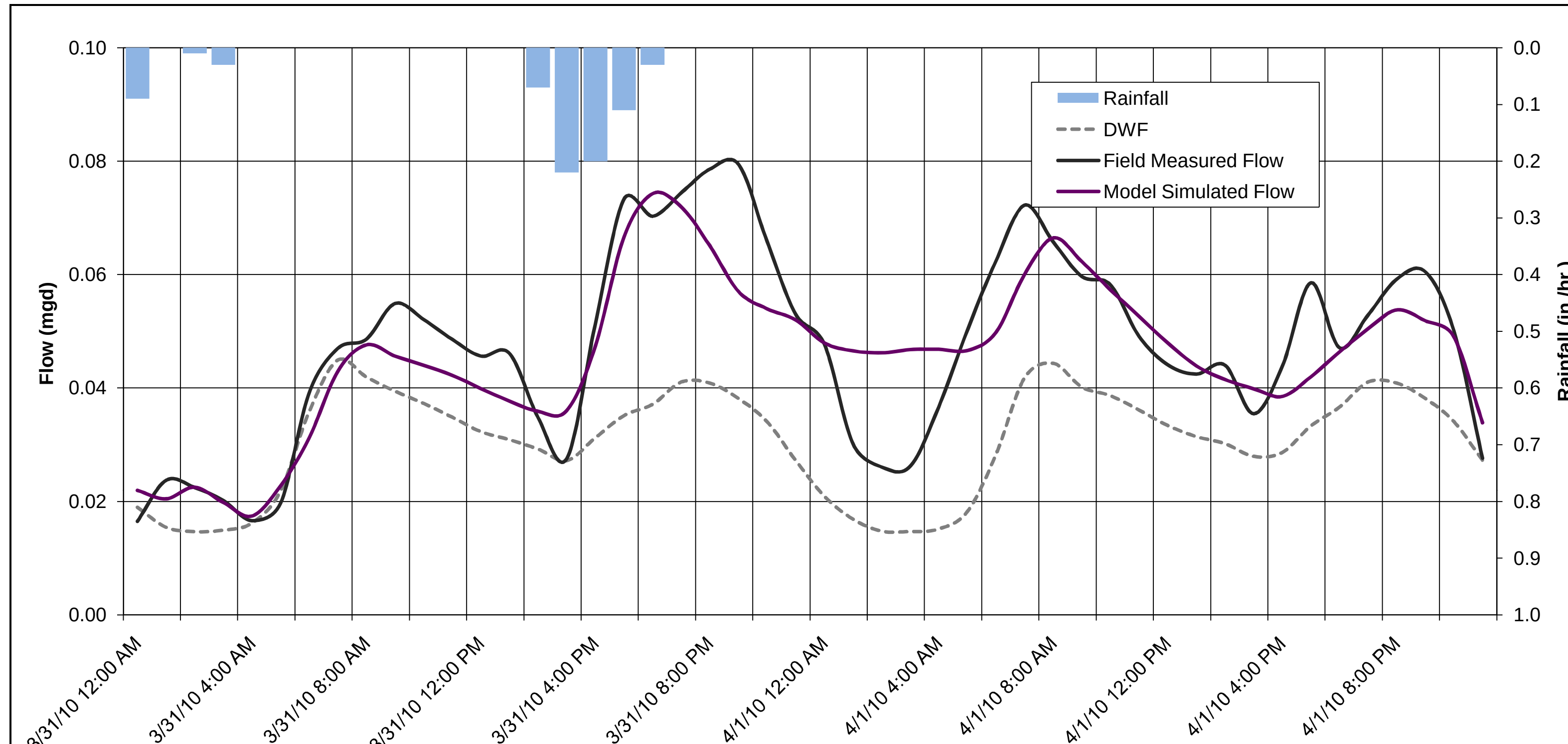
FLOW METER 4 WET WEATHER FLOW CALIBRATION SUMMARY

WWF Calibration Details

April 11 - 13, 2010 Event					March 31 - April 1, 2010 Event				
Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)	Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)
4/11/2010 0:00	0.018	0.00	0.026	0.020	3/31/2010 0:00	0.019	0.09	0.016	0.022
4/11/2010 1:00	0.015	0.00	0.015	0.017	3/31/2010 1:00	0.015	0.00	0.024	0.020
4/11/2010 2:00	0.015	0.00	0.013	0.015	3/31/2010 2:00	0.015	0.01	0.022	0.023
4/11/2010 3:00	0.015	0.00	0.017	0.015	3/31/2010 3:00	0.015	0.03	0.020	0.020
4/11/2010 4:00	0.015	0.00	0.014	0.015	3/31/2010 4:00	0.016	0.00	0.017	0.017
4/11/2010 5:00	0.017	0.00	0.017	0.016	3/31/2010 5:00	0.022	0.00	0.020	0.023
4/11/2010 6:00	0.019	0.04	0.020	0.018	3/31/2010 6:00	0.036	0.00	0.039	0.031
4/11/2010 7:00	0.028	0.11	0.027	0.023	3/31/2010 7:00	0.045	0.00	0.047	0.043
4/11/2010 8:00	0.041	0.13	0.036	0.040	3/31/2010 8:00	0.042	0.00	0.049	0.048
4/11/2010 9:00	0.044	0.15	0.048	0.058	3/31/2010 9:00	0.039	0.00	0.055	0.046
4/11/2010 10:00	0.043	0.26	0.057	0.066	3/31/2010 10:00	0.037	0.00	0.052	0.044
4/11/2010 11:00	0.044	0.09	0.072	0.075	3/31/2010 11:00	0.035	0.00	0.049	0.042
4/11/2010 12:00	0.038	0.25	0.078	0.079	3/31/2010 12:00	0.032	0.00	0.046	0.040
4/11/2010 13:00	0.034	0.19	0.068	0.076	3/31/2010 13:00	0.031	0.00	0.046	0.038
4/11/2010 14:00	0.030	0.00	0.075	0.081	3/31/2010 14:00	0.029	0.07	0.035	0.036
4/11/2010 15:00	0.033	0.00	0.089	0.080	3/31/2010 15:00	0.027	0.22	0.028	0.036
4/11/2010 16:00	0.035	0.00	0.091	0.072	3/31/2010 16:00	0.031	0.20	0.051	0.047
4/11/2010 17:00	0.032	0.00	0.062	0.070	3/31/2010 17:00	0.035	0.11	0.073	0.067
4/11/2010 18:00	0.034	0.03	0.066	0.073	3/31/2010 18:00	0.037	0.03	0.070	0.074
4/11/2010 19:00	0.035	0.05	0.090	0.080	3/31/2010 19:00	0.041	0.00	0.074	0.072
4/11/2010 20:00	0.040	0.04	0.102	0.090	3/31/2010 20:00	0.041	0.00	0.079	0.065
4/11/2010 21:00	0.035	0.01	0.095	0.098	3/31/2010 21:00	0.038	0.00	0.079	0.057
4/11/2010 22:00	0.028	0.00	0.076	0.092	3/31/2010 22:00	0.034	0.00	0.066	0.054
4/11/2010 23:00	0.023	0.00	0.073	0.085	3/31/2010 23:00	0.027	0.00	0.053	0.052
4/12/2010 0:00	0.020	0.00	0.062	0.076	4/1/2010 0:00	0.021	0.00	0.048	0.048
4/12/2010 1:00	0.017	0.00	0.056	0.069	4/1/2010 1:00	0.017	0.00	0.030	0.047
4/12/2010 2:00	0.015	0.08	0.055	0.062	4/1/2010 2:00	0.015	0.00	0.026	0.046
4/12/2010 3:00	0.015	0.07	0.054	0.057	4/1/2010 3:00	0.015	0.00	0.026	0.047
4/12/2010 4:00	0.015	0.03	0.058	0.059	4/1/2010 4:00	0.015	0.00	0.037	0.047
4/12/2010 5:00	0.018	0.01	0.067	0.062	4/1/2010 5:00	0.018	0.00	0.050	0.047
4/12/2010 6:00	0.028	0.04	0.081	0.062	4/1/2010 6:00	0.028	0.00	0.062	0.050
4/12/2010 7:00	0.042	0.01	0.093	0.068	4/1/2010 7:00	0.042	0.00	0.072	0.060
4/12/2010 8:00	0.044	0.00	0.093	0.076	4/1/2010 8:00	0.044	0.00	0.066	0.066
4/12/2010 9:00	0.040	0.00	0.086	0.073	4/1/2010 9:00	0.040	0.00	0.060	0.062
4/12/2010 10:00	0.039	0.05	0.083	0.068	4/1/2010 10:00	0.039	0.00	0.058	0.057
4/12/2010 11:00	0.036	0.02	0.073	0.066	4/1/2010 11:00	0.036	0.00	0.049	0.053
4/12/2010 12:00	0.033	0.00	0.071	0.068	4/1/2010 12:00	0.033	0.00	0.044	0.048
4/12/2010 13:00	0.031	0.00	0.070	0.069	4/1/2010 13:00	0.031	0.00	0.042	0.044
4/12/2010 14:00	0.030	0.00	0.070	0.065	4/1/2010 14:00	0.030	0.00	0.044	0.041
4/12/2010 15:00	0.028	0.00	0.075	0.063	4/1/2010 15:00	0.028	0.00	0.035	0.040
4/12/2010 16:00	0.029	0.00	0.078	0.061	4/1/2010 16:00	0.029	0.00	0.044	0.039
4/12/2010 17:00	0.033	0.00	0.074	0.065	4/1/2010 17:00	0.033	0.00	0.059	0.042
4/12/2010 18:00	0.037	0.00	0.074	0.069	4/1/2010 18:00	0.037	0.00	0.047	0.046
4/12/2010 19:00	0.041	0.00	0.077	0.073	4/1/2010 19:00	0.041	0.00	0.053	0.050
4/12/2010 20:00	0.041	0.00	0.077	0.076	4/1/2010 20:00	0.041	0.00	0.059	0.054
4/12/2010 21:00	0.038	0.00	0.074	0.074	4/1/2010 21:00	0.038	0.00	0.061	0.052
4/12/2010 22:00	0.034	0.00	0.070	0.070	4/1/2010 22:00	0.034	0.00	0.050	0.049
4/12/2010 23:00	0.027	0.00	0.064	0.065	4/1/2010 23:00	0.027	0.00	0.028	0.034
4/13/2010 0:00	0.021	0.00	0.055	0.058					
4/13/2010 1:00	0.017	0.00	0.048	0.053					
4/13/2010 2:00	0.015	0.00	0.048	0.050					
4/13/2010 3:00	0.015	0.00	0.051	0.048					
4/13/2010 4:00	0.015	0.00	0.054	0.049					
4/13/2010 5:00	0.018	0.00	0.051	0.050					
4/13/2010 6:00	0.028	0.00	0.068	0.055					
4/13/2010 7:00	0.042	0.00	0.078	0.068					
4/13/2010 8:00	0.044	0.00	0.076	0.076					
4/13/2010 9:00	0.040	0.00	0.074	0.074					
4/13/2010 10:00	0.039	0.00	0.067	0.071					
4/13/2010 11:00	0.036	0.00	0.061	0.069					
4/13/2010 12:00	0.033	0.00	0.057	0.066					
4/13/2010 13:00	0.031	0.00	0.063	0.064					
4/13/2010 14:00	0.030	0.00	0.062	0.062					
4/13/2010 15:00	0.028	0.00	0.060	0.060					
4/13/2010 16:00	0.029	0.00	0.057	0.058					
4/13/2010 17:00	0.033	0.00	0.064	0.061					
4/13/2010 18:00	0.037	0.00	0.074	0.065					
4/13/2010 19:00	0.041	0.00	0.076	0.068					
4/13/2010 20:00	0.041	0.00	0.076	0.071					
4/13/2010 21:00	0.038	0.00	0.077	0.068					
4/13/2010 22:00	0.034	0.00	0.068	0.064					
4/13/2010 23:00	0.027	0.00	0.056	0.045					



