Technical Report

Genesee CSO Reduction Project Flow Monitoring Report

January 2008 through May 2009

Prepared for

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This report has been prepared under the direction
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Executive Summary

This Flow Monitoring Report describes the results of flow monitoring of the combined sewer system within the Genesee Area. Flow monitoring is the simultaneous measurements of velocity and depth at strategic points within the system and precipitation over the Genesee Area. The flow monitoring was conducted as part of the Genesee Combined Sewer Overflow (CSO) Reduction project. The goal of the project is to design and construct CSO reduction facilities that reduce CSOs from NPDES Basins 37, 38, 40, 41, 42, 43, and 165 down to one overflow per site per year on average. A model capable of facilitating preliminary and design engineering is required to meet this goal. To develop, calibrate, and validate the model, additional flow monitoring data were needed to meet the following objectives:

- Measure the volume, performance, and frequency of overflows at each of the Genesee Area's outfall locations.
- Obtain depth and velocity measurements to develop stage discharge curves at the CSO control facilities (hydrobrakes).
- Measure flow at strategic points to support allocating flow upstream within the flow monitoring basins for both dry weather and wet weather conditions.

The Genesee CSO Area occupies 676 acres (1.05 square miles) in southwest Seattle, just north of Seward Park as shown in Figure 1-1. The Genesee Area consists of CSO Basins 37, 38, 40, 41, 42, 43, and 165. To achieve the data objectives, 21 temporary monitors were installed and maintained from January 15, 2008 to May 31, 2009, throughout Genesee. Additional data came from the following sources:

- 8 SPU-maintained permanent flow monitors installed at each of the NPDES CSO Basin outfalls
- Supervisory control and data acquisition (SCADA) data from SPU Pump Stations #5 and #6
- 3 monitors installed and maintained for SPU for the RainCatchers project (also known as the Lakewood RainCatchers project) by Herrera Environmental Consultants (Herrera 2006b). This project assessed the effectiveness of reducing CSOs though the use of rain gardens and cisterns on residential sites.
- Precipitation data from SPU's rain gage #18.

All flow from the Genesee Area is conveyed to the King County Metro system through Hanford Street Trunk B and the King County Rainier Avenue Lift Station. In support of the project, King County provided data from 1) monitor 059-443 installed near the bottom of the Genesee Area in Charlestown Street, and 2) SCADA data from the lift station.

During the 17 months of monitoring from January, 2008 through May, 2009, there were 48 rainfall events that included:

- Two 2-year storms
- Four 1-year storms
- 20 storms between 2 months and 1 year

Of these, seven storms have been recommended as model calibration storms, and five are available for model validation.

The rainfall that fell during the monitoring period is representative of the historical record and data quality from the flow monitors, and SCADA data are suitable to support hydraulic modeling. The combination of availability of good rain events with suitable flow monitor data greatly increases the accuracy of the calibrated model. Precipitation and monitoring results are summarized in Tables 3-1 and 3-2, respectively.

In addition, the following are noted from the data or through field investigations resulting from the project:

- Twenty-six separate combined sewer overflows (CSOs) occurred during the flow monitoring period. Half of these occurred at NPDES 41B. These overflows are summarized in Table 4-1, which is derived from the information provided in the SPU monthly CSO Reports to Ecology.
- Hydrobrake stage-discharge curves were developed for three of the four hydrobrakes. The fourth hydrobrake, located in CSO Facility #12 at NPDES Basin 38 (059-458), had a maximum differential head of 43 inches in a 72-inch inline storage pipe, corresponding to a total depth of 56.9 inches of depth at the hydrobrake and a storage tank approximately 60% full. This tank cannot be filled over 60% full given the current hydrobrake and weir configuration. Monitoring at this location continues beyond May, 2009 in order to better define the model curve.
- Available inline and offline storage was utilized at CSO Facilities #9, 10, and 11 during storm events. The storage facility in NPDES Basin 38 (CSO Facility #12) could be more fully used and will be evaluated during alternative analysis with the hydraulic model.
- During the monitoring period, the King County Rainier Avenue Lift Station pumped all incoming flow without restriction, in some cases exceeding the published firm capacity of 9 mgd by almost 3 mgd. Coordination with King County on the operational boundary constraints at this pump station will be necessary prior to alternatives analysis.
- An industrial discharge from the Darigold facility upstream of MH 059-131 was evident. King County issues and enforces an industrial discharge permit that allows Darigold to discharge into the King County system for treatment at a King County wastewater treatment plant. During permit renewals, the City provides input to King County with respect to the Darigold discharge duration, flow rate, and timing. If the model indicates the discharge as it now occurs impacts the system and contributes to overflows, Darigold has indicated it is open to modifying, within reason, discharge duration, timing, and flow rate, with concurrence from King County.
- NPDES Basin 41 outfall was found to be crushed during field investigations by SPU Operations and Maintenance (O&M) personnel, resulting in a flow restriction. The overflow volume calculated by the depth over the CSO outfall weir is likely to be an

over-estimation. Occurrence of CSO events is considered valid. SPU is working to repair this outfall.

- The Lake Line from NPDES 165 downstream to Pump Station #5 is under capacity. Increasing the capacity of Pump Station #5 is likely to be needed if the Lake Line is to be upgraded. Recent improvements upstream of Pump Station #6 that include root-cutting, pipe rehabilitation, insituform, and raising the weir at NPDES 165 in September, 2008, may eliminate the need to increase the capacity of Pump Station #6. The model will be used to verify the effects of improvements on NPDES 165.
- Investigations into a potential constriction along the Lake Line between 060W-019 and 060W-012 are inconclusive. O&M personnel have cleaned this section of pipe; however, scattergraphs of flow data suggest persistent constrictions in the line. Subsequent review of 1985 as-built drawings reveal a sand-catcher just downstream of MH 060W-014 was to be abandoned by others. Regular cleanings of this section are recommended, as is continued flow monitoring and investigation as to source of the restriction. This should include a video inspection of the line.

Acronyms

A/V	area/velocity
City	City of Seattle
CSO	combined sewer overflow
CSS	combined sewer system
fps	feet per second
DWF	dry weather flow
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
GIS	Geographic Information System
GLUE	Generalized Likelihood Uncertainty Estimation
KC	King County
MG	million gallons
mgd	million gallons per day
MH	maintenance hole
NPDES	National Pollutant Discharge Elimination System
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
O&M	Operations and Maintenance
SCADA	Supervisory Control and Data Acquisition
SOP	Standard Operating Procedure
SPU	Seattle Public Utilities
WWF	wet weather flow

1. Introduction

1.1 Background and Purpose

The City of Seattle (City) has a National Pollutant Discharge Elimination System (NPDES) permit for its Combined Sewer Overflow (CSO) outfalls. In accordance with the NPDES permit and State Law, the City is required to implement capital projects in its uncontrolled NPDES CSO Basins to reduce CSOs to an average of one untreated discharge per CSO site per year. The Genesee CSO Area was designated for a CSO reduction project in the 2001 and 2005 CSO Plan Amendments.

This Flow Monitoring Report describes the results of flow monitoring of the combined sewer system within the Genesee Area. Flow monitoring was conducted as part of the Genesee CSO Reduction Plan, primarily to characterize the performance of the combined sewer system and existing facilities in order to support Genesee Area modeling and to verify basin performance. This Flow Monitoring Report evaluates the suitability of the data for modeling in support of the requirements for Monitoring and Planning for the Facilities Plan due to the Washington State Department of Ecology (Ecology) by December 31, 2010.

The goal of the Genesee CSO Reduction project is to design and construct CSO reduction facilities that reduce CSOs from NPDES Basins 37, 38, 40, 41, 42, 43, and 165 down to one overflow per site per year on average. A model capable of facilitating preliminary and design engineering is required to achieve this goal. In preparation for updating the model, SPU and CH2M HILL evaluated the availability of monitoring data to meet the project objectives. Flow monitoring data prior to 2008 were deemed insufficient, and SPU authorized CH2M HILL to expand the existing program and select flow monitoring locations that meet the immediate needs of the project. The objective of this flow monitoring program was to accurately characterize the performance of the Genesee Area combined sewer system and facilities before, during, and after storm events. The goal was to capture adequate data from two storm events that do not cause overflows, and two storm events that do cause overflows (although not necessarily at each outfall).

The project data needs included the following:

- Measuring the volume, performance, and frequency of overflows at each of the NPDES outfall locations.
- Measuring depth and velocity to develop stage discharge curves at the CSO control facilities (hydrobrakes).
- Measuring flow at strategic points to support allocating flow upstream within the NPDES Basins for both dry weather and wet weather flow (DWF and WWF, respectively) conditions.

