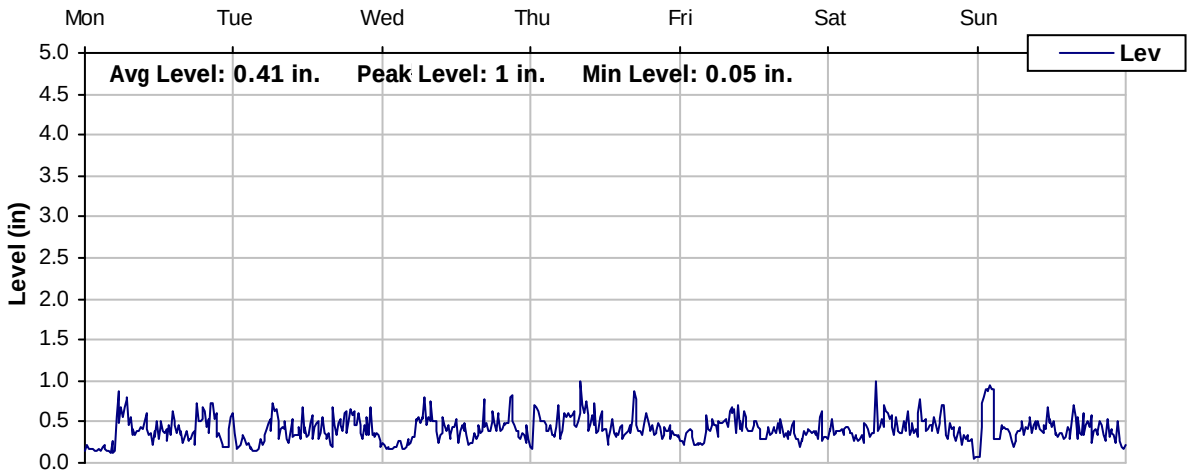
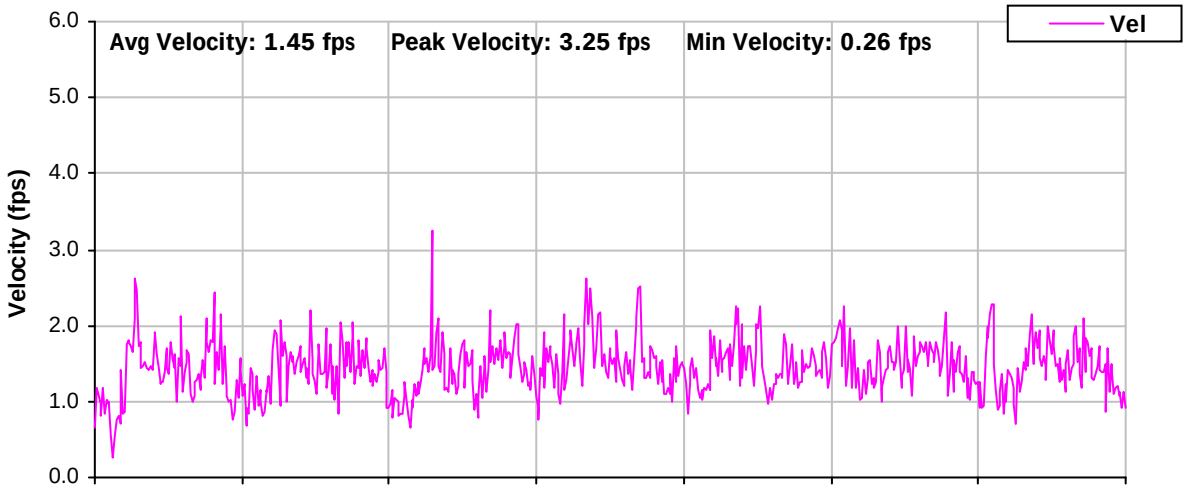
Level, Velocity and Flow

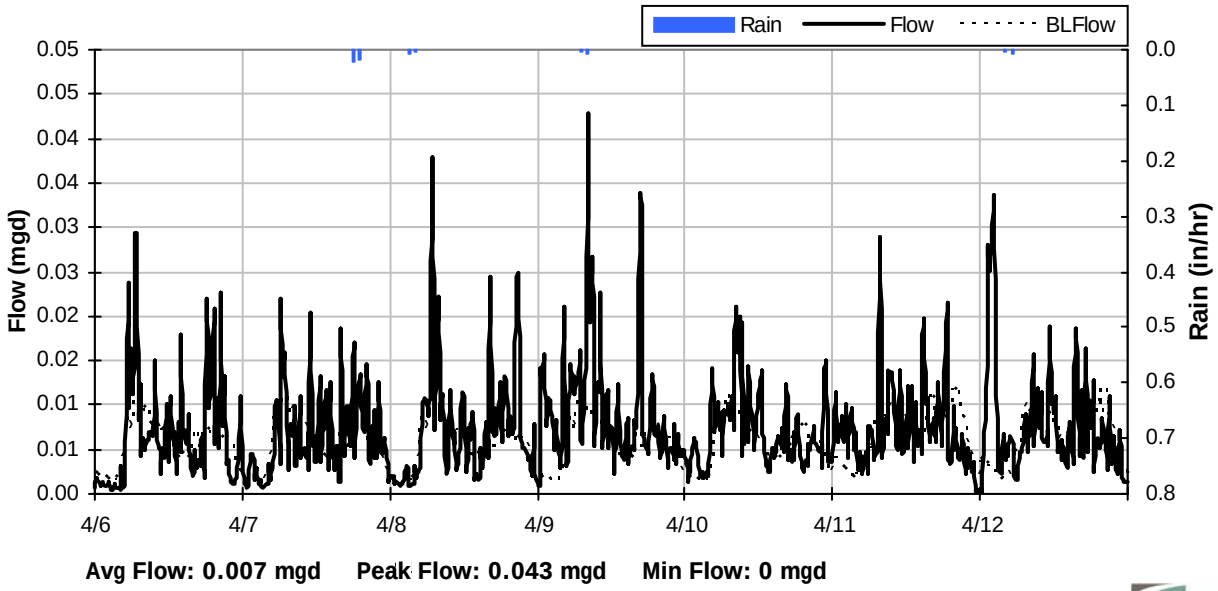
From 4/6/2009 to 4/13/2009

Monitoring Site:

MH 84







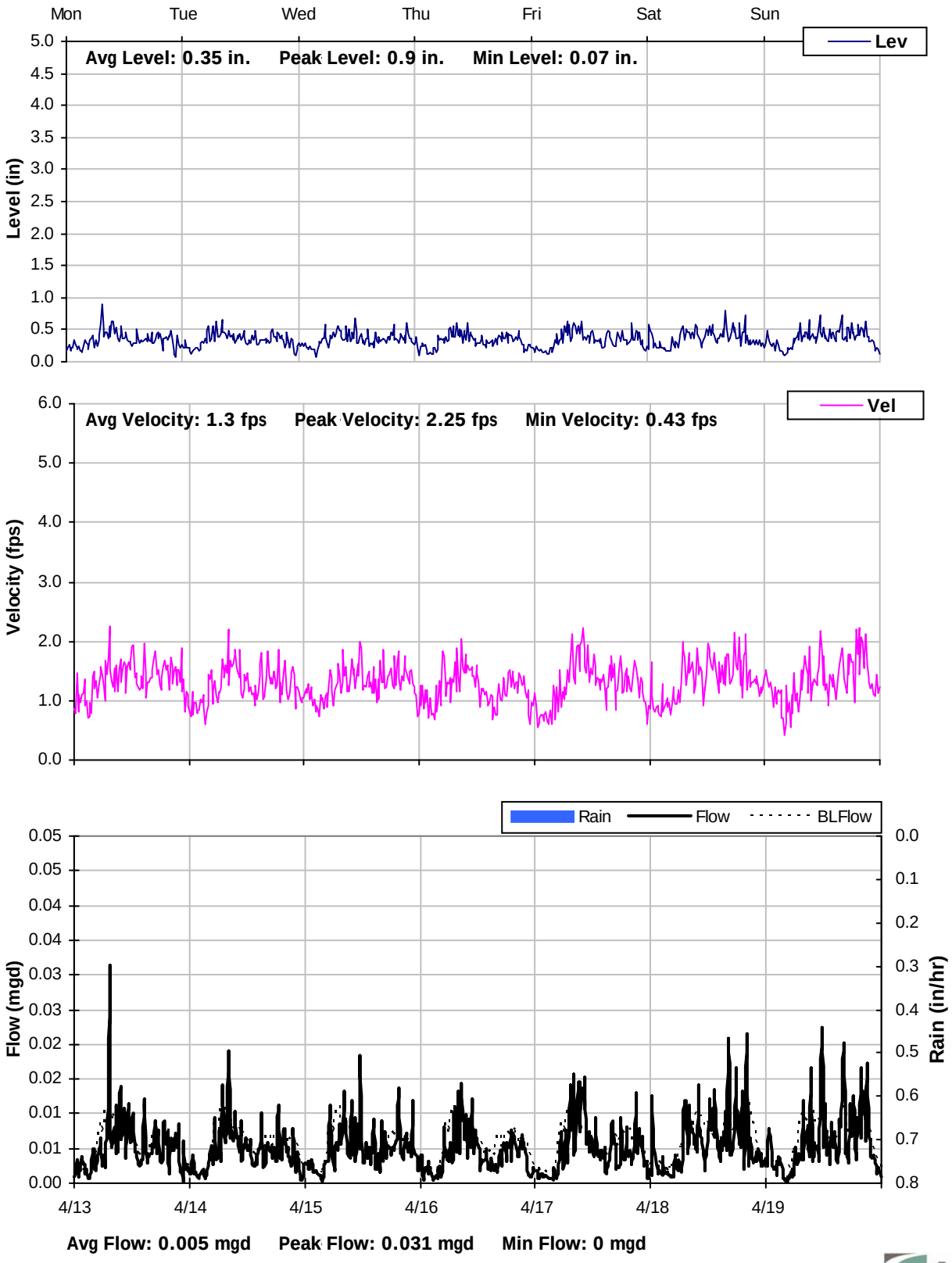
Avg Flow: 0.007 mgd **Peak Flow: 0.043 mgd** **Min Flow: 0 mgd**

Level, Velocity and Flow

From 4/13/2009 to 4/20/2009

Monitoring Site:

MH 84

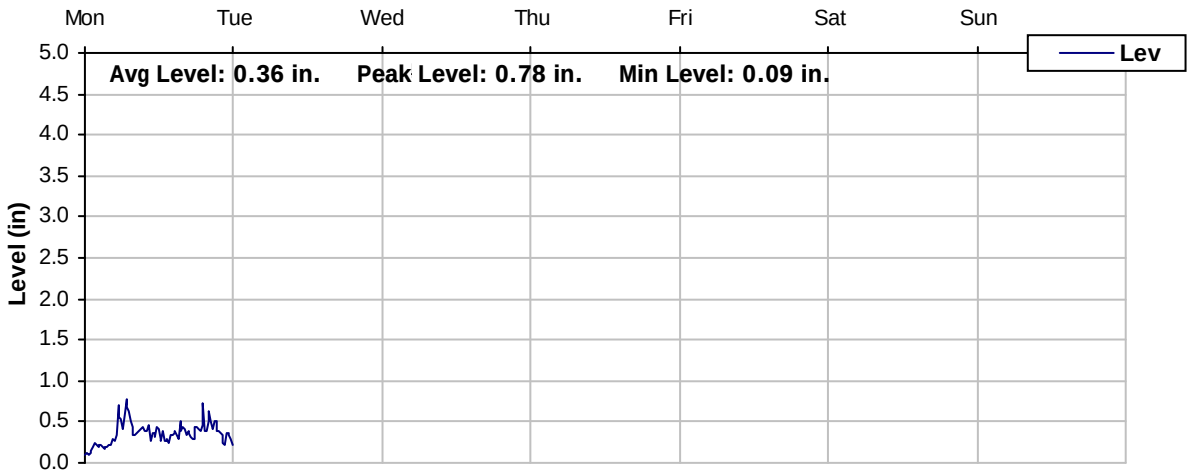


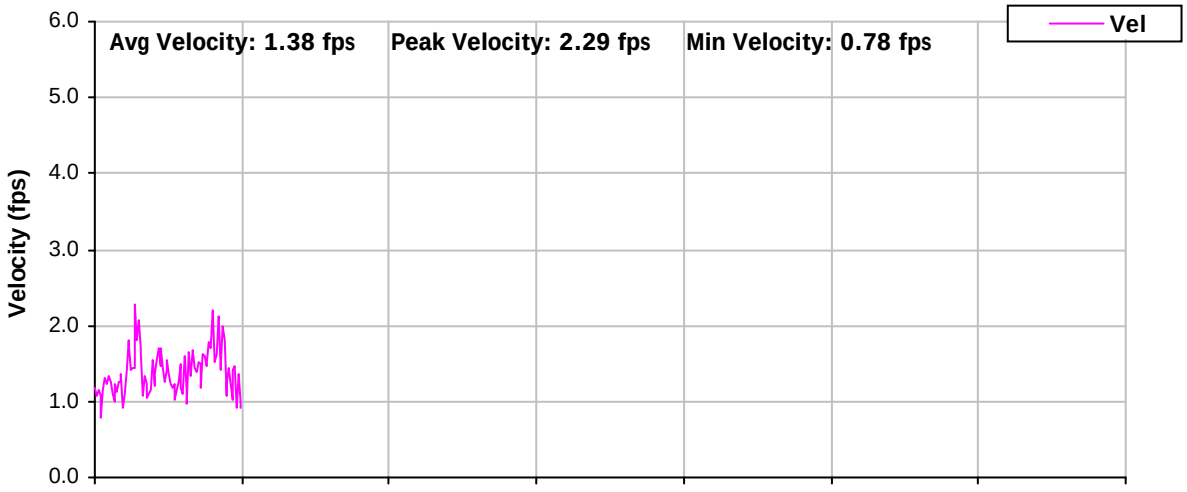
Level, Velocity and Flow

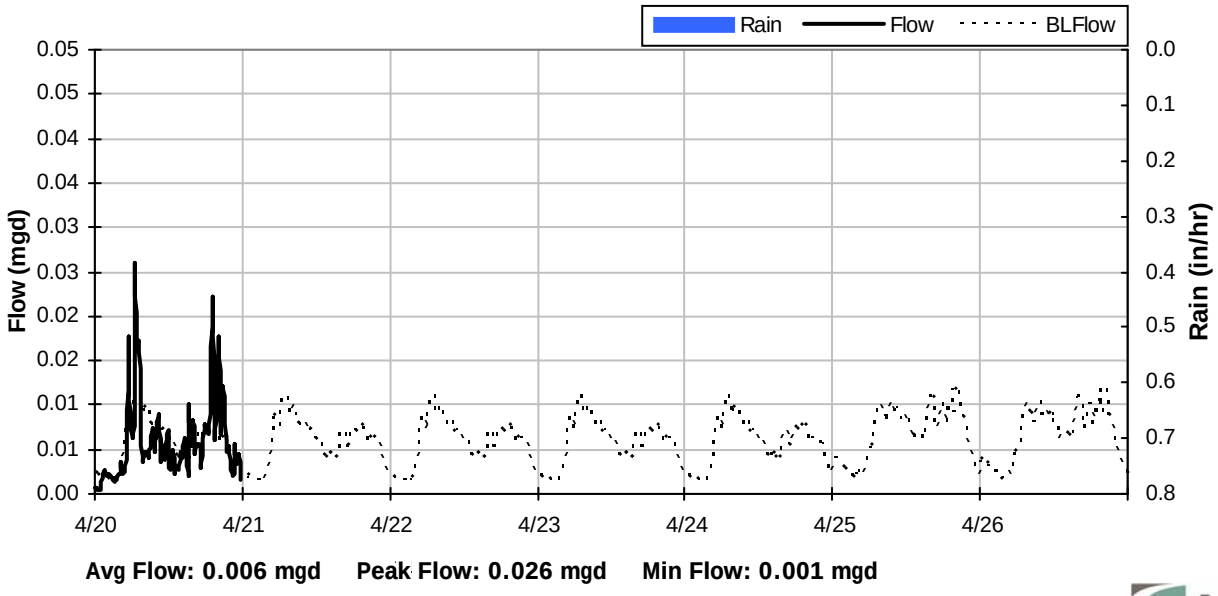
From 4/20/2009 to 4/27/2009

Monitoring Site:

MH 84







Avg Flow: 0.006 mgd **Peak Flow: 0.026 mgd** **Min Flow: 0.001 mgd**

Temporary Flow Monitoring Study

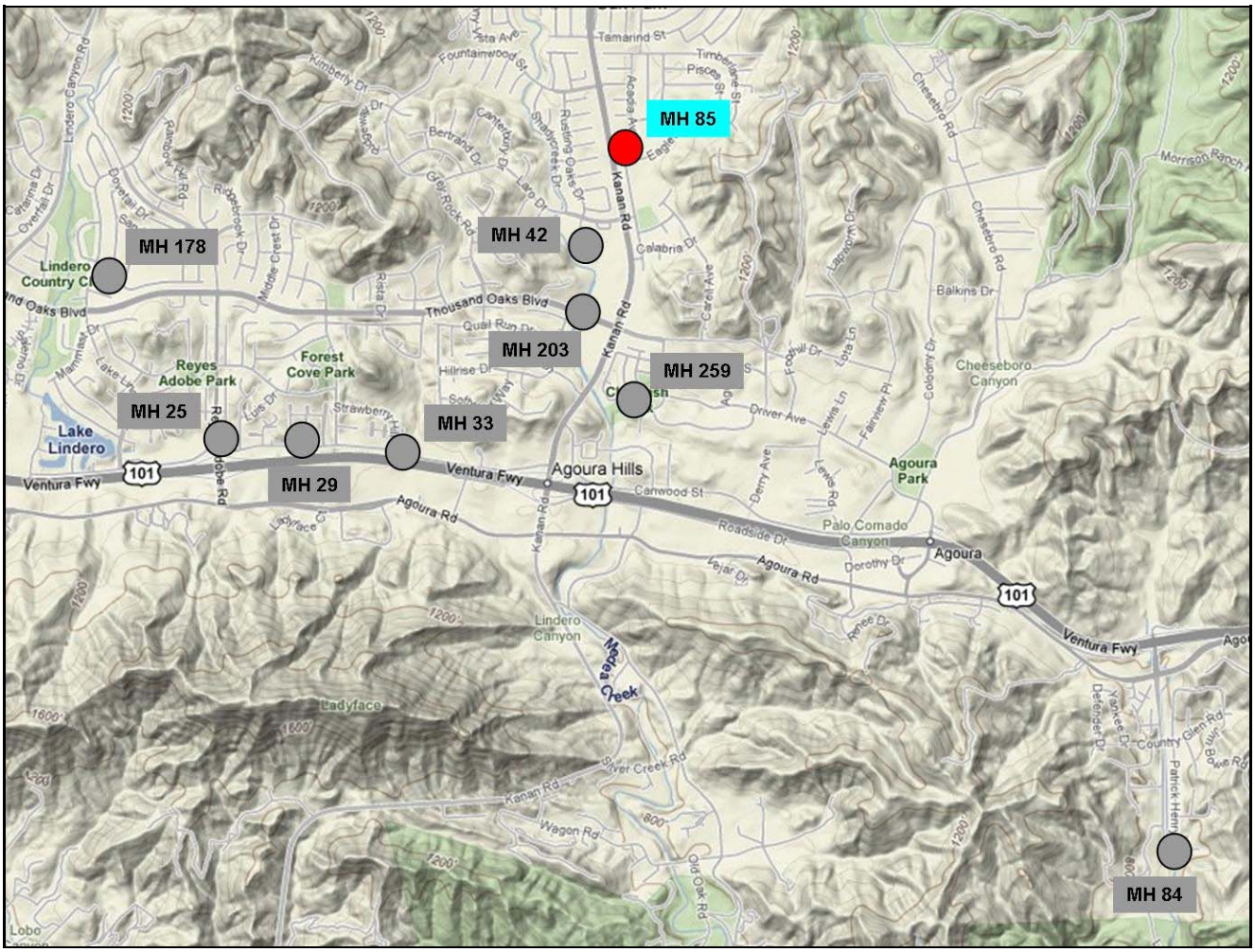
Sanitary Sewer Collection System

Monitoring Site: MH 85

Location: Dargan Street, west of Acadia Avenue

Size / Type Line: 10-inch Sanitary Sewer Pipe

Data Summary Report



Site Information Report

Monitoring Site: MH 85

Location: Dargan Street, west of Acadia Avenue

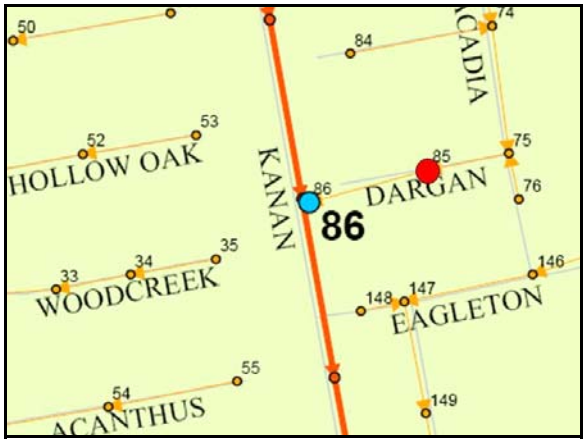
Diameter: 10 inches

Average Dry Weather Flow: 0.06 *mgd*

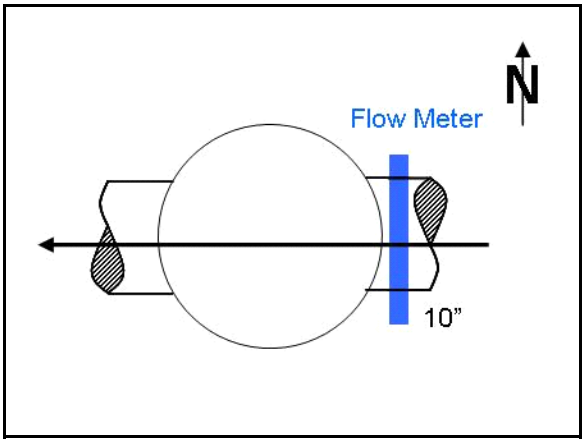
Peak Measured Flow: 0.15 *mgd*

Satellite Map

Sanitary Map



Flow Sketch



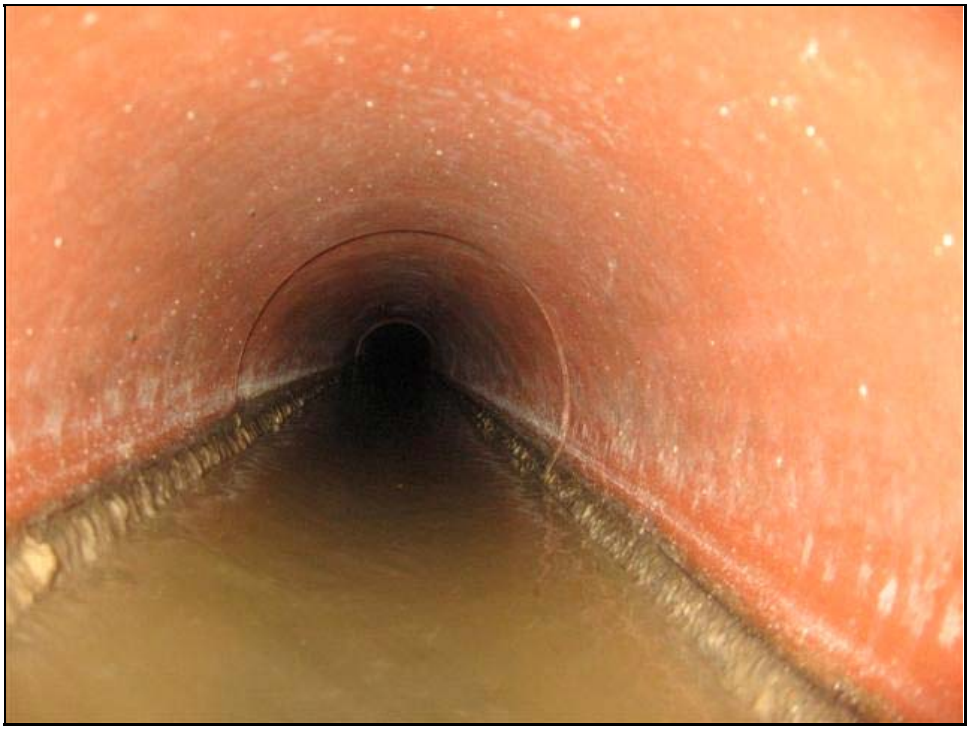
Street View Photo

Plan View Photo

	Site Information Report Photos	**Monitoring Site:** MH 85

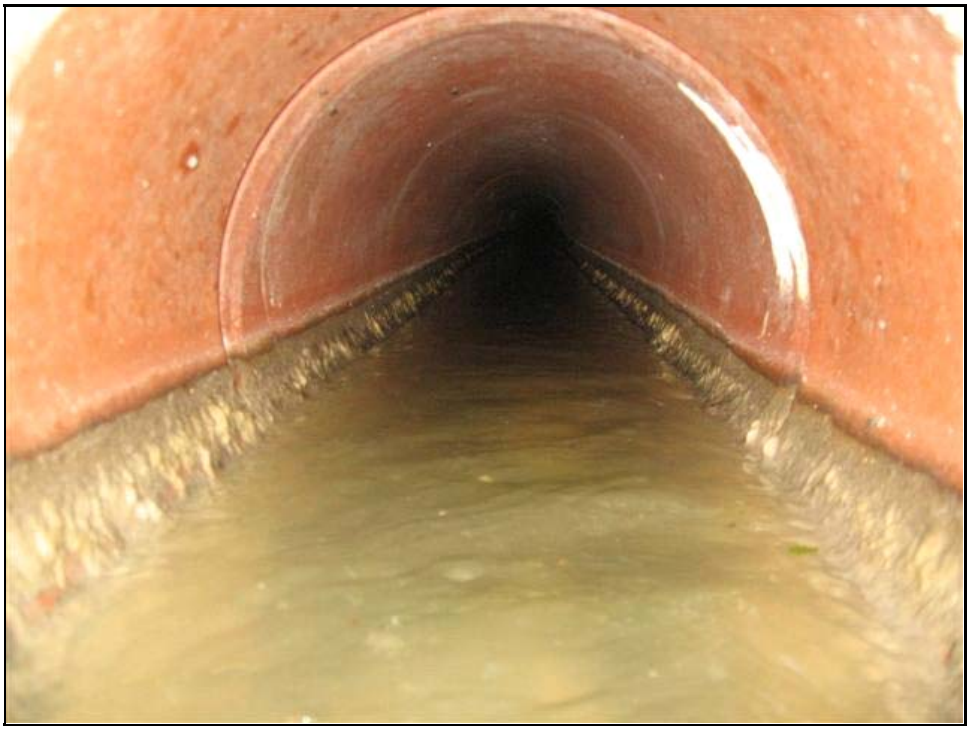
Manhole Lid

East Inlet



	Site Information Report Photos	**Monitoring Site:** MH 85

West Outlet



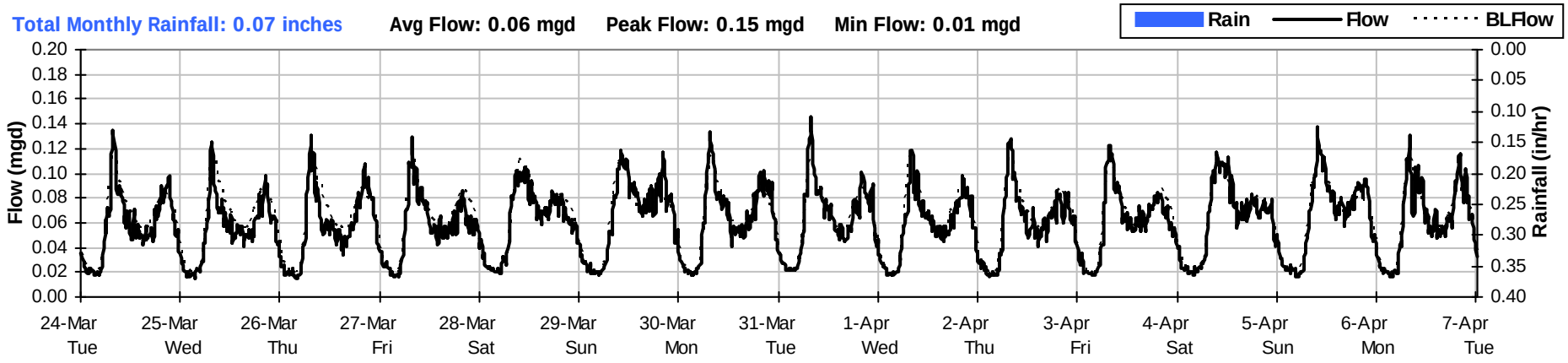
Period Flow Summary

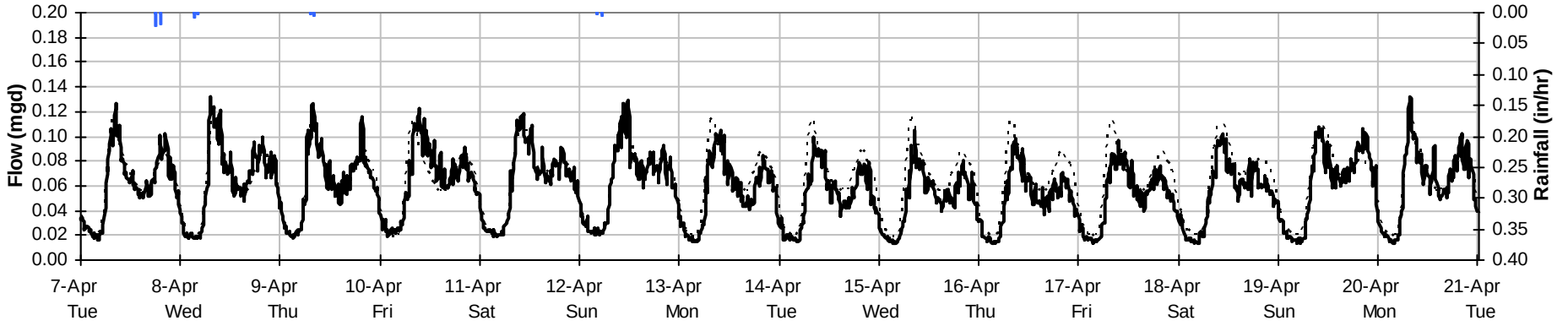
March 24, 2009 to April 21, 2009

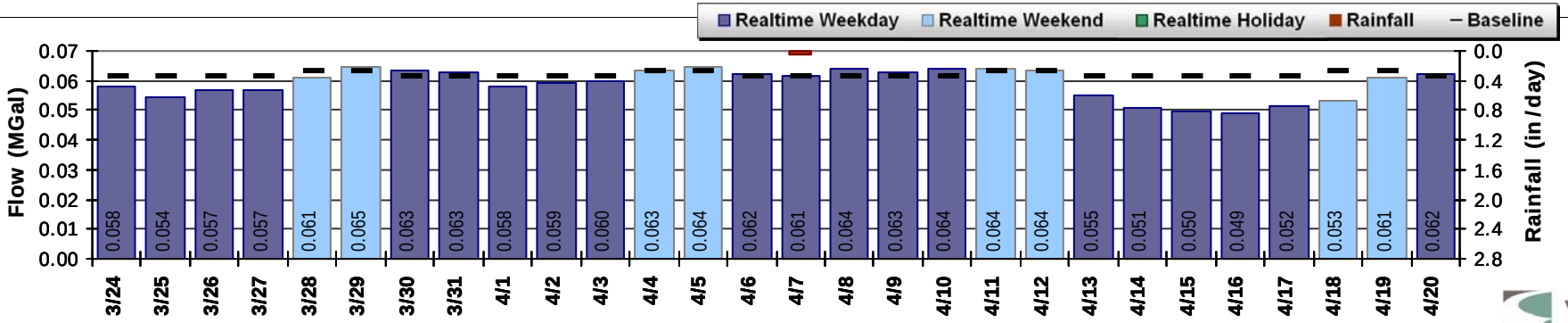
Monitoring Site:

MH 85

Total Monthly Rainfall: 0.07 inches **Avg Flow: 0.06 mgd** **Peak Flow: 0.15 mgd** **Min Flow: 0.01 mgd**

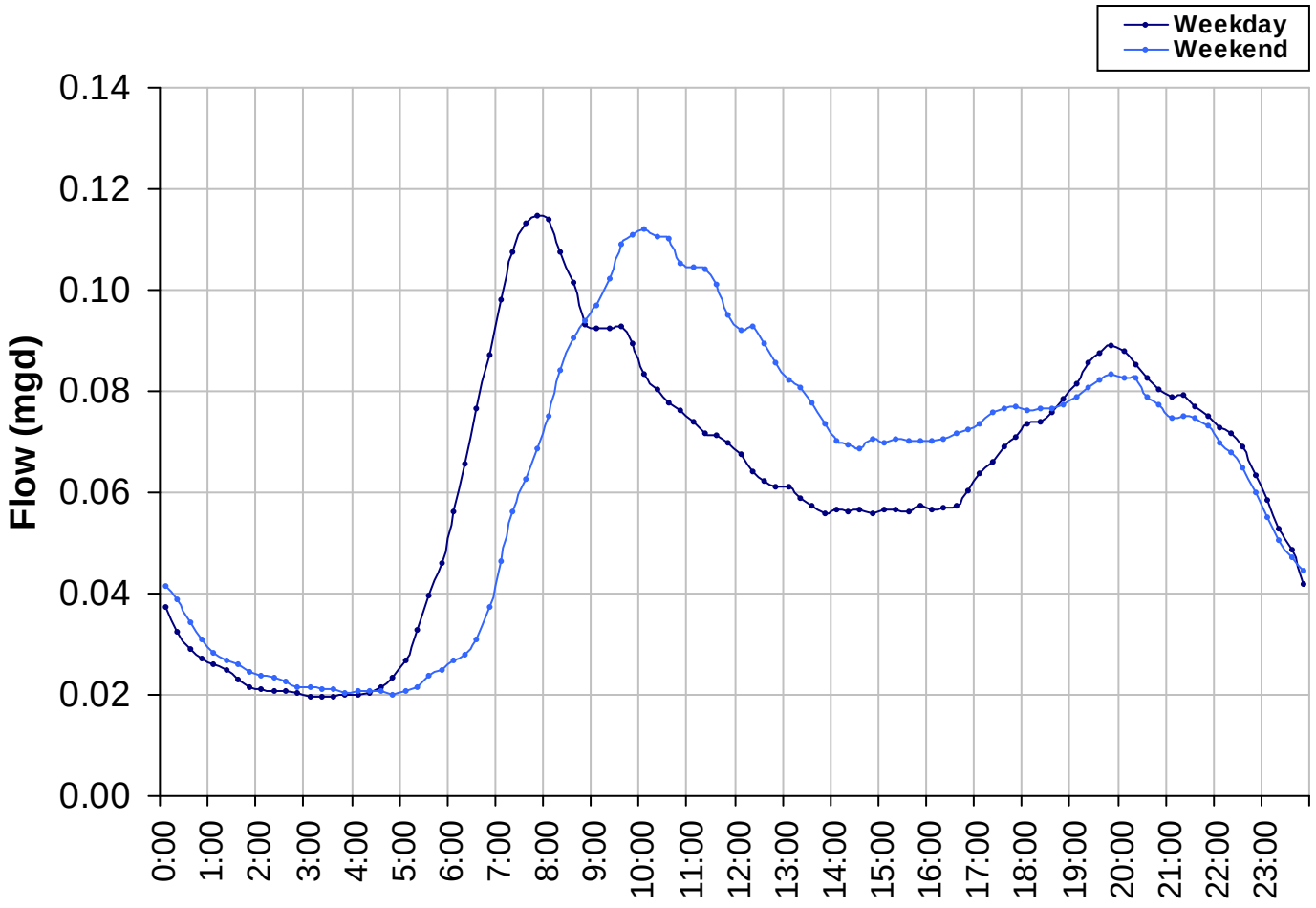






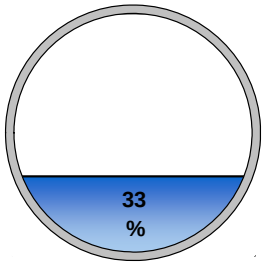
Average Dry Weather Flow

Monitoring Site:
MH 85



Peak Measured Flow:

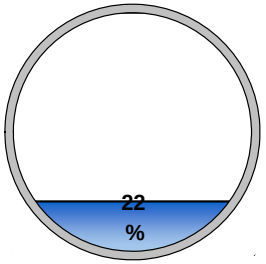
0.15 *mgd*



Peak measured flow shown in weekly graphs on following pages

Average Dry Weather Flow:

0.06 *mgd*

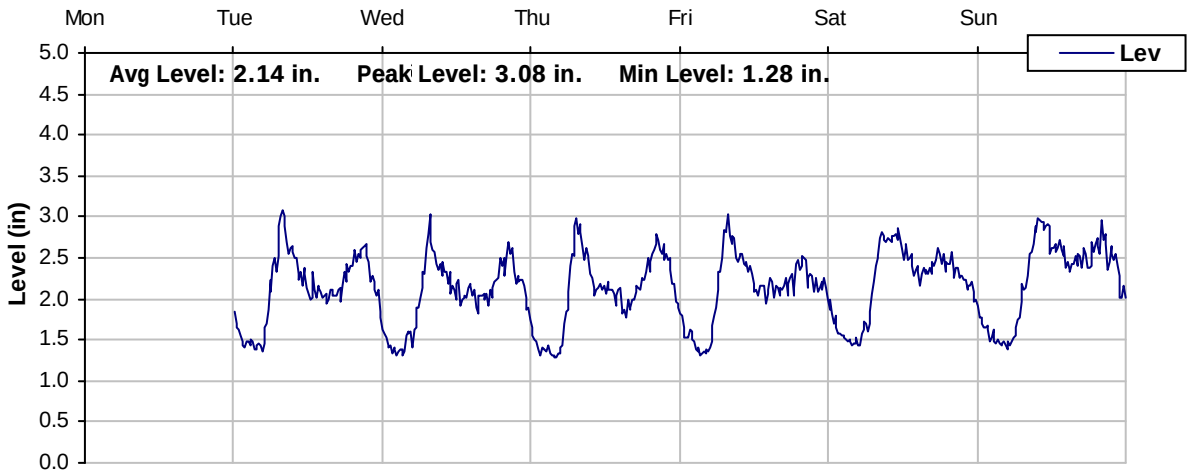


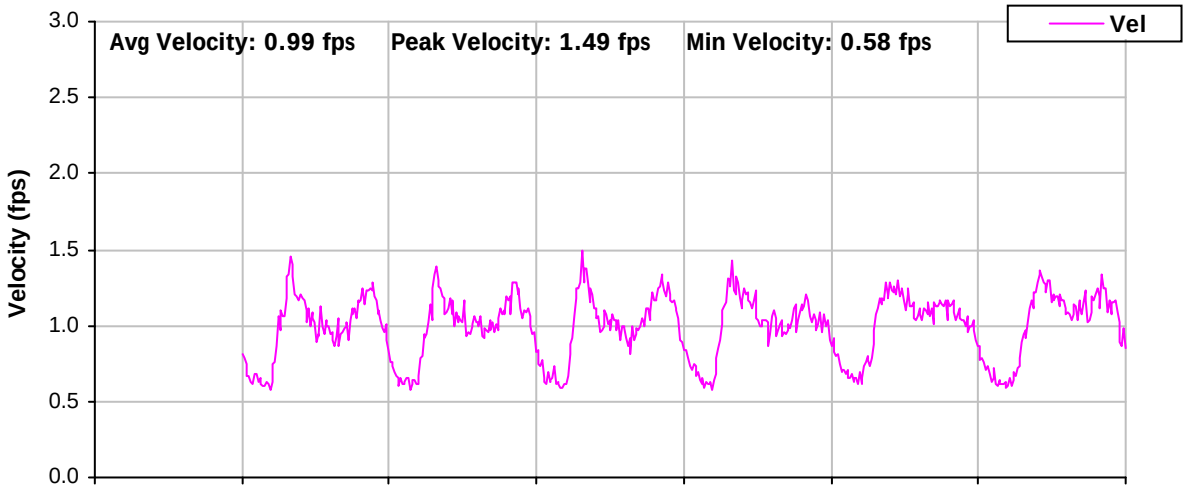
Level, Velocity and Flow

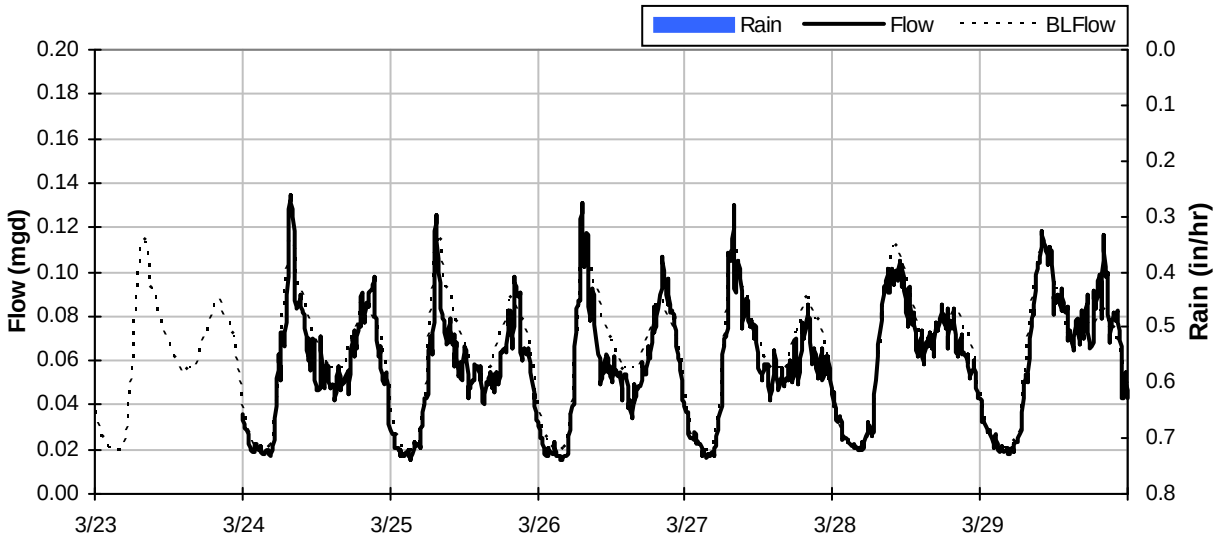
From 3/23/2009 to 3/30/2009

Monitoring Site:

MH 85







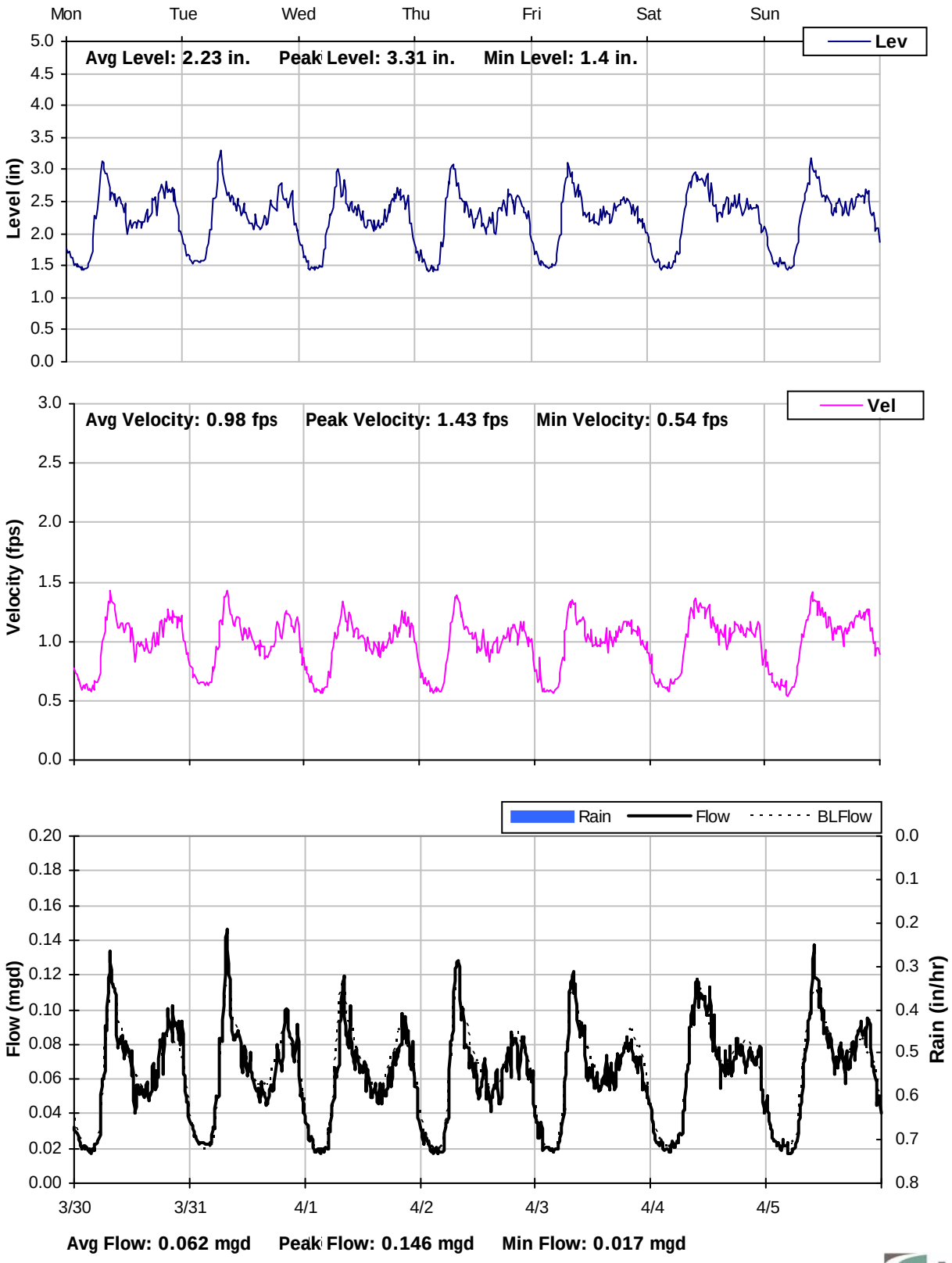
Avg Flow: 0.059 mgd **Peak Flow: 0.134 mgd** **Min Flow: 0.016 mgd**

Level, Velocity and Flow

From 3/30/2009 to 4/6/2009

Monitoring Site:

MH 85

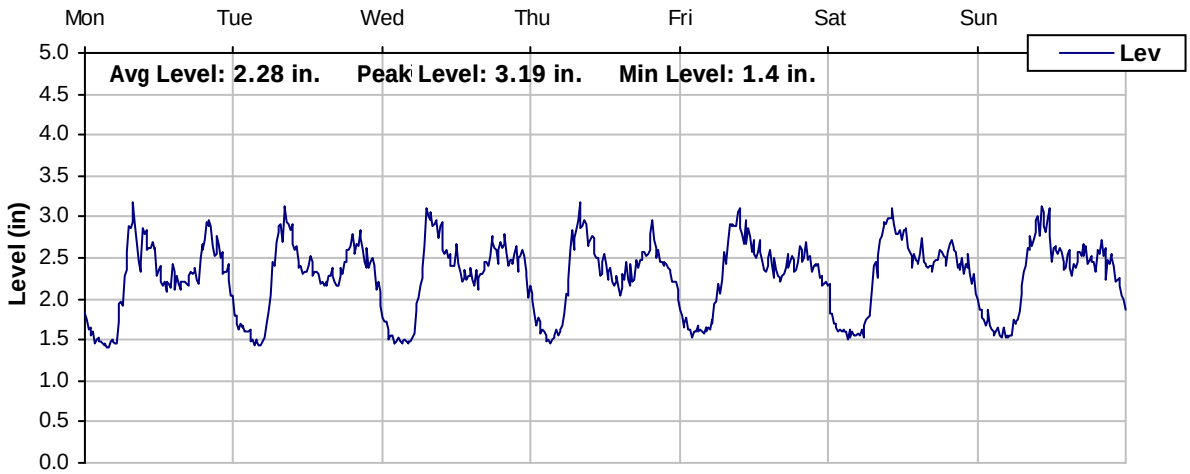


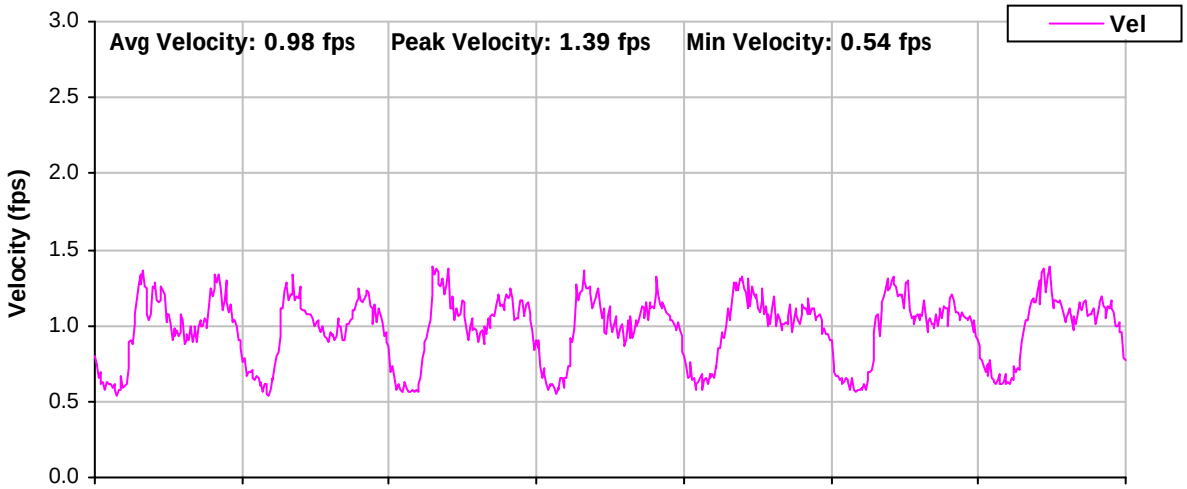
Level, Velocity and Flow

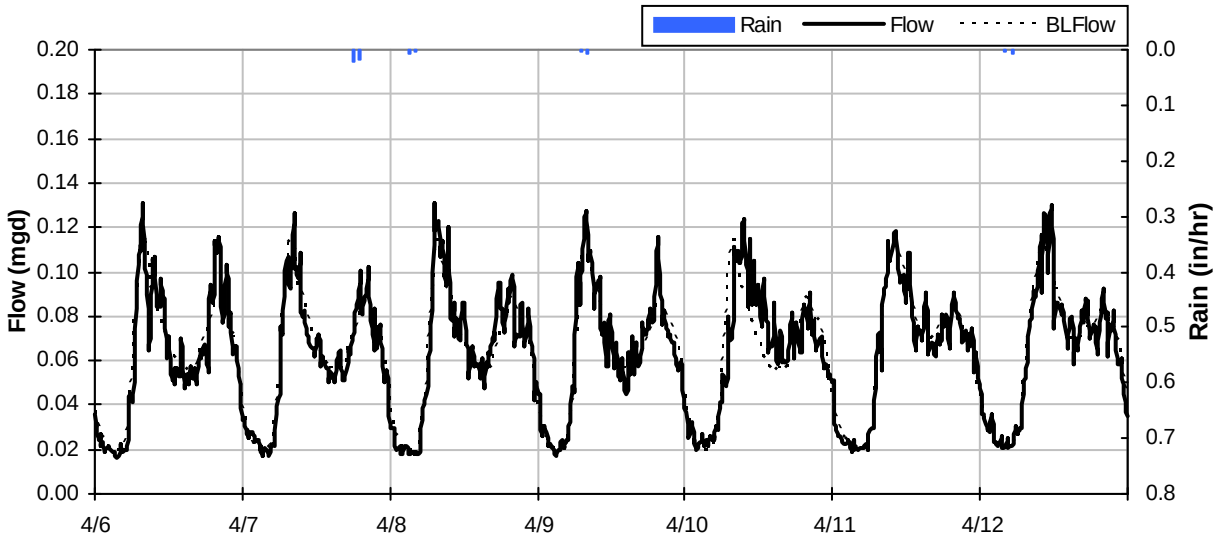
From 4/6/2009 to 4/13/2009

Monitoring Site:

MH 85







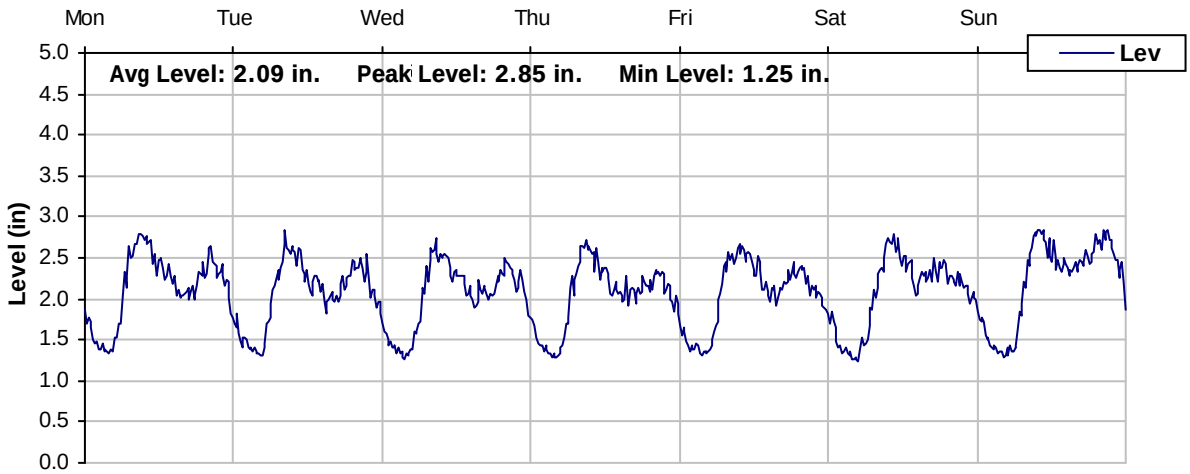
Avg Flow: 0.063 mgd **Peak Flow: 0.131 mgd** **Min Flow: 0.016 mgd**

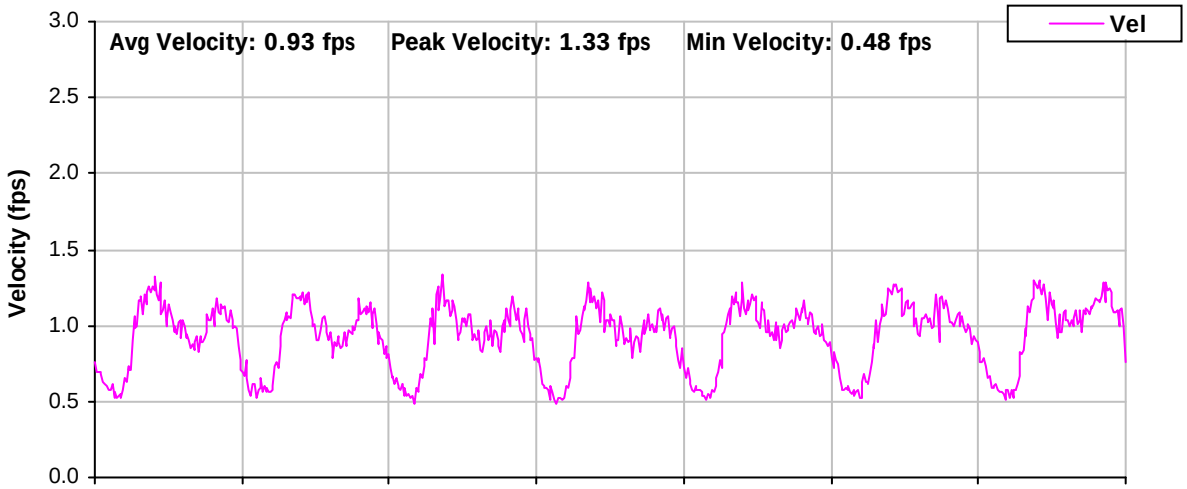
Level, Velocity and Flow

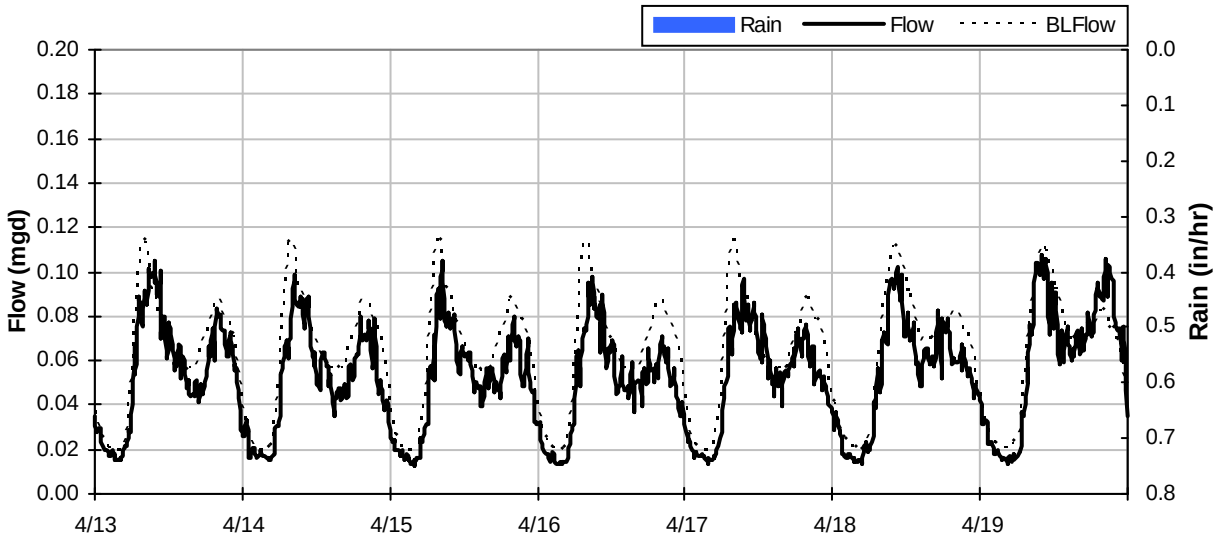
From 4/13/2009 to 4/20/2009

Monitoring Site:

MH 85







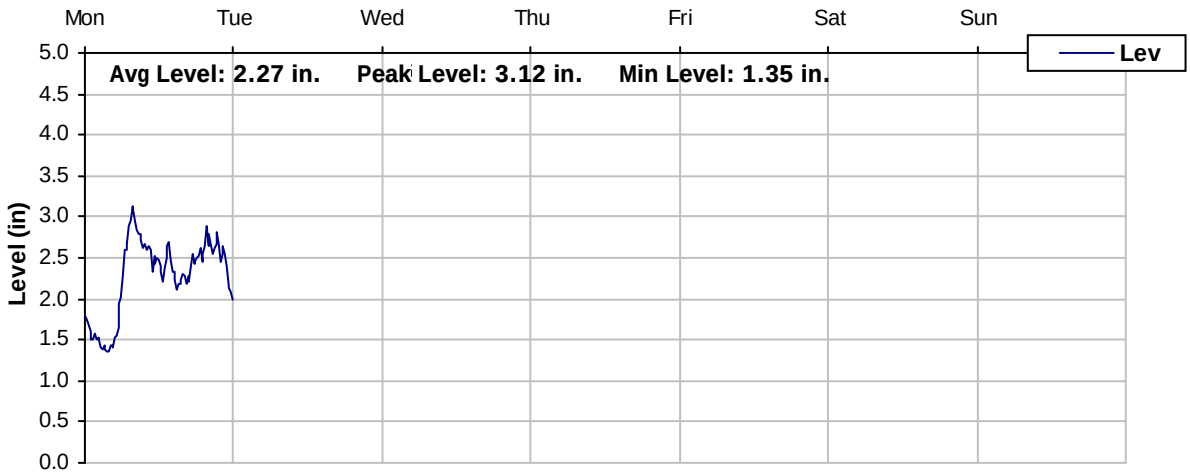
Avg Flow: 0.053 mgd **Peak Flow: 0.108 mgd** **Min Flow: 0.013 mgd**

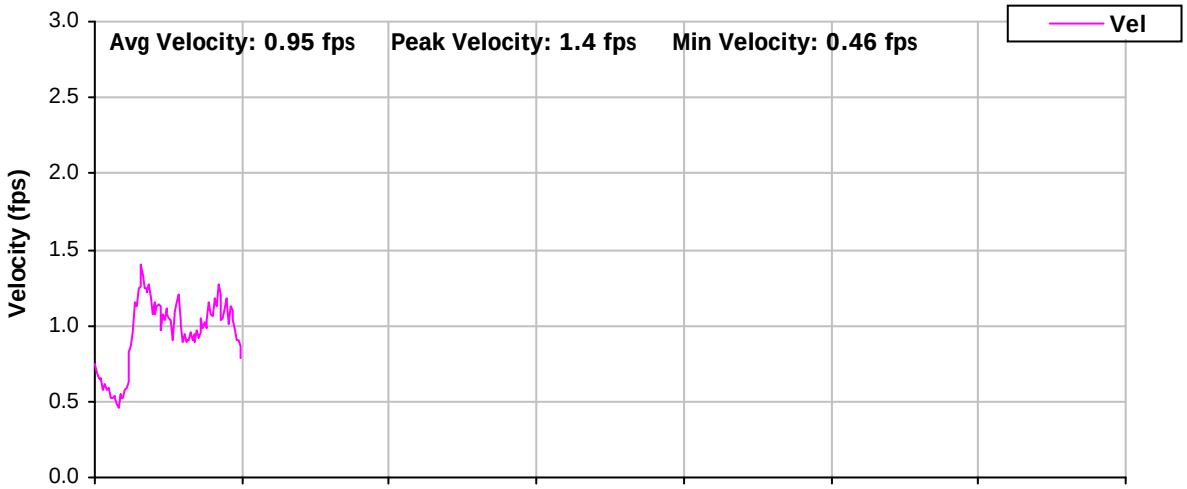
Level, Velocity and Flow

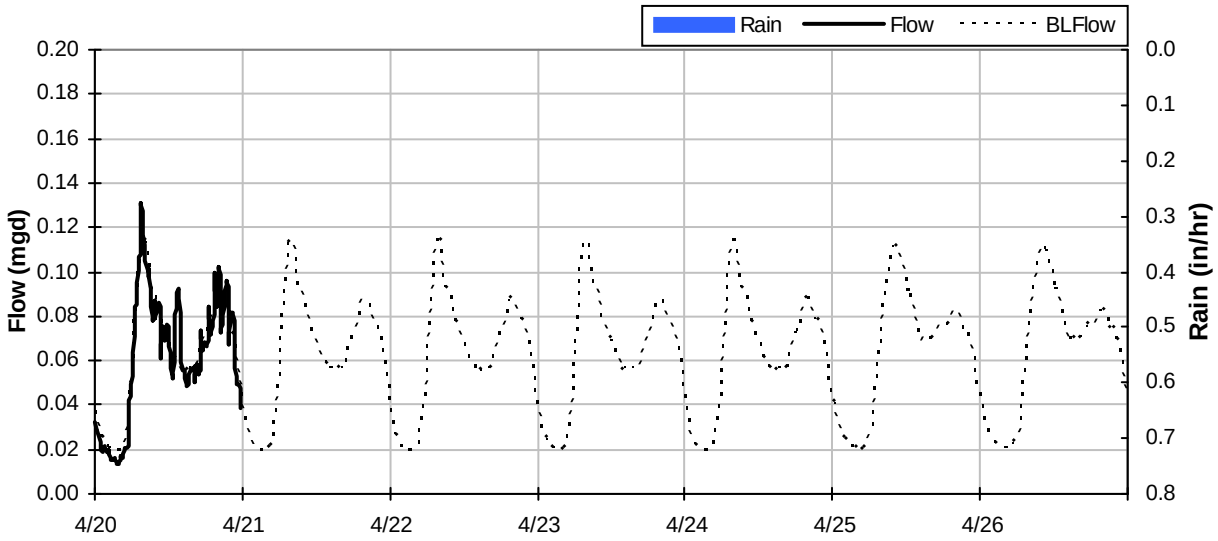
From 4/20/2009 to 4/27/2009

Monitoring Site:

MH 85







Avg Flow: 0.062 mgd **Peak Flow: 0.131 mgd** **Min Flow: 0.013 mgd**

Temporary Flow Monitoring Study

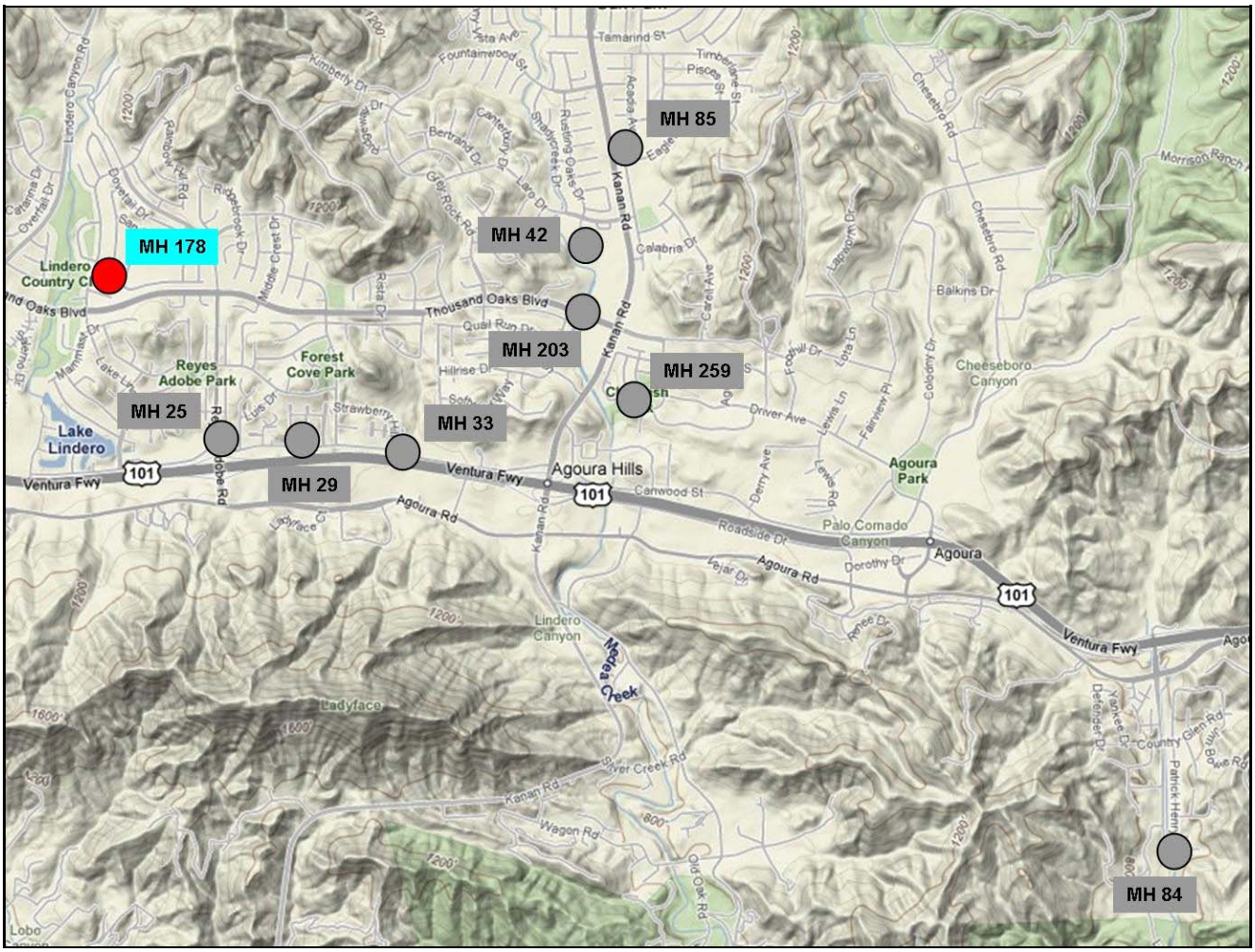
Sanitary Sewer Collection System

Monitoring Site: MH 178

Location: Rainbow View Drive and Wheelhouse Lane

Size / Type Line: 8-inch Sanitary Sewer Pipe

Data Summary Report



Site Information Report

Monitoring Site: MH 178

Location: Rainbow View Drive and Wheelhouse Lane

Diameter: 8 inches

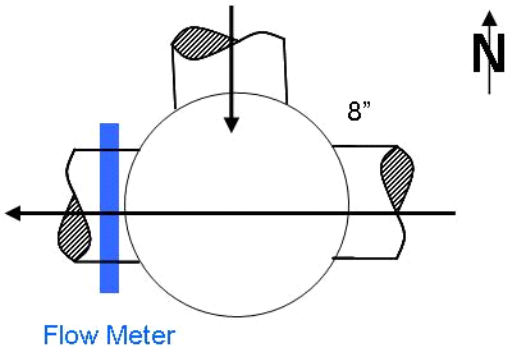
Average Dry Weather Flow: 0.09 *mgd*

Peak Measured Flow: 0.27 *mgd*

Satellite Map

Sanitary Map

Flow Sketch

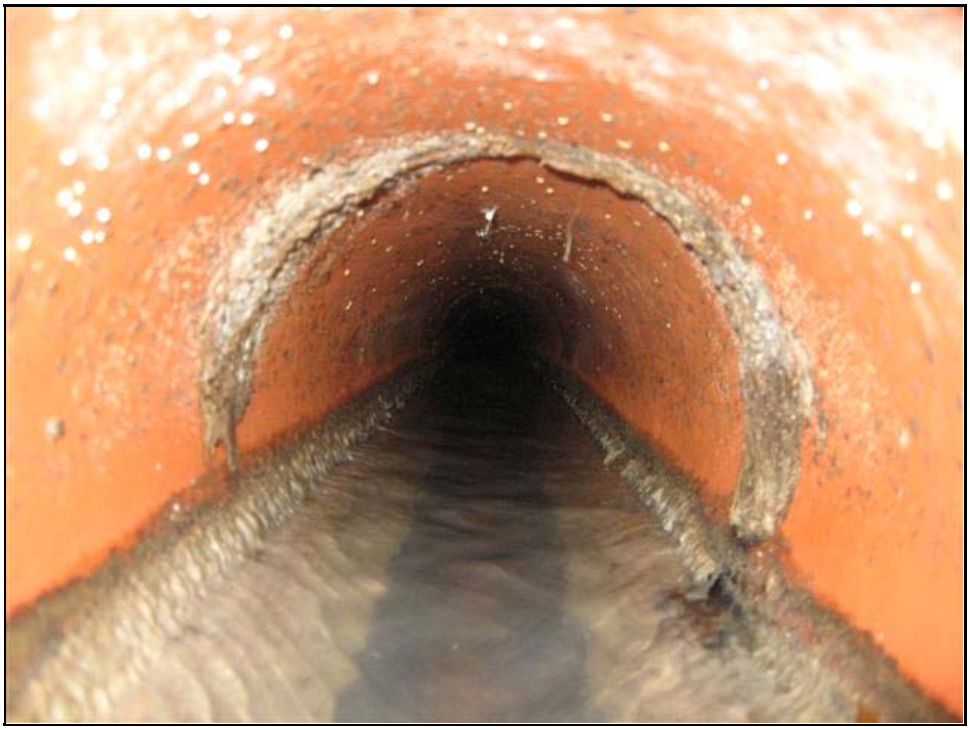


Street View Photo

Plan View Photo

	Site Information Report Photos	**Monitoring Site:** MH 178

East Inlet



North Inlet

	Site Information Report Photos	**Monitoring Site:** MH 178

West Outlet

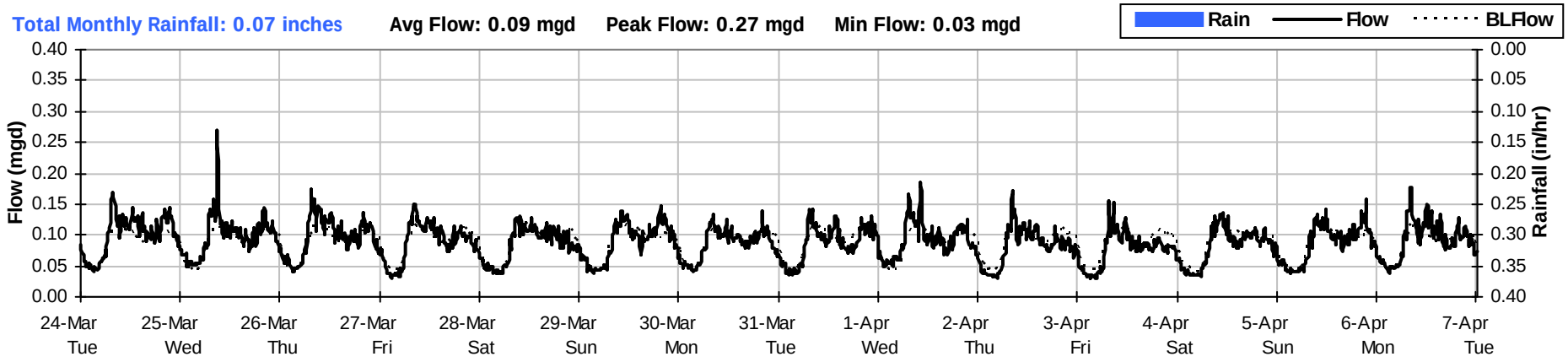
Period Flow Summary

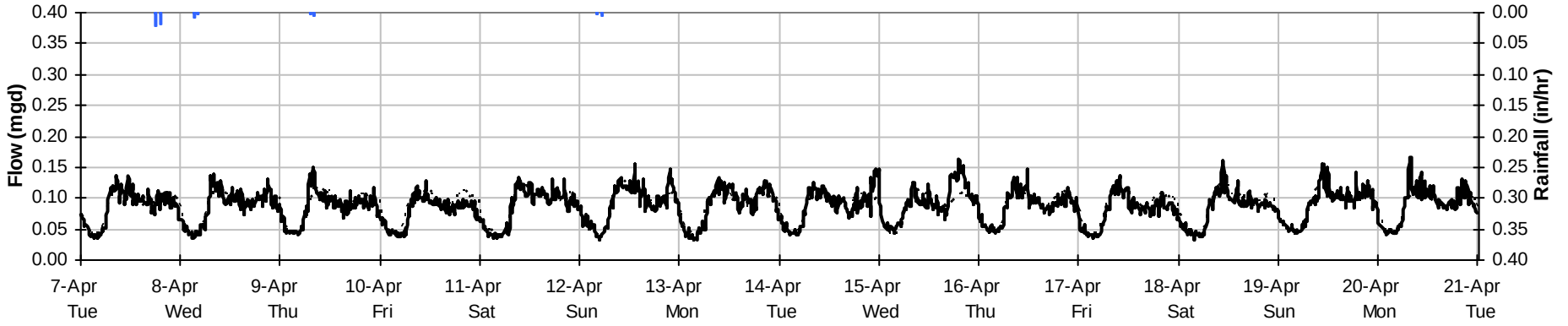
March 24, 2009 to April 21, 2009

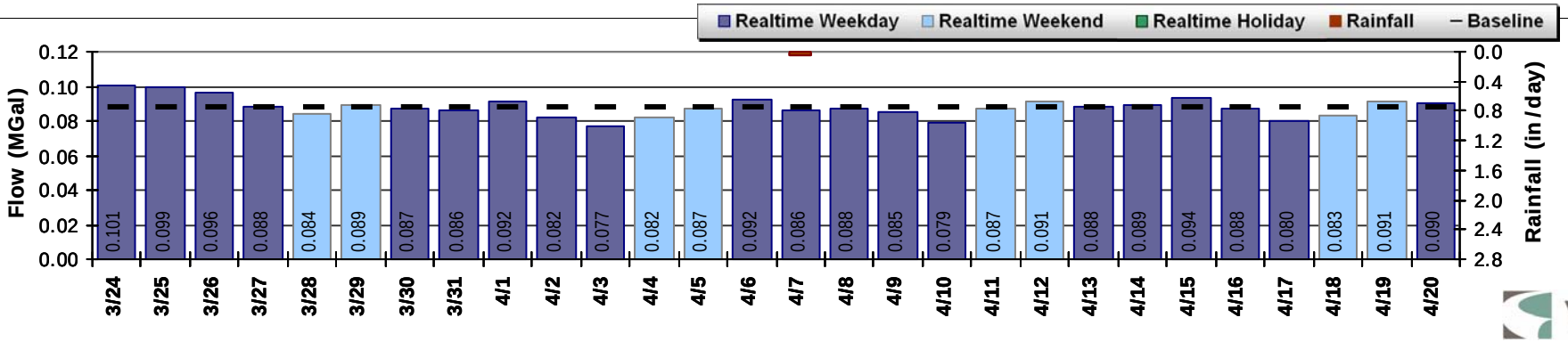
Monitoring Site:

MH 178

Total Monthly Rainfall: 0.07 inches **Avg Flow: 0.09 mgd** **Peak Flow: 0.27 mgd** **Min Flow: 0.03 mgd**



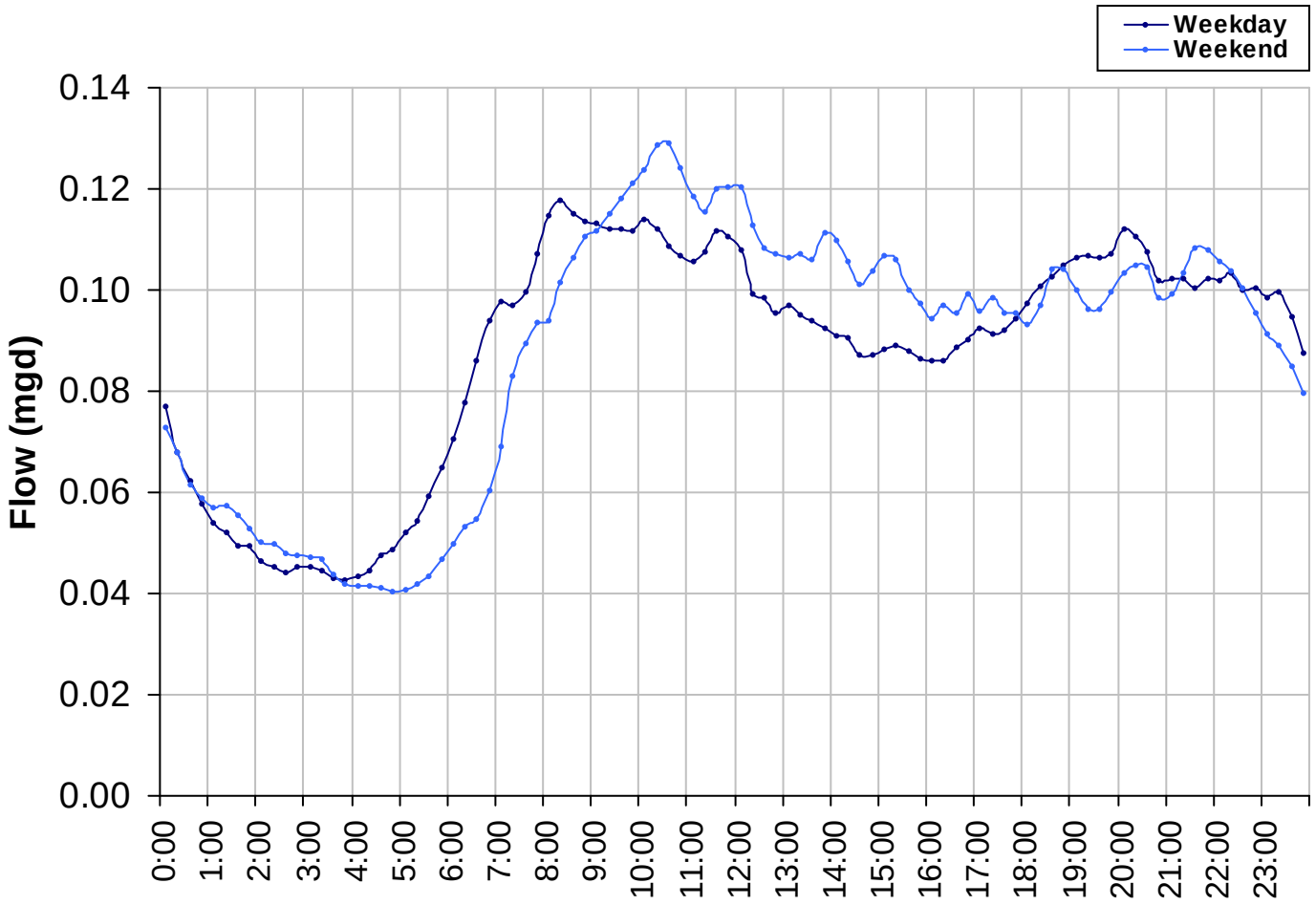




V&A

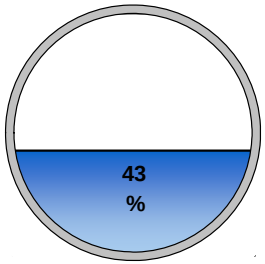
Average Dry Weather Flow

Monitoring Site:
MH 178



Peak Measured Flow:

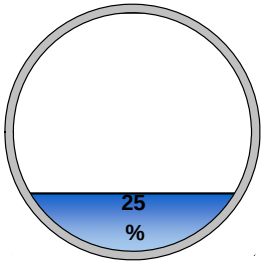
0.27 *mgd*



Peak measured flow shown in weekly graphs on following pages

Average Dry Weather Flow:

0.09 *mgd*

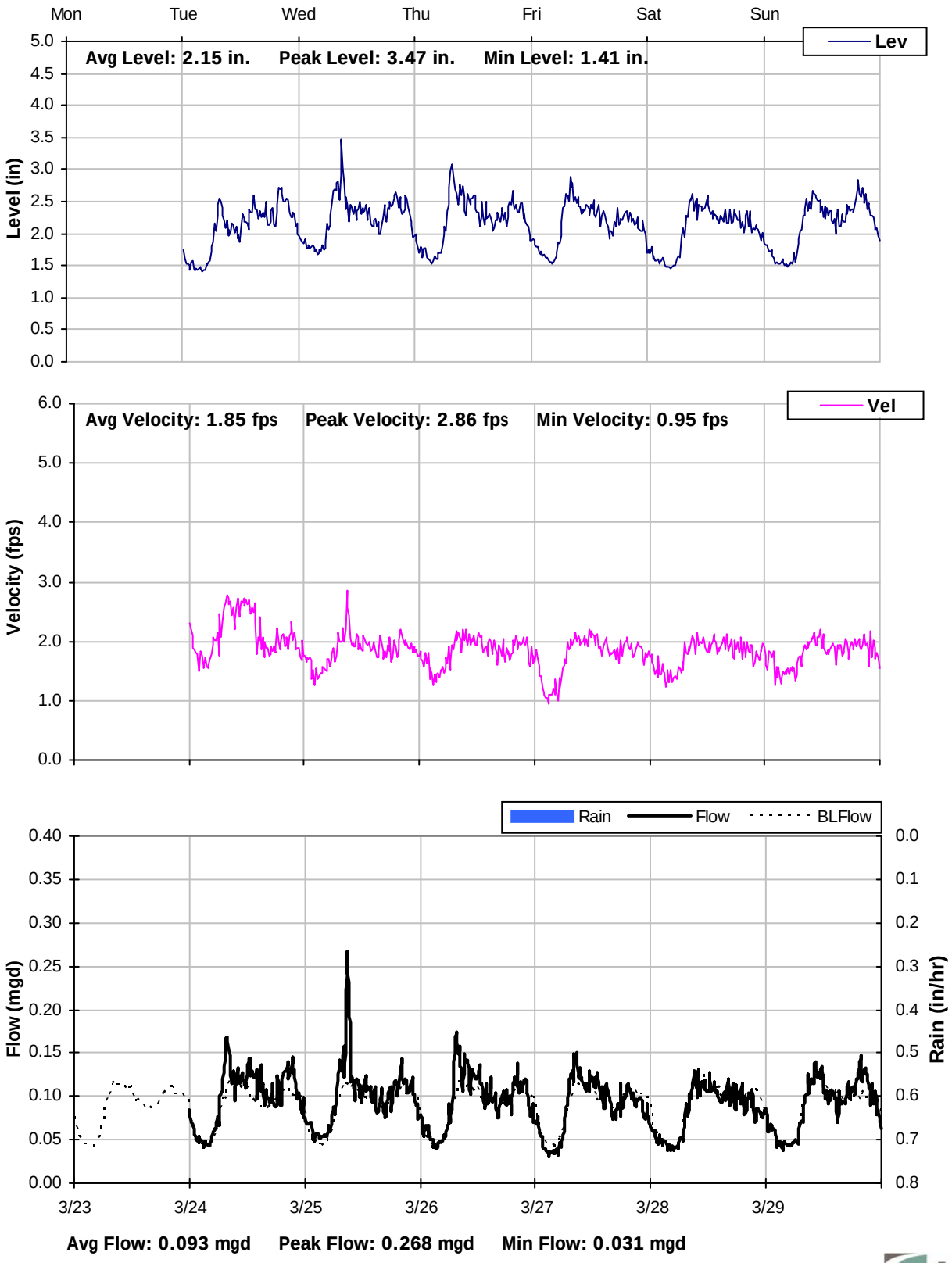


Level, Velocity and Flow

From 3/23/2009 to 3/30/2009

Monitoring Site:

MH 178

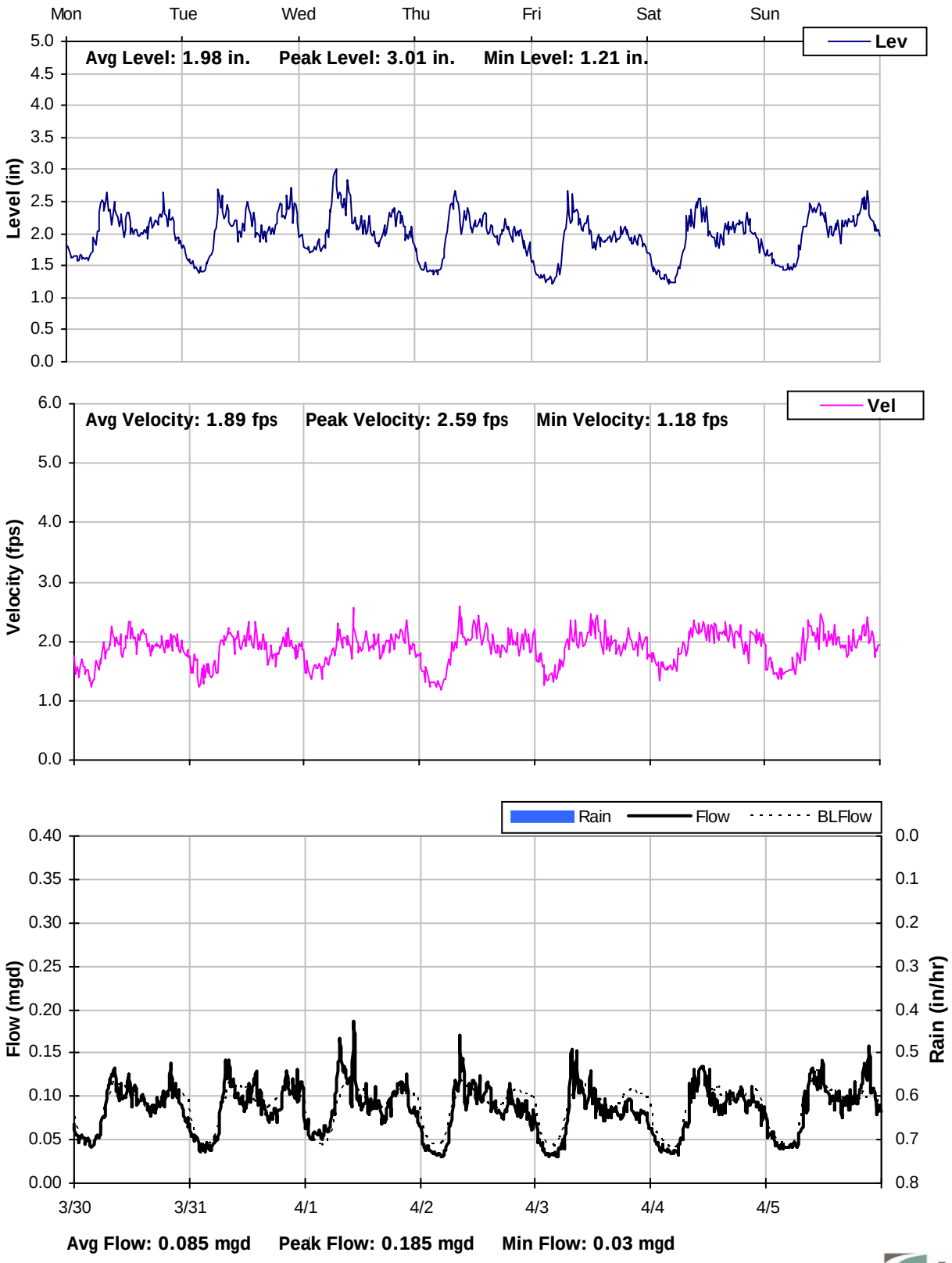


Level, Velocity and Flow

From 3/30/2009 to 4/6/2009

Monitoring Site:

MH 178

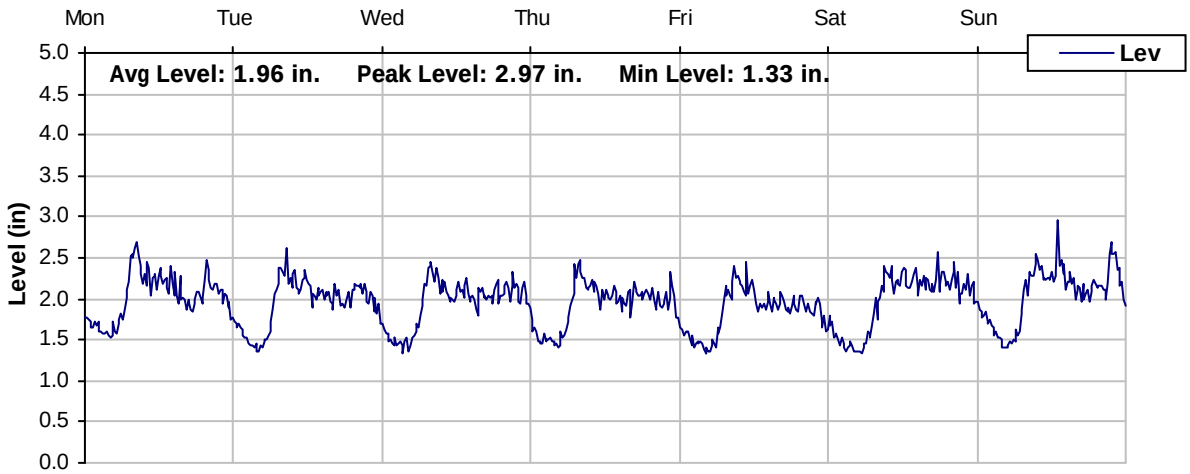


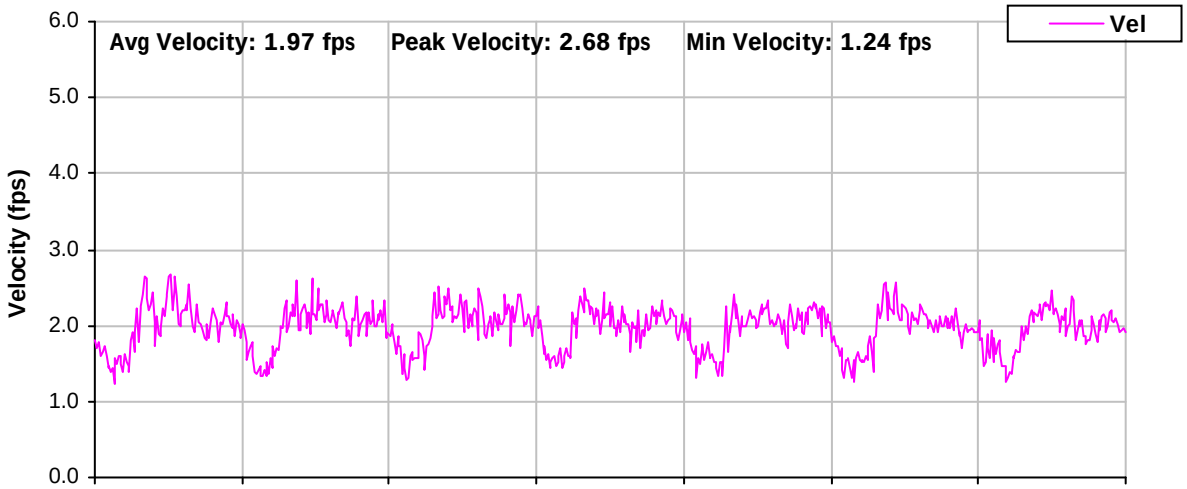
Level, Velocity and Flow

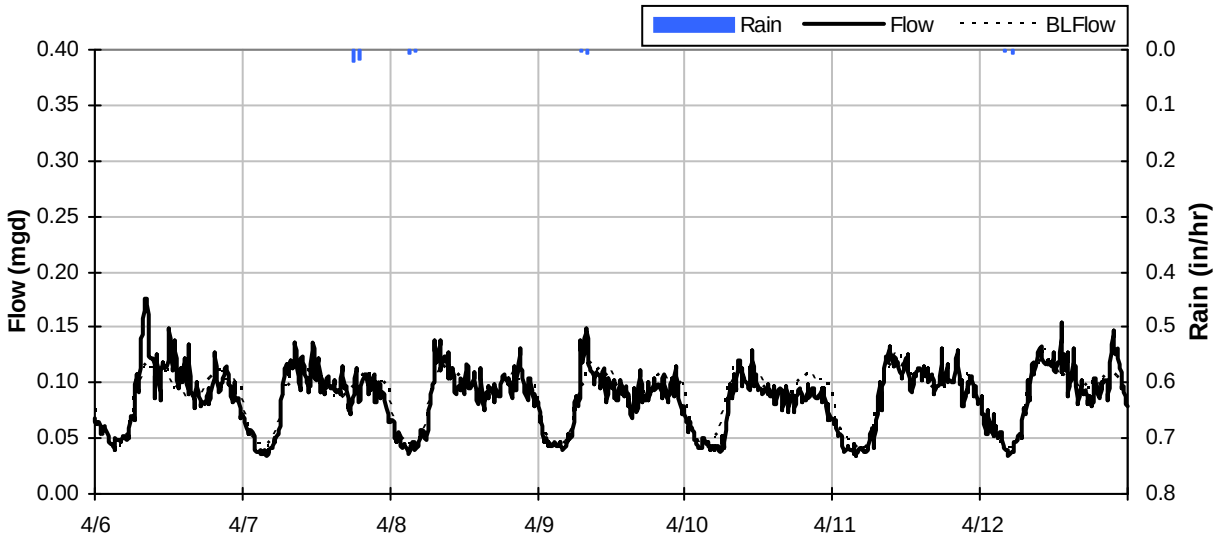
From 4/6/2009 to 4/13/2009

Monitoring Site:

MH 178







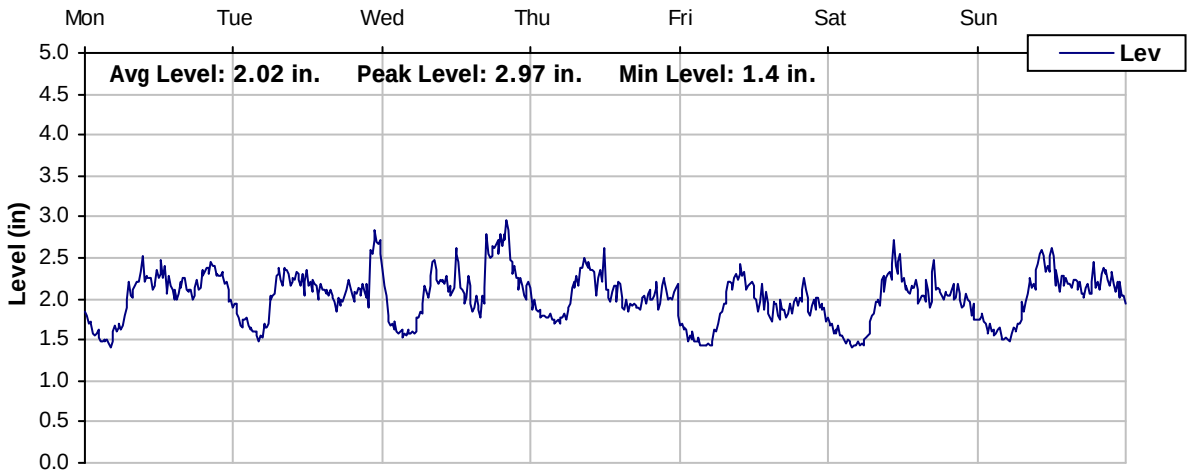
Avg Flow: 0.087 mgd **Peak Flow: 0.176 mgd** **Min Flow: 0.034 mgd**

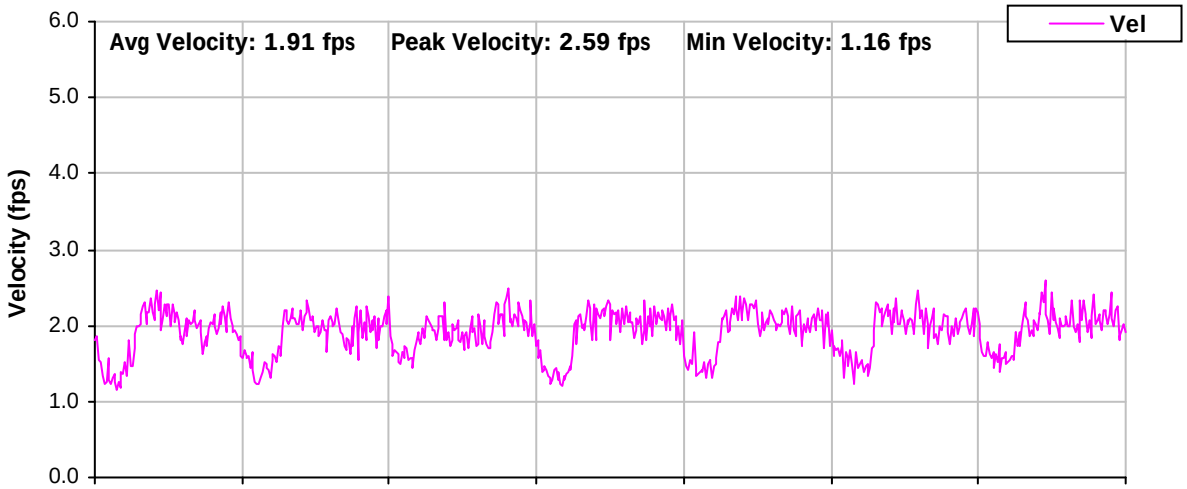
Level, Velocity and Flow

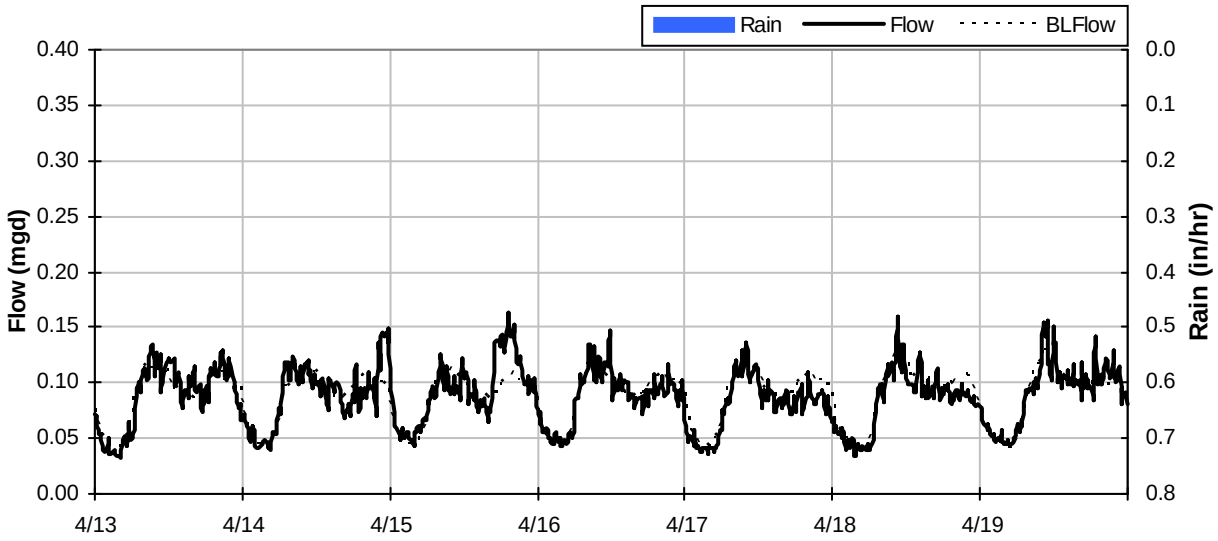
From 4/13/2009 to 4/20/2009

Monitoring Site:

MH 178







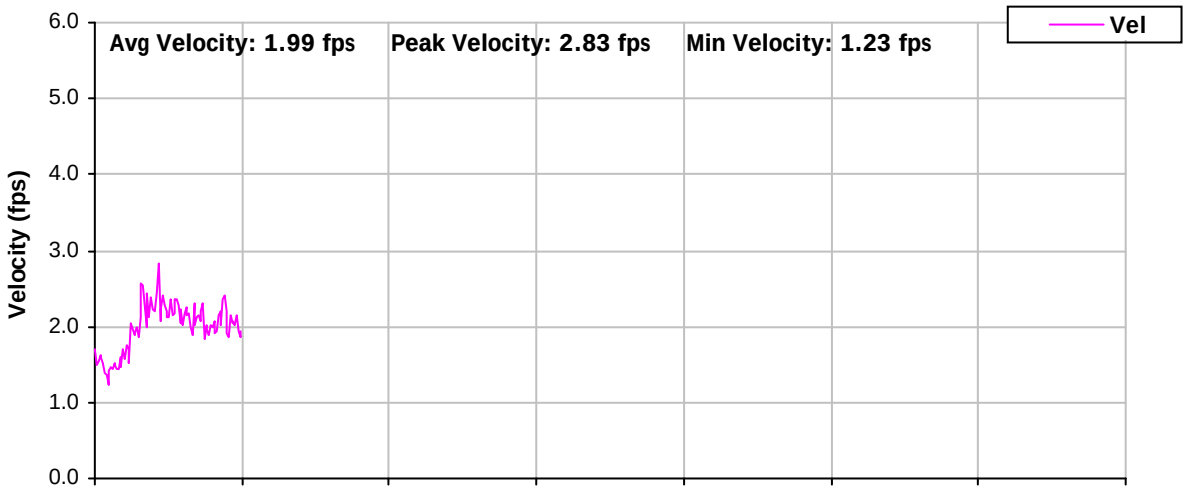
Avg Flow: 0.088 mgd **Peak Flow: 0.164 mgd** **Min Flow: 0.032 mgd**

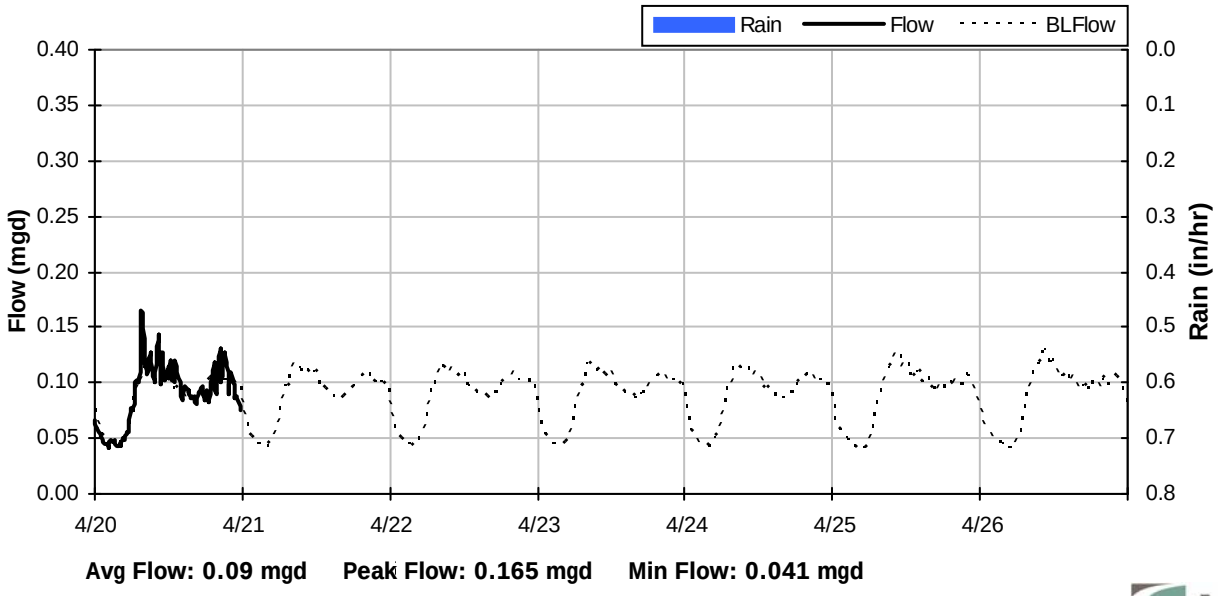
Level, Velocity and Flow

From 4/20/2009 to 4/27/2009

Monitoring Site:

MH 178





Avg Flow: 0.09 mgd **Peak Flow: 0.165 mgd** **Min Flow: 0.041 mgd**

Temporary Flow Monitoring Study

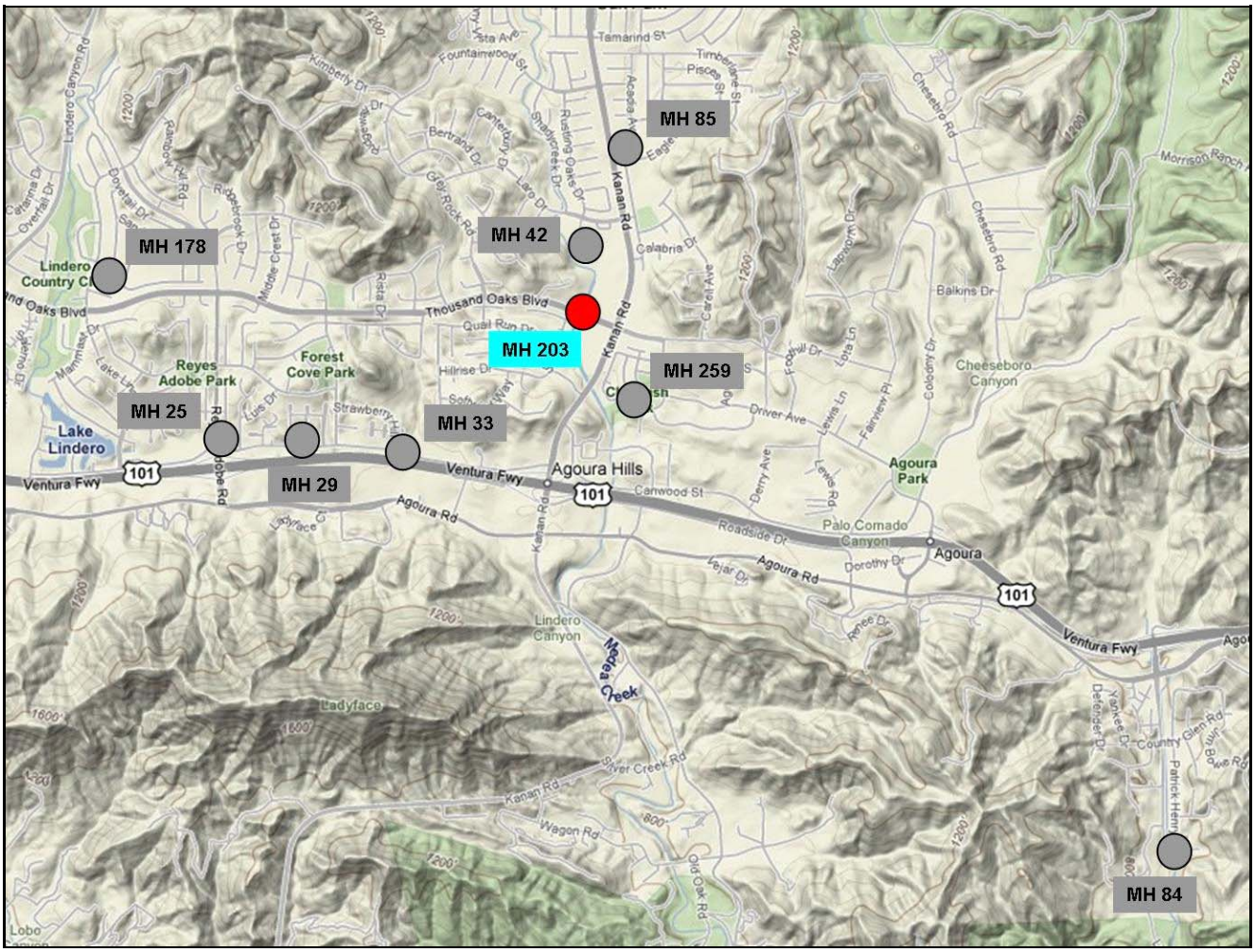
Sanitary Sewer Collection System

Monitoring Site: MH 203

Location: Thousand Oaks Boulevard, west of Kanan Road

Size / Type Line: 8-inch Sanitary Sewer Pipe

Data Summary Report



V&A

Site Information Report

Monitoring Site: MH 203

Location: Thousand Oaks Boulevard, west of Kanan Road

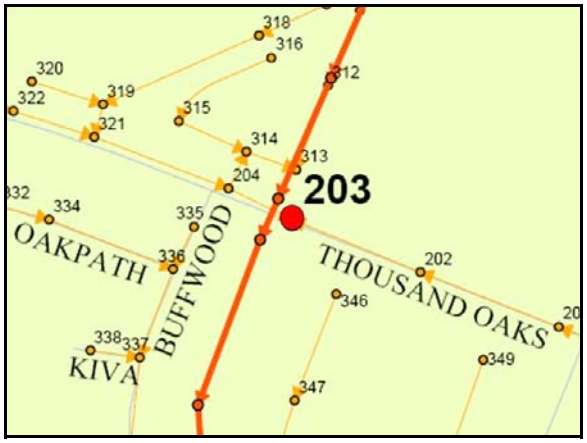
Diameter: 8 inches

Average Dry Weather Flow: 0.09 *mgd*

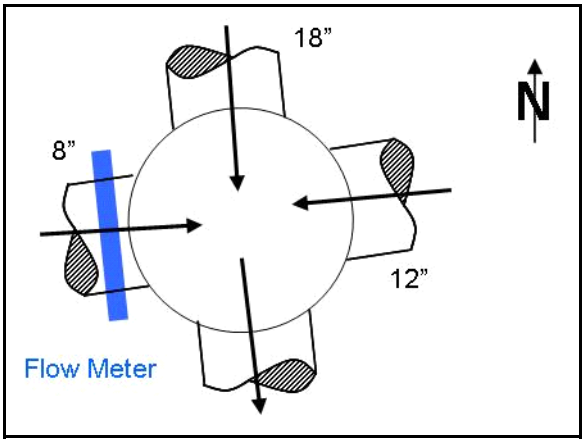
Peak Measured Flow: 0.20 *mgd*

Satellite Map

Sanitary Map



Flow Sketch



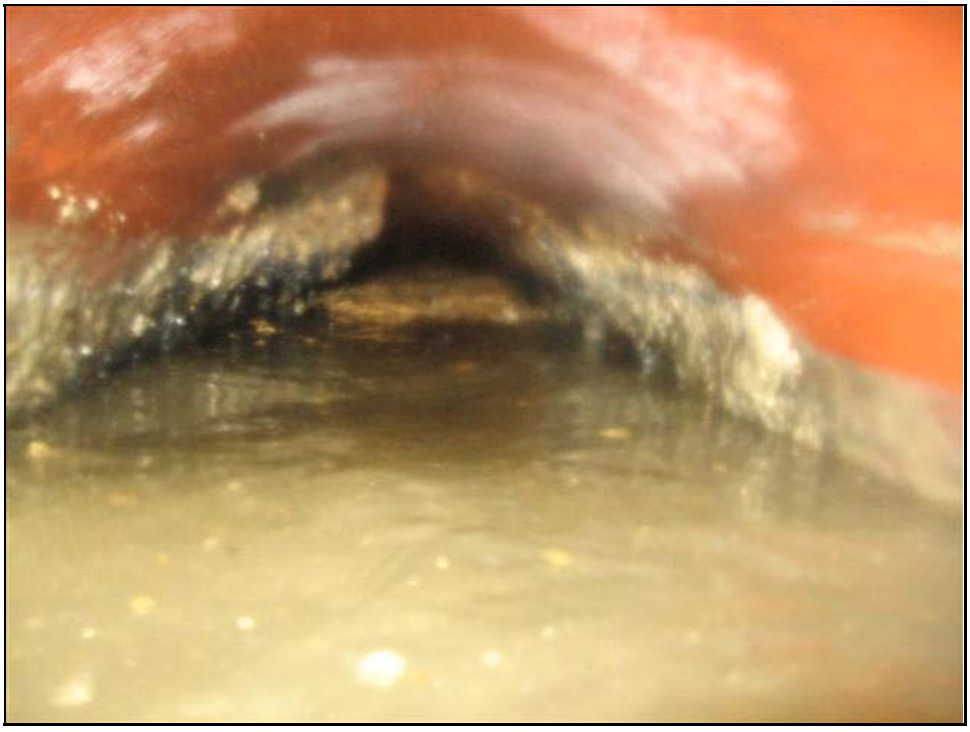
Street View Photo

Plan View Photo

	Site Information Report Photos	**Monitoring Site:** MH 203

Manhole Lid

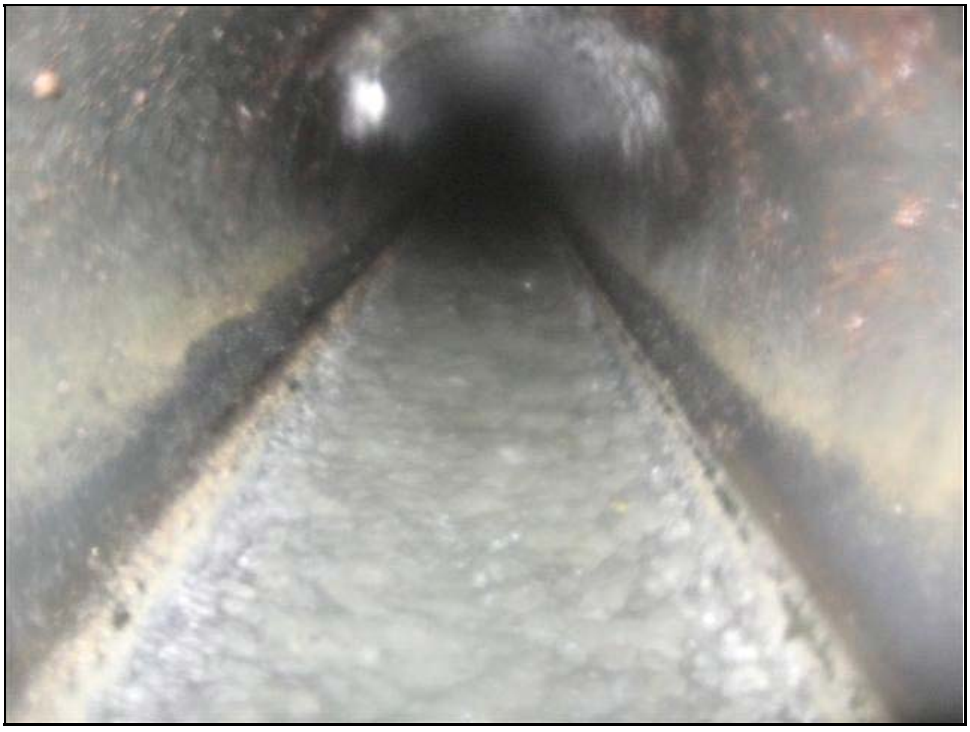
East Inlet



	Site Information Report Photos	**Monitoring Site:** MH 203

North Inlet

West Inlet



	Site Information Report Photos	**Monitoring Site:** MH 203

South Outlet

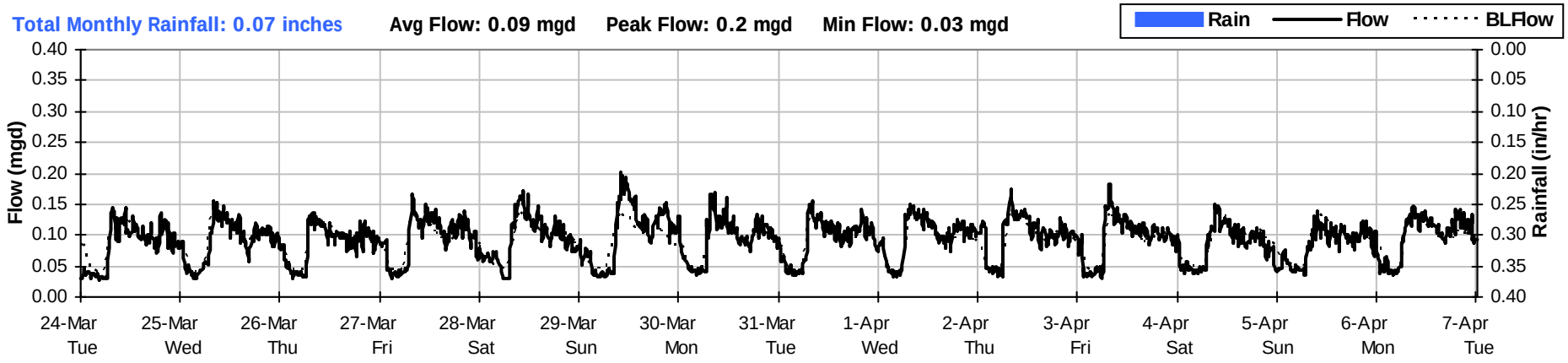
Period Flow Summary

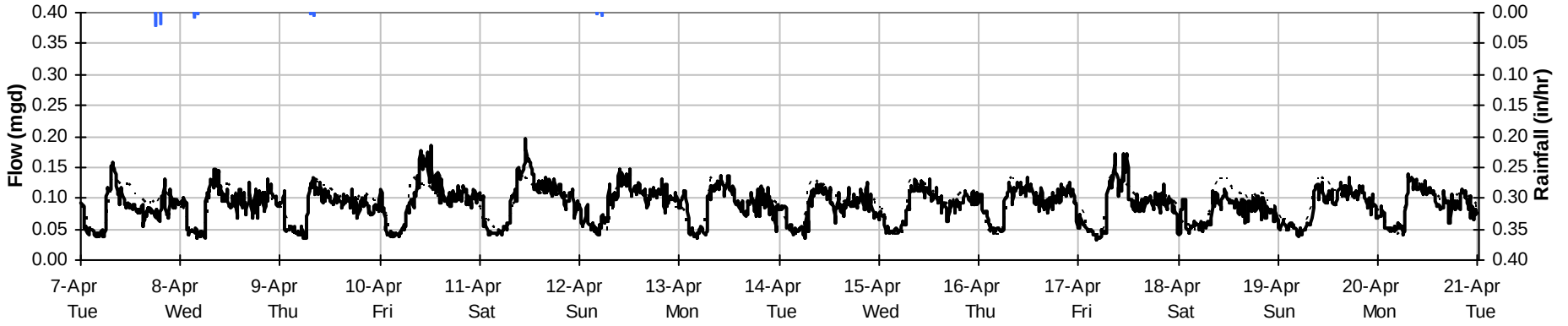
March 24, 2009 to April 21, 2009

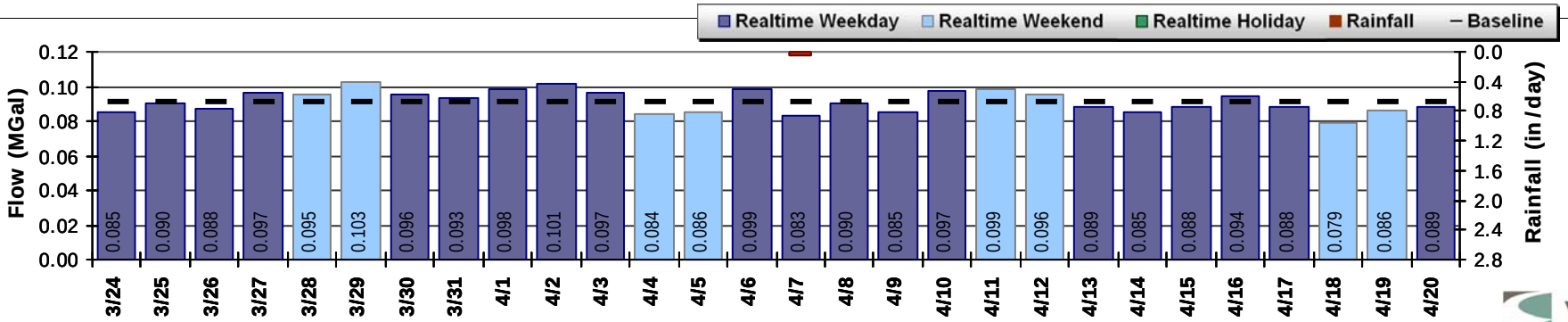
Monitoring Site:

MH 203

Total Monthly Rainfall: 0.07 inches **Avg Flow: 0.09 mgd** **Peak Flow: 0.2 mgd** **Min Flow: 0.03 mgd**



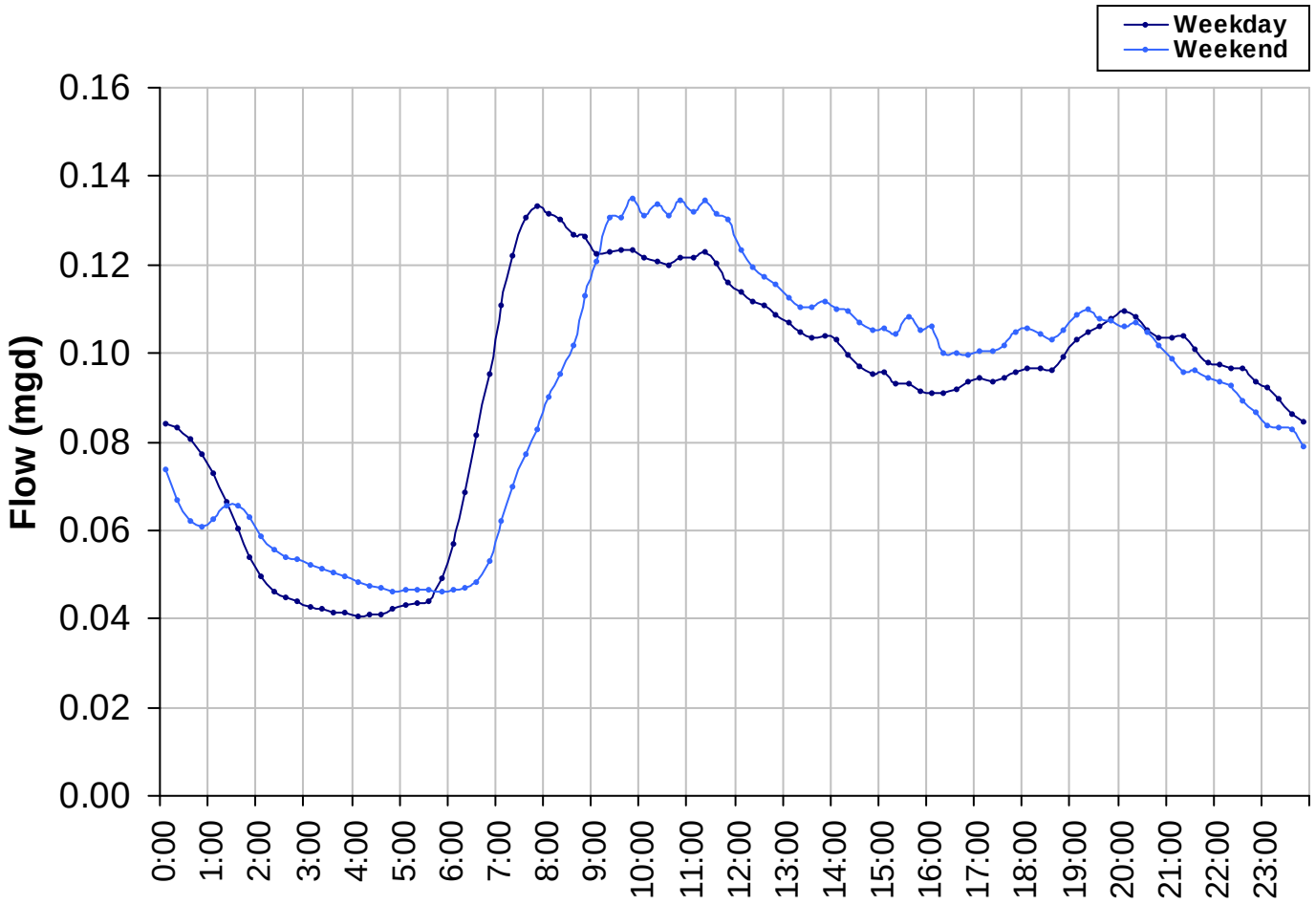




V&A

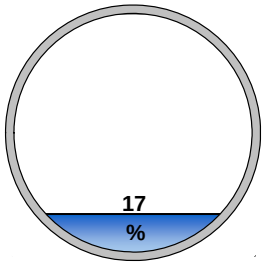
Average Dry Weather Flow

Monitoring Site:
MH 203



Peak Measured Flow:

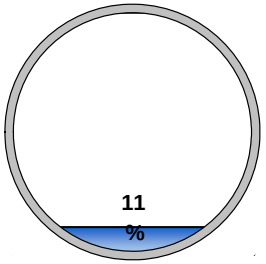
0.20 *mgd*



Peak measured flow shown in weekly graphs on following pages

Average Dry Weather Flow:

0.09 *mgd*

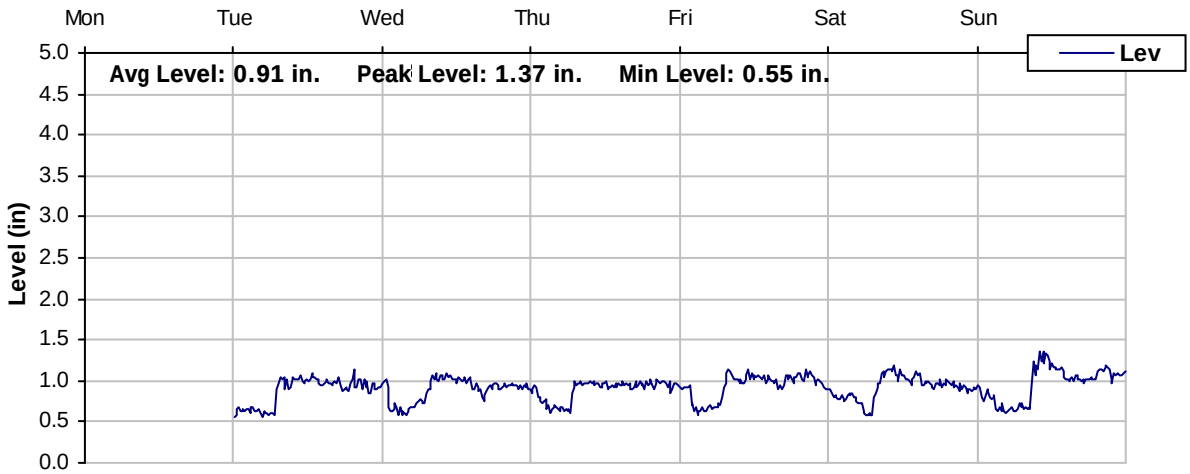


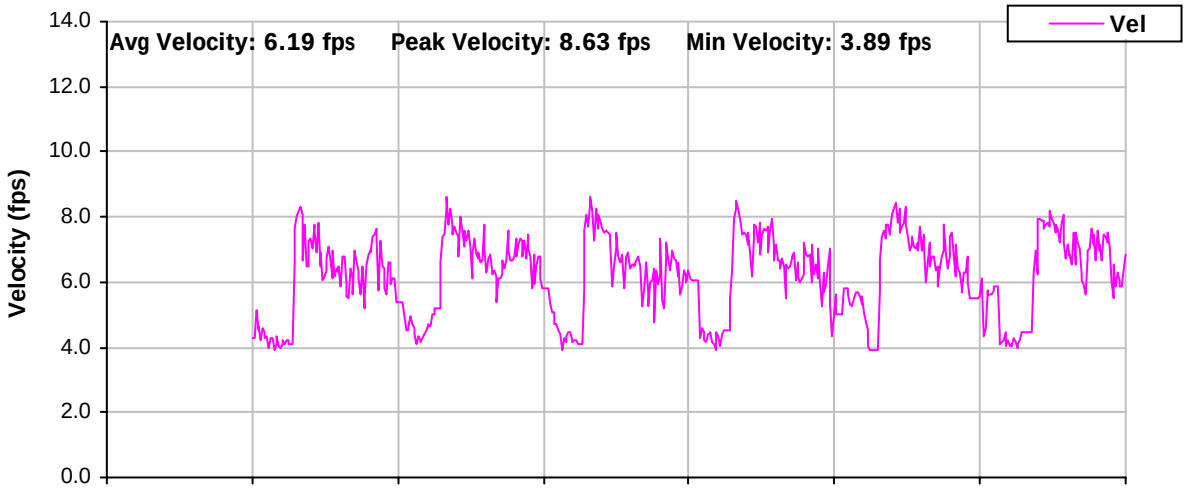
Level, Velocity and Flow

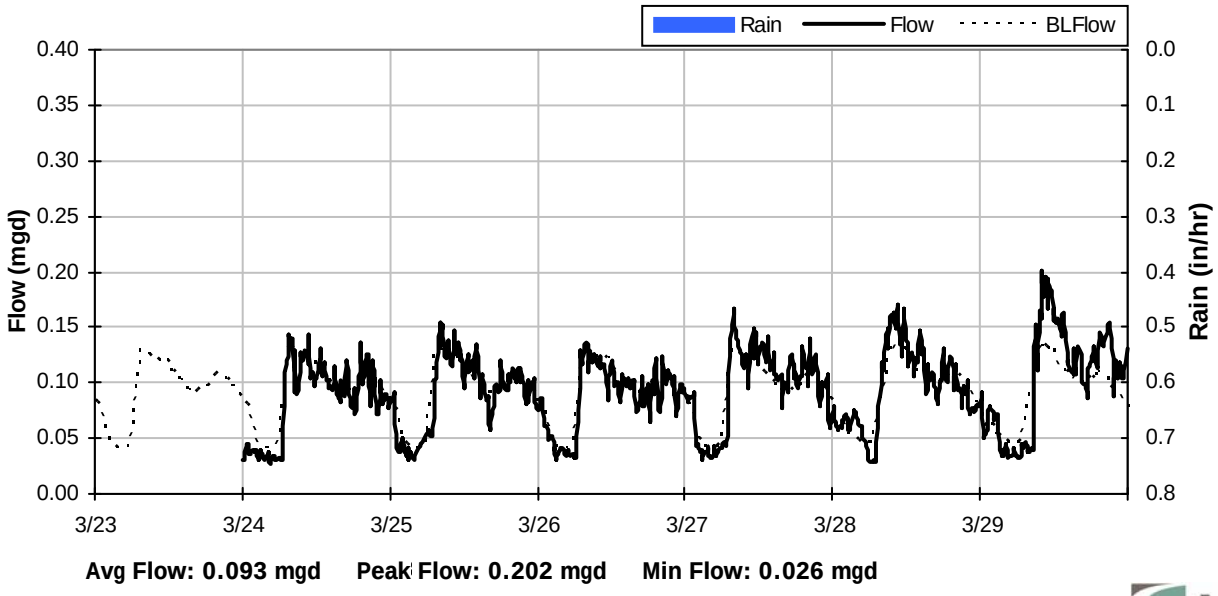
From 3/23/2009 to 3/30/2009

Monitoring Site:

MH 203







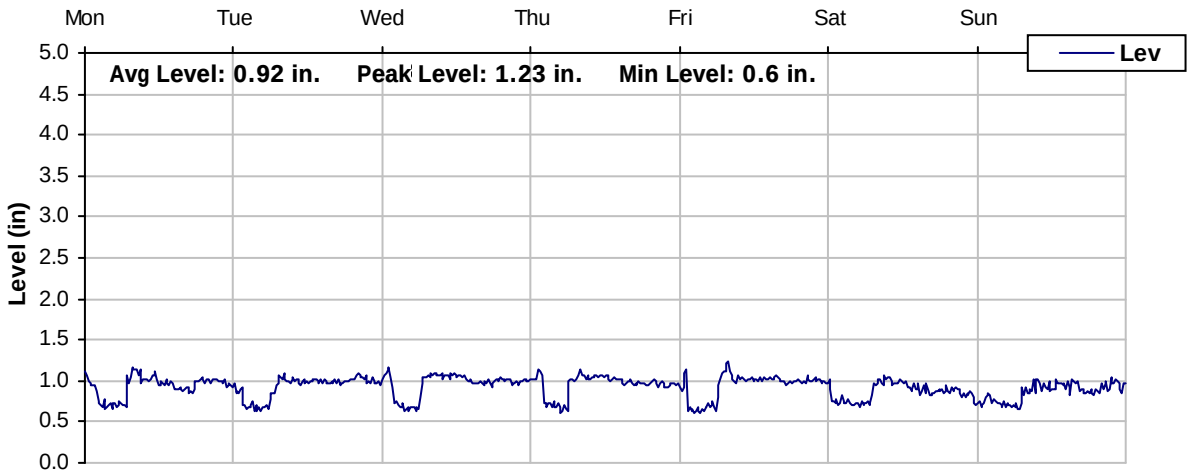
Avg Flow: 0.093 mgd **Peak Flow: 0.202 mgd** **Min Flow: 0.026 mgd**

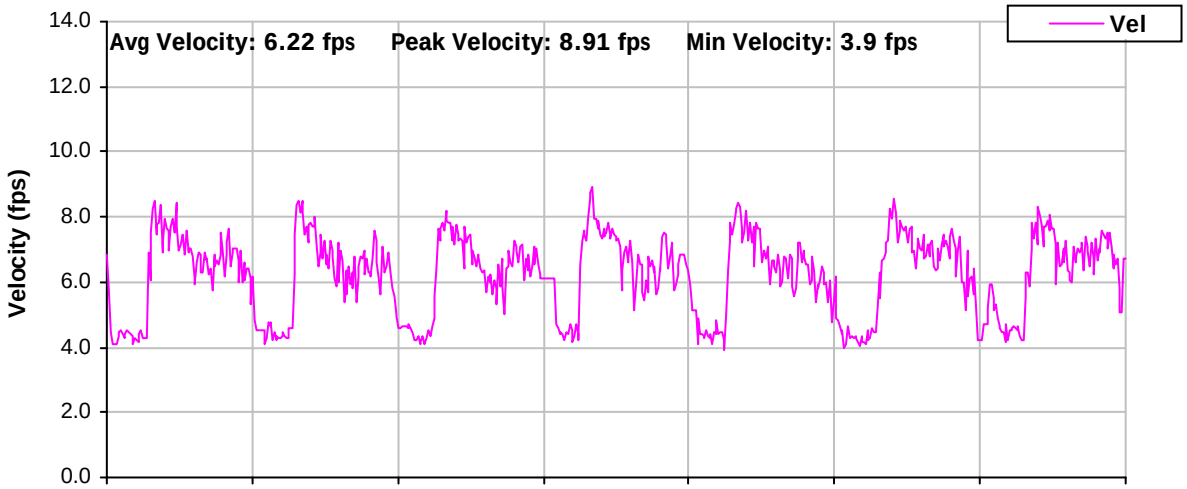
Level, Velocity and Flow

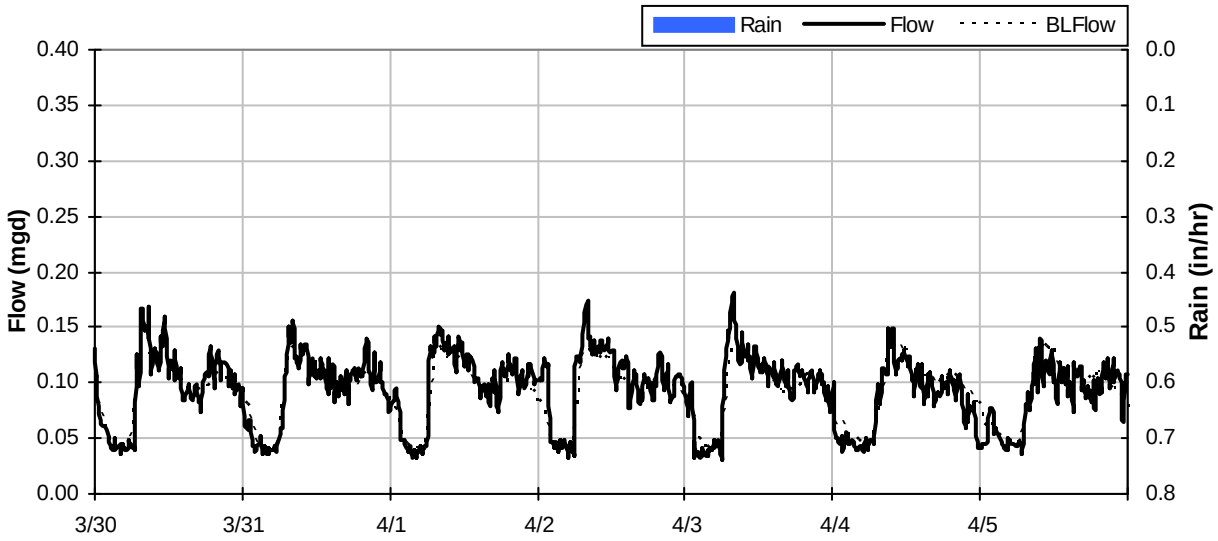
From 3/30/2009 to 4/6/2009

Monitoring Site:

MH 203







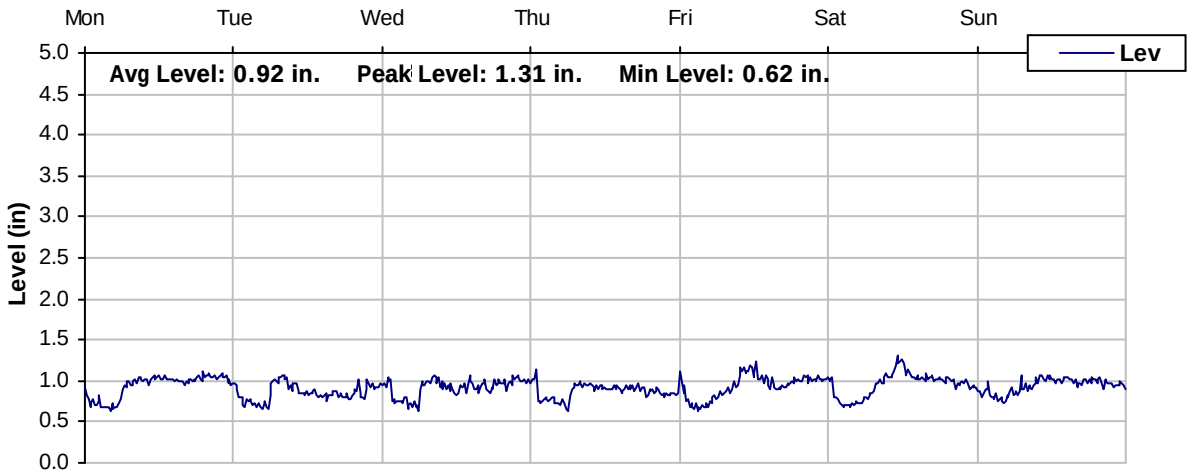
Avg Flow: 0.094 mgd **Peak Flow: 0.181 mgd** **Min Flow: 0.031 mgd**

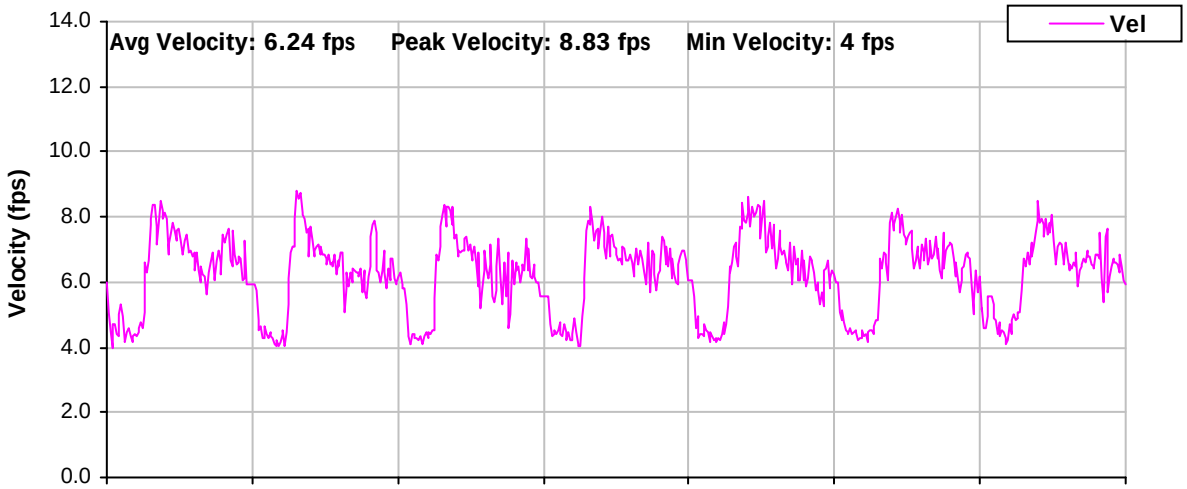
Level, Velocity and Flow

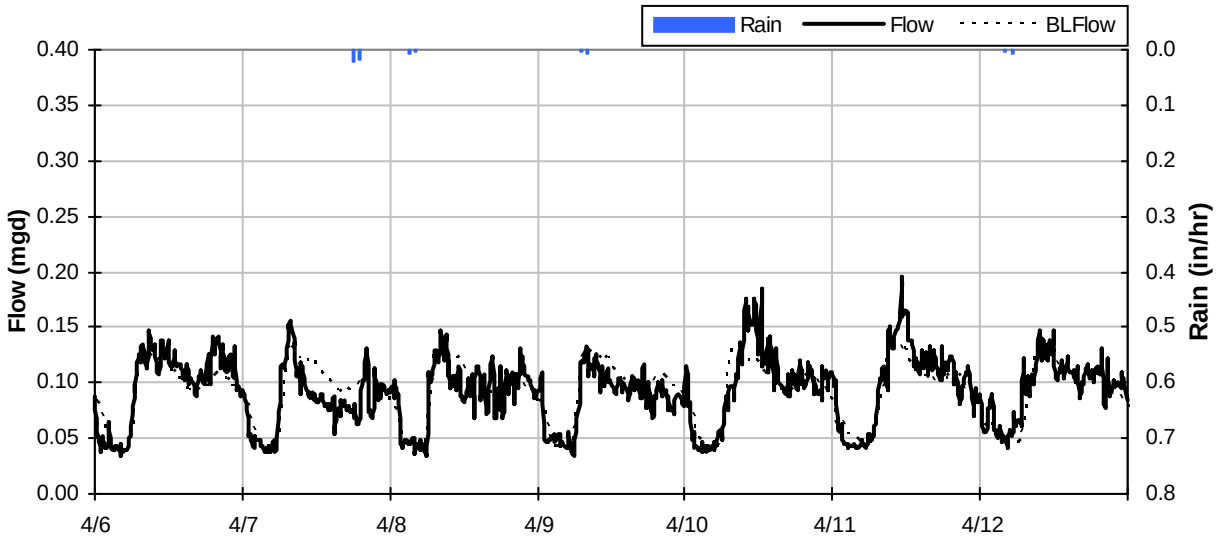
From 4/6/2009 to 4/13/2009

Monitoring Site:

MH 203







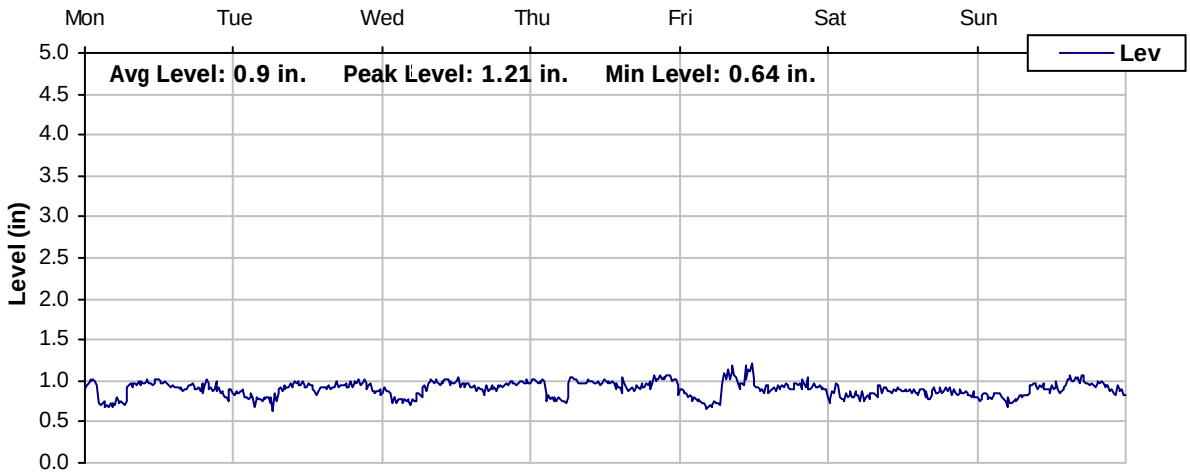
Avg Flow: 0.093 mgd **Peak Flow: 0.196 mgd** **Min Flow: 0.034 mgd**