Flow Meter 4 Wet Weather Calibration Plot (April 11 - 13, 2010)



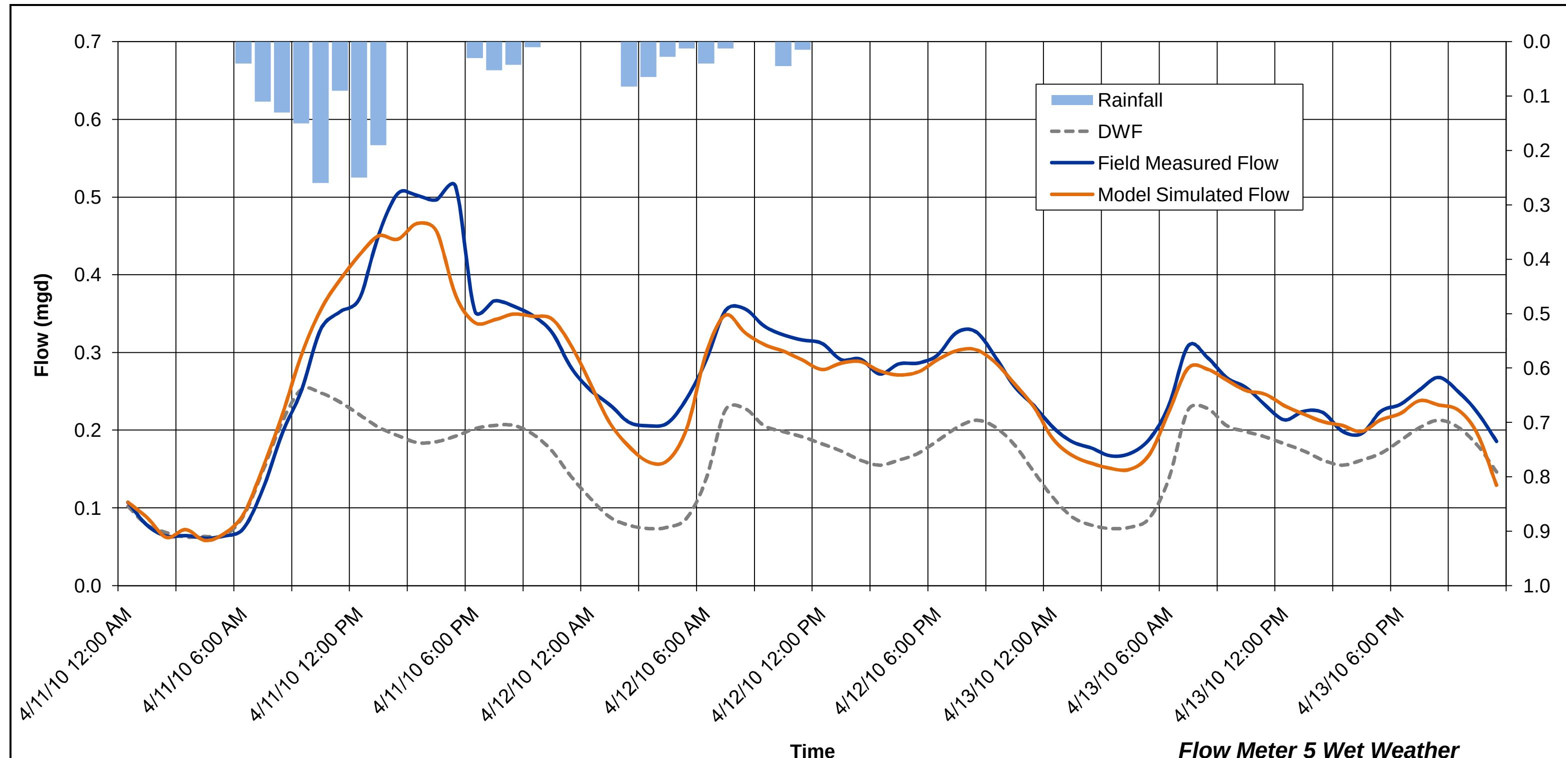
Flow Meter 4 Wet Weather Calibration Plot (March 31 - April 1, 2010)