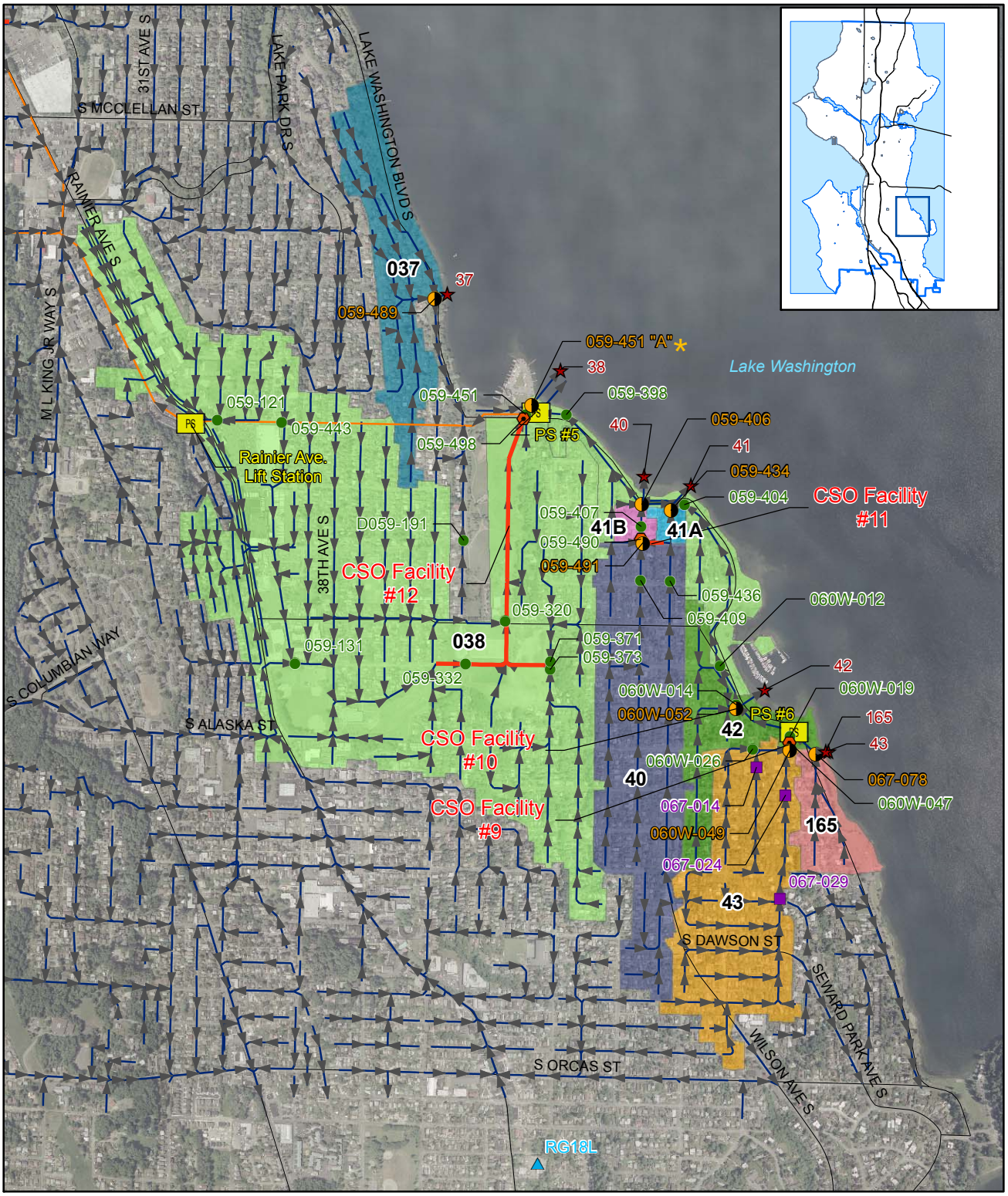
Flow monitoring used to support the Genesee model update was conducted by ADS Environmental Services (ADS) and commenced on January 15, 2008, concluding on May 31,

2009. The flow monitoring period was divided into two phases of data collection: Phase I occurred January 15, 2008 through June 10, 2008, and Phase II occurred June 11, 2008 through May 31, 2009. Phase II was added to the monitoring period because larger events captured during Phase I were insufficient for modeling needs. More extensive quality assurance/quality control (QA/QC) measures were performed during Phase I because the monitors had just been installed and overall data quality was uncertain. The specific changes on QA/QC procedures are described in detail in Section 2.4. Except where the monitors were removed due to poor site quality, all of the monitors were maintained in place for the entire duration. Flow monitoring will continue at eight of the sites beyond May 31, 2009, in order to collect data at sites requiring additional characterization and to assess future retrofits or other improvements in the system. The flow monitoring plan guiding the objectives, approach, and QA/QC procedures for the project is summarized in the *Quality Assurance Project Plan (QAPP): Genesee Basin Flow Monitoring Study* (CH2M HILL 2008). Throughout the flow monitoring period, CH2M HILL evaluated the data with respect to its ability to meet Genesee Area modeling data needs. This evaluation resulted in a series of written data review summaries and flow monitoring workshops. The purpose of this report is to summarize the data review and workshop findings, and to present a summary of the flow monitoring period. The finalize flow monitoring data from ADS is included on a CD in Appendix L. Basin modeling completed using the flow monitoring data discussed in this report is described in the *Genesee Combined Sewer Overflow Reduction Project: Hydrologic and Hydraulic Modeling Report* (CH2M HILL 2010 publication pending).

1.2 Study Boundaries

The study area is the Genesee CSO Area, which includes NPDES Basins 37, 38, 40, 41, 42, 43, and 165. The Genesee Area occupies 676 acres (1.05 square miles) in southwest Seattle, just north of Seward Park. It is bounded by Lake Washington on the east, Rainier Avenue on the west, Mt. Baker Boulevard on the north, and S Orcas Street on the south. The Genesee Area is served primarily by a partially separated sanitary sewer system that conveys wastewater and runoff from directly connected rooftops and area drains to the trunk line along Lake Washington (also called the *Lake Line*), to the King County Hanford Street Trunk B that runs along Charlestown Street (also called the Charlestown Street Trunk), into the Rainier Avenue Lift Station, and ultimately to the King County West Point Treatment Plant. CSO outfalls discharge directly to Lake Washington. Separated stormwater is discharged to Lake Washington through multiple storm drain outfalls. An overview map of the study area is shown in Figure 1-1.

Study boundaries include 21 temporary flow monitors and 8 permanent monitors within the Genesee Area, as well as one rain gage. The permanent monitors were established prior to the flow monitoring period by ADS at hydraulically complex diversion structures to record CSO overflow events for the purpose of reporting to Ecology, while the temporary monitors were established to characterize flow through Genesee and hydrobrake performance. The study boundary also includes three flow monitors from the SPU RainCatchers program (Herrera 2006b), two SPU pump stations, one King County flow monitor, and one King County lift station. The flow monitoring basins that are tributary to each monitoring site are within the 676 acres comprising the study area. Temporary monitoring will extend beyond May 31, 2009, at eight selected locations in order to validate and refine the model. These



LEGEND

- Permanent Monitoring Point
- Temporary Monitoring Point
- RainCatchers Monitor
- PS Pump Station
- Outfall
- Rain Gauge
- Hydrobrake
- King County CSO Pipe
- SPU CSO/Storm Drain Pipe
- Detention Facility
- * This site was incorrectly labeled. See Section 3.2 *059-451 "A"* for more details
- NPDES Basin

0 500 1,000
Feet

N

FIGURE 1-1
Area Overview
Flow Monitoring Report
SPU Genesee Area

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sites are noted in Table 2-1. King County wastewater and CSO control facilities within the Genesee CSO Area include:

- Rainier Avenue Lift Station
- Hanford Street Trunk B
- Stan Sayres Pit Overflow (King County Overflow 033)

The Rainier Avenue Lift Station (3761 Rainier Avenue S) serves an area of 720 acres in the Rainier Valley area. Flow to this lift station is conveyed through King County's 42-inch-diameter Hanford Street Trunk B. 470 acres flow into the trunk by gravity, and 250 acres are pumped into the trunk by the City of Seattle's Pump Station #5. Rainier Avenue Lift Station has a peak capacity of 6,300 gpm with the largest pump out of service. The pump station pumps wastewater through an 18-inch-diameter force main to the County's Rainier-Hanford 60- and 66-inch-diameter Trunk Sewer. Flow continues through the Elliot Bay Interceptor and is treated at the West Point Treatment Plant before discharge to Puget Sound.

The emergency bypass for the Rainier Avenue Lift Station (KC 033) and Hanford Street Trunk B is the same as the City's overflow for NPDES Basin 38 which is now combined with NPDES Basin 39. KC 033 is in compliance with its NPDES permit. The overflow for these NPDES Basins and the bypass for the Rainier Avenue Lift Station is located in Lake Washington near the Stan Sayres Pit at 45th Avenue S and Lake Washington Boulevard (Municipality of Metropolitan Seattle, 1993). During normal flow events, sewage flows to the Hanford Street Trunk B and through the Rainier Avenue Lift Station. Bypass flows from Rainier Avenue Lift Station would back up above the grit chamber, over the Horseshoe Weir at MH 059-451, and over two sets of weirs at MH 059-574 (also known as Structure A). The final downstream weir in 059-574 is the NPDES 38 overflow weir. Downstream of the NPDES 38 overflow weir is a 72-inch-diameter overflow line connected to a 36-inch outfall pipe that extends into Lake Washington. This 72-inch overflow is shared by KC 033 bypass and SPU NPDES 38 overflows. Although King County owns the outfall structure ("Stan Sayres Pit Overflow" in Municipality of Metropolitan Seattle, 1993), King County and SPU have assumed that when the Rainier Avenue Lift Station is pumping at stated firm capacity, overflows at this location are from the City's system resulting in SPU taking responsibility for maintenance.