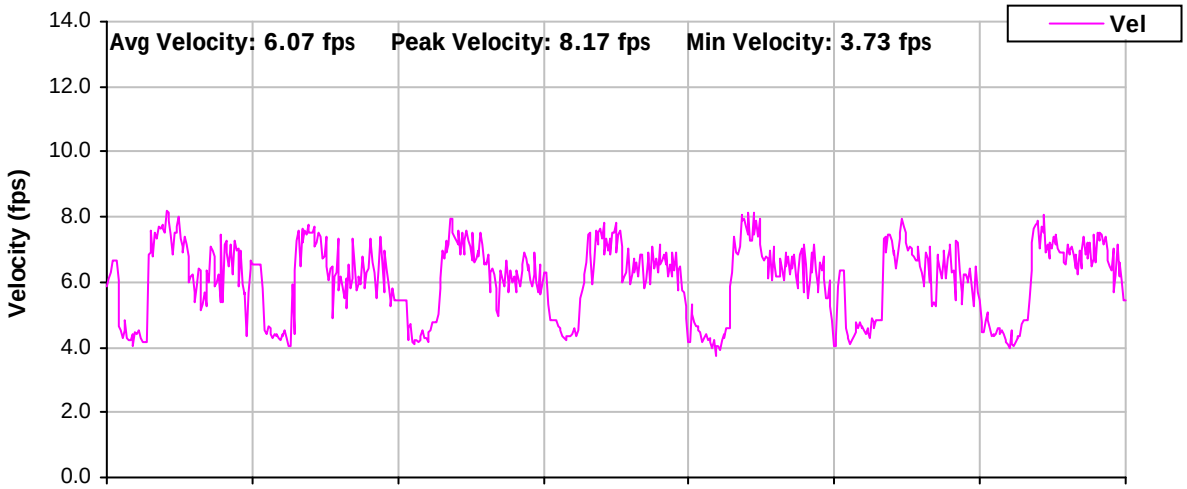
Level, Velocity and Flow

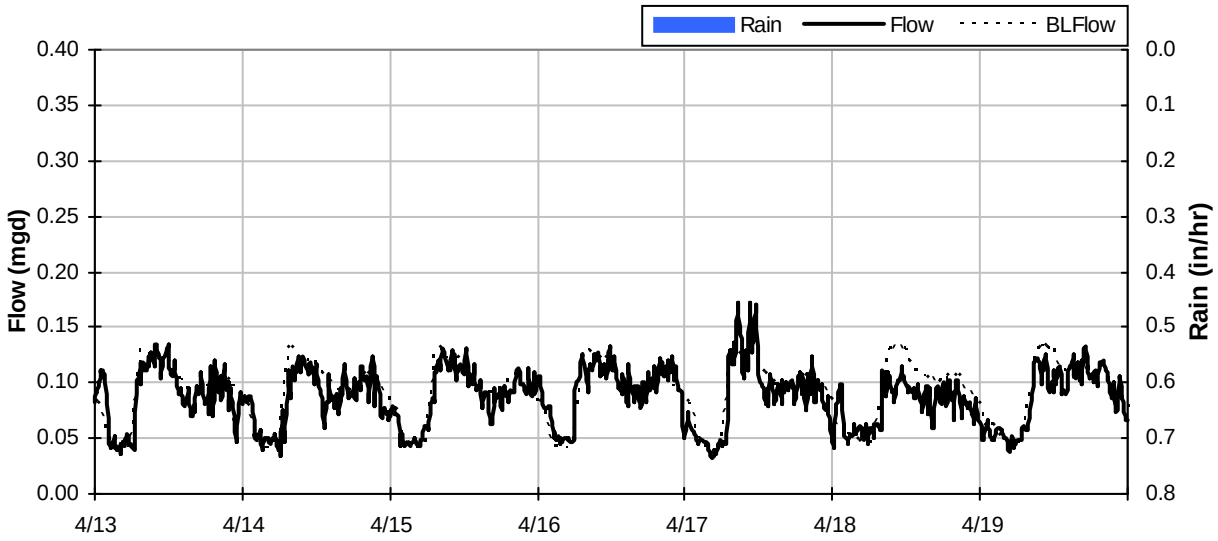
From 4/13/2009 to 4/20/2009

Monitoring Site:

MH 203







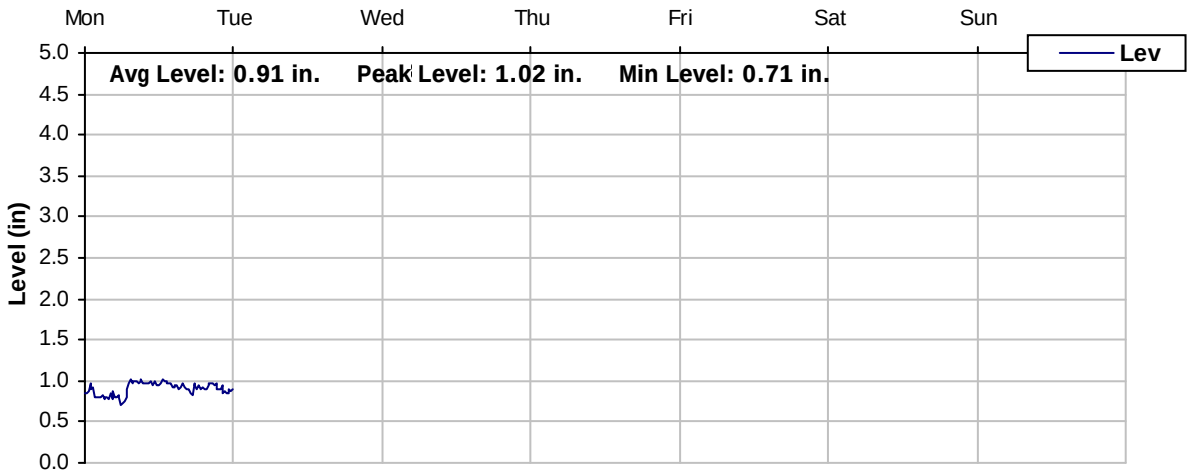
Avg Flow: 0.087 mgd **Peak Flow: 0.171 mgd** **Min Flow: 0.032 mgd**

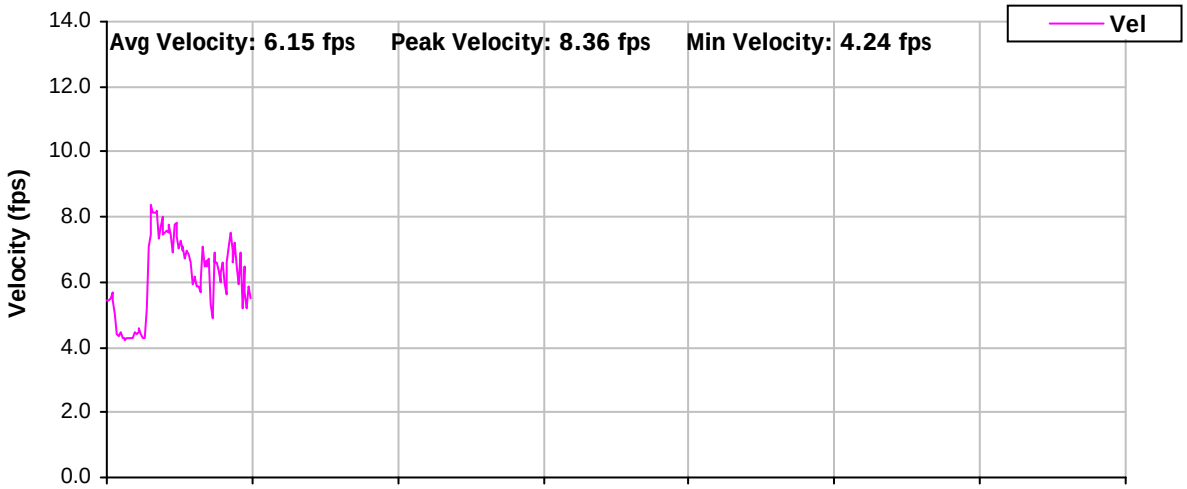
Level, Velocity and Flow

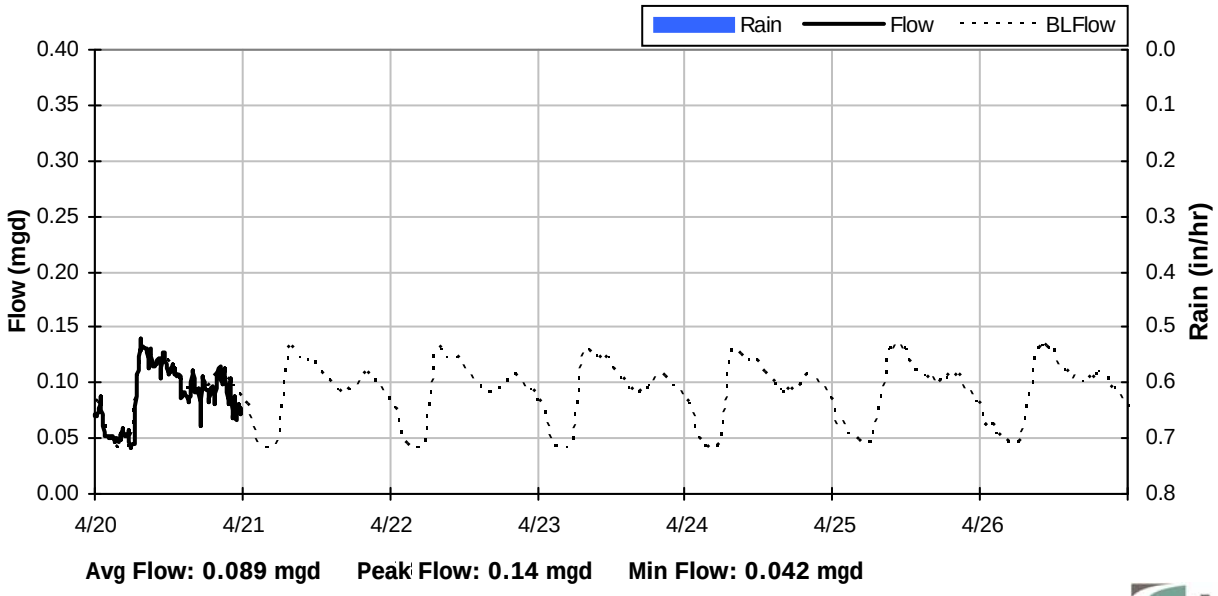
From 4/20/2009 to 4/27/2009

Monitoring Site:

MH 203







Avg Flow: 0.089 mgd **Peak Flow: 0.14 mgd** **Min Flow: 0.042 mgd**

Temporary Flow Monitoring Study

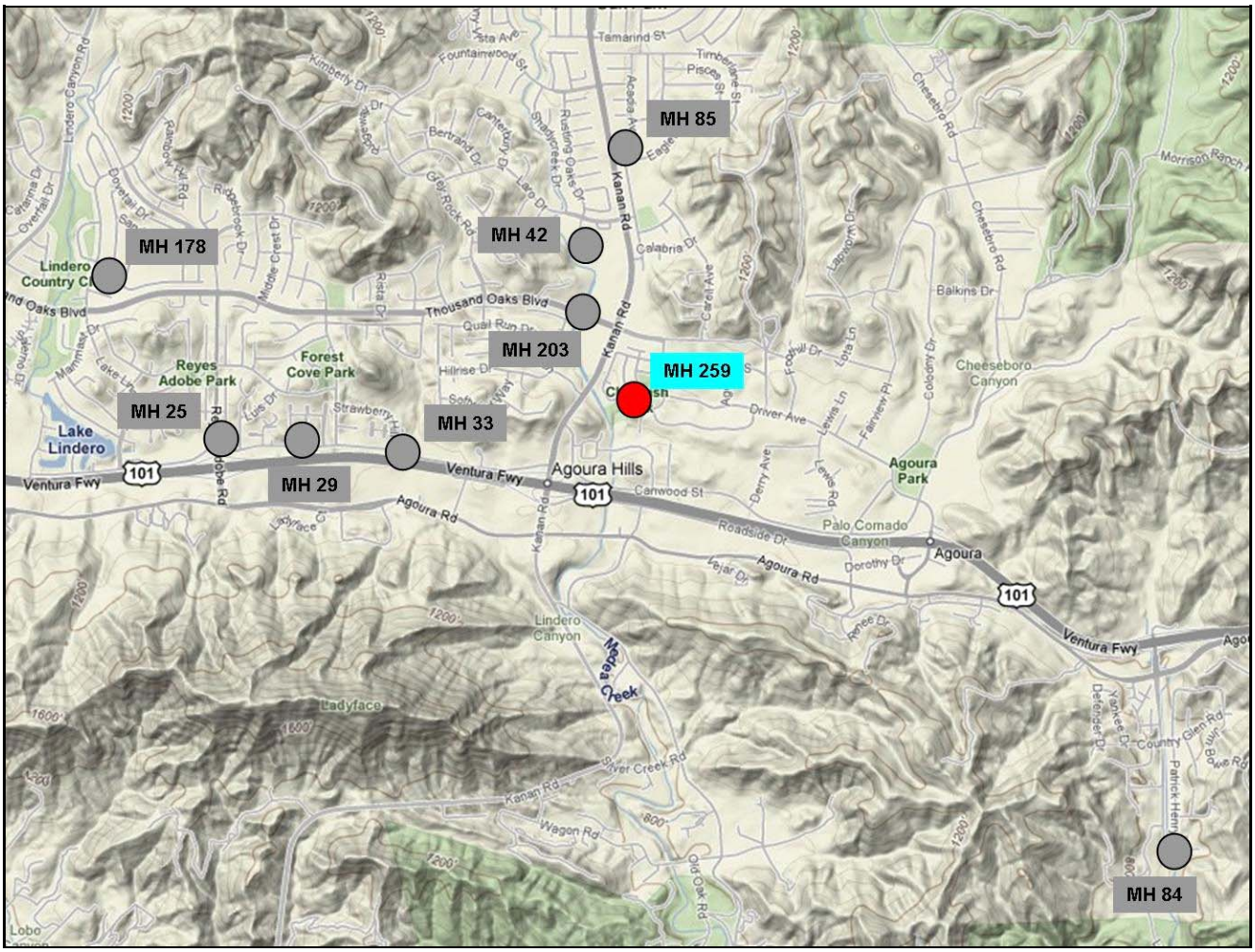
Sanitary Sewer Collection System

Monitoring Site: MH 259

Location: Chumash Park near Medea Valley Drive

Size / Type Line: 8-inch Sanitary Sewer Pipe

Data Summary Report



Site Information Report

Monitoring Site: MH 259

Location: Chumash Park near Medea Valley Drive

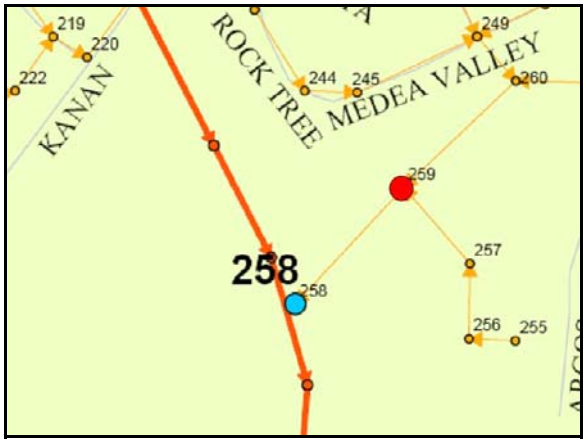
Diameter: 8 inches

Average Dry Weather Flow: 0.14 *mgd*

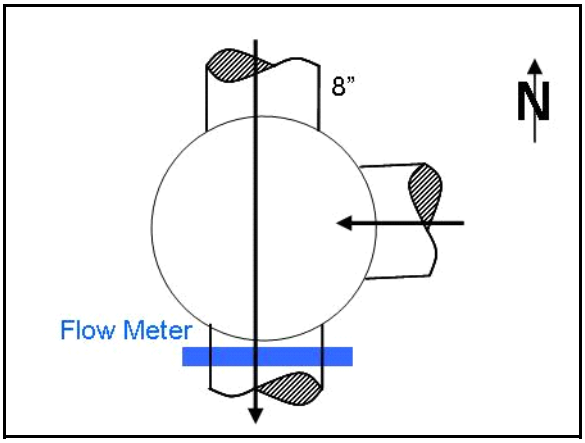
Peak Measured Flow: 0.35 *mgd*

Satellite Map

Sanitary Map



Flow Sketch



Street View Photo

Plan View Photo

	Site Information Report Photos	**Monitoring Site:** MH 259

East Inlet

South Inlet

	Site Information Report Photos	**Monitoring Site:** MH 259

West Outlet

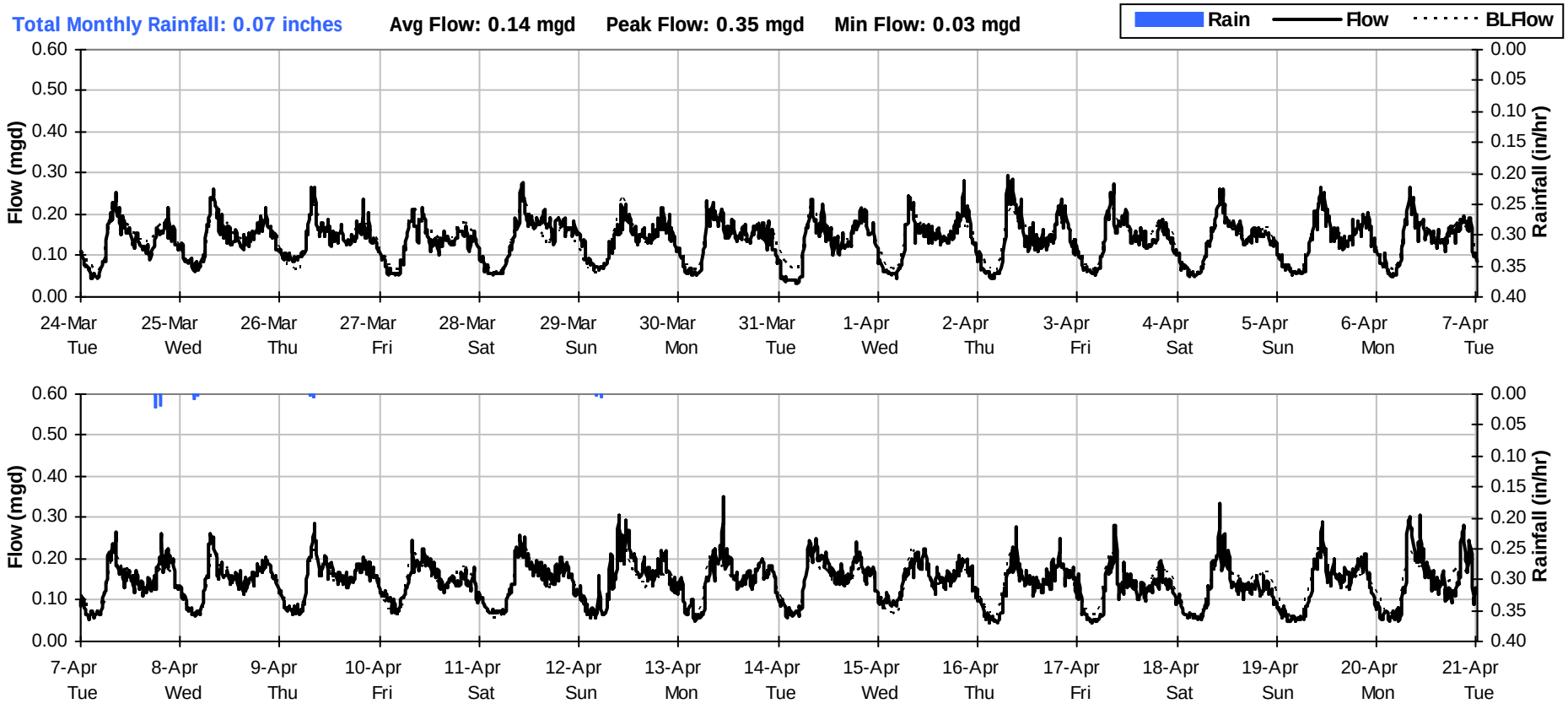
Period Flow Summary

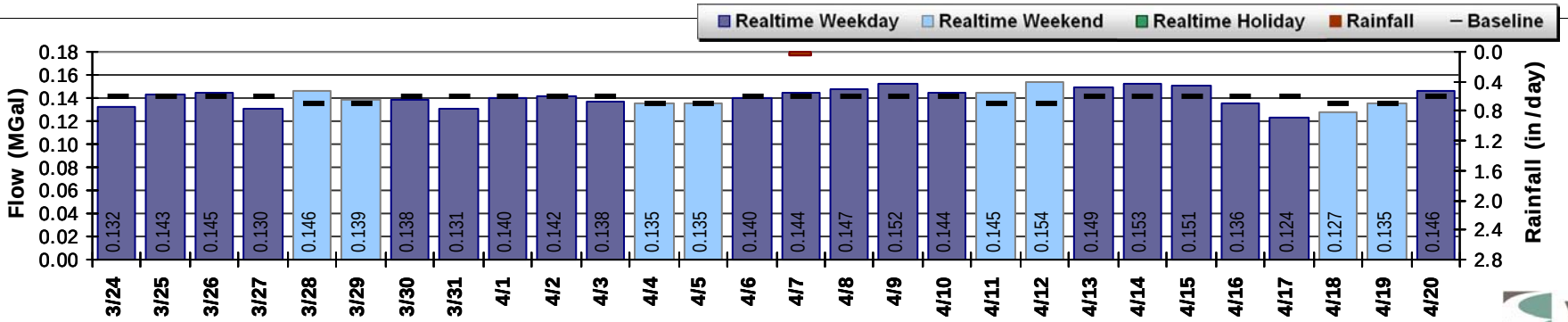
March 24, 2009 to April 21, 2009

Monitoring Site:

MH 259

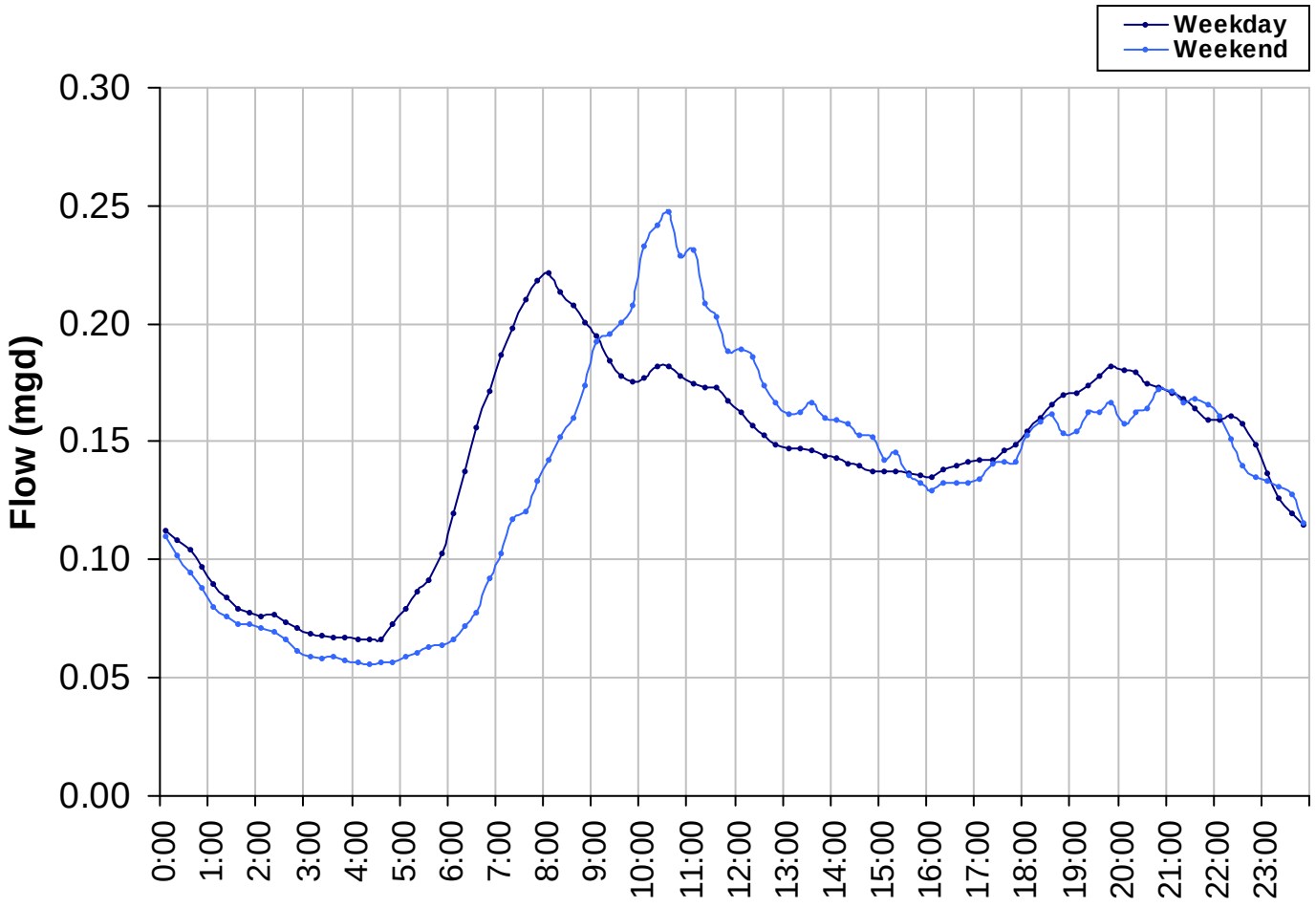
Total Monthly Rainfall: 0.07 inches **Avg Flow: 0.14 mgd** **Peak Flow: 0.35 mgd** **Min Flow: 0.03 mgd**





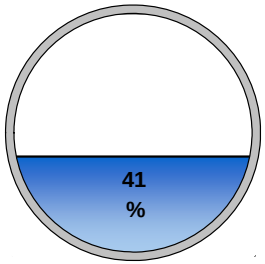
Average Dry Weather Flow

Monitoring Site:
MH 259



Peak Measured Flow:

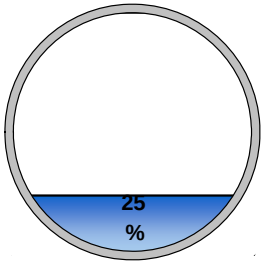
0.35 *mgd*



Peak measured flow shown in weekly graphs on following pages

Average Dry Weather Flow:

0.14 *mgd*

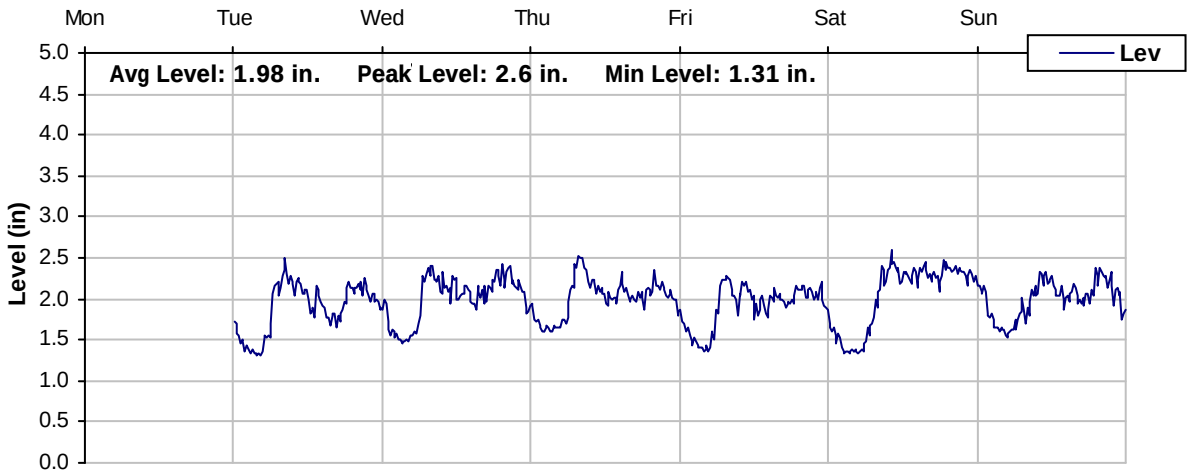


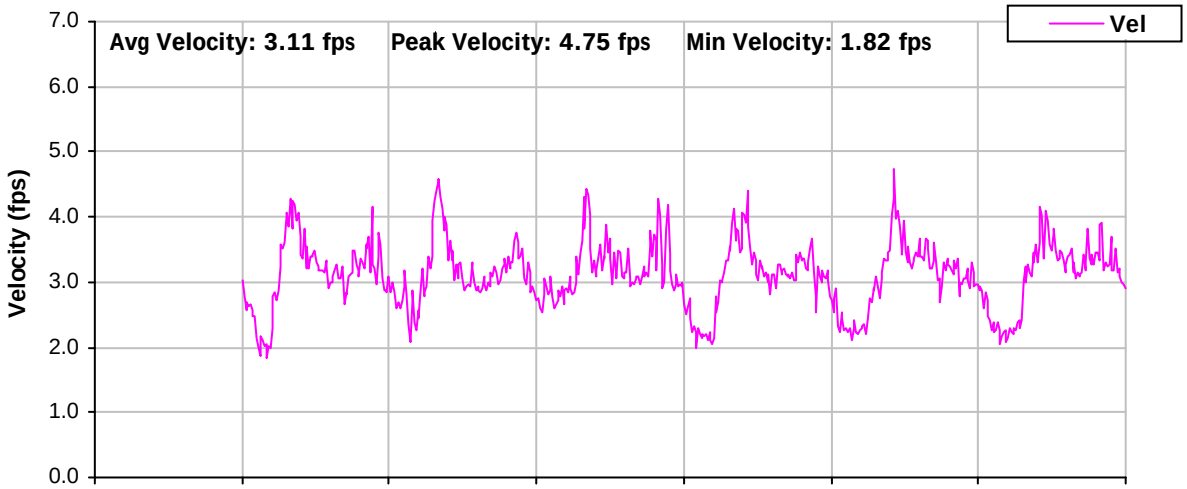
Level, Velocity and Flow

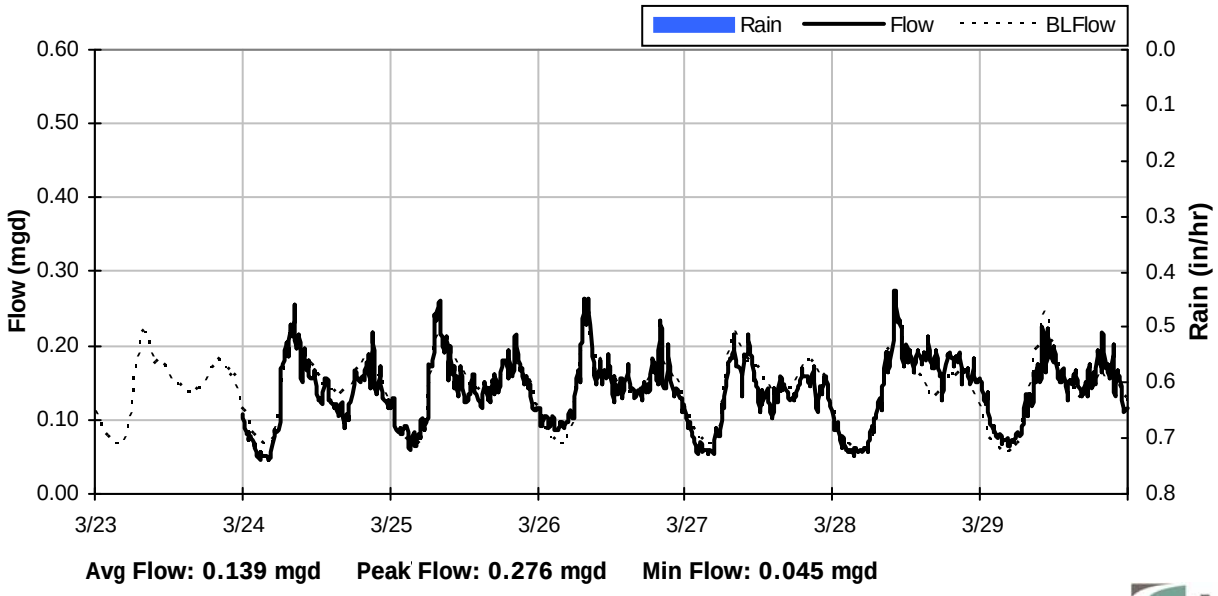
From 3/23/2009 to 3/30/2009

Monitoring Site:

MH 259







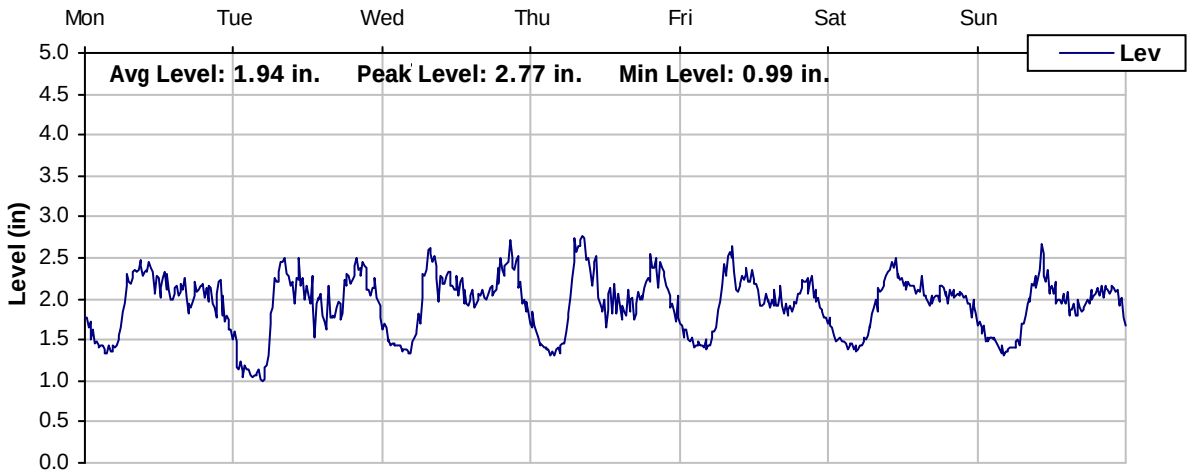
Avg Flow: 0.139 mgd **Peak Flow: 0.276 mgd** **Min Flow: 0.045 mgd**

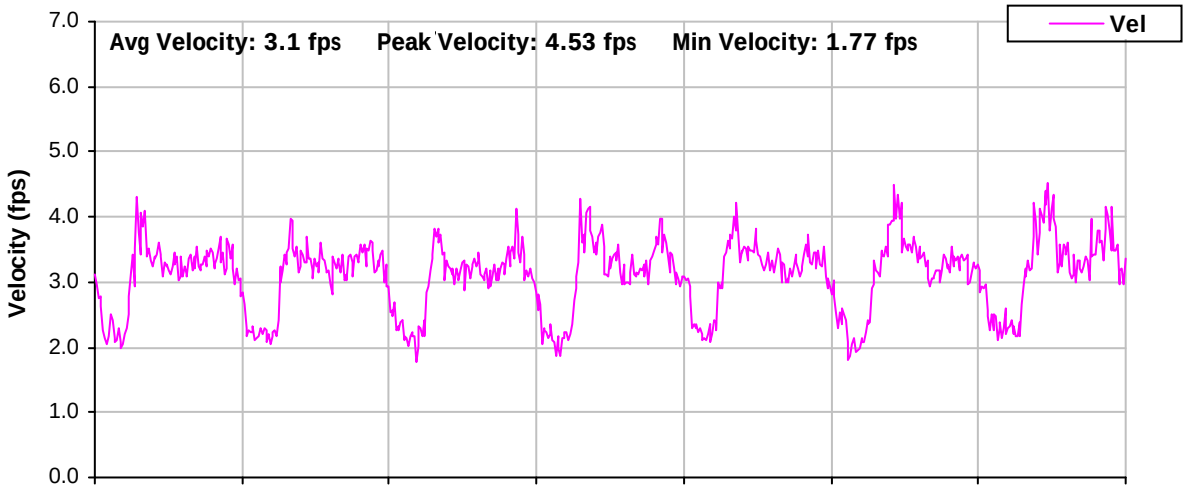
Level, Velocity and Flow

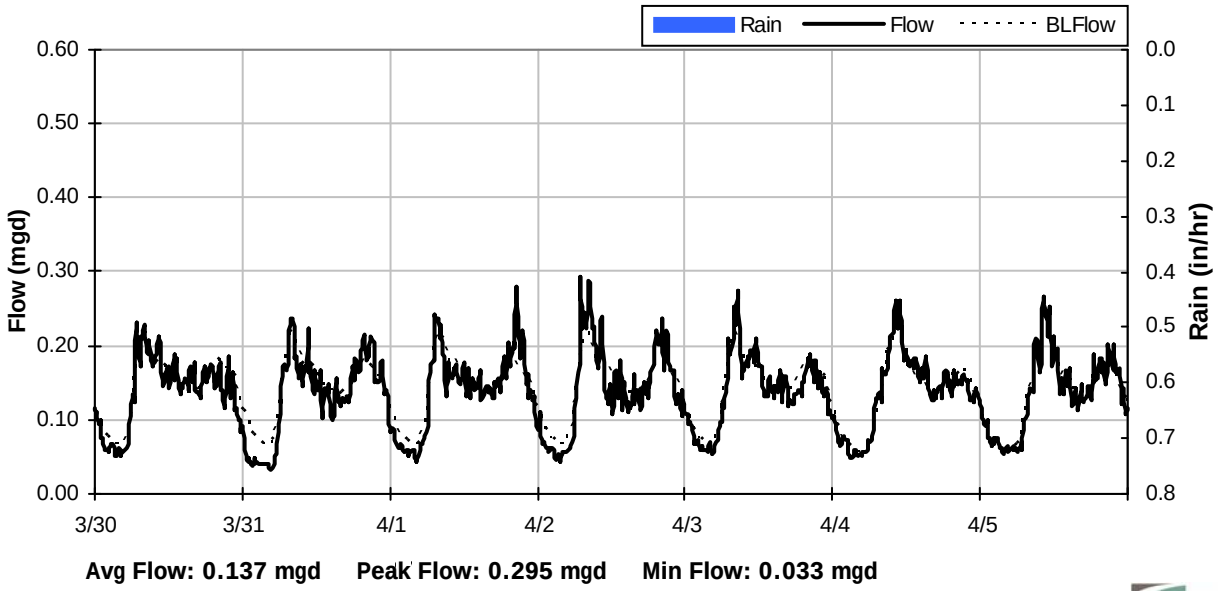
From 3/30/2009 to 4/6/2009

Monitoring Site:

MH 259







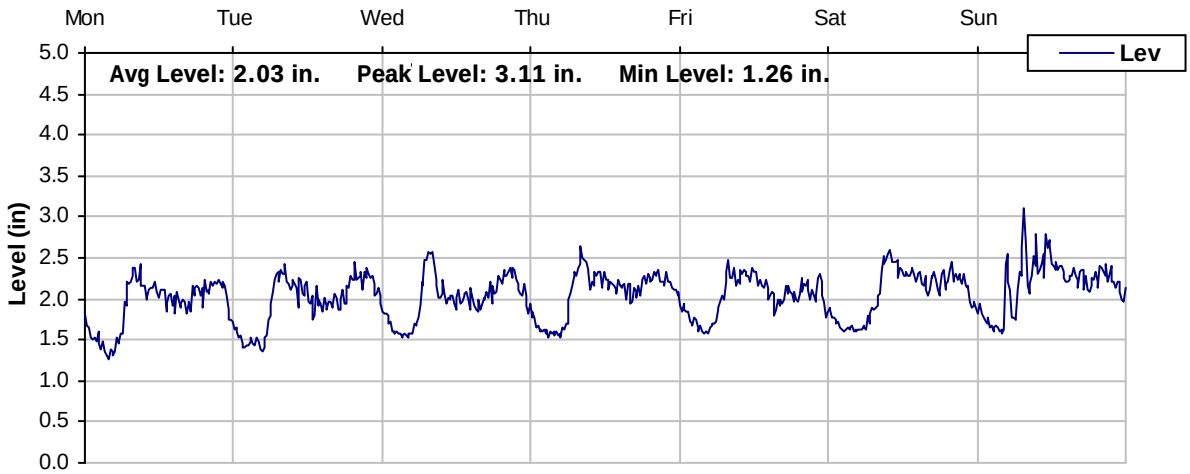
Avg Flow: 0.137 mgd **Peak Flow: 0.295 mgd** **Min Flow: 0.033 mgd**

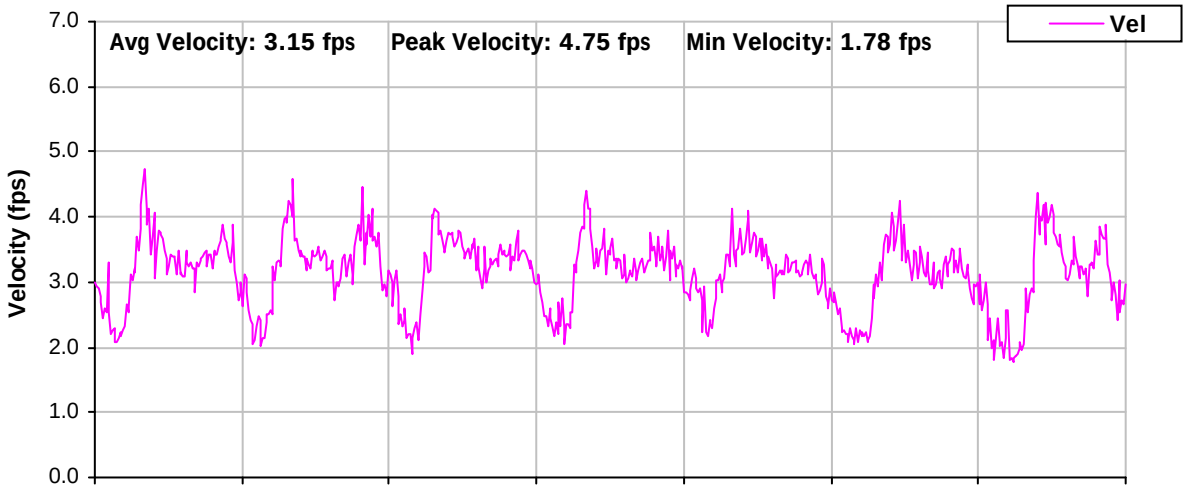
Level, Velocity and Flow

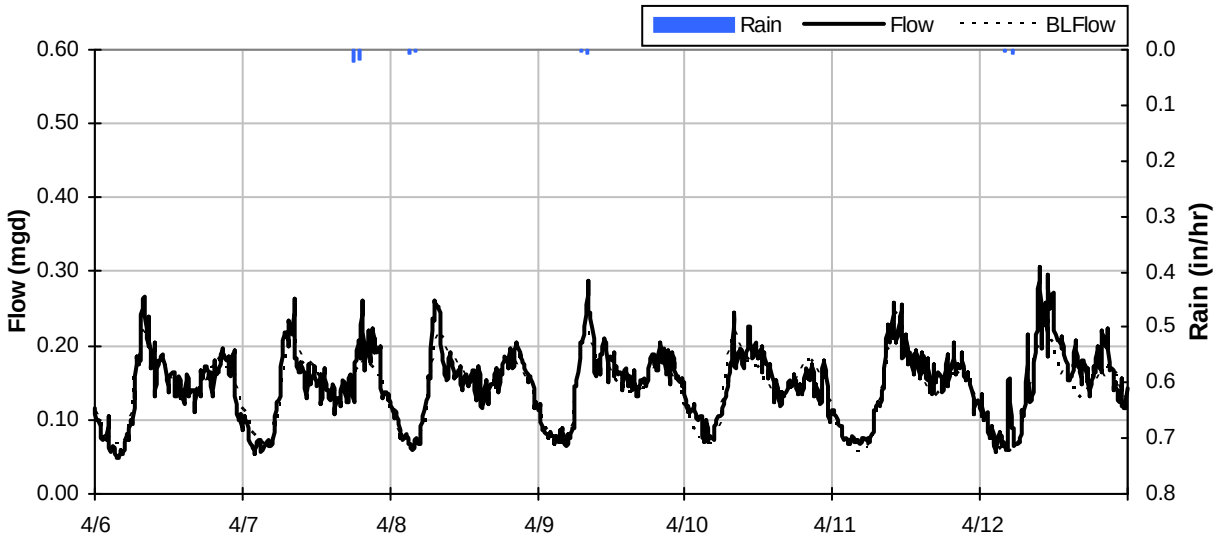
From 4/6/2009 to 4/13/2009

Monitoring Site:

MH 259







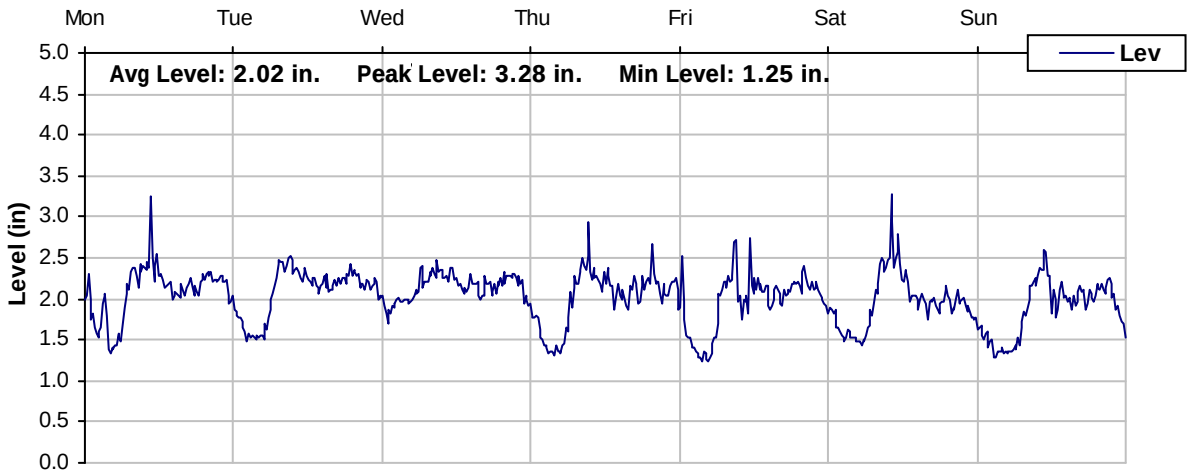
Avg Flow: 0.147 mgd **Peak Flow: 0.307 mgd** **Min Flow: 0.049 mgd**

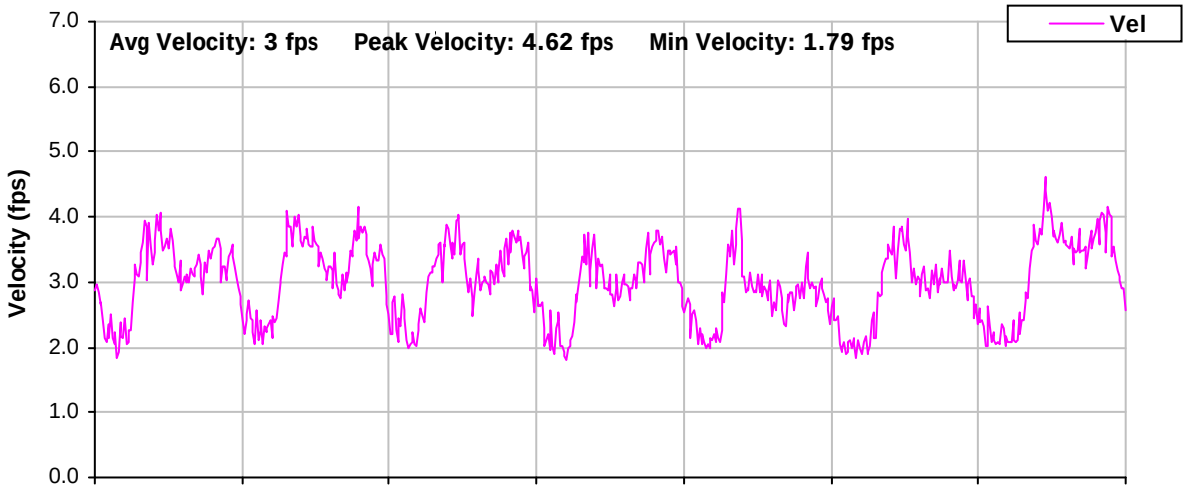
Level, Velocity and Flow

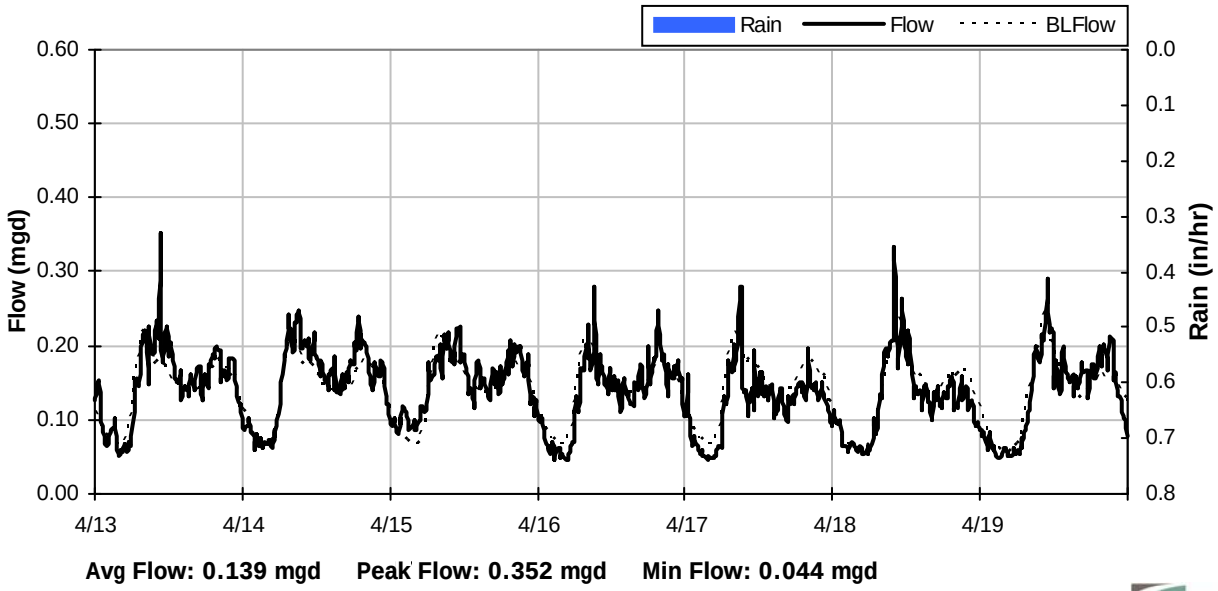
From 4/13/2009 to 4/20/2009

Monitoring Site:

MH 259







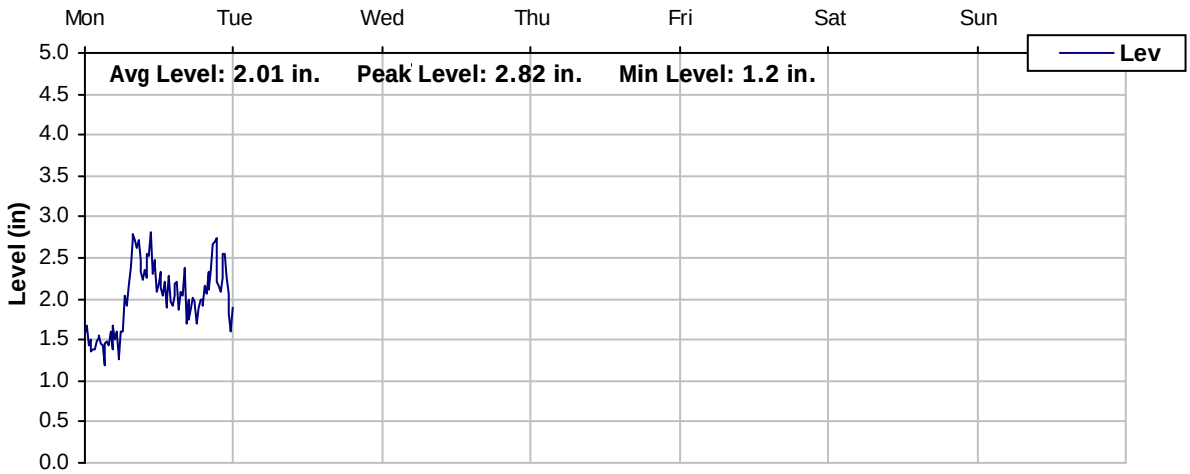
Avg Flow: 0.139 mgd **Peak Flow: 0.352 mgd** **Min Flow: 0.044 mgd**

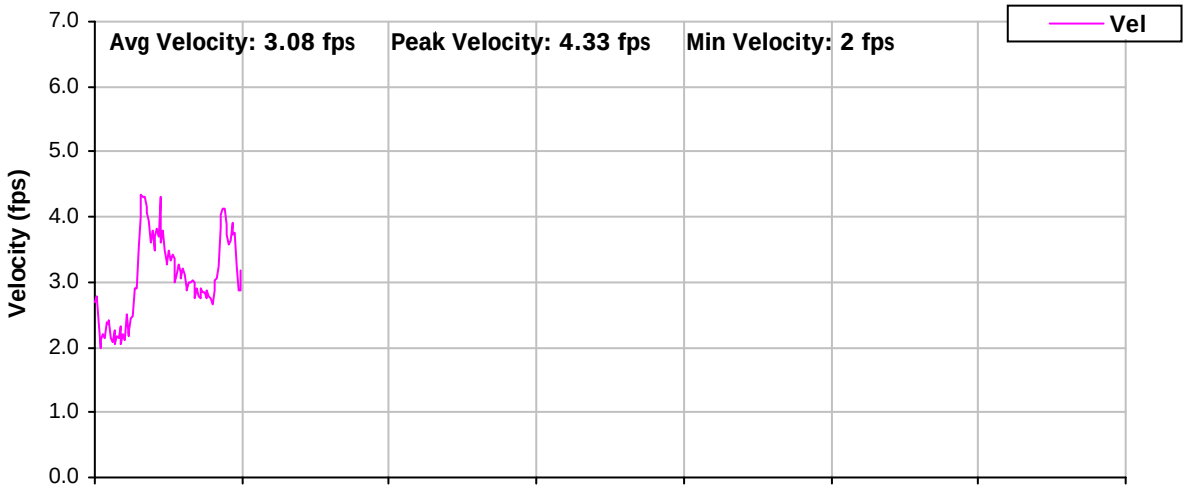
Level, Velocity and Flow

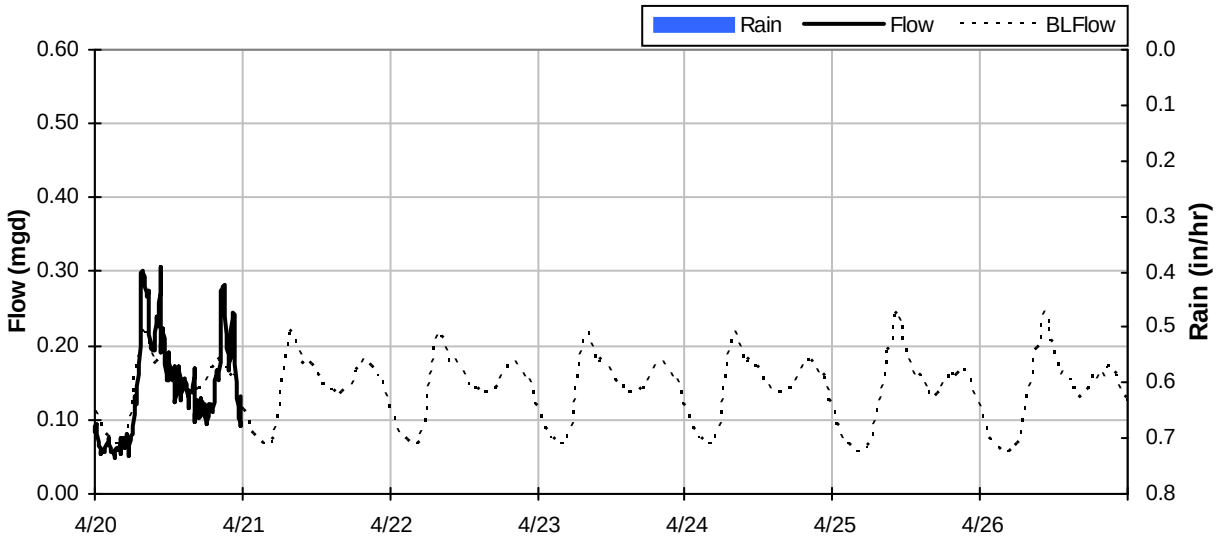
From 4/20/2009 to 4/27/2009

Monitoring Site:

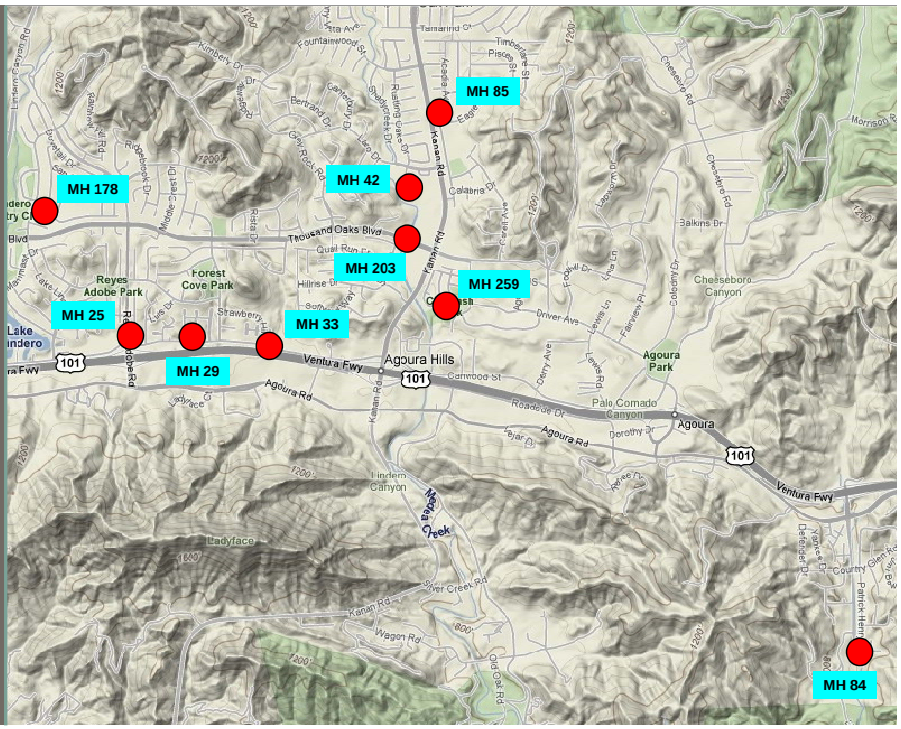
MH 259







Avg Flow: 0.146 mgd **Peak Flow: 0.306 mgd** **Min Flow: 0.048 mgd**



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San Diego, CA 92123
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858.576.0004 **Fax**

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Seattle, WA 96818
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206.674.4561 **Fax**

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Houston, TX 77056
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vaengineering.com

APPENDIX ‘L-5’

City Land Use Designations Map

CITY OF AGOURA HILLS

General Plan Land Use

Land Use Designations

- Rural Residential (RR)
- Very Low-Residential (<2 du/ac) (RV)
- Low Density-Residential (1-2 du/ac) (RL)
- Single Family-Residential (2-6 du/ac) (RS)
- Medium Density-Residential (6-15 du/ac) (RM)
- High Density-Residential (15-20 du/ac) (HDR)
- Commercial Shopping Center (CS)
- Commercial Retail/Service (CRS)
- Commerical Recreation (CR)
- Business Park Office Retail (BP-OR)
- Business Park-Manufacturing (BP-M)
- Public Facility (PF)
- Open Water (OW)
- Local Park (P)
- Restricted Open Space (OS/R)
- Open Space/Deed Restricted (OS/R/DR)
- Agoura Village Specific Plan (SP)
- Ladyface Specific Plan (SP)

Base Map Features

- County Boundary
- City Boundary
- Water Courses
- Santa Monica Mountains National Recreation Area
- Trails and Fire Roads
- Trail Head/Parking
- Schools

Last Updated: November 21, 2006

0 1,000 2,000 3,000 4,000 Feet

CITY OF AGOURA HILLS

THIS AREA ON PRIVATE DISPOSAL SYSTEMS

SPLIT

N

0 250500 1,000 1,500
Feet

1 inch = 500 feet

MATCHLINE - SEE RIGHT

MATCHLINE - SEE LEFT

LEGEND

- SEWER PIPES
- 0.85 < d/D (UNSTABLE OR FULL FLOW)
- 0.64 < d/D < 0.85
- 0.50 , d/D < 0.64 (EXCEEDS DESIGN - MONITOR)
- LOCAL MANHOLES
- PRIVATE SEWER PIPES
- PRIVATE SEWER MANHOLES
- LVMWD Sewer Trunk
- SEWER MAINTENANCE ZONES
- (53) SEWER MAINTENANCE ZONE ID'S
- CITY BOUNDARY

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CITY OF AGOURA HILLS
SEWER SYSTEM MANAGEMENT PLAN
JUNE 2009

APPENDIX L-2:

SEWER SYSTEM CAPACITY ANALYSIS DEFICIENT PIPES

POLICIES FOR MANAGING AVAILABLE SEWER CAPACITY

INTRODUCTION

In 2009 the City serves the wastewater disposal needs of approximately 23,350 people. The community sewers receive and convey approximately 3.6 million gallons per day of wastewater to regional CSD trunk sewers and wastewater treatment plants.

The purpose of this document is to describe the policies and practices followed by the City in tracking and determining the remaining available capacity within its sanitary sewer system. Tracking (monitoring) is necessary because of the significant lead time required for accomplishing such improvements as sewer rehabilitation or facility expansion without overloading sewage facilities. The objective is to enable the City to:

- Become more aware of how the sewer facilities are performing in order to take steps necessary to avoid (prevent) a SSO or nuisance problem due to operations.

- Provide all local decision makers with information needed to make informed decisions about the capacity of the wastewater system and its ability to accommodate new or increased connections.

- Make commitments for new or upsized connections with confidence that there is adequate capacity to serve additional demand as well as existing customers.

- Determine when the issuance of additional building permits must be curtailed until sewer facility improvements are completed so that facilities are maintained in compliance with discharge permit criteria.

- Have more lead time to plan and arrange financing for needed sewer system upgrades.

LEGAL MANDATE TO MANAGE WASTEWATER ALLOCATIONS

Local sewering entities have a crucial role in providing safe and adequate wastewater systems and high quality operational performance. These entities face many challenges to maintain and operate their systems in compliance with Federal and State laws and regulations. Cost continues to increase to keep these increasingly complex facilities operating properly, and the ability to raise rates to keep pace with costs is a challenge.

Perhaps most challenging is the need to manage the allocation of flow for new or expanding customer discharges in conformance with local land use, water and sewage plans, and the NPDES and local permit limits. The agency responsible for issuing building/development

approvals and permits must ensure adequate capacity is or will be reasonably available without impairing water quality or threatening public health and safety.

ACTIONS TO BE TAKEN TO MANAGE AVAILABLE SEWER CAPACITY

Sewering entities are expected to manage their facility capacities responsibly and to ensure sewer systems remain within design capacity. In order to accomplish these expectations, it is necessary to prepare a planning and engineering tool used to monitor the relationship between sewer facility capacity and population/economic growth while complying with statutes and regulations relative to discharges. Such tool could be a Municipal Sewage Capacity Plan/Report (MSCP/R).

A MSRC/P would contain information on sewage system capacity including the demand created by both the existing and proposed development. To ensure the accuracy of such report will require the City to monitor flows, evaluate the need for additional capacity, identify deficiencies, take proactive, corrective steps to maintain system capacity, and to undertake orderly and timely projects to maintain or improve the system capacity. These actions for a successful reporting tool will be accomplished through the application of the following policies:

1. Develop a moving 10 year capital improvement program that:

    a. Includes pro-active sanitary sewer system improvements to correct and prevent system failures and overflows,

    b. Addresses current and reasonably anticipated regulatory requirements,

    c. Provides sewer capacity in a timely manner to accommodate system expansion and redevelopment,

    d. Maintains level of service standards that are desired and acceptable to the community.

2. Actively manage the sanitary sewer conveyance system through a data collection and analysis process that determines wastewater usage by development type, projects future demand, and identifies inflow/infiltration deficiencies.

3. Issue development approvals based upon available capacity of the sanitary sewer system.

4. Implement work process and data management systems improvements for sewer service management, operation, and maintenance that comply with SSMP regulations and result in more effective and efficient sewer service.

5. Abate storm water inflow and groundwater infiltration to maintain capacity for sewer service and minimize service costs.

6. Expand the production and annual average use of recycled water to reduce the cost and environmental risk of effluent disposal and reduce reliance upon potable water sources.

7. Implement complete asset management program for sustaining the sewer infrastructure through optimized service levels, managed risks, and minimized life-cycle costs of asset ownership

City of Agoura Hills
CCTV INSPECTION REPORT
Spring 2009

Introduction and History

The City owns and operates its local sanitary sewer system consisting of approximately 54 miles of gravity flow sewer pipelines (of 8 to 15-inch in diameter, mostly vitrified clay pipe) and 1,294 manholes. The existing sewer system consists completely of local collector sewers that discharge to trunk sewers owned and operated by the Las Virgenes Municipal Water District in western Los Angeles County.

As part of the services provided by LACDPW for cities within the CSMD, the DPW did perform CCTV inspection (a recorded video inspection of a portion of the community's sewer system) on 5.4 miles of the city sewer system between June and August 2006. The DPW provided the city with a report on that investigation effort, and that work is not part of the CCTV inspection addressed in this report.

As part of this SSMP document preparation, a separate CCTV investigation report was obtained through a subconsultant (Ventura Regional sanitation District) who inspected another 10% of the city sewer system. This investigation was performed on segments of the system as mutually selected by Willdan and City personnel in order to address areas of concern. The video logging and documentation provided a current physical condition and evaluation record of the selected portion of the sewer system. The resulting findings are addressed in this report segment and depicted on the two exhibit maps in appendix 'N-3'.

The purpose of this report is two fold. 1) To document and synthesize the CCTV inspection results, and 2) To establish a list of improvement projects to eliminate both structural and maintenance defects identified in the mainline sewer. The objective is to preserve the City's infrastructure investment, maintain service, prevent failures and limit inflow, infiltration and overflow potential.

Study Approach

Preparation of the Year 2009 CCTV Inspection Report involved the following sequence of tasks used in this study:

1. Review the digital video record of the CCTV inspection along with the inspection log and evaluation summary, prepared by the contractor.
2. Establish a priority list for implementation of recommended improvements. Factors considered in formulating the priority list included: a) severity of damage to the

existing pipe, b) risk potential for public health problems, c) prior maintenance problems made known, if any, d) consequences to other known improvement projects, and, e) other criteria of relevance.

3. Development of recommendations for system improvements to correct defects based on the above priority list.
4. Preparation of cost estimate for the recommended structural improvements.
5. Preparation of the CCTV Inspection report.

Analysis of CCTV Inspection

Analysis of the CCTV inspection consisted of reviewing the digital video inspection log and evaluation summary, and the digital videos as necessary. . Identified defects were ranked by the severity of the defect based on deficiency criteria listed below. The length of sewer to be repaired or replaced was based on the type or extent of repairs that are needed. The types of repair considered consisted of:

1. Spot Repair (Remove and replace a segment or several segments of mainline pipe)
2. Remove and replace the reach between manholes.
3. Sewer pipe lining with Cured in Place Pipe (CIPP).

Pipeline Grading System

The Pipeline Assessment and Certification Program (PACP), developed by The National Association of Sewer Service Companies (NASSCO), provides a uniform mechanism for creating reliable descriptions of pipe conditions. NASSCO has also developed a system based on the PACP codes to assign a condition rating to pipelines. Requirements of the grading system are as follows:

1. The grading system should be direct and objective.
2. The system should provide the ability to quantitatively measure the difference in pipe condition, between one inspection and subsequent inspections, and to prioritize among different pipe segments.

Many other approaches to sewer pipe grading have been used in the United States as well as in other parts of the World. These approaches generally use some type of defect grading that is then used to calculate an overall pipe rating. It is problematic to develop a single pipe segment rating that fully describes all of the important aspects of a pipe. Therefore the PACP Condition Grading System uses more than one method of rating pipe segment condition including a rating that considers the number of total defects within the pipe segment and a rating that considers the most severe types of defects within the pipe segment.

The PACP Condition Grading System only considers internal pipe conditions obtained from TV inspection. While other factors such as pipe material, depth, soils, and surface conditions also affect pipe survivability, those factors have not been included in the current version of the PACP Condition Grading System. It is expected that as the PACP further develops the PACP Condition Grading System will expand to include other factors.

The PACP Condition Grading System provides ratings for Structural Defects and Maintenance Defects.

APPROACH - Using the PACP Code Matrix, (see Appendix 'N-1') in which each defect code is assigned a condition grade of from 1 to 5; grades are assigned based on potential for further deterioration or pipe failure. Pipe failure is defined as when the pipe can no longer convey the pipe design capacity.

Grades are assigned for two categories, Structural, and Maintenance defects, as follows:

5 - Immediate Attention	Defects requiring immediate attention
4 - Poor	Severe defects that will become Grade 5 defects within the foreseeable future
3 - Fair	Moderate defects that will continue to deteriorate over time
2 - Good	Defects that have not begun to deteriorate
1 -Excellent	Minor defects

The mechanisms and rates of pipeline deterioration are highly dependent on local conditions. However the following general guidelines are provided to estimate the amount of time before the defect causes complete line failure. These guidelines should be verified by actual research under prevailing local conditions.

5 - Pipe has failed or will likely fail within the next five years. Missing materials with large voids and soil is visible.
4 - Pipe will probably fail in 5 to 10 years or will become category 5 in foreseeable future.
3 - Pipe may fail in 10 to 20 years and should be monitored for further deterioration and replaced as the conditions warrant.
2 - Pipe unlikely to fail for at least 20 years
1 - Failure unlikely in the foreseeable future

CONTINUOUS DEFECTS - The number of "repeated continuous" (joint) defect grades is calculated by dividing the length of the continuous defect by the joint length. For example, a 15 ft long repeating continuous defect, 3-foot joints, and a grade 2 defect, would equate to 5 grade 2 defects.

The number of "truly continuous" defects is calculated by dividing the length of the continuous defect by 5. Example, a 20-foot long continuous defect, grade 3, should equate to four Grade 3 defects. Fractions are rounded to the nearest whole number.

PIPE RATINGS - The pipe rating is based on the number of occurrences for each condition grade. Ratings are calculated separately for Structural and Maintenance Defects. Several ways of expressing pipe segment condition are used by the PACP Condition Grading System as follows:

Segment Grade Scores - Each pipe segment will have a Segment Grade Score for each of the five grades. The number of occurrences of each pipe grade is multiplied by the pipe grade to calculate the segment grade score. Example, six Grade 5 defects would be 6 times 5 and equates to a Segment Grade 5 Score of 30. If a pipe segment had no defects of a particular grade, then the Segment Grade Score for that grade would be 0.

Overall Pipe Rating -The five Segment Grade Scores are added together to calculate the Overall Pipe Rating. Structural Pipe Ratings are calculated using only Structural Defect grades, while O&M Pipe Ratings are calculated using only Maintenance Defect grades.

PACP Quick Rating -The PACP Quick Rating is a shorthand way of expressing the number of occurrences for the two highest severity grades. The PACP Quick Rating is a four character score as follows:

1. The first character is the highest severity grade occurring along the pipe length.
2. The second character is the total number of occurrences of the highest severity grade. If the total number exceeds 9, then alphabetic characters are used as follows - '0 to 14 - A; 15 to 19 - B; 20 to 24 - C; etc.
3. The third character is the next highest severity grade occurring along the pipe length.
4. The fourth character is the total number of the second highest severity grade occurrences, derived as in item 2 above.

Example

A segment of pipe with a PACP rating 4B27

This immediately shows that no grade 5 defects or grade 3 defects, however 15 to 19 grade 4 defects and seven grade 2 defects were found.

Another Example

A segment of pipe with a PACP rating 3224

Two grade 3 defects and four grade 2 defects, however no grade 5 or grade 4 defects were found.

The PACP Quick Rating provides the ability to summarize the number and severity of defects found within a pipe segment, as with the Pipe Rating, Quick Structural Ratings are calculated using only Structural Defect Grades, and Quick O&M Ratings are calculated using only O&M Defect Grades.

Pipe Ratings Index -This is an indicator of the distribution of defect severity. The Pipe Ratings Index is calculated by dividing the Pipe Rating by the number of defects. For example, the Structural Pipe Ratings Index would be the Structural Pipe Rating divided by the number of structural defects. Pipe Ratings Indexes are calculated for Structural, O&M, and Overall.

Summary

The following procedures are used to calculate pipe segment ratings using the PACP Condition Grading System:

1. Determine the number of occurrences for each condition grade within the pipe segment. Calculate separately for Structural Defect Grades and O&M Defect Grades.
2. Calculate the Segment Grade Score by multiplying the number of occurrences by the respective grade 1 through 5. Calculate the Structural Segment Grade Score and the O&M Segment Grade Score separately, and then add together for the Overall Segment Grade Score.
3. Calculate the Pipe Rating for the pipe segment by adding the Segment Grade Scores. Add all five Structural Segment Grade Scores for the Structural Pipe Rating, and add all five O&M Segment Grade Scores for the O&M Pipe Rating. Add all five Overall Segment Grade Scores for the Overall Pipe Rating.
4. Determine the PACP Quick Rating by calculating the number of occurrences of the two highest severity grades.
5. Calculate the Pipe Ratings Index by dividing the Pipe Rating by the number of defects.

Identified Structural Defects Correction Projects

General Repair Methods

Repairs to existing sewers can be separated into two categories, traditional removal and replacement of the damaged pipe with the standard trench operation or trenchless method using Cured in Place Pipe (CIPP) typically called a sewer-lining repair. Each method has advantages and disadvantages. The most cost effective repair of the sewer is a combination of the two methods since there may be only 8-10 foot length of sewer mainline that is in disrepair, but the remaining mainline contains cracks that can be repaired by lining the sewer with CIPP. The advantages and disadvantages and recommended uses for each method are listed below:

Traditional sewer replacement advantages are:

1. The sewer is replaced with a new VCP of the same diameter and will have a design life of over 50-years.
2. Only the section of pipe that is damaged needs to be replaced. (Listed as point repair in estimates) The remaining line is not replaced or disturbed.
3. Common trench construction method employed.
4. Best choice if the line to be repaired also needs to be upsized.

Disadvantages:

1. Sewer line must be taken out of service for the duration of the repair and a temporary sewer by-pass system must be used.
2. If sewer is located within a street, traffic must be rerouted or detoured around trench or construction operation.
3. Sewer is located in an easement, access, and working space may be a practical factor.

Trenchless (CIPP) sewer rehabilitation advantages:

1. Minimal traffic interruptions.
2. Can repair sewer defects under existing improvements, i.e. signs, fencing, etc.
3. Faster installation. Typically can install 300'-600' per day.
4. Sewer line is typically out of sewer less then 3 hours.
5. Can repair multiple defects in a sewer line.

Disadvantages:

1. Must have approximately 3000 to 4000-feet of lining to be economical due to higher mobilization and equipment costs.
2. Cannot be used to upsize deficient pipe.
3. Depending on pipe flow, may require temporary sewer by-pass system.

Recommended Sewer System Improvements

Presented in the engineer's estimate (Appendix 'N-2') is a brief summary of the measures recommended to correct the structural defects which are also shown on maps in Appendix 'N-3'. The criteria for recommending and prioritizing relief facilities are as follows:

1. Sewers with critical structural defects, ranked as category 5's, are recommended for prompt correction measures.

2. Sewers with structural defects, ranked as category 4's, are recommended for correction measures as funding is scheduled over the next 4-8 years. Sewers meeting these criteria should be monitored for signs of further deterioration.

3. Sewers with structural defects, ranked as category 3's, are recommended for correction measures as change in conditions warrant. Sewers meeting these criteria should be periodically monitored for signs of further deterioration.

Please note that the recommended sewer system improvements as presented here are general in nature and should not be considered as absolutes for final design. Rather, they should be considered more as a plan guide.

Recommended Sewer System Improvement Projects

Contained within the engineer’s estimate (Appendix ‘N-2’) is a brief description of the recommended sewer system repair work for the identified structural defects. The first project is all of the category 5 structural defects. These repairs are recommended for immediate replacement as these pipes are of high risk for failure. The category 4 structural defects can be completed separately or together based on the funding available. It is recommended that the repair projects within each category be constructed as complete projects, if at all possible, in order to benefit from the economy of scale rather than to perform the repairs individually which would increase the cost considerably.

Sewer System Improvements Costs

The unit prices shown in the engineer’s estimate (Appendix ‘N-2’) represent the anticipated construction cost applicable for mid 2008. Bid prices received on jobs of similar nature in Southern California area were one source of information used to derive the cost figure. In addition, manufacturers, suppliers of material and equipment, and local contractors were consulted on various cost items. The unit prices do not include right-of-way acquisition or legal costs. An additional 35% of construction cost is added to cover the cost of design engineering, contract administration, inspection, survey and contingency cost.

The engineer’s estimate does not include an adjustment for inflation. Construction costs can be expected to fluctuate as corresponding changes occur in the national or local economy. One available indicator of these changes is the Engineering News-Record Construction Cost Index for the Los Angeles metropolitan area. This index is compiled from actual construction cost data for materials and labor and is reported in Engineering News-Record magazine. It is suggested that this index be used to update the unit prices presented in the Appendix and in adjusting the estimate from the date of the initial estimates.

Identified Maintenance Defect Locations

In general, category 5 defects are recommended for immediate correction. These defects may be complete blockages caused by root intrusion with maximum flow disruption. Roots can also fracture sewer lines, causing soil and ground water contamination.

Category 4 defects are recommended for correction within the next year. A high majority of those blockages are caused by root intrusion. These defects will become category 5 defects within the foreseeable future.

Categories 3 defects and lower are generally recommended for correction after the correction of category 5 and 4 defects. Pipe segments with a rating of 3 should be monitored for further deterioration and corrected as the conditions warrant and budgeted funds are available.

The location of Categories 5 and 4 maintenance defects are shown on the corresponding map in Appendix 'N-3'.

General Maintenance Methods

Maintenance is performed using rodders and/or high pressure cleaners (hereinafter referred to as HPCs). A rodder is preferably used to deal with root intrusion (though a rodder may be used to remove grease also). A rodder consists of a saw/blade attached to rod (metal cables) which is contained within a cage. The saw/blades and rods are fed out of the cage while spinning. The resulting motion cuts and dislodges roots and grease allowing the intrusions to move down the sewer line to be caught and removed at a downstream manhole. An HPC is preferably used to remove coagulated grease and grit (particulate matter) from the sewer lines. The HPC pumps water at a high pressure through the sewer lines. This water displaces the grease and grit. In some areas, workers may find it helpful to use a foaming chemical root treatment. This foam is pumped into selected sewer mains to kill existing roots and to inhibit their re-growth.

Summary

Ten percent of the city sewer system was CCTV inspected. Each reach of sewer inspected is put into a category based on the NASSCO-PACP (more fully described in the above Pipeline Grading System criteria section of this report).

Based on the ratings for Structural Defects, only one (1) location within the inspected system was identified as being Category 5 structurally defective, only one (1) location within the inspected system were identified as being Category 4 structurally defective, and two (2) locations within the inspected system were identified as being Category 3 structurally defective. The engineer's opinion of cost to repair the structurally defective segments is presented in Appendix 'N-2'.

Based on the ratings for Maintenance Defects, approximately 73 pipe segments (lengths between manholes) were reported containing a total of 546 various defects. Since these are maintenance activity related there is no repair cost estimate prepared.

APPENDIX ‘N-1’

NASSCO PACP Condition Grading System Code Matrix

NASSCO PACP Condition Grading System
Code Matrix

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
Structural	Crack (C)	Circumferential (C)		CC	1	
		Longitudinal (L)		CL	2	
		Multiple (M)		CM	3	
		Spiral (S)		CS	2	
Structural	Fracture (F)	Circumferential (C)		FC	2	
		Longitudinal (L)		FL	3	
		Multiple (M)		FM	4	
		Spiral (S)		FS	3	
Structural	Pipe Failures (Silent)	Broken (B)		B	1 clock pos - 3, 2 clock pos - 4, >=3 clock pos - 5	
		Broken (B)	Soil Visible (SV)	BSV	5	
		Broken (B)	Void Visible (V V)	BVV	5	
		Hole (H)		H	1 clock pos - 3, 2 clock pos - 4, >= 3 clock pos - 5	
		Hole (H)	Soil Visible (SV)	HSV	5	
		Hole (H)	Void Visible (V V)	HVV	5	
Structural	Collapse (X)	Pipe (P)		XP	5	
		Brick (B)		XB	5	
Structural	Deformed (D)	(Pipe) (P)		D	<=10% - 4,>10% - 5	
		Brick (B)	Horizontally (H)	DH	5	
		Brick (B)	Vertically (V)	DV	5	
Structural	Joint (J)	Offset (displaced) (O)	Med (M)	JOM	1	
			Large (L)	JOL	2	
		Separated (open) (S)	Med (M)	JSM	1	
			Large (L)	JSL	2	
		Angular (A)	Med (M)	JAM	1	
			Large (L)	JAL	2	
	Surface Damage Chemical (S)	Roughness Increased (RI)	C	SRIC	1	
		Surface Spalling (SS)	C	SSSC	2	
		Aggregate Visible (AV)	C	SAVC	3	
		Aggregate Projecting (AP)	C	SAPC	3	
		Aggregate Missing (AM)	C	SAMC	4	
		Reinforcement Visible (RV)	C	SRVC	5	
		Reinforcement Corroded (RC)	C	SRCC	5	
		Missing Wall (MW)	C	SMWC	5	
		Other (Z)	C	SZC		
	Surface Damage Mechanical (M)	Roughness Increased (RI)	M	SRIM	1	
		Surface Spalling (SS)	M	SSSM	2	
		Aggregate Visible (AV)	M	SAVM	3	
		Aggregate Projecting (AP)	M	SAPM	3	

NASSCO PACP Condition Grading System
Code Matrix

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
		Aggregate Missing (AM)	M	SAMM	4	
		Reinforcement Visible (RV)	M	SRVM	5	
		Reinforcement Corroded (RC)	M	SRCM	5	
		Missing Wall (MW)	M	SMWM	5	
		Other (Z)	M	SZM	N/A	
	Surface Damage Not Evident (Z)	Roughness Increased (RI)	Z	SRIZ	1	
		Surface Spalling (SS)	Z	SSSZ	2	
		Aggregate Visible (AV)	Z	SAVZ	3	
		Aggregate Projecting (AP)	Z	SAPZ	3	
		Aggregate Missing (AM)	Z	SAMZ	4	
		Reinforcement Visible (RV)	Z	SRVZ	5	
		Reinforcement Corroded (RC)	Z	SRCZ	5	
		Missing Wall (MW)	Z	SMWZ	5	
		Other (Z)	Z	SZZ	N/A	
	Surface Damage (Metal Pipes)	Corrosion (CP)		SCP	3	
Structural	Lining Failure (LF)	Detached (D)		LFD	3	
		Defective End (DE)		LFDE	3	
		Blistered (B)		LFB	3	
		Service Cut Shifted (CS)		LFCS	3	
		Abandoned Connection (AC)		LFAC		
		Overcut Service (OC)		LFOC	3	
		Undercut Service (UC)		LFUC	3	
		Buckled (BK)		LFBK	3	
		Wrinkled (W)		LFW	3	
		Other (Z)		LFZ		
Structural	Weld Failure (WF)	Circumfrential (C)		WFC	2	
		Longitudinal (L)		WFL	2	
		Multiple (M)		WFM	3	
		Spiral (S)		WFS	2	
Structural	Point Repair (RP)	Localized Lining (L)		RPL		
		Localized Lining (L)	Defective (D)	RPLD	4	
		Patch Repair (P)		RPP		
		Patch Repair (P)	Defective (D)	RPPD	4	
		Pipe Replaced (R)		RPR		
		Pipe Replaced (R)	Defective (D)	RPRD	4	
		Other (Z)		RPRZ		
		Other (Z)		RPRZD		
Structural	Brickwork (Silent)	Displaced (DB)		DB	3	
		Missing (MB)		MB	4	
		Dropped Invert (DI)		DI	5	
		Missing Mortar	Slight	MMS	2	
			Medium	MMM	3	
			Large	MML	3	

NASSCO PACP Condition Grading System
Code Matrix

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
O&M	Deposits Attached (DA)	Encrustation (E)		DAE		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Grease (G)		DAGS		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Ragging (R)		DAR		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Other (Z)		DAZ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
	Deposits Settled (DS)	Hard/Compacted (C)		DSC		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Fine (F)		DSF		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Gravel (G)		DSGV		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Other (Z)		DSZ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
	Deposits Ingress (DN)	Fines silt/sand (F)		DNF		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Gravel (GV)		DNGV		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Other (Z)		DNZ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
O&M	Roots (R)	Fine (F)	Barrel (B)	RFB		2
			Lateral (L)	RFL		1
			Connecfion (C)	RFC		1
	Roots (R) at a Joint		N/A	RF		1
		Tap (T)	Barrel (B)	RTB		3
			Lateral (L)	RTL		2
			Connecfion (C)	RTC		2
	Roots (R) at a Joint		N/A	RT		2
		Medium (M)	Barrel (B)	RMB		4
			Lateral (L)	RML		3
			Connecfion (C)	RMC		3
	Roots (R) at a Joint		N/A	RM		3
		Ball (B)	Barrel (B)	RBB		5

NASSCO PACP Condition Grading System
Code Matrix

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
			Lateral (L)	RBL		4
			Connecfion (C)	RBC		4
	Roots (R) at a Joint		N/A	RB		4
O&M	Infiltration (I)	Weeper (W)		IW		2
		Dripper (D)		ID		3
		Runner (R)		IR		4
		Gusher (G)		IG		5
O&M	Obstacles/Obstructions (OB)	Brick or Masonry (B)		OBB		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Pipe Material in Invert (M)		OBM		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Object Protruding Thru Wall (I)		OBI		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Object Wedged in Joint (J)		OBJ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Object Thru Connection (C)		OBC		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		External Pipe or Cable In Sewer (P)		OBP		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Built Into Structure (S)		OBS		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Construction Debris (N)		OBN		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Rocks (R)		OBR		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Other Objects (Z)		OBZ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
O&M	Vermin (V)	Rat (R)		VR		2
		Cockroach (C)		VC		1
		Other (Z)		VZ		1
Construction Features	Tap (T)	Factory Made (F)		TF		
			Capped (C)	TFC		
			Defective (D)	TFD		2
			Intruding (I)	TFI		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Active (A)	TFA		

NASSCO PACP Condition Grading System
Code Matrix

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
		Break-In/Hammer (B)		TB		
			Capped (C)	TBC		2
			Defective (D)	TBD		3
			Intruding (I)	TBI		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Active (A)	TBA		
		Saddle (S)		TS		
			Capped (C)	TSC		
			Defective (D)	TSD		2
			Intruding (I)	TSI		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Active (A)	TSA		
Construction Features	Intruding Seal Material (IS)			IS		
		Sealing Ring (SR)		ISSR		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Hanging	ISSRH		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Broken	ISSRB		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Grout (GT)		ISGT		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Other (Z)		ISZ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
Construction Features	Line (L)	Left (L)		LL		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Left/UP (LU)		LLU		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Left/Down (LD)		LLD		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Right (R)		LR		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Right/Up (RU)		LRU		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4

NASSCO PACP Condition Grading System
Code Matrix

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
		Right/Down (RD)		LRD		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Up (U)		LU		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Down (D)		LD		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
Construction	Access Points (A)					
		Cleanout (CO)		ACO		
			Mainline (M)	ACOM		
			Property (P)	ACOP		
			House (H)	ACOH		
		Discharge Point (DP)		ADP		
		Junction Box (JB)		AJB		
		Meter (M)		AM		
		Manhole (MH)		AMH		
		Other Special Chamber (OC)		AOC		
		Tee Connection (TC)		ATC		
		WW Access Device (WA)		AWA		
		Wet Well (WW)		AWW		
Other	Miscellaneous (M)	Camera Underwater (CU)		MCU		4
		Dimension/Diam/Shape Change (SC)		MSC		
		General Observation (GO)		MGO		
		General Photograph (GP)		MGP		
		Material Change (MC)		MMC		
		Lining Change (LC)		MLC		
		Joint Length Change (JL)		MJL		
		Survey Abandoned (SA)		MSA		
		Water Level (WL)		MWL		
		Water Level (WL)	(S)	MWLS		<=30% - 2, <=50% - 3, >50% - 4
		Water Mark (WM)		MWM		>=50% 4, >=75% 5
		Dye Test (Y)		MY		
			Visible (V)	MYV		5
			Not Visible (N)	MYN		3

APPENDIX ‘N-2’

Engineer’s Estimate

City of Agora Hills

Table 1
Priority Ranking and Summary of Structural Defect Correction Measures

Priority Ranking	Defect Category	WINCAN Run No.	Street Name	Description of Repair	From		To	Cost
1	5	116	Provident Rd	Point Repair	MH 76	-	MH 77	$4,200
				SUBTOTAL - DEFECT CATEGORY 5 REPAIRS:				**$4,200**
2	4	102	Endeavor St	Point Repair	MH 109	-	MH 104	$4,200
				SUBTOTAL - DEFECT CATEGORY 4 REPAIRS:				**$4,200**
3	3	136	Canwood Dr	Point Repair	MH 44	-	MH 43	$12,600
4	3	117	Patrick Henry Pl	Point Repair	MH 77	-	MH 78	$4,200
				SUBTOTAL - DEFECT CATEGORY 3 REPAIRS:				**$16,800**
				TOTAL - DEFECT CATEGORY 3, 4, & 5 REPAIRS:				**$25,200**

APPENDIX ‘N-3’

Exhibit Maps

Structural Defects
and
Maintenance Defects