City of Cotati
Sewer System Master Plan

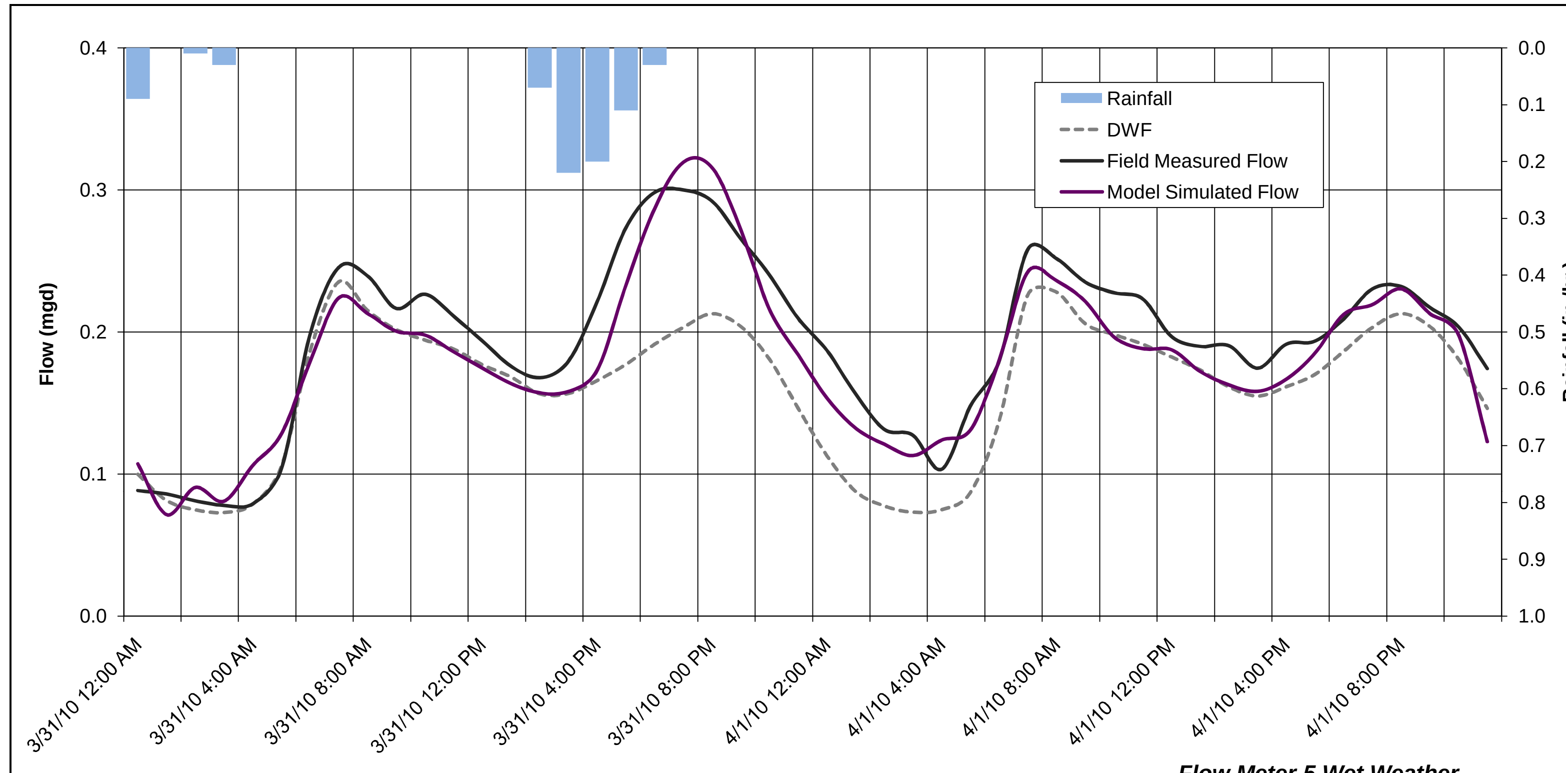
FLOW METER 5 WET WEATHER FLOW CALIBRATION SUMMARY

WWF Calibration Details

April 11 - 13, 2010 Event					March 31 - April 1, 2010 Event				
Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)	Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)
4/11/2010 0:00	0.102	0.00	0.107	0.107	3/31/2010 0:00	0.100	0.09	0.088	0.107
4/11/2010 1:00	0.078	0.00	0.077	0.087	3/31/2010 1:00	0.081	0.00	0.086	0.071
4/11/2010 2:00	0.068	0.00	0.063	0.062	3/31/2010 2:00	0.075	0.01	0.081	0.091
4/11/2010 3:00	0.062	0.00	0.064	0.072	3/31/2010 3:00	0.073	0.03	0.078	0.081
4/11/2010 4:00	0.063	0.00	0.061	0.058	3/31/2010 4:00	0.079	0.00	0.079	0.106
4/11/2010 5:00	0.064	0.00	0.064	0.067	3/31/2010 5:00	0.105	0.00	0.104	0.128
4/11/2010 6:00	0.090	0.04	0.074	0.092	3/31/2010 6:00	0.187	0.00	0.198	0.179
4/11/2010 7:00	0.147	0.11	0.124	0.151	3/31/2010 7:00	0.235	0.00	0.245	0.224
4/11/2010 8:00	0.210	0.13	0.196	0.219	3/31/2010 8:00	0.215	0.00	0.239	0.213
4/11/2010 9:00	0.252	0.15	0.251	0.297	3/31/2010 9:00	0.202	0.00	0.217	0.201
4/11/2010 10:00	0.248	0.26	0.330	0.355	3/31/2010 10:00	0.194	0.00	0.227	0.198
4/11/2010 11:00	0.236	0.09	0.352	0.394	3/31/2010 11:00	0.188	0.00	0.211	0.186
4/11/2010 12:00	0.220	0.25	0.369	0.425	3/31/2010 12:00	0.177	0.00	0.194	0.175
4/11/2010 13:00	0.204	0.19	0.451	0.450	3/31/2010 13:00	0.168	0.00	0.176	0.164
4/11/2010 14:00	0.193	0.00	0.505	0.446	3/31/2010 14:00	0.156	0.07	0.168	0.157
4/11/2010 15:00	0.184	0.00	0.502	0.466	3/31/2010 15:00	0.157	0.22	0.179	0.158
4/11/2010 16:00	0.185	0.00	0.496	0.456	3/31/2010 16:00	0.166	0.20	0.221	0.173
4/11/2010 17:00	0.192	0.00	0.514	0.374	3/31/2010 17:00	0.177	0.11	0.273	0.233
4/11/2010 18:00	0.202	0.03	0.353	0.338	3/31/2010 18:00	0.191	0.03	0.298	0.287
4/11/2010 19:00	0.206	0.05	0.366	0.342	3/31/2010 19:00	0.203	0.00	0.300	0.320
4/11/2010 20:00	0.206	0.04	0.360	0.349	3/31/2010 20:00	0.213	0.00	0.292	0.316
4/11/2010 21:00	0.195	0.01	0.347	0.346	3/31/2010 21:00	0.204	0.00	0.265	0.272
4/11/2010 22:00	0.173	0.00	0.326	0.343	3/31/2010 22:00	0.181	0.00	0.240	0.216
4/11/2010 23:00	0.140	0.00	0.280	0.309	3/31/2010 23:00	0.146	0.00	0.209	0.184
4/12/2010 0:00	0.112	0.00	0.252	0.259	4/1/2010 0:00	0.113	0.00	0.187	0.154
4/12/2010 1:00	0.088	0.00	0.233	0.209	4/1/2010 1:00	0.088	0.00	0.156	0.132
4/12/2010 2:00	0.078	0.08	0.210	0.179	4/1/2010 2:00	0.078	0.00	0.131	0.121
4/12/2010 3:00	0.073	0.07	0.206	0.159	4/1/2010 3:00	0.073	0.00	0.127	0.113
4/12/2010 4:00	0.075	0.03	0.209	0.161	4/1/2010 4:00	0.075	0.00	0.103	0.124
4/12/2010 5:00	0.087	0.01	0.241	0.203	4/1/2010 5:00	0.087	0.00	0.148	0.131
4/12/2010 6:00	0.137	0.04	0.290	0.299	4/1/2010 6:00	0.137	0.00	0.180	0.180
4/12/2010 7:00	0.226	0.01	0.354	0.348	4/1/2010 7:00	0.226	0.00	0.258	0.242
4/12/2010 8:00	0.228	0.00	0.356	0.326	4/1/2010 8:00	0.228	0.00	0.251	0.236
4/12/2010 9:00	0.206	0.00	0.334	0.310	4/1/2010 9:00	0.206	0.00	0.235	0.221
4/12/2010 10:00	0.198	0.05	0.323	0.302	4/1/2010 10:00	0.198	0.00	0.228	0.197
4/12/2010 11:00	0.191	0.02	0.316	0.290	4/1/2010 11:00	0.191	0.00	0.223	0.188
4/12/2010 12:00	0.182	0.00	0.312	0.278	4/1/2010 12:00	0.182	0.00	0.197	0.188
4/12/2010 13:00	0.173	0.00	0.291	0.286	4/1/2010 13:00	0.173	0.00	0.190	0.172
4/12/2010 14:00	0.161	0.00	0.291	0.288	4/1/2010 14:00	0.161	0.00	0.190	0.163
4/12/2010 15:00	0.155	0.00	0.272	0.276	4/1/2010 15:00	0.155	0.00	0.174	0.158
4/12/2010 16:00	0.161	0.00	0.285	0.271	4/1/2010 16:00	0.161	0.00	0.191	0.167
4/12/2010 17:00	0.170	0.00	0.286	0.275	4/1/2010 17:00	0.170	0.00	0.194	0.185
4/12/2010 18:00	0.186	0.00	0.297	0.291	4/1/2010 18:00	0.186	0.00	0.209	0.212
4/12/2010 19:00	0.203	0.00	0.326	0.302	4/1/2010 19:00	0.203	0.00	0.230	0.219
4/12/2010 20:00	0.213	0.00	0.326	0.303	4/1/2010 20:00	0.213	0.00	0.232	0.230
4/12/2010 21:00	0.204	0.00	0.294	0.287	4/1/2010 21:00	0.204	0.00	0.217	0.213
4/12/2010 22:00	0.181	0.00	0.256	0.259	4/1/2010 22:00	0.181	0.00	0.204	0.198
4/12/2010 23:00	0.146	0.00	0.232	0.230	4/1/2010 23:00	0.146	0.00	0.174	0.123
4/13/2010 0:00	0.113	0.00	0.203	0.188					
4/13/2010 1:00	0.088	0.00	0.185	0.167					
4/13/2010 2:00	0.078	0.00	0.177	0.157					
4/13/2010 3:00	0.073	0.00	0.167	0.151					
4/13/2010 4:00	0.075	0.00	0.170	0.150					
4/13/2010 5:00	0.087	0.00	0.189	0.169					
4/13/2010 6:00	0.137	0.00	0.232	0.223					
4/13/2010 7:00	0.226	0.00	0.308	0.280					
4/13/2010 8:00	0.228	0.00	0.294	0.278					
4/13/2010 9:00	0.206	0.00	0.267	0.265					
4/13/2010 10:00	0.198	0.00	0.255	0.251					
4/13/2010 11:00	0.191	0.00	0.232	0.246					
4/13/2010 12:00	0.182	0.00	0.213	0.231					
4/13/2010 13:00	0.173	0.00	0.224	0.221					
4/13/2010 14:00	0.161	0.00	0.222	0.211					
4/13/2010 15:00	0.155	0.00	0.199	0.206					
4/13/2010 16:00	0.161	0.00	0.195	0.198					
4/13/2010 17:00	0.170	0.00	0.224	0.213					
4/13/2010 18:00	0.186	0.00	0.233	0.221					
4/13/2010 19:00	0.203	0.00	0.252	0.238					
4/13/2010 20:00	0.213	0.00	0.268	0.232					
4/13/2010 21:00	0.204	0.00	0.250	0.226					
4/13/2010 22:00	0.181	0.00	0.223	0.195					
4/13/2010 23:00	0.146	0.00	0.185	0.129					



Flow Meter 5 Wet Weather Calibration Plot (April 11 - 13, 2010)