2. Monitoring Network

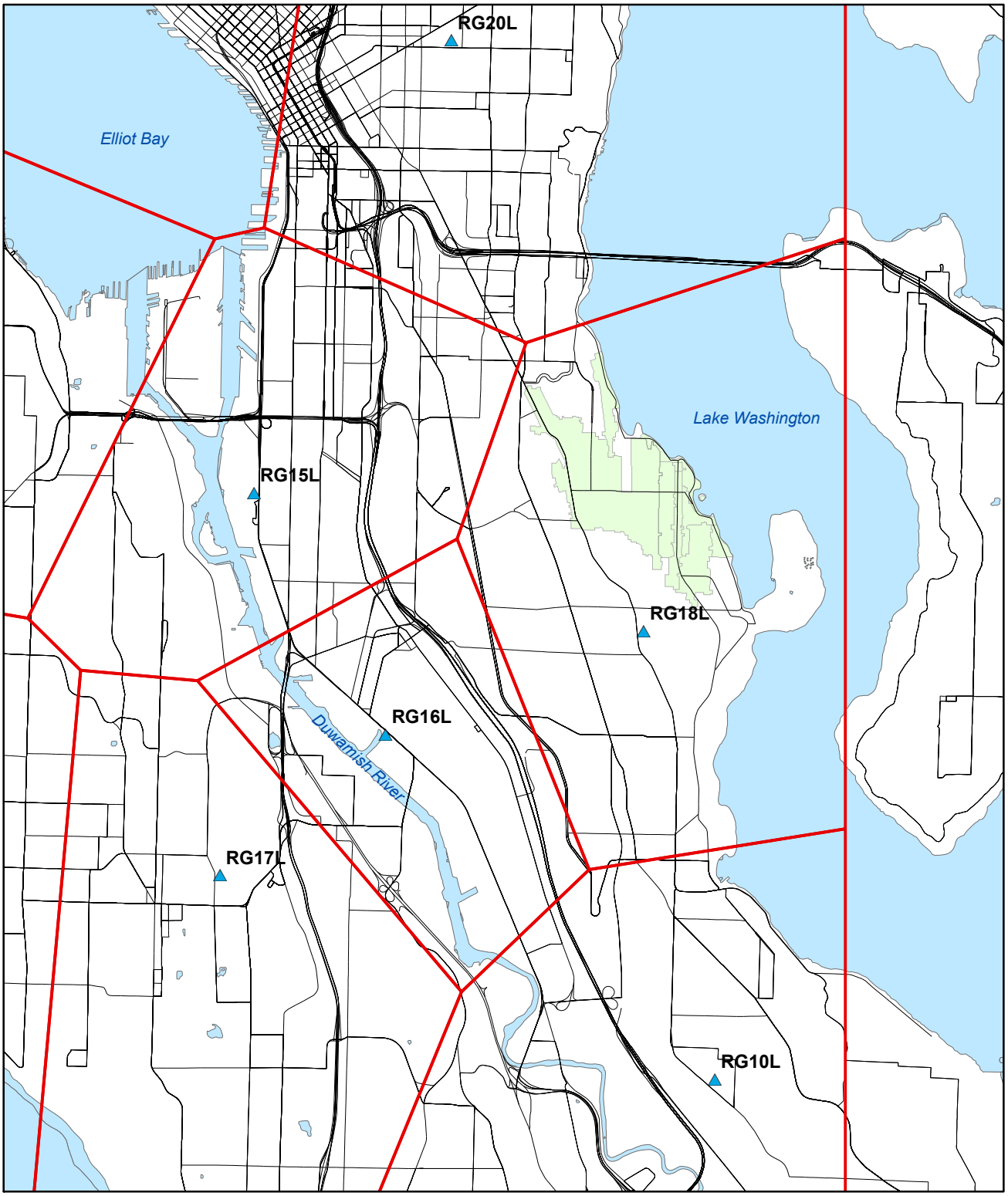
2.1 Rainfall Monitoring Equipment

The City of Seattle operates a network of 17 rain gages. Thiessen Polygons for the City's rain gages indicated that all parts of the Genesee Area are closest to Rain Gage 18 (RG 18), located at the Rainer Avenue Seattle Fire Department station. This rain gage is 2.1 miles from the farthest point within the Genesee Area. The data from this gage are suitable for model calibration and analysis. Rain data from Rain Gages 10, 20, and 30 were used to check the data from Rain Gage 18, or in the event that data from Rain Gage 18 were missing. Rain Gage 18 is not heated, and may deliver inconsistent results during freezing weather and snow events. The nearest heated unit is Rain Gage 15, located at SW Barton Street and 8th Avenue SW, 5 miles from the farthest point within the Genesee Area. Figure 2-1 shows the rain gages, Thiessen Polygons, and the Genesee Area. In order to better capture potential spatial variation in rainfall in the Genesee Area, the City installed a temporary rain gage in Genesee Park after the completion of Phase II data collection. The new rain gage is discussed in more detail in Section 5.1.2. Rain gage specifications and data quality assurance procedures are discussed in Section 7.5 and Section 9 of the QAPP (CH2M HILL 2008a), and in SPU Standard Operating Procedures (SOPs) METR Q1100_R0D7, METR Q1200_R0D3, and METR Q1300_R0D2. The SPU SOPs are included in Appendix H of the QAPP. Rain gage data results are discussed in Section 3.1. The rain gages record precipitation depth in 0.01-inch increments and 1-minute intervals.

2.2 Flow Monitoring Equipment

Monitoring consisted of simultaneous measurements of velocity and depth at strategic points within the system and precipitation over the Genesee Area. Temporary flow monitors complemented the permanent flow monitors installed at Genesee's CSO outfalls. The permanent flow monitors were installed in the summer of 2007 at each NPDES Basin's outfall diversion structure to record and quantify CSO overflow events, as required by the City's NPDES permit. These monitors will remain in place beyond the duration of the flow monitoring period described in this report, and are described in greater detail in Section 2.3.1. The majority of the temporary flow monitors were installed in mid-December, 2007, and all were installed by January 31, 2008. The temporary monitors were installed to characterize the hydrologic and hydraulic response (also referred to as "flow loading") of each subcatchment within the Genesee Area, or to develop stage-discharge curves for each of the four hydrobrakes located in Genesee.

The typical configuration of the monitoring instruments within the Genesee Area includes one set of sensors, including a velocity, pressure, and ultrasonic sensor, in a pipe upstream of a maintenance hole (MH) recording instantaneous data at 5-minute intervals. Deviations from the typical configuration occurred in order to better capture unique hydraulics and included an additional set of sensors or sensors installed on the downstream side of an MH.



LEGEND

- Rain Gage
- SPU Rain Gage Thiessen Polygon
- Genesee Basin

0 0.5 1
Miles
N

FIGURE 2-1
SPU Rain Gages Near Genesee Basin
Flow Monitoring Report
SPU Genesee Basin

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Specific site configurations are reported in Section 7.1 of the QAPP (CH2M HILL 2008a) and are included in Section 3.2 and site reports in Appendix A of this report. Appendix B contains the specifications for the flow monitors used in this study. Table 2-1 below summarizes the temporary and permanent monitoring locations. Additional details regarding the monitors and their locations can be found in Section 2.3.

2.3 Flow Monitors

Each of the monitoring locations (both temporary and permanent) was selected to meet a primary purpose, and often one or more secondary purposes. The three purposes consist of measuring overflows, measuring hydrobrake performance, and measuring flow monitoring basin hydrologic and hydraulic response. These purposes are noted in Table 2-1 for each of the monitor locations.

Maps of the individual site locations can be found in the site reports in Appendix A. Figure 1-1 shows a map of the entire Genesee Area. Figures 2-2 and 2-3 show two schematic diagrams detailing the monitors, hydrobrakes, CSO outfalls, and related CSO storage facilities. Table 2-1 summarizes location details for each of the monitored sites. The table also includes the tributary area of each monitoring basin, reporting both *gross* and *net* areas. The terms gross and net, in reference to both area and flow, are used throughout the report. Unless noted otherwise, the term *tributary area* refers to the gross area. Gross flow or area includes all upstream flow monitoring basins, whereas net subtracts out upstream flow monitoring basins and represents only that basin's contribution. For *terminal* flow monitoring basins, those basins that are most upstream, the gross and net values are equal.

A note about report organization: the monitors listed in each of the tables and appendixes of this report are arranged in order of ascending MH ID, regardless of NPDES Basin or monitor type. This is meant to make it easier to look up specific locations in each of the sections.

Measuring Overflows

The primary purpose of the permanent monitors is to measure combined sewer overflows through the seven NDPES regulated outfalls. This purpose and its implications are discussed in greater detail in Section 2.3.1. Most of the permanent monitors also served secondary purposes of measuring hydrobrake performance and/or flow monitoring basin hydraulic response.

Hydrobrake Performance

The second category of monitors is used to develop an accurate in-situ stage-discharge curve for the four hydrobrakes located throughout the Genesee Area (located at MH IDs 059-490, 060W-052, 060W-047, and 059-498 and further described in Sections 2.3.2 and 4.2). Because of local pipe network conditions from the effects of the hydrobrake, the monitors upstream of the hydrobrakes experienced tail-water conditions. Monitors were needed both upstream and downstream of the hydrobrake to determine the differential head across the hydrobrake. Data from these monitoring locations are not primarily intended, or optimal, for use in flow loading of the model, but may inform that effort.

Hydrologic and Hydraulic Response

The third category of monitors is used to characterize the hydrologic and hydraulic response during both DWF and WWF, and will be used as "flow loading" inputs into the model. These monitors were used to break up the total Genesee Area into smaller areas, referred to as *flow monitoring basins*, allowing for more refined model calibration and validation. The goal for each of these locations is to determine flow through a specific point.

One of the temporary monitors, D059-191, was used to measure flow from the stormwater basin whose outfall is adjacent to the outfall of NPDES Basin 38. The purpose of this monitor was to gather general information about the hydrologic and hydraulic response of the stormwater basin.

Other Meters

In addition to the temporary and permanent monitors used in this project, data from monitors operated by different programs and agencies are available, and will be used for model calibration. One monitor, 059-443, is owned and operated by King County, and three (067-014, 067-024, and 067-029) by the RainCatcher's project. The RainCatchers project (also known as the Lakewood RainCatchers project) was a study conducted by SPU to evaluate the use of decentralized strategies for reducing CSOs to Lake Washington (Herrera 2006b). The strategies evaluated included rain gardens and cisterns on residential sites. Sewer flow monitoring to support this evaluation started in May, 2006, and will continue through the spring of 2010.

Pump Station Data

The Supervisory Control and Data Acquisition (SCADA) data from the three pump stations in the Genesee Area were compiled and analyzed for use in calibrating and validating the model. King County owns and operates the Rainier Avenue Lift Station, and SPU owns and operates Pump Stations #5 and #6. The SCADA data provided by King County for model calibration consisted of both wet well levels and flow through the pump station. SCADA data provided by SPU consisted of wet well levels and pump status (indication of number of pumps running). Pump status in combination with the draw-down tests performed by CH2M HILL allow estimating of flow through the pump station.

2.3.1 Permanent Flow Monitors

Because the ADS-operated permanent flow monitors in the Genesee Area are part of the NPDES permit program established prior to this study, they are maintained and operated differently from the temporary monitors installed specifically for this study. Data from these permanent monitors are made available in near real-time via an automatic data collection and reporting system (*Intelliserve*) to facilitate CSO overflow alarming and monitoring required by the City's NPDES permit.

Some of the permanent flow monitors have two sets of sensors: "MP1" and "MP2." Typically, MP1 is placed upstream of the CSO weir and measures both DWF and WWF; MP2 is located in the outfall pipe downstream of the weir and measures overflows only. This configuration allows overflows to be measured more accurately using the continuity equation to supplement the depth measured over the weir and volumes calculated with the weir equation.

TABLE 2-1: MONITORING LOCATIONS
Genesee Basin Permanent and Temporary Monitoring Locations

Line	NPDES No.	MH ID	Type*	Status	Purpose	Monitor Type**	Gross Basin Area (acres)	Net Basin Area (acres)	Net Basin Length of Pipe (feet)	Suitability of Data for Modeling		
										DWF	WWF	Notes
1	38	059-121	T	#	Flow loading (characterize basin flow).	MP1 (FS)	39.6	39.6	10,772	Suitable	Suitable	
2	38	059-131	T	#	Flow loading (characterize basin flow).	MP1 (FS)	58.8	58.8	19,548	Suitable	Suitable	Significant reconstruction of DWF velocity readings required.
3	38	059-320	T	#	Flow loading (characterize basin flow).	MP1 (FS)	45.9	45.9	11,728	Suitable	Suitable	
4	38	059-332	T	#	Flow loading (characterize basin flow).	MP1 (FS)	160.7	101.9	20,644	Suitable	Suitable	Significant scatter during WWF caused by industrial discharge and hydraulic shifting.
5	38	059-346 (“Structure A”)	T	Moved to 059-574	Verify flows into “Structure A” over the horseshoe weir, and the operation of the downstream pinch valve by comparing measured depths to those at downstream permanent meter (059-451, MP 2). This monitor will remain in place after May 2009.	MP1 (FS)	NA***	N/A***	N/A	N/A	Unsuitable	Site does not measure DWF. WWF data do not balance with upstream site 059-451 for January, 2009 event.
6	38	059-371	T	#	Flow loading (characterize basin flow).	MP1 (FS)	30.1	30.1	4,364	Suitable	Suitable	
7	38	059-373	T	#	Flow loading (characterize basin flow).	MP1 (FS), Reverse Install	46.3	46.3	7,348	Suitable	Suitable	Significant shifting during DWF and WWF caused by reverse installation.
8	38	059-398	T	To remain after 5/31/2009	Flow loading (characterize basin flow) upstream of Pump Station #5. This monitor will remain in place after May 2009 to continue to measure flows through the Lake Line as well as backwater conditions from Pump Station #5, especially those related to CSO overflows at NPDES 38 (MH 059-346, “Structure A”). This monitor will also remain in place to evaluate the effects of any changes (i.e., cleaning, retrofits, or unknown changes) on system performance in the Genesee Area.	MP1 (FS)	228.3	9.8	3,525	Suitable	Suitable	
9	38	059-404	T	#	Flow loading (characterize basin flow) and characterize flows in Lake Line.	MP1 (FS)	125.2	11.7	3,002	Suitable	Suitable	
10	41B	059-406	P	NA	Measure overflow volume. Suitable DWF data, which provided a check of flow loading calibration from upstream temporary and permanent monitors. Presence of silt at this site required depth data adjustment. The outfall pipe downstream of the weir is crushed, resulting in likely overestimation of overflow volumes.	MP1 (FS) MP2 (FS)	90.4	2.7	762	Suitable	Suitable	Downstream outfall pipe is crushed. Reported overflow volumes may be inaccurate. Reported overflow frequency likely not affected. See Section 3.2 for more details.
11	41B	059-407	T	To remain after 5/31/2009	Characterize hydrobrake in MH 059-490 (downstream meter). This monitor will remain in place after May 2009 to measure the effects of changes (i.e., cleaning, retrofits, or unknown changes) on system performance in NPDES Basin 40 and 41B, as well as to continue to characterize the hydrobrake at MH 059-490.	MP1 (FS)	87.7	N/A***	N/A	Suitable	Suitable	Occasional instances of imbalances. Use for Hydrobrake stage-discharge curve only.
12	40	059-409	T	#	Flow loading (characterize basin flow).	MP1 (FS)	38.8	38.8	6,195	Suitable	Suitable	DWF frequently shifted from sub to supercritical flow.

TABLE 2-1: MONITORING LOCATIONS
Genesee Basin Permanent and Temporary Monitoring Locations

Line	NPDES No.	MH ID	Type*	Status	Purpose	Monitor Type**	Gross Basin Area (acres)	Net Basin Area (acres)	Net Basin Length of Pipe (feet)	Suitability of Data for Modeling		
										DWF	WWF	Notes
12	41A	059-434	P	NA	Measure overflow volume. Repeatable and consistent DWF data; because this is the only monitor within this NPDES Basin, DWF data from this monitor are required for flow loading and model calibration. However, slow low flows and a vertical scattergraph required caution during flow calculations.	MP1 (FS) MP2 (FS)	2.8	2.8	458	Suitable	Suitable	Slow low flow resulted in difficulty developing diurnal curve. Downstream outfall pipe is crushed. See Section 3.2 for more details.
14	40	059-436	T	#	Flow loading (characterize basin flow).	MP1 (FS)	37.0	37.0	6,827	Suitable	Suitable	Significant scatter during DWF due to shifting site hydraulics.
15	38	059-443	King County	#	Verify flows from NPDES Basins 38, 40, 41, 42, 43, and 165.		634.2	39.2	9,757	Suitable	Suitable	QA/QC Procedures have not been performed. See Section 2.4.
16	38	059-451	T	To remain after 5/31/2009	Characterize hydrobrake in MH 059-498 (downstream meter). This monitor will remain in place after May 2009 to continue to characterize the hydrobrake at MH 059-498, and to measure depth over the horseshoe weir and into the downstream storage tank (“Structure A”). This monitor will remain in place also to measure the effects of changes (i.e., cleaning, retrofits, land use changes) on system performance in NPDES Basin 38, and to measure any backwatering into NPDES Basin 38 from the Hanford Street Trunk B.	MP1 (FS)	327.6	N/A***	N/A	Suitable	Suitable	Reconstructed depth measurements until December 2008.
17	38	059-451 (“Structure A”)	P	NA	Measure overflow volume. Little DWF data due to stagnant conditions during dry weather. The monitors in this location are setup with MP2 as the upstream monitor, between weir 1 and weir 2, and MP2 as the downstream monitor, over weir 2. MP2 is influenced during the summer by the level of Lake Washington. See Appendix A for more detail.	MP1 (FS) MP2 (FS)	NA***	NA***		N/A	Suitable	Incorrect MH ID used for site (this site is <u>not</u> at MH 059-451). It is instead at MH 059-346. See description of NPDES38_059-451, “Structure A” in Section 3.2 for description. Site does not measure DWF. Overflow site - difficult to calibrate WWF.
18	37	059-489	P	NA	Measure overflow volume. Repeatable and consistent DWF data; because this is the only monitor within this NPDES Basin, DWF data from this monitor are required for flow loading and model calibration. However, low velocity during minimum flows at this site required some data editing. Monitoring configuration changed on 5/30/08. See Section 3.2 for details	MP1 (P) MP2 (U,V) O: (FS)	39.1	39.1	10,849	Suitable	Suitable	Hydraulic shifting causes scatter during DWF and WWF.
19	40	059-490	T	#	Flow loading (characterize basin flow) and characterize the hydrobrake in MH 059-490 (upstream meter).	MP1 (FS) MP2 (U,P)	87.7	8.8	1,890	Suitable	Suitable Depth Unsuitable Velocity	WWF velocity tends to dropout during storms due to hydrobrake activation. Use for hydrobrake stage-discharge curve only.

TABLE 2-1: MONITORING LOCATIONS
Genesee Basin Permanent and Temporary Monitoring Locations

Line	NPDES No.	MH ID	Type*	Status	Purpose	Monitor Type**	Gross Basin Area (acres)	Net Basin Area (acres)	Net Basin Length of Pipe (feet)	Suitability of Data for Modeling		
										DWF	WWF	Notes
20	40	059-491	P	NA	Measure overflow volume. Repeatable and consistent DWF data, to be used for verification of data from the temporary monitor at 059-490 and for evaluation of storage utilization in the NPDES 40 detention facility. Observed data patterns were repeatable throughout the monitoring period.	MP1 (FS)	40.1	3.1	686	Suitable	Suitable	Velocity dropouts during WWF due to downstream hydrobrake.
21	38	059-498	T	To remain after 5/31/2009	Flow loading (characterize basin flow) and characterize the hydrobrake in MH 059-498 (upstream meter). A depth meter at this monitoring location will remain in place after May 2009 to continue to characterize the hydrobrake at MH 059-498, and to measure utilization of the upstream storage tank.	MP1 (FS)	327.6	44.5	6,452	Suitable	Suitable	Velocity dropouts during WWF due to downstream hydrobrake. Use for hydrobrake stage-discharge curve only.
22	38	060W-012	T	To remain after 5/31/2009	Flow loading (characterize basin flow). This monitor will remain in place after May 2009 to measure the effects of changes (i.e., cleaning, retrofits, land use changes) on system performance; in particular, to evaluate any improvements in system performance after the cleaning that was completed in the vicinity of this monitor in the main CSO line that connects to each Genesee Area overflow along the Lake Washington shoreline.	MP1 (FS)	113.5	7.4	2,104	Suitable	Suitable	
23	42	060W-014	T	To remain after 5/31/2009	Characterize the hydrobrake in MH 060W-052 (downstream meter). This monitor will remain in place after May 2009 to measure the effects of changes (i.e., cleaning, retrofits, land use changes) on system performance in NPDES Basin 42; in particular, to evaluate any improvements in system performance after the cleaning that was completed in the vicinity of this monitor in the main CSO line that connects to each Genesee Area overflow along the Lake Washington shoreline. This monitor will also remain in place to continue to characterize the hydrobrake at MH 060W-052.	MP1 (FS)	20.8	N/A***	N/A	Suitable	Suitable	Hydraulic shifting causes significant scatter during DWF and WWF.
24	42	060W-019	T	To remain after 5/31/2009	Characterize the hydrobrake in MH 060W0-047 (downstream meter). This monitor will remain in place after May 2009 to measure the effects of changes (i.e., cleaning, retrofits, land use changes) on system performance in NPDES Basin 43; in particular, to evaluate any improvements in system performance after the cleaning that was completed in the vicinity of this monitor in the main CSO line that connects to each Genesee Area overflow along the Lake Washington shoreline.	MP1 (FS)	73.7	N/A***	N/A	Suitable	Suitable	Hydraulic shifting causes significant scatter during DWF and WWF.
25	43	060W-025	T	Removed February, 2008						Unsuitable	Unsuitable	Poor site hydraulics resulted in unreliable DWF and WWF measurements.
26	43	060W-026	T	Removed July, 2008	Flow loading (characterize basin flow).	DataGator	9.6	9.6	1,767	Suitable	Unsuitable	Poor site hydraulics and monitor set up resulted in inconsistent WWF data.