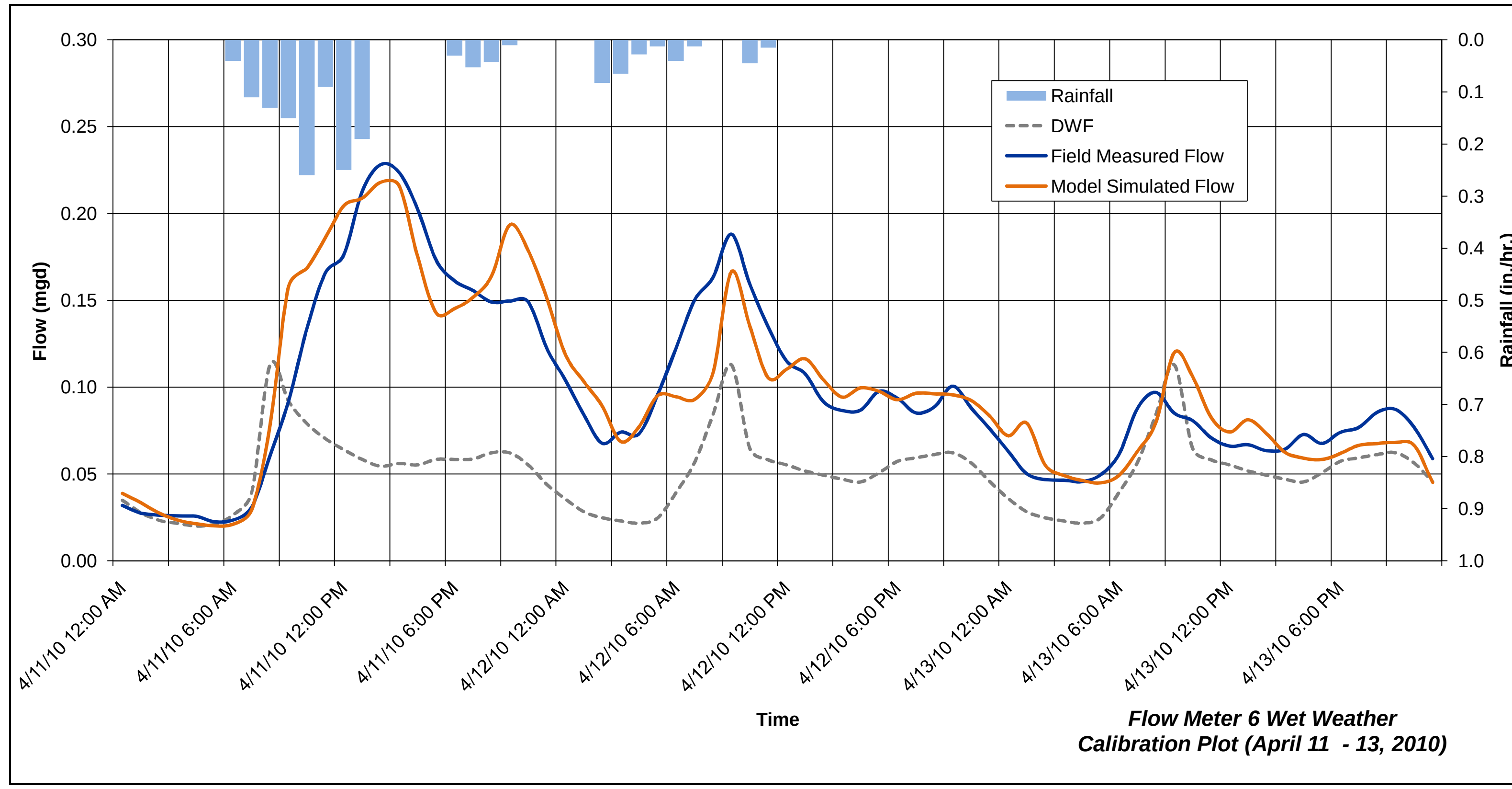
Flow Meter 5 Wet Weather Calibration Plot (March 31 - April 1, 2010)