TABLE 2-1: MONITORING LOCATIONS
Genesee Basin Permanent and Temporary Monitoring Locations

Line	NPDES No.	MH ID	Type*	Status	Purpose	Monitor Type**	Gross Basin Area (acres)	Net Basin Area (acres)	Net Basin Length of Pipe (feet)	Suitability of Data for Modeling		
										DWF	WWF	Notes
27	42	060W-047	T	#	Flow loading (characterize basin flow) and characterize the hydrobrake in MH 060W-047 (upstream meter).	MP1 (U/P)	73.7	4.4	1,267	Suitable	Unsuitable Velocity Suitable Depth	Over-prediction of high depth velocity results in unreliable WWF data. Use for hydrobrake stage-discharge curve only.
28	43	060W-049	P	NA	Measure overflow volume. Repeatable and consistent DWF data, to be used for flow balancing for three upstream monitors and for determining upstream water levels for the NPDES 43 detention facility. Observed data patterns were repeatable throughout the monitoring period.	MP1 (FS), Reverse Install	73.7	N/A***	N/A	Unsuitable	Suitable	Hydraulic shifting causes scatter during DWF.
29	42	060W-052	P	NA	Measure overflow volume. Inconsistent and non-repeatable DWF data due low velocity and silt. DWF data were used for hydrobrake characterization in MH 060W-047 (downstream), for flow loading for the basin, and for evaluation of storage utilization for the NPDES 42 detention facility.	MP1 (FS) MP2 (U)	20.8	20.8	4,947	Suitable	Unsuitable Velocity Suitable Depth	WWF velocity tends to dropout during storms due to hydrobrake activation.
30	43	067-014	RainCatchers Program	To remain until spring, 2009	Flow loading (characterize basin flow)	DataGator	9.3	9.3	1,568	Suitable	Unsuitable	Monitor drift results in progressively less reliable readings. Extensive quality review not performed- see Section 2.4.
31	43	067-024	RainCatchers Program	To remain until spring, 2009	Flow loading (characterize basin flow)	DataGator	50.4	9.4	2,071	Suitable	Unsuitable	Frequent Extended dropouts result in lack of WWF data. Extensive quality review not performed- see Section 2.4.
32	43	067-029	RainCatchers Program	To remain until spring, 2009	Flow loading (characterize basin flow)	DataGator	41.0	41.0	8,559	Suitable	Suitable	Extensive quality review not performed- see Section 2.4.
33	165	067-078	P	NA	Measure overflow volume. Inconsistent and non-repeatable quality DWF data due to slow, low flows, multiple hydraulic regimes, and silt. Orifice effects also occur at water depths greater than 9 inches. However, because this is the only monitor within the NPDES Basin, DWF data from this site were required for flow loading and model calibration, as well as flow balancing with Pump Station #6.	MP1 (FS) MP2 (FS)	11.6	11.6	2,447	Suitable	Suitable	Site hydraulics result in inconsistent and non-repeatable data.
34	38	D059-191	T	#	Flow loading (characterize basin flow) from the separated storm drain system that outfalls adjacent to the NPDES CSO Basin 38. Level is controlled by Lake Washington Level and may be difficult to calibrate for wet weather events.	MP1 (FS)				N/A	Suitable	Stormwater pipe, no DWF. Influence of lake water results in difficulty calibrating WWF data.
35	38	Pump Station #5	SPU SCADA		Wet-well depth				N/A	Suitable	Suitable	See Table 2-5 for description of data use
36	165	Pump Station #6	SPU SCADA		Wet-well depth				N/A	Suitable	Suitable	See Table 2-5 for description of data use

TABLE 2-1: MONITORING LOCATIONS
Genesee Basin Permanent and Temporary Monitoring Locations

Line	NPDES No.	MH ID	Type*	Status	Purpose	Monitor Type**	Gross Basin Area (acres)	Net Basin Area (acres)	Net Basin Length of Pipe (feet)	Suitability of Data for Modeling		
										DWF	WWF	Notes
37	38	Rainier Ave Lift Station	KC SCADA		Wet-well depth and total flow				N/A	Suitable	Suitable	See Table 2-5 for description of data use

* P = Permanent Monitoring Location; T = Temporary Monitoring Location

= Removed on or after June 1, 2009

** MP = monitoring point; FS = full set (ultrasonic level, pressure level, velocity); U = ultrasonic level meter; P = pressure level meter; V = velocity meter

*** Due to other monitors one pipe length away or because this site only measures overflows, the net basin area was not calculated for this site.

Note: The monitors in Table 2-1 are ordered in ascending MH ID for ease of look-up. This does not correspond with geographic or basin boundaries.

Figure 2-2: Genesee Monitoring Diagram

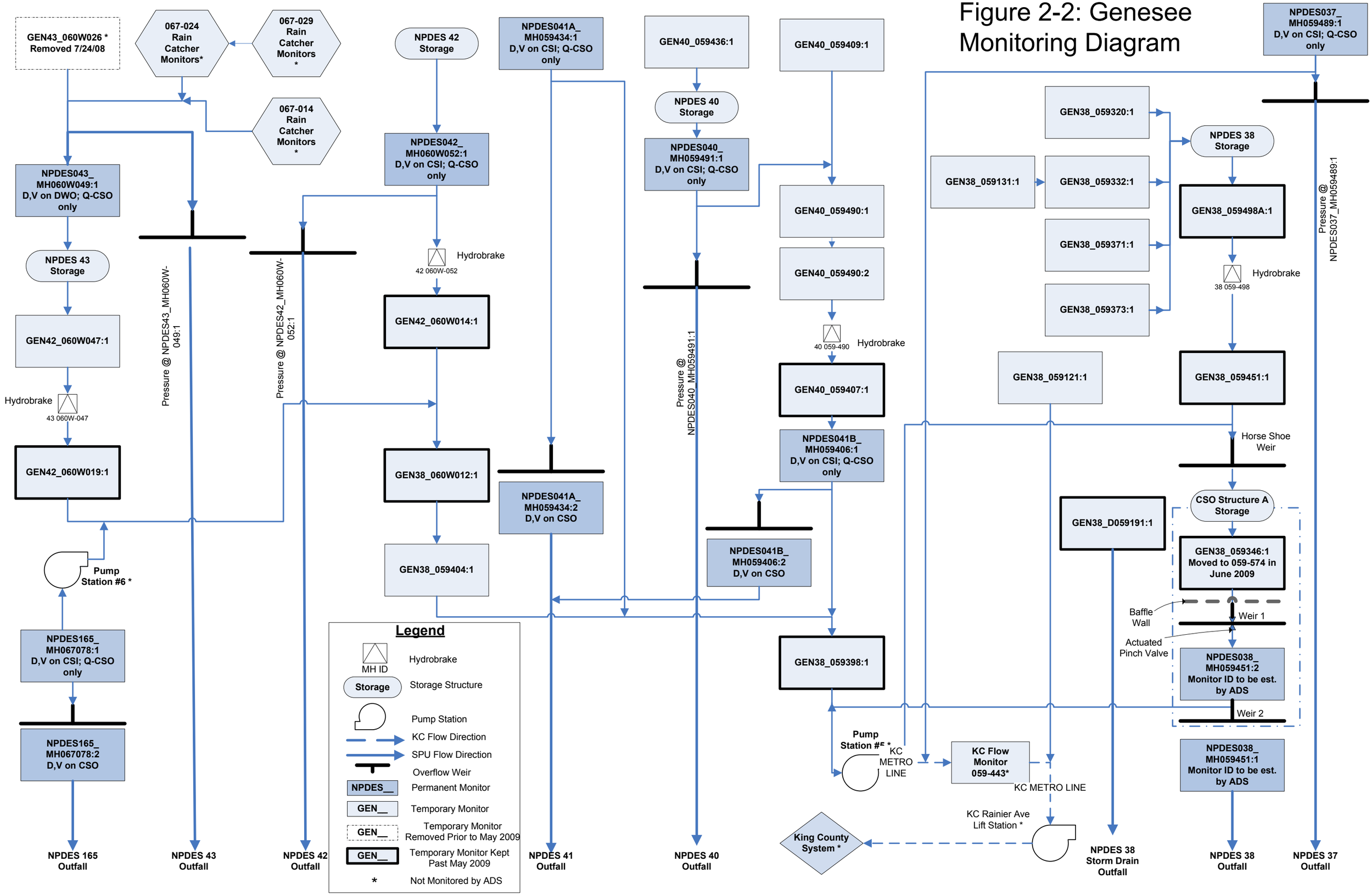
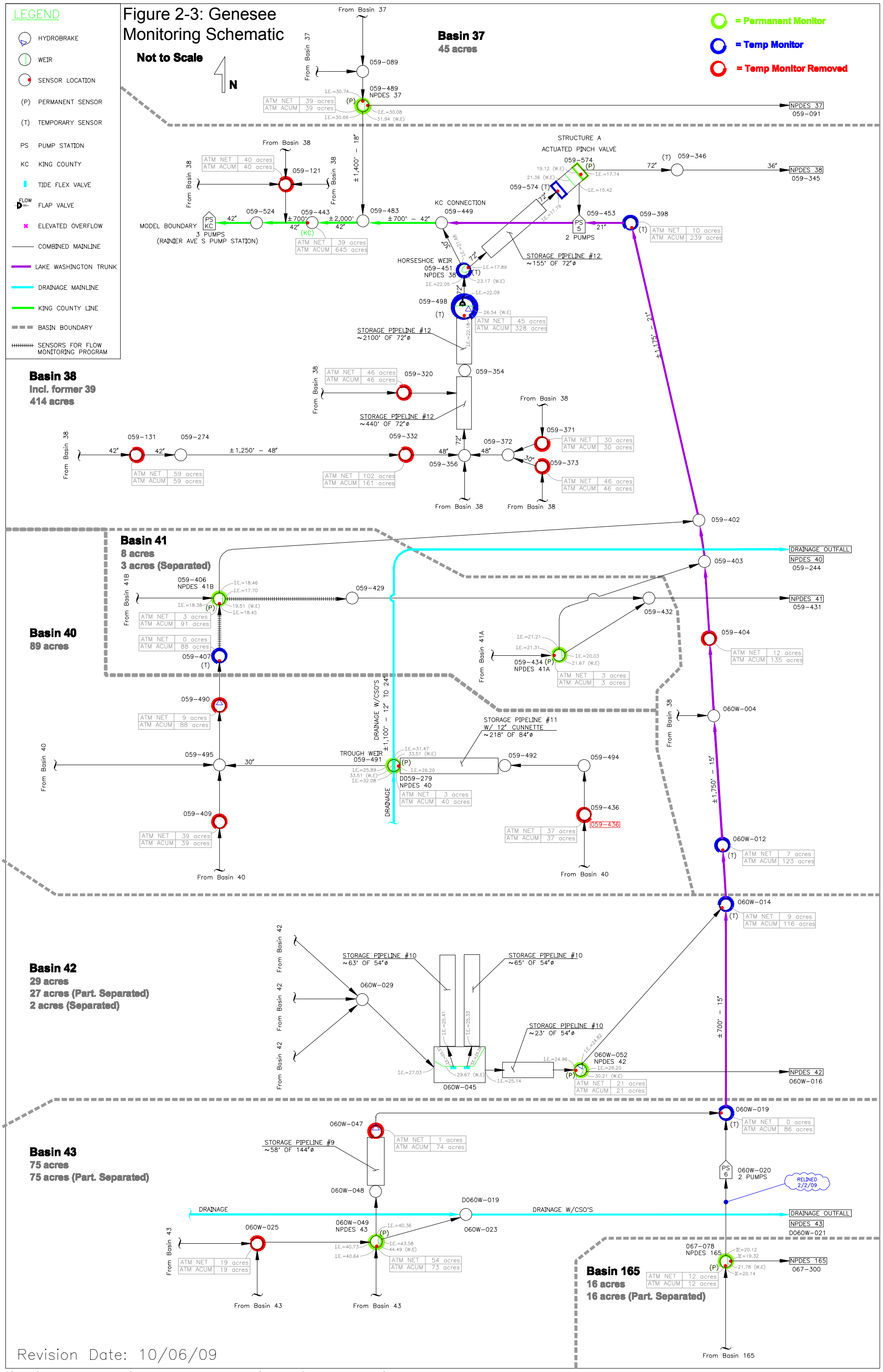