City of Cotati
Sewer System Master Plan

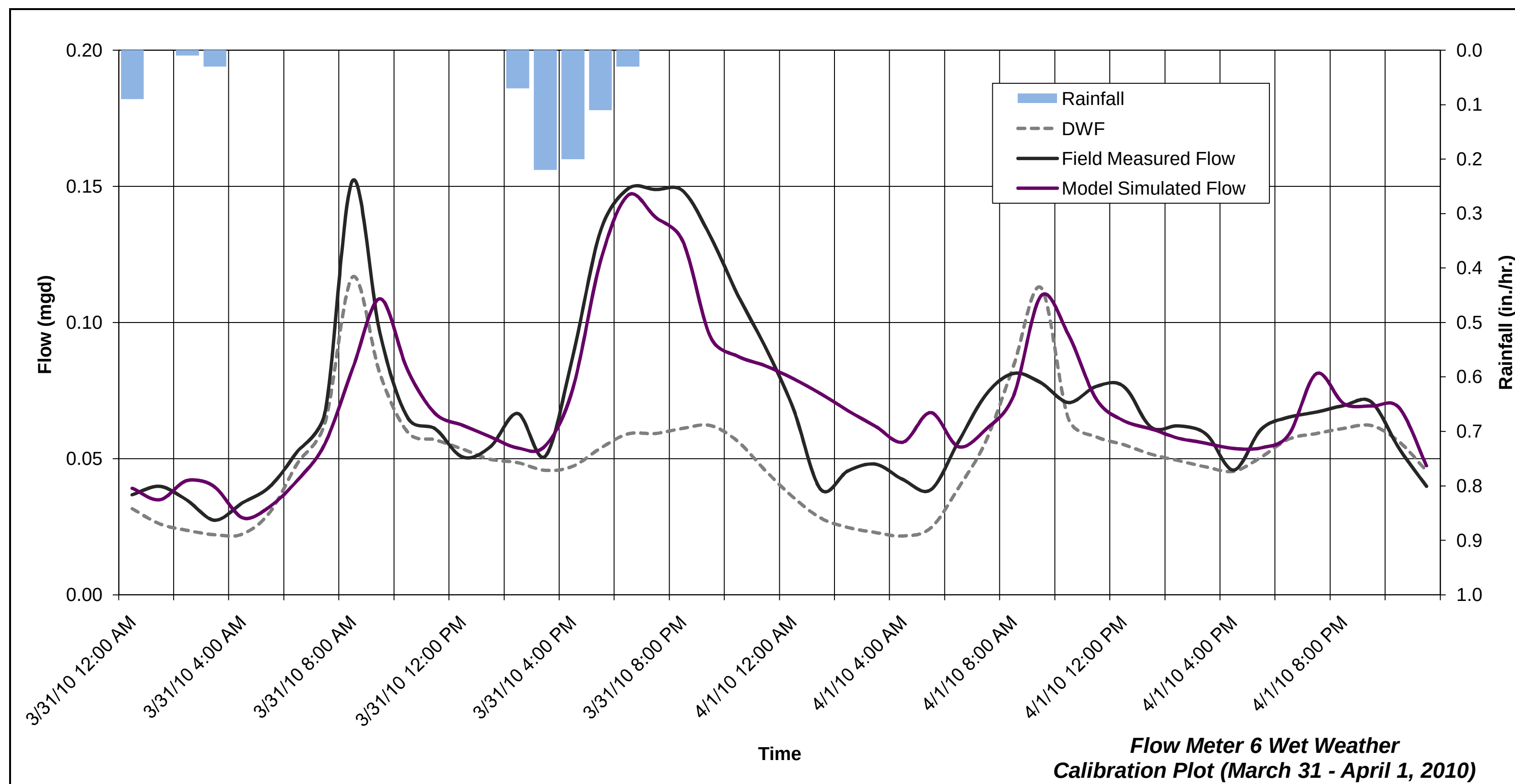
FLOW METER 6 WET WEATHER FLOW CALIBRATION SUMMARY

WWF Calibration Details

April 11 - 13, 2010 Event					March 31 - April 1, 2010 Event				
Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)	Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)
4/11/2010 0:00	0.035	0.00	0.032	0.039	3/31/2010 0:00	0.032	0.09	0.037	0.039
4/11/2010 1:00	0.028	0.00	0.027	0.033	3/31/2010 1:00	0.026	0.00	0.040	0.035
4/11/2010 2:00	0.023	0.00	0.026	0.027	3/31/2010 2:00	0.024	0.01	0.035	0.042
4/11/2010 3:00	0.021	0.00	0.026	0.023	3/31/2010 3:00	0.022	0.03	0.027	0.040
4/11/2010 4:00	0.020	0.00	0.026	0.021	3/31/2010 4:00	0.022	0.00	0.034	0.028
4/11/2010 5:00	0.021	0.00	0.022	0.020	3/31/2010 5:00	0.030	0.00	0.040	0.032
4/11/2010 6:00	0.026	0.04	0.023	0.021	3/31/2010 6:00	0.048	0.00	0.053	0.042
4/11/2010 7:00	0.039	0.11	0.031	0.029	3/31/2010 7:00	0.063	0.00	0.067	0.056
4/11/2010 8:00	0.113	0.13	0.061	0.078	3/31/2010 8:00	0.117	0.00	0.152	0.083
4/11/2010 9:00	0.092	0.15	0.092	0.158	3/31/2010 9:00	0.081	0.00	0.096	0.109
4/11/2010 10:00	0.079	0.26	0.134	0.169	3/31/2010 10:00	0.060	0.00	0.065	0.083
4/11/2010 11:00	0.070	0.09	0.166	0.186	3/31/2010 11:00	0.057	0.00	0.061	0.067
4/11/2010 12:00	0.064	0.25	0.176	0.205	3/31/2010 12:00	0.053	0.00	0.051	0.062
4/11/2010 13:00	0.058	0.19	0.213	0.209	3/31/2010 13:00	0.050	0.00	0.054	0.058
4/11/2010 14:00	0.054	0.00	0.228	0.218	3/31/2010 14:00	0.049	0.07	0.067	0.054
4/11/2010 15:00	0.056	0.00	0.224	0.216	3/31/2010 15:00	0.046	0.22	0.051	0.055
4/11/2010 16:00	0.055	0.00	0.202	0.175	3/31/2010 16:00	0.047	0.20	0.088	0.076
4/11/2010 17:00	0.058	0.00	0.173	0.143	3/31/2010 17:00	0.054	0.11	0.133	0.122
4/11/2010 18:00	0.058	0.03	0.161	0.145	3/31/2010 18:00	0.059	0.03	0.149	0.147
4/11/2010 19:00	0.059	0.05	0.156	0.152	3/31/2010 19:00	0.059	0.00	0.149	0.139
4/11/2010 20:00	0.062	0.04	0.149	0.164	3/31/2010 20:00	0.061	0.00	0.148	0.130
4/11/2010 21:00	0.062	0.01	0.150	0.194	3/31/2010 21:00	0.062	0.00	0.132	0.095
4/11/2010 22:00	0.055	0.00	0.149	0.178	3/31/2010 22:00	0.056	0.00	0.110	0.088
4/11/2010 23:00	0.044	0.00	0.122	0.151	3/31/2010 23:00	0.045	0.00	0.091	0.084
4/12/2010 0:00	0.035	0.00	0.104	0.119	4/1/2010 0:00	0.036	0.00	0.069	0.079
4/12/2010 1:00	0.028	0.00	0.084	0.103	4/1/2010 1:00	0.028	0.00	0.039	0.074
4/12/2010 2:00	0.025	0.08	0.068	0.089	4/1/2010 2:00	0.025	0.00	0.046	0.068
4/12/2010 3:00	0.023	0.07	0.074	0.069	4/1/2010 3:00	0.023	0.00	0.048	0.062
4/12/2010 4:00	0.022	0.03	0.073	0.077	4/1/2010 4:00	0.022	0.00	0.042	0.056
4/12/2010 5:00	0.025	0.01	0.096	0.095	4/1/2010 5:00	0.025	0.00	0.039	0.067
4/12/2010 6:00	0.039	0.04	0.122	0.094	4/1/2010 6:00	0.039	0.00	0.056	0.054
4/12/2010 7:00	0.056	0.01	0.150	0.093	4/1/2010 7:00	0.056	0.00	0.073	0.061
4/12/2010 8:00	0.084	0.00	0.163	0.108	4/1/2010 8:00	0.084	0.00	0.081	0.073
4/12/2010 9:00	0.113	0.00	0.188	0.166	4/1/2010 9:00	0.113	0.00	0.078	0.110
4/12/2010 10:00	0.065	0.05	0.159	0.135	4/1/2010 10:00	0.065	0.00	0.071	0.095
4/12/2010 11:00	0.058	0.02	0.135	0.105	4/1/2010 11:00	0.058	0.00	0.077	0.072
4/12/2010 12:00	0.055	0.00	0.115	0.110	4/1/2010 12:00	0.055	0.00	0.077	0.064
4/12/2010 13:00	0.052	0.00	0.108	0.116	4/1/2010 13:00	0.052	0.00	0.062	0.061
4/12/2010 14:00	0.049	0.00	0.091	0.104	4/1/2010 14:00	0.049	0.00	0.062	0.057
4/12/2010 15:00	0.047	0.00	0.087	0.094	4/1/2010 15:00	0.047	0.00	0.059	0.056
4/12/2010 16:00	0.045	0.00	0.087	0.100	4/1/2010 16:00	0.045	0.00	0.046	0.054
4/12/2010 17:00	0.051	0.00	0.097	0.098	4/1/2010 17:00	0.051	0.00	0.061	0.054
4/12/2010 18:00	0.057	0.00	0.094	0.093	4/1/2010 18:00	0.057	0.00	0.065	0.059
4/12/2010 19:00	0.059	0.00	0.085	0.096	4/1/2010 19:00	0.059	0.00	0.067	0.081
4/12/2010 20:00	0.061	0.00	0.089	0.096	4/1/2010 20:00	0.061	0.00	0.070	0.070
4/12/2010 21:00	0.062	0.00	0.101	0.096	4/1/2010 21:00	0.062	0.00	0.071	0.069
4/12/2010 22:00	0.056	0.00	0.088	0.092	4/1/2010 22:00	0.056	0.00	0.054	0.069
4/12/2010 23:00	0.045	0.00	0.076	0.083	4/1/2010 23:00	0.045	0.00	0.040	0.047
4/13/2010 0:00	0.036	0.00	0.063	0.072					
4/13/2010 1:00	0.028	0.00	0.050	0.079					
4/13/2010 2:00	0.025	0.00	0.047	0.055					
4/13/2010 3:00	0.023	0.00	0.046	0.049					
4/13/2010 4:00	0.022	0.00	0.046	0.046					
4/13/2010 5:00	0.025	0.00	0.049	0.045					
4/13/2010 6:00	0.039	0.00	0.061	0.049					
4/13/2010 7:00	0.056	0.00	0.088	0.063					
4/13/2010 8:00	0.084	0.00	0.097	0.080					
4/13/2010 9:00	0.113	0.00	0.085	0.120					
4/13/2010 10:00	0.065	0.00	0.081	0.106					
4/13/2010 11:00	0.058	0.00	0.071	0.083					
4/13/2010 12:00	0.055	0.00	0.066	0.074					
4/13/2010 13:00	0.052	0.00	0.067	0.081					
4/13/2010 14:00	0.049	0.00	0.063	0.073					
4/13/2010 15:00	0.047	0.00	0.064	0.062					
4/13/2010 16:00	0.045	0.00	0.073	0.059					
4/13/2010 17:00	0.051	0.00	0.068	0.058					
4/13/2010 18:00	0.057	0.00	0.074	0.062					
4/13/2010 19:00	0.059	0.00	0.077	0.066					
4/13/2010 20:00	0.061	0.00	0.085	0.068					
4/13/2010 21:00	0.062	0.00	0.087	0.068					
4/13/2010 22:00	0.056	0.00	0.077	0.067					
4/13/2010 23:00	0.045	0.00	0.059	0.045					



Flow Meter 6 Wet Weather Calibration Plot (April 11 - 13, 2010)

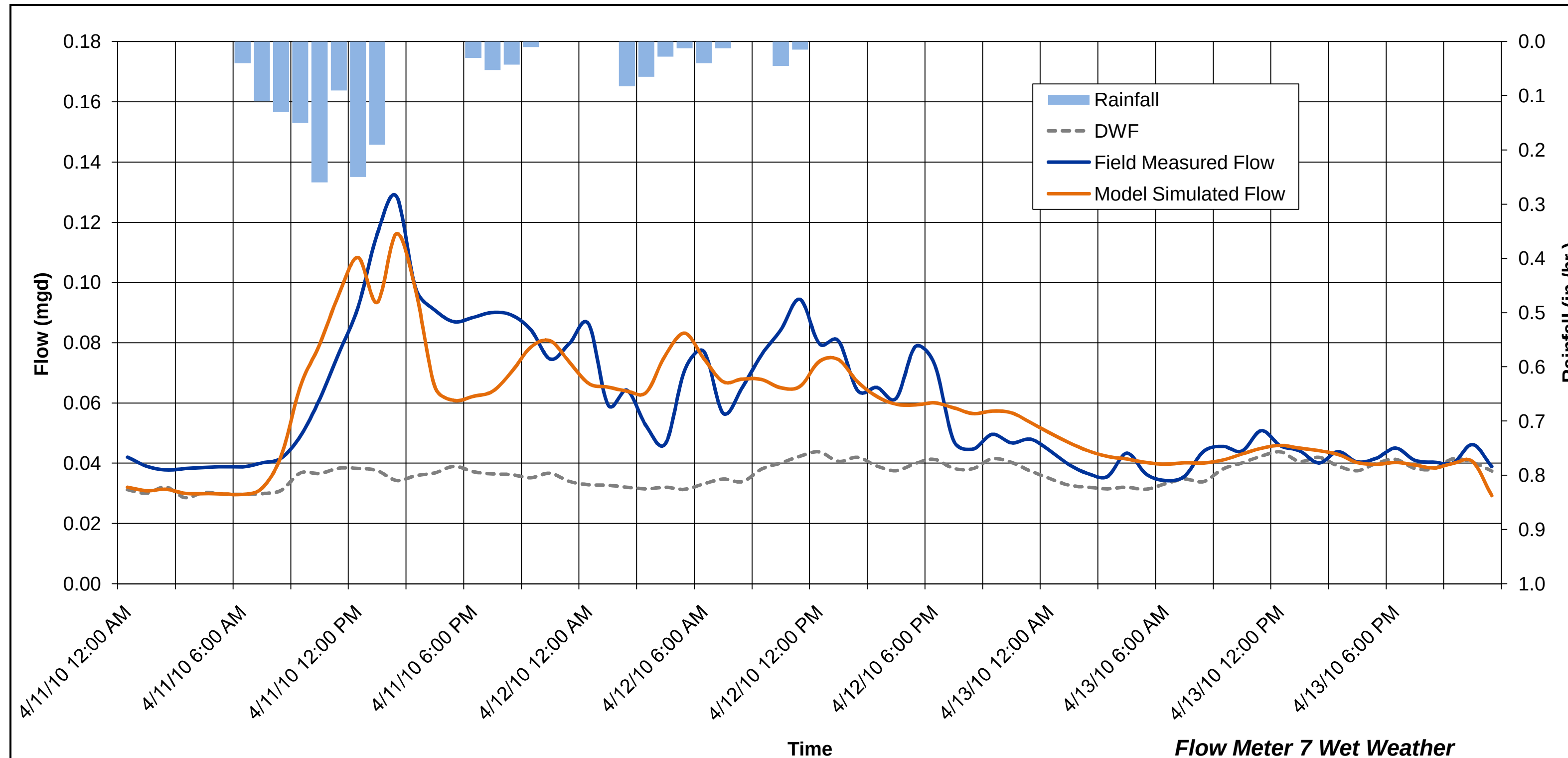


Flow Meter 6 Wet Weather Calibration Plot (March 31 - April 1, 2010)