Figure 2-3: Genesee Monitoring Schematic

Not to Scale



P:\Utility\C303103_Genesee CSO\Genesee CSO System Schematic\Schematic\Schematic_Old Files\C303103_Schematic_10062009.dwg

This configuration is used at the overflow structures in NPDES Basins 41A, 41B, 165, at 37 after May 30, 2008 and at 43 after April 9, 2009. The overflow structure at NPDES 38 has two sets of sensors, where MP1 is downstream of the overflow weir and MP2 upstream of the overflow weir. The overflow structure at NPDES 42 has a second ultrasonic depth sensor (MP2) mounted above the weir to obtain more accurate depth measurements during surcharge conditions. The permanent flow monitor in NPDES Basin 40 has a single set of sensors (MP1). A single set of sensors was initially installed at many permanent locations throughout the city for multiple reasons, including CSO flow in the overflow pipe was difficult or impossible to monitor; historic overflows were infrequent and backup monitoring of overflows was not necessary; and other monitors in the system provide overflow verification. Additional sensors were added at NPDES 37 and 43 after the beginning of the flow monitoring period to provide additional CSO event verification. Monitoring CSO flows in the outfall pipe at NPDES 40 is not feasible because it is a shared stormwater and CSO outfall pipe. Detailed schematics of the monitoring configuration at each of the permanent sites can be found in Appendix A. Table 2-2 presents a summary of the permanent monitoring locations, installation dates, CSO alarming heights, and sensor installation.

A detailed review of weir elevations at the permanent sites was performed and documented in *Technical Memorandum: Genesee Weir Elevations for use in InfoWorks CSO Model* (CH2M HILL 2008b), included in Appendix K. Additional survey data were collected in March, 2009. The results of that survey were compared with elevations from the technical memorandum, and some adjustments made to overflow alarming and reporting weir heights. Table 2-3 includes the results of the survey.

Some of the permanent flow monitors are also used to measure both DWF and WWF upstream of the diversion weir (also referred to as the *Combined Sewer Inlet* [CSI]). Although the primary purpose for the sensors in the CSI is to obtain CSO volumes and flows, the data are also used to supplement the flow loading data collected by the temporary monitors (for example, NPDES 37 at MH 059-489). Because of complex hydraulic conditions inherent at these sites, it was common that many of these sites did not have high-quality flow data for both DWF and WWF. Depth in excess of 1 inch and a velocity between 2 and approximately 4 fps are typically needed to yield high-quality flow data. In addition to the complex hydraulics of the site, one or more of the following conditions were present at many of the permanent monitoring CSI locations limiting their use in model calibration: a nearby downstream constriction, such as a hydrobrake, resulted in backwatering and velocity dropouts; pipe materials or shape that caused uneven flow (standing waves); non-uniform weir elevations; and frequent debris or sediments that accumulated on the monitoring sensors.

The permanent flow monitoring locations that do not have repeatable and reliable dry weather flow data are at NPDES 38 (059-451 "A"), 42 (060W-052), and 165 (067-078) (see Table 2-1). In some instances, for example, with the permanent monitor at NPDES 165 (067-078), dry weather flow data were still used to support typical hydrologic and hydraulic analysis although the quality of data was not as high as preferred. Field investigations during site selection were performed, but alternative sites providing for better quality of data were not available. Inconsistent and unreliable dry weather flow data may limit the use of a given monitor's data in assignment of dry weather flows (net flow monitoring basin

TABLE 2-2: PERMANENT MONITORING SITE DETAILS

Site*	Installed	High High Alarm (inches)	High Alarm (inches)	Pipe Height (inches)	Pipe Width (inches)	Sensors	Overflow Calculation Method #
37 MP1 (059-489)	7/30/07	14.32	7.16	18.63	18.38	Pres only	N/A
37 MP2 (059-489)	5/30/08	N/A	N/A	18.63	18.38	Ultra only	N/A
37 Overflow (059-489)	5/30/08	N/A	N/A	12.00	12.00	Ultra, Pres, & Vel	N/A
38 MP1 (059-451 “A”)	8/22/07	N/A	N/A	72.75	72.50	Ultra, Pres, & Vel	N/A
38 MP2 (059-451 “A”)	10/18/07	31.26	15.63	106.00	48.00	Ultra, Pres, & Vel	MP1 Qfinal (Qcont)
40 (059-491)	8/2/07	87.72	43.86	80.50	84.00	Ultra, Pres, & Vel	Weir
41A MP1** (059-434)	7/23/07	3.85	1.93	14.50	14.13	Ultra, Pres, & Vel	MP2 Qfinal (Qcont)
41A MP2** (059-434)	7/23/07	N/A	N/A	15.13	15.50	Ultra, Pres, & Vel	N/A
41B MP1** (059-406)	8/29/07	12.73	10.18	12.00	12.00	Ultra, Pres, & Vel	Weir
41B MP2** (059-406)	8/29/07	N/A	N/A	15.00	15.00	Ultra, Pres, & Vel	N/A
42 MP1 (060W-052)	8/2/07	62.78	31.39	51.88	54.12	Ultra, Pres, & Vel	Weir
42 MP2 (060W-052)	9/4/08	N/A	N/A	79.63	95.25	Ultra only	N/A
43 MP1 (060W-049)	8/1/07	49.42	24.71	24.38	24.13	Ultra, Pres, & Vel	MP2 Qfinal (Qcont)
43 MP2 (060W-049)	4/9/09	N/A	N/A	20.50	20.50	Ultra, Pres, & Vel	N/A
165 MP1 (067-078)	8/21/07	20.50	14.35	10	10.13	Ultra, Pres, & Vel	Weir
165 MP2 (067-078)	8/21/07	N/A	N/A	8	8	Ultra, Pres, & Vel	N/A

* MP1 and MP2 refer to monitoring point 1 and monitoring point 2. See description of each meter location in Section 3.2 for more information.
**The outfall at CSO 41 is crushed, resulting in inaccurate overflow volume estimates at 41B. The overflow frequency is likely unaffected.
Where monitoring setup allows, overflows are measured directly using a depth and velocity meter in the overflow pipe to generate flow data (QFinal). This method is called Q Continuity, or “Qcont”. In some locations, monitoring in the overflow pipe is not performed, or is difficult to calibrate. In these situations, overflows are quantified using depth over the weir and a weir equation. These are noted as “Weir”. Locations where overflows have not occurred during ADS monitoring do not have an overflow method listed.