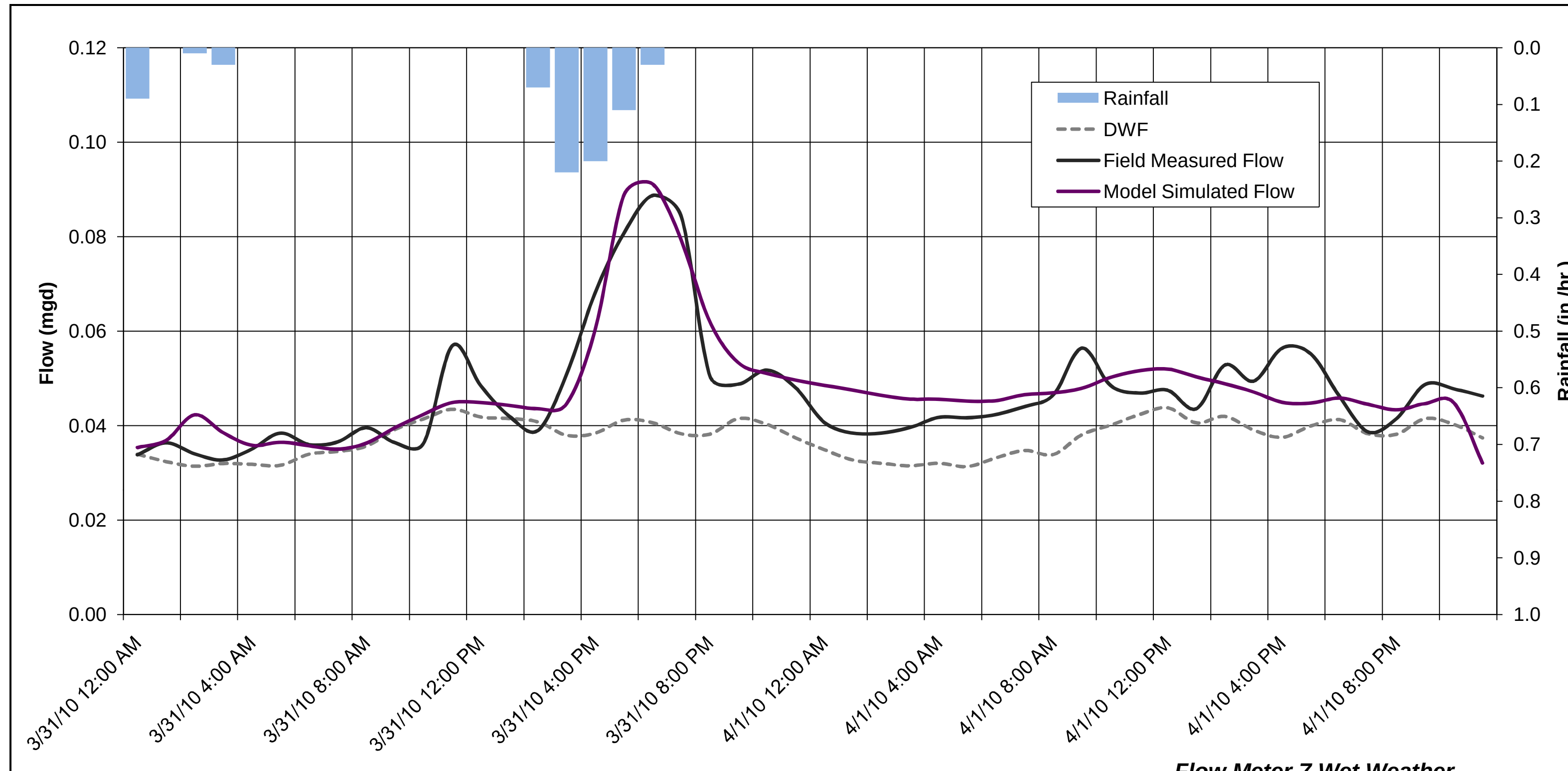
FLOW METER 7 WET WEATHER FLOW CALIBRATION SUMMARY

WWF Calibration Details

April 11 - 13, 2010 Event					March 31 - April 1, 2010 Event				
Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)	Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)
4/11/2010 0:00	0.031	0.00	0.042	0.032	3/31/2010 0:00	0.034	0.09	0.034	0.035
4/11/2010 1:00	0.030	0.00	0.039	0.031	3/31/2010 1:00	0.032	0.00	0.036	0.037
4/11/2010 2:00	0.032	0.00	0.038	0.031	3/31/2010 2:00	0.031	0.01	0.034	0.042
4/11/2010 3:00	0.029	0.00	0.038	0.030	3/31/2010 3:00	0.032	0.03	0.033	0.039
4/11/2010 4:00	0.030	0.00	0.039	0.030	3/31/2010 4:00	0.032	0.00	0.035	0.036
4/11/2010 5:00	0.030	0.00	0.039	0.030	3/31/2010 5:00	0.032	0.00	0.038	0.037
4/11/2010 6:00	0.030	0.04	0.039	0.030	3/31/2010 6:00	0.034	0.00	0.036	0.036
4/11/2010 7:00	0.030	0.11	0.040	0.032	3/31/2010 7:00	0.035	0.00	0.037	0.035
4/11/2010 8:00	0.031	0.13	0.042	0.042	3/31/2010 8:00	0.036	0.00	0.040	0.036
4/11/2010 9:00	0.037	0.15	0.049	0.066	3/31/2010 9:00	0.039	0.00	0.036	0.040
4/11/2010 10:00	0.037	0.26	0.061	0.079	3/31/2010 10:00	0.041	0.00	0.036	0.042
4/11/2010 11:00	0.038	0.09	0.077	0.096	3/31/2010 11:00	0.043	0.00	0.057	0.045
4/11/2010 12:00	0.038	0.25	0.092	0.108	3/31/2010 12:00	0.042	0.00	0.048	0.045
4/11/2010 13:00	0.038	0.19	0.116	0.093	3/31/2010 13:00	0.042	0.00	0.042	0.044
4/11/2010 14:00	0.034	0.00	0.129	0.116	3/31/2010 14:00	0.041	0.07	0.039	0.044
4/11/2010 15:00	0.036	0.00	0.098	0.097	3/31/2010 15:00	0.038	0.22	0.051	0.045
4/11/2010 16:00	0.037	0.00	0.091	0.065	3/31/2010 16:00	0.038	0.20	0.068	0.060
4/11/2010 17:00	0.039	0.00	0.087	0.061	3/31/2010 17:00	0.041	0.11	0.081	0.089
4/11/2010 18:00	0.037	0.03	0.088	0.062	3/31/2010 18:00	0.041	0.03	0.089	0.091
4/11/2010 19:00	0.036	0.05	0.090	0.064	3/31/2010 19:00	0.038	0.00	0.084	0.079
4/11/2010 20:00	0.036	0.04	0.089	0.070	3/31/2010 20:00	0.038	0.00	0.051	0.062
4/11/2010 21:00	0.035	0.01	0.084	0.079	3/31/2010 21:00	0.041	0.00	0.049	0.053
4/11/2010 22:00	0.037	0.00	0.075	0.081	3/31/2010 22:00	0.040	0.00	0.052	0.051
4/11/2010 23:00	0.034	0.00	0.080	0.074	3/31/2010 23:00	0.037	0.00	0.048	0.050
4/12/2010 0:00	0.033	0.00	0.086	0.067	4/1/2010 0:00	0.035	0.00	0.041	0.049
4/12/2010 1:00	0.033	0.00	0.059	0.065	4/1/2010 1:00	0.033	0.00	0.038	0.048
4/12/2010 2:00	0.032	0.08	0.064	0.064	4/1/2010 2:00	0.032	0.00	0.038	0.046
4/12/2010 3:00	0.032	0.07	0.052	0.064	4/1/2010 3:00	0.032	0.00	0.040	0.046
4/12/2010 4:00	0.032	0.03	0.047	0.076	4/1/2010 4:00	0.032	0.00	0.042	0.046
4/12/2010 5:00	0.031	0.01	0.071	0.083	4/1/2010 5:00	0.031	0.00	0.042	0.045
4/12/2010 6:00	0.033	0.04	0.077	0.075	4/1/2010 6:00	0.033	0.00	0.042	0.045
4/12/2010 7:00	0.035	0.01	0.057	0.067	4/1/2010 7:00	0.035	0.00	0.044	0.047
4/12/2010 8:00	0.034	0.00	0.065	0.068	4/1/2010 8:00	0.034	0.00	0.046	0.047
4/12/2010 9:00	0.038	0.00	0.076	0.068	4/1/2010 9:00	0.038	0.00	0.056	0.048
4/12/2010 10:00	0.040	0.05	0.084	0.065	4/1/2010 10:00	0.040	0.00	0.048	0.050
4/12/2010 11:00	0.042	0.02	0.094	0.066	4/1/2010 11:00	0.042	0.00	0.047	0.052
4/12/2010 12:00	0.044	0.00	0.080	0.074	4/1/2010 12:00	0.044	0.00	0.047	0.052
4/12/2010 13:00	0.041	0.00	0.081	0.074	4/1/2010 13:00	0.041	0.00	0.044	0.050
4/12/2010 14:00	0.042	0.00	0.064	0.067	4/1/2010 14:00	0.042	0.00	0.053	0.049
4/12/2010 15:00	0.039	0.00	0.065	0.062	4/1/2010 15:00	0.039	0.00	0.049	0.047
4/12/2010 16:00	0.038	0.00	0.062	0.060	4/1/2010 16:00	0.038	0.00	0.056	0.045
4/12/2010 17:00	0.040	0.00	0.079	0.059	4/1/2010 17:00	0.040	0.00	0.055	0.045
4/12/2010 18:00	0.041	0.00	0.073	0.060	4/1/2010 18:00	0.041	0.00	0.046	0.046
4/12/2010 19:00	0.038	0.00	0.047	0.058	4/1/2010 19:00	0.038	0.00	0.039	0.045
4/12/2010 20:00	0.038	0.00	0.045	0.056	4/1/2010 20:00	0.038	0.00	0.042	0.043
4/12/2010 21:00	0.041	0.00	0.050	0.057	4/1/2010 21:00	0.041	0.00	0.049	0.045
4/12/2010 22:00	0.040	0.00	0.047	0.057	4/1/2010 22:00	0.040	0.00	0.048	0.045
4/12/2010 23:00	0.037	0.00	0.048	0.054	4/1/2010 23:00	0.037	0.00	0.046	0.032
4/13/2010 0:00	0.035	0.00	0.044	0.050					
4/13/2010 1:00	0.033	0.00	0.040	0.047					
4/13/2010 2:00	0.032	0.00	0.037	0.044					
4/13/2010 3:00	0.032	0.00	0.036	0.042					
4/13/2010 4:00	0.032	0.00	0.043	0.041					
4/13/2010 5:00	0.031	0.00	0.037	0.040					
4/13/2010 6:00	0.033	0.00	0.034	0.040					
4/13/2010 7:00	0.035	0.00	0.036	0.040					
4/13/2010 8:00	0.034	0.00	0.044	0.040					
4/13/2010 9:00	0.038	0.00	0.046	0.041					
4/13/2010 10:00	0.040	0.00	0.044	0.043					
4/13/2010 11:00	0.042	0.00	0.051	0.045					
4/13/2010 12:00	0.044	0.00	0.046	0.046					
4/13/2010 13:00	0.041	0.00	0.044	0.045					
4/13/2010 14:00	0.042	0.00	0.040	0.044					
4/13/2010 15:00	0.039	0.00	0.044	0.043					
4/13/2010 16:00	0.038	0.00	0.040	0.040					
4/13/2010 17:00	0.040	0.00	0.042	0.040					
4/13/2010 18:00	0.041	0.00	0.045	0.040					
4/13/2010 19:00	0.038	0.00	0.041	0.039					
4/13/2010 20:00	0.038	0.00	0.040	0.038					
4/13/2010 21:00	0.041	0.00	0.040	0.040					
4/13/2010 22:00	0.040	0.00	0.046	0.041					
4/13/2010 23:00	0.037	0.00	0.039	0.029					

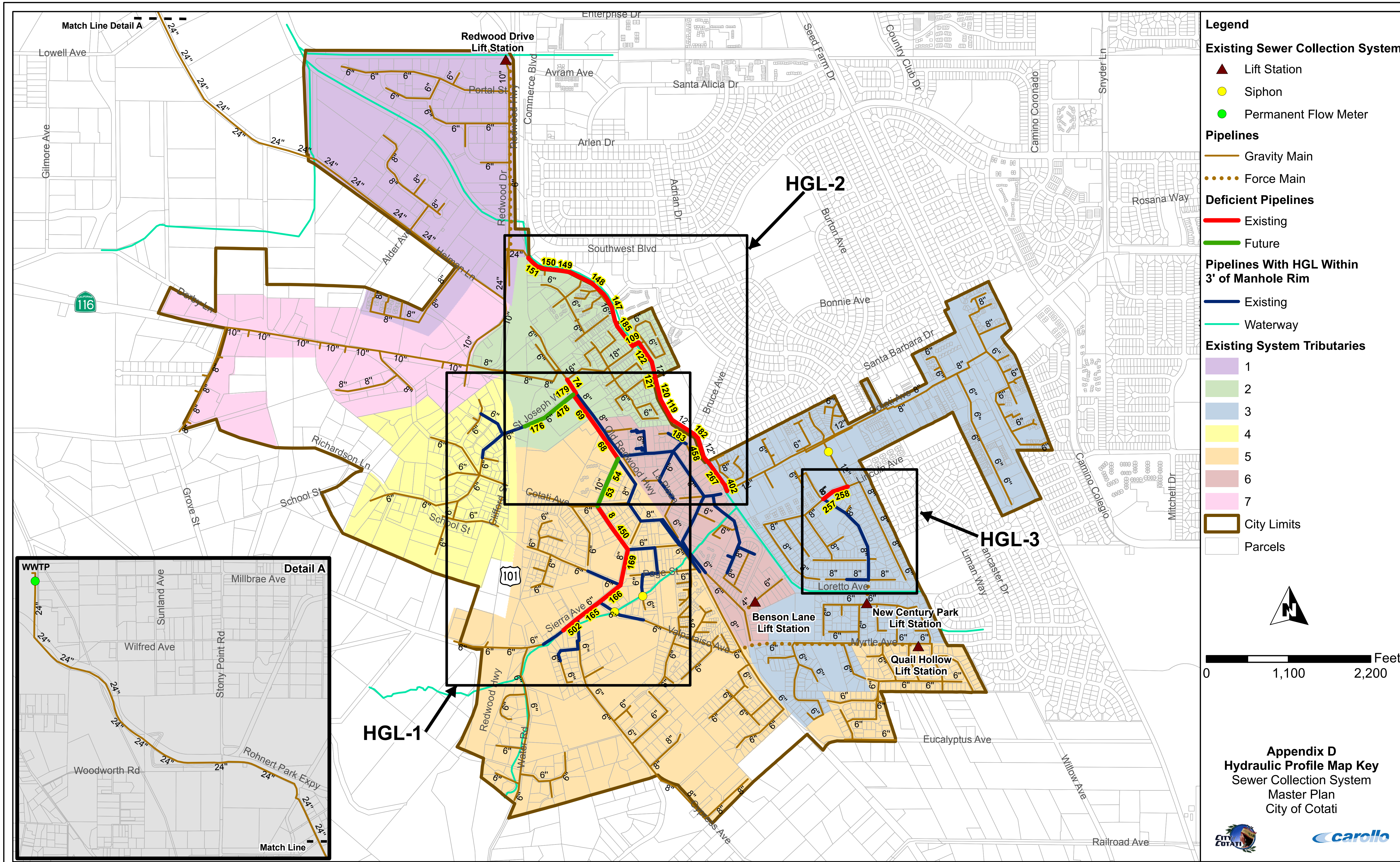


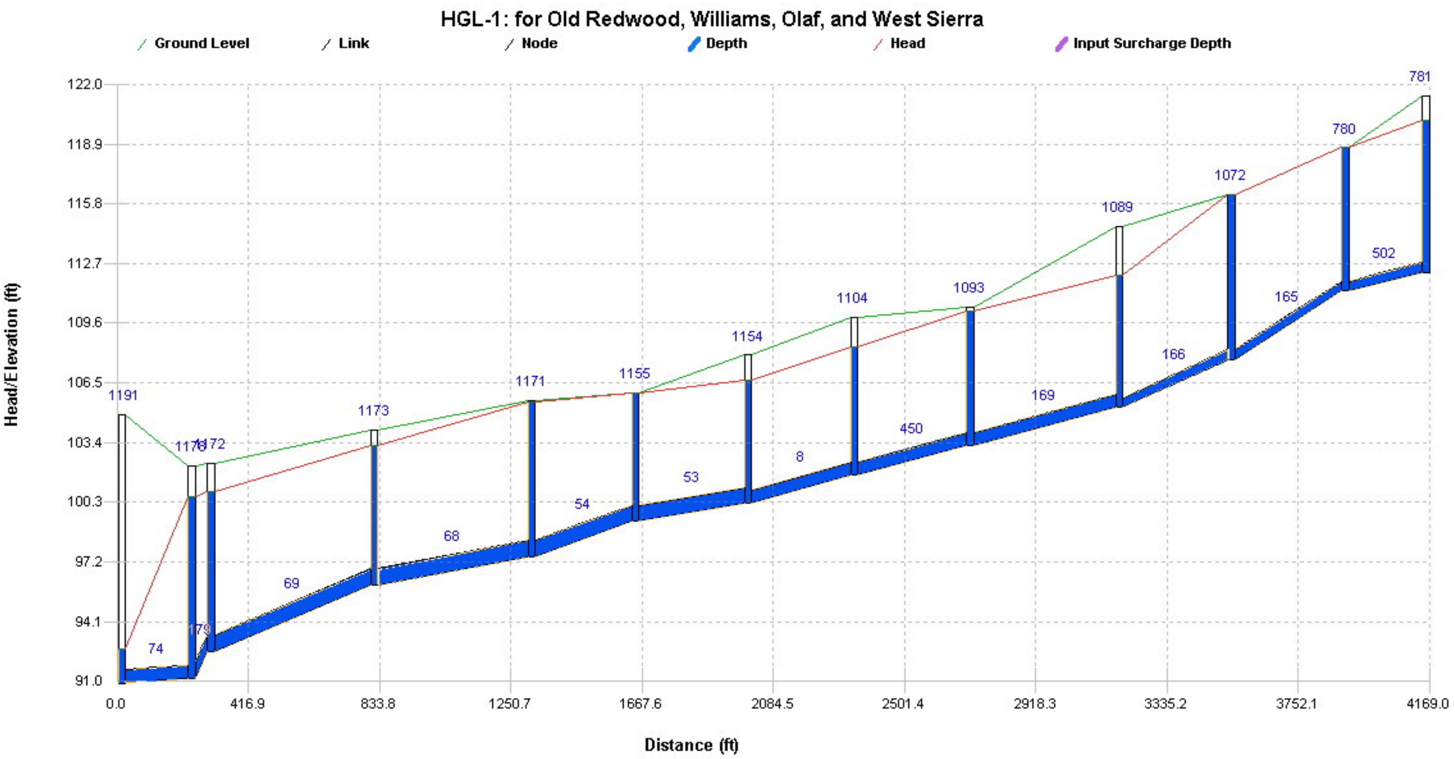
Flow Meter 7 Wet Weather Calibration Plot (April 11 - 13, 2010)