TABLE 2-3: WEIR SURVEY RESULTS

Weir	MH ID	Weir Crest Elevation[1] (ft)		Weir Length (ft)		Weir Height (inches)				Sensor Elevation[1] (ft)	
		Weir Crest Elevation [3]	Weir Crest Elevation [4]	Weir Length[2,] ft	Weir Length [4], ft	Weir Height, inches [3]	Weir Height [4], inches	Weir Height, from ADS Site Install Sheet (accessed Jan 20, 2009), inches [2]	High-High Alarm [6], inches	Weir Monitor Sensor Elevation (pipe invert)*, [3]	Weir Monitor Sensor Elevation (pipe invert) [5]
NPDES 37	059-489	32.40	31.93	5.92	5.46	16.80	14.32	16.38	14.32	31.00	30.74
NPDES 38, Structure A, Weir #1	059-346	21.26	21.33	8.00	7.91	56.52	57.72	N/A	N/A	16.55	16.52
NPDES 38, Structure A, Weir # 2	059-346	19.26	19.13	8.00	7.97	32.50	31.26	31.00	31.26	16.55	16.52
NPDES 40	059-491	33.80	33.51	21.67	19.95	87.72	87.72	71.88	87.72	26.49	26.20
NPDES 41A	059-434	21.80	21.63	6.63	4.96	5.04	3.85	5.38	3.85	21.38	21.31
NPDES 41B	059-406	20.23	19.51	5.83	5.71	12.36	12.73	13.75	12.73	19.20	18.45
NPDES 42 Storage	060W-045	29.54	29.67	8.83	8.41	55.32	56.48	N/A	N/A	24.93	24.96
NDPES 42 Overflow	060W-052	30.17	30.19	8.00	7.46	62.88	62.78	62.88	62.78	24.93	24.96
NPDES 43	060W-049	44.40	44.48	7.67	7.25	48.84	49.42	48.25	49.42	40.33	40.36
NPDES 165	067-078	21.76	21.79	2.92	4.40	20.52	19.80	20.50	19.80	20.05	20.14
GEN38_059-498A	059-498	26.74	26.55	7.02	6.88	56.88	52.45	N/A	N/A	22.00	22.18
GEN38_059-451 (Horseshoe Weir)	059-451	23.17	23.17	23.89	N/A	13.44	13.44	N/A	N/A	22.05	22.05

Data that is considered obsolete is shaded in gray

[1] All elevations are in feet, NAVD 1988

[2] From ADS Detailed Site Sheet (included in Appendix A)

[3] From "WeirElevationTechMemo" dated 12/9/08, updated 1/20/09 and 3/10/09. This Technical Memorandum is included in Appendix K.

[4] From SPU 3D survey scan of the weir structure, completed by David Evans & Associates

[5] From SPU survey data sheet, derived from 3D survey scan of the weir structure, completed by David Evans & Associates

[6] From ADS Client Summary Sheet, Version H, Revised 8/3/09

contributions or diurnal patterns). In these cases, dry weather flow loading may be derived from the next downstream flow monitoring basin.

In addition to quantifying CSO volumes/flows and characterizing DWF and WWF, depth data from the permanent flow monitor located at NPDES 42 (060W-052) were also used to complete the stage-discharge curve for the hydrobrake. Because this monitor experiences velocity dropouts during WWF, the use of flow data may be limited during model calibration. In its place, flow data from other monitors in NPDES Basin 42 may be used for model calibration.

Detailed drawings for each of the permanent monitoring locations in Appendix A show the complex structures surrounding the flow monitoring equipment. Additional description of local site hydraulics is provided for each permanent and temporary location in Section 3.2. The use of monitor data for model calibration is described in Section 5.2.

2.3.2 Temporary Flow Monitors

The temporary flow monitors were used for hydrobrake characterization and/or flow loading. All but eight temporary monitors were removed soon after the conclusion of the monitoring program in May, 2009. Table 2-1 summarizes the location, purpose, and data quality of the flow monitors used in this study. It also denotes those monitors that will continue to operate beyond May 31, 2009. Monitor installation and use are discussed below.

Hydrobrake Characterization

Hydrobrakes use vortex action to regulate flow and are designed to allow nearly constant flow for a given differential head, which 1) reduces the flow downstream of the hydrobrake during large flow events, and 2) increases inline and offline storage efficiency upstream of the hydrobrake. However, hydrobrakes may not operate as designed, and as a critical aspect of the basin model for the Genesee CSO Reduction Project, their actual operation must be characterized for the model to be calibrated correctly.

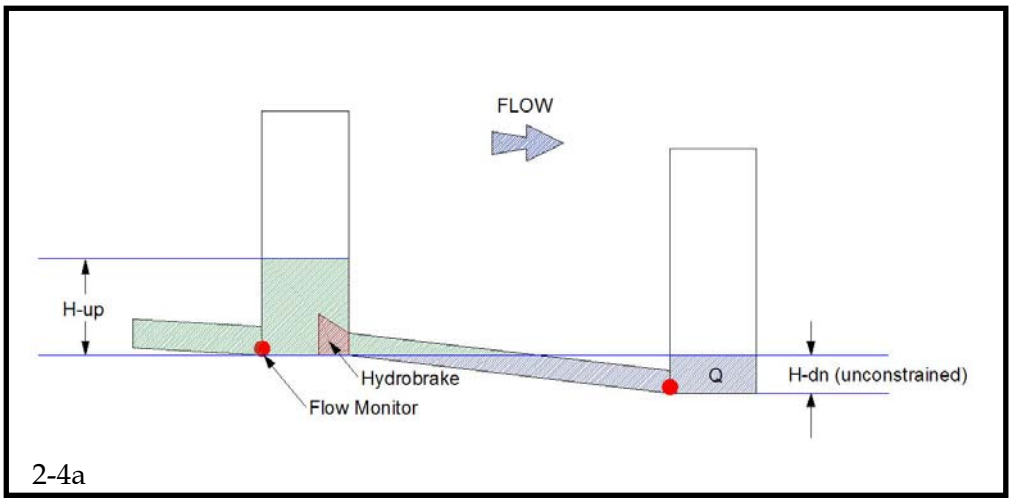
Hydrobrake characterization requires two sets of flow depths to determine the differential head across a hydrobrake (as opposed to absolute depth upstream of the hydrobrake). The monitors used to measure differential head are listed in Table 2-4, and the measurement of differential head is shown in Figures 2-4a through 2-4c. The calculated differential head is plotted with flow, and a best fit line is digitized to develop a hydrobrake stage-discharge curve for use in the model. Flow was typically used from the monitor located downstream of the hydrobrake. The downstream monitor typically yielded more accurate flow measurement during high flows. The hydrobrake's intended purpose to regulate flow within the basin causes the water level to increase behind the hydrobrake and into a CSO storage facility until flows ultimately overflow a weir. These characteristics resulted in very low velocity or near-stagnant water just upstream of the hydrobrake, which often resulted in velocity dropouts and low-quality flow data. For this reason, the downstream monitor was generally used. One exception to this is the temporary flow monitor at MH 059-498, located upstream of the hydrobrake in NPDES Basin 38. Flow for the stage-discharge curve for this hydrobrake was provided by the upstream monitor, because unrealistically high flows had been recorded at the downstream monitor (MH 059-451). These unrealistically high flows were caused by faulty readings by the ultrasonic sensor of interference from turbulent flows exiting the hydrobrake, and were indicated by flows of over 60 mgd. The stage-discharge curve developed for each hydrobrake was compared to the manufacturer's curve except for the NPDES Basin 38 hydrobrake where no manufacturer curve was available.

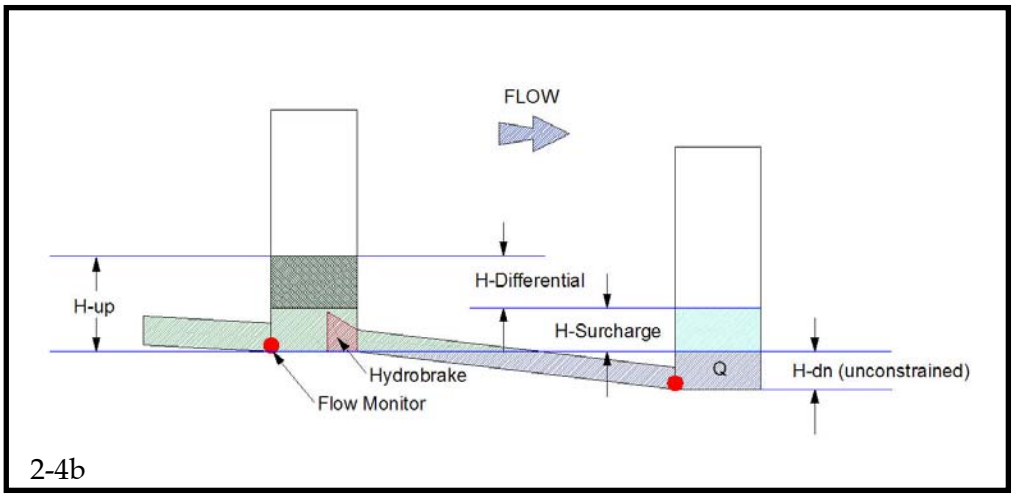
Flow Loading

Many of the monitoring locations were selected to support flow loading in the hydraulic model for both DWF and WWF. For dry weather loading, the monitor data provide each flow monitoring basin's net contribution on a typical day-to-day basis. The InfoWorks model used for the project loads the DWF using a per capita flow (gal/day/person) and a diurnal flow pattern.

TABLE 2-4: MONITORS AT GENESEE HYDROBRAKES

Line	NPDES Basin	CSO Facility #	Hydrobrake (MH ID)	Supporting Upstream Monitoring Locations (MH ID)	Supporting Downstream Monitoring Locations (MH ID)
1	38	12	059-498	059-498	059-451
2	40	11	059-490	059-490	059-407
3	42	10	060W-052	060W-052	060W-014
4	43	9	060W-047	060W-047	060W-019





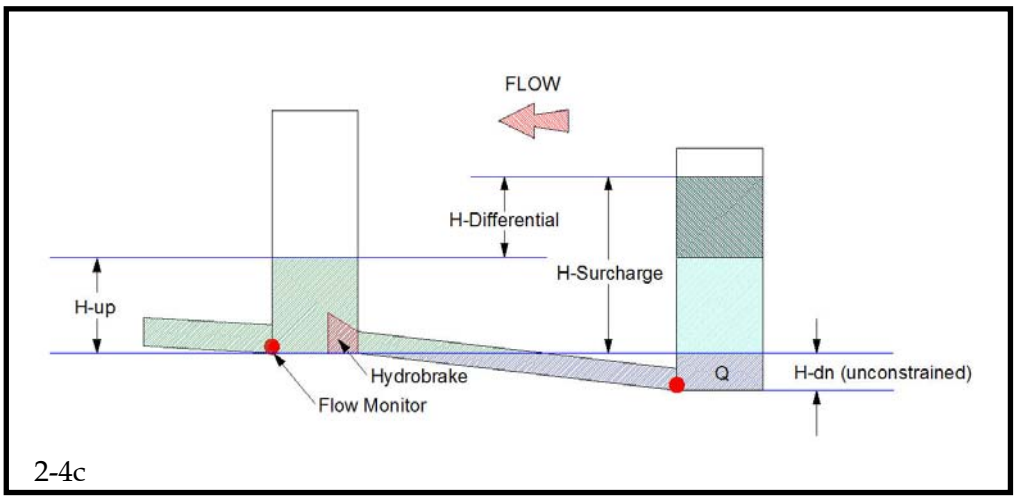


FIGURE 2-4: HYDROBRAKE DIFFERENTIAL HEAD CALCULATION METHODS - TYPICAL

a) Level at downstream monitor is lower than hydrobrake outlet. Differential head = upstream head (H-up). b) Level at downstream monitor is higher than hydrobrake outlet, but lower than upstream level. Differential head = H-up – H-Surcharge. c) Level downstream is higher than level upstream. Flow is reverse through hydrobrake. Differential head = H-Surcharge – H-up.

Of greater importance in calibrating the model, the monitoring data will also be used as the basis to calibrate the WWF hydrological response within each flow monitoring. Most of the temporary monitor locations with a primary purpose of flow loading were selected in order to provide the best available WWF data. Hydrologic model parameters affecting timing and volume of flow will be adjusted in each flow monitoring basin to match WWF at locations selected for wet weather calibration. These adjustments will be made manually during initial calibration as well as automatically using the Generalized Likelihood Uncertainty Estimation (GLUE) procedures adopted by SPU. The use of individual monitor data for wet weather calibration will depend on the quality of WWF (see Table 2-1). Monitors recommended for wet weather model calibration are listed in Table 5-1. Flow loading in the model is discussed in greater detail in the *Genesee Combined Sewer Overflow Reduction Project: Hydrologic and Hydraulic Modeling Report* (CH2M HILL 2010 publication pending).

As described above, there are pairs of flow monitors installed at each hydrobrake (upstream and downstream). During site selection, it was intended that the monitor that provided the most reliable, accurate low- and medium-flow data would be used for DWF loading. Typically, this was the monitor upstream of the hydrobrake. If the data from the upstream monitor also indicated good repeatability and quality during WWF, the data would be used to supplement wet-weather hydrological responses within the flow monitoring basin; however, as somewhat expected, these data provided limited use for wet weather model calibration due to the hydrobrake activating and causing the velocity to drop too low, nullifying the ability to measure a WWF response in the flow monitoring basin upstream of the hydrobrake.

Storm Sewer System Monitoring

One monitoring location (D059-191) was selected for monitoring flow in the storm sewer outfall. This site was selected because of its proximity to the NPDES 38 sewer CSO outfall line and may sometime in the future offer an opportunity to incorporate a wet-weather stormwater/CSO treatment alternative. SPU instructed the installation of a monitor in the storm sewer line in Genesee Park to quantify the flow and characteristics of the stormwater basin tributary to that location. These data will be used for future SPU informational use on the stormwater system and not used for the combined sewer system hydraulic model development or calibration.

2.4 Data Collection and Reporting Procedures

The objective of the flow monitoring program was to adequately and accurately characterize the performance of the combined sewer system and existing facilities before, during, and after storm events that do cause overflows as well as before, during, and after those storm events that do not cause overflows. This range includes approximately two storm events that are mild enough to not cause overflows and two medium storm events that cause some overflow (not necessarily in each of the outfalls in the Genesee Area). Although statistically unlikely, it is also beneficial for system characterization to capture two heavier storm events that cause overflow in all seven of the outfalls. A summary of the storms experienced during the monitoring period is presented in Section 3.1. A summary of actual overflow events is presented in Section 4.1.

With the exception of the monitors from other programs (King County and RainCatchers) and the monitor at 060W-026, flow monitoring meters were installed by ADS Environmental Services (see Table 2-5). These raw data were automatically downloaded through daily wireless transfer or periodic manual data collection, and accessed by project team members through the Web-based *Intelliserve* the next day. In accordance with the QAPP (CH2M HILL 2008a), quality review by SPU and ADS personnel (each reviewing the data two days per week) of the *Intelliserve* data was designed to ensure the availability of data, and enable field crews to quickly mobilize to address suspect monitors. During Phase I (January, 2008 to June, 2008), CH2M HILL reviewed the raw data available on Intelliserve every two weeks to verify data met project objectives. Preliminary data from which suspect data had been flagged by ADS analysts were loaded to *FlowView Portal* during Phase I. Using data from the *FlowView Portal* and using the ADS analysis tool *Sliicer,* CH2M HILL evaluated the data for quality and availability to meet the project objectives and prepared documentation for monthly meetings with SPU. At the conclusion of Phase I, missing data were reconstituted where possible, and any additional adjustments made by ADS analysts. These finalized data were then uploaded to *Intelliserve* for data distribution to CH2M HILL and SPU. During Phase II, raw data continued to be regularly reviewed by ADS and SPU personnel. Because most issues with the data had been reconciled, the bi-weekly review of raw data by CH2M HILL ceased. Finalized data, available monthly on *Intelliserve,* were reviewed by CH2M HILL to ensure their ability to meet modeling needs, and presented in monthly workshops. Workshop frequency decreased during periods of reduced rain and CSO activity.

Data from the King County system were collected from existing King County monitors. SCADA data from the Rainier Avenue Lift Station were used to characterize pump performance and confirm WWF data collected throughout the Genesee Area. See Section 4.4.3 for more information on the Rainier Avenue Lift Station. In addition, flow monitoring data from an existing King County flow meter located in MH 059-443 were used to characterize flows in the King County Hanford Street Trunk B and from a few unmonitored portions of the Genesee Area.

Data from the RainCatchers monitors were received from that program as-is. Reports from that program indicate that few data quality assurance procedures were performed (Herrera 2006b). As such, the use of these data may be limited for model calibration.

Differences in data quality and quality assurance procedures are summarized in Table 2-5. In general, the project team was responsible for reviewing the quality of the ADS data. All other sources were received and used as-is with no additional review or adjustment. This introduces risks of unknown data quality and potential inability to use data for its intended purpose. Data from non-reviewed sources may be used with less confidence than ADS data during model calibration. Flow balancing, diurnal curve creation, and general model quality control is made more difficult by differences in time steps, which varied by source and are summarized in Table 2-5.

Data collection, quality assurance, and reporting procedures for this study are presented in greater detail in Sections 6 through 14 of the QAPP (CH2M HILL 2008a).

TABLE 2-5: COMPARISON OF FLOW MONITORING DATA SOURCES

Data Source	ADS – Temporary	ADS – Permanent	Flow Monitoring and Analysis, Inc. – Temporary	SPU SCADA	King County Flow Monitoring	King County SCADA	Herrera – RainCatchers
Number of Meters	**20**	**8**	**1**	**2**	**1**	**1**	**3**
Data Description	FlowShark monitors installed throughout Genesee Basin for the purpose of gathering flow, depth and velocity data to calibrate a Genesee Area wide model. See Sections 2.3.2 and 3.2 for more information.	FlowShark monitors installed throughout the city at CSO diversion structures for the purpose of measuring overflows. Some sites have two sets of monitors, typically installed on both the normal and overflow side of the weir. See Sections 2.3.1 and 3.2 for more information.	Flow monitoring data at one DataGator monitor in NPDES Basin 43 provides flow data only. See Section 3.2 for more information.	SCADA monitoring data at SPU pump stations #5 and #5. The SCADA data include an indication of how many pumps are running (0, 1 or 2), and the wet well level. See Sections 4.4.1 and 4.4.2 for more information.	Flow monitoring data at King County's MH 059-443 on the Hanford Street Trunk B. The data from this monitor include level, velocity, and flow. See Section 3.2 for more information.	SCADA monitoring data at King County's Rainier Avenue Lift Station. These SCADA data include wet well level and a flow rate through the variable speed pumps. See Section 4.4.3 for more information.	Flow monitoring data at three monitors in NPDES Basin 43, operated as part of SPU's RainCatchers program. These DataGator monitors provide flow data only. See Section 3.2 for more information.
QC Procedures	CH2M HILL, ADS, and SPU provided QA/QC for these data. QA/QC procedures were most robust for Phase I, with less frequent QA/QC performed for Phase II. See Section 2.4 and Sections 6 through 14 of the QAPP for a description of these procedures.	ADS performed primary QA/QC for these data. CH2M HILL and SPU provided limited QA/QC, consisting of checking data for suitability for modeling needs.	Data quality was checked by SPU and CH2M HILL and found to be inconsistent.	Data were used as-is, delivered by SPU.	Data were used as-is, delivered by King County. QA/QC procedures have not been performed on these data, per 9/26/2007 email from SPU to CH2M HILL.	Data were used as-is, delivered by King County. QA/QC procedures have not been performed on these data, per *rainier_readme.txt* delivered by King County with data.	Data were used as-is, delivered by SPU. Extensive quality review was not performed on these data.
Time Step	5 minute (some periods of 15 minutes due to monitor malfunction)	5 minute	5 minute	1 minute and/or reporting by exception to the nearest second (an exception being a change from the preceding time step in pump status or wet well level).	15 minute	5 minute	15 minute
Data Collection Procedures	Download from Intelliserve. Raw data uploaded daily. Finalized data uploaded monthly.