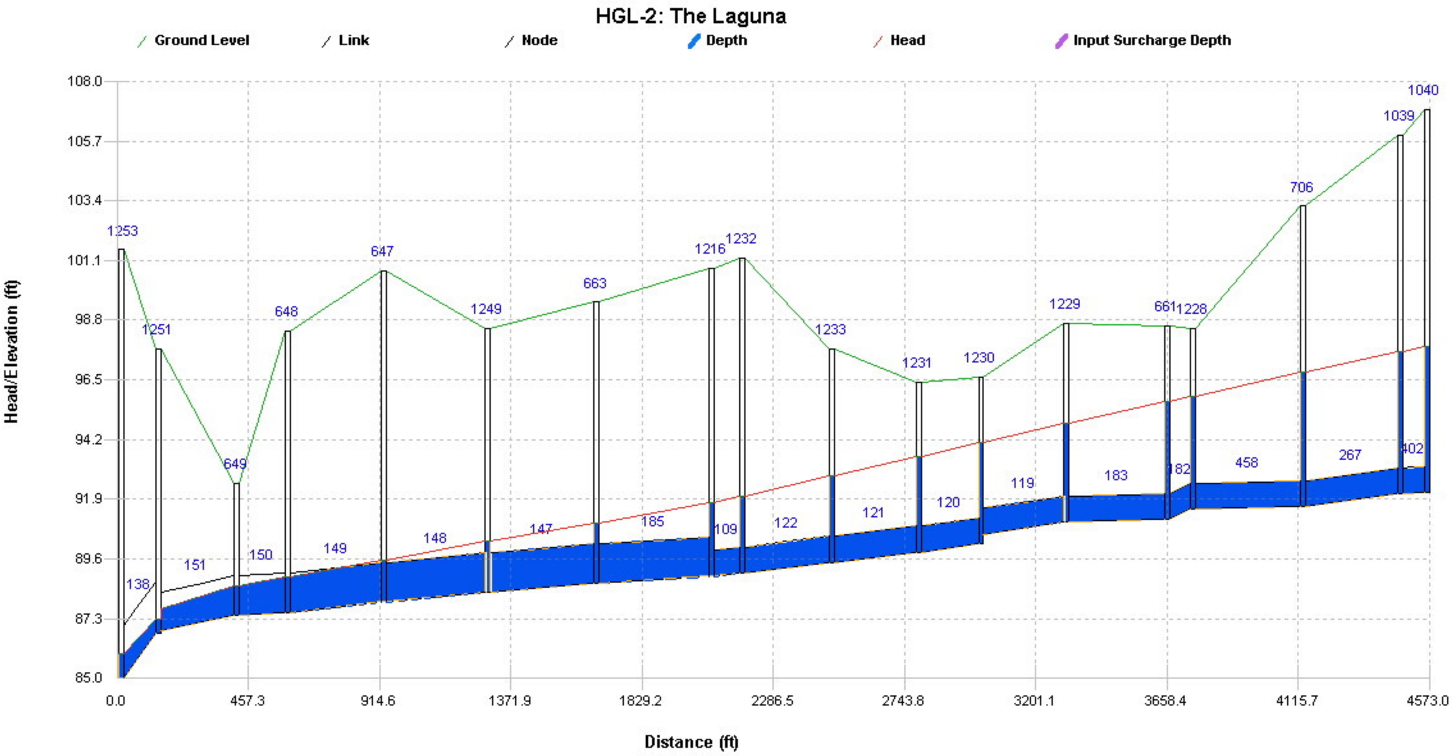
Flow Meter 7 Wet Weather Calibration Plot (March 31 - April 1, 2010)

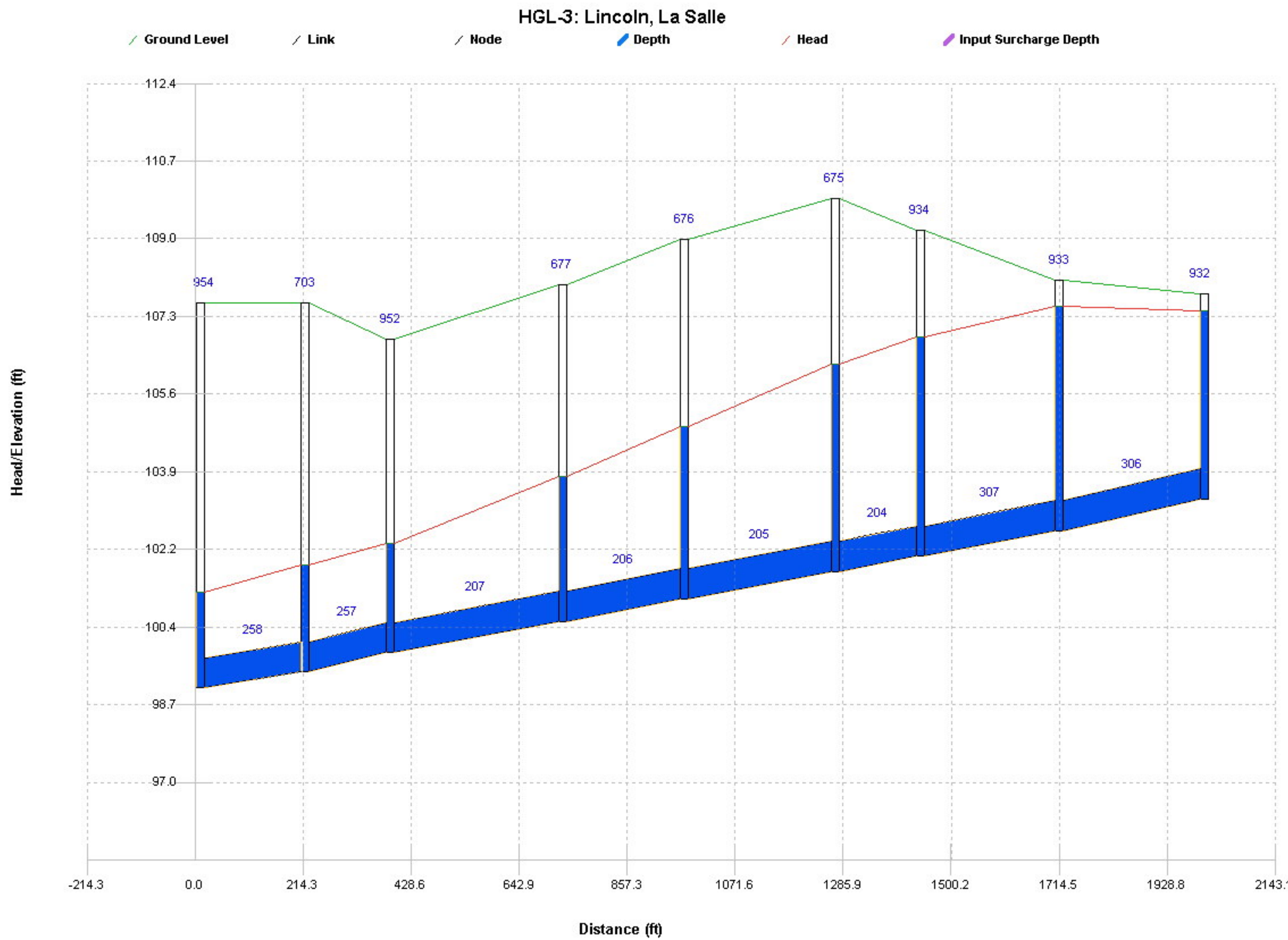
APPENDIX D – MODEL HYDRAULIC PROFILES


Legend
Existing Sewer Collection System
Lift Station
Siphon
Permanent Flow Meter
Pipelines
Gravity Main
Force Main
Deficient Pipelines
Existing
Future
Pipelines With HGL Within 3' of Manhole Rim
Existing
Waterway
Existing System Tributaries
1
2
3
4
5
6
7
City Limits
Parcels
Feet
0
1,100
2,200
HGL-1
HGL-2
HGL-3
Detail A
WWTP
Match Line
Match Line Detail A
Redwood Drive Lift Station
Benson Lane Lift Station
New Century Park Lift Station
Quail Hollow Lift Station
Appendix D
Hydraulic Profile Map Key
Sewer Collection System
Master Plan
City of Cotati



HGL-1: for Old Redwood, Williams, Olaf, and West Sierra
Ground Level
Link
Node
Depth
Head
Input Surcharge Depth
Head/Elevation (ft)
122.0
118.9
115.8
112.7
109.6
106.5
103.4
100.3
97.2
94.1
91.0
1191
1178
1172
1173
1171
1155
1154
1104
1093
1089
1072
780
781
74
179
69
68
54
53
8
450
169
166
165
502
0.0
416.9
833.8
1250.7
1667.6
2084.5
2501.4
2918.3
3335.2
3752.1
4169.0
Distance (ft)


HGL-2: The Laguna
Ground Level
Link
Node
Depth
Head
Input Surcharge Depth
Head/Elevation (ft)
Distance (ft)
108.0
105.7
103.4
101.1
98.8
96.5
94.2
91.9
89.6
87.3
85.0
0.0
457.3
914.6
1371.9
1829.2
2286.5
2743.8
3201.1
3658.4
4115.7
4573.0
1253
1251
649
648
647
1249
663
1216
1232
1233
1231
1230
1229
661
1228
706
1039
1040
138
151
150
149
148
147
185
109
122
121
120
119
183
182
458
267
402



HGL-3: Lincoln, La Salle
Ground Level
Link
Node
Depth
Head
Input Surcharge Depth
Head/Elevation (ft)
112.4
110.7
109.0
107.3
105.6
103.9
102.2
100.4
98.7
97.0
954
703
952
677
676
675
934
933
932
258
257
207
206
205
204
307
306
-214.3
0.0
214.3
428.6
642.9
857.3
1071.6
1285.9
1500.2
1714.5
1928.8
2143.1
Distance (ft)

APPENDIX E – RETURN-TO-SEWER RATIO

Table A Return-To-Sewer Ratio by Land Use
Sewer Collection System Master Plan
City of Cotati

Zoning	Existing Water Duty Factor (gpd/ac)	Wastewater Flow Coefficient (gpd/ac)	Return To Sewer Ratio
CD - Downtown Commercial	2,900	1,400	48.3%
CE - Commercial, East Cotati Corridor	2,000	1,000	50.0%
CG - Commercial, Gravenstein Corridor	1,400	600	42.9%
CI - Commercial/Industrial District	1,000	400	40.0%
IG - General Industrial District	900	400	44.4%
NL - Neighborhood, Low Density	1,600	900	56.3%
NM - Neighborhood, Medium Density	2,300	1,100	47.8%
NU - Neighborhood, Urban	3,300	1,600	48.5%
OSR - Open Space - Recreation	1,300	0	0.0%
PF - Public Facility District	1,100	600	54.5%
RR - Rural Residential	400	200	50.0%
RVL - Residential Very Low Density	900	400	44.4%
SPD - Specific Plan, Downtown	2,300	800	34.8%
SPSW - Specific Plan, Santero Way	4,200	1,300	31.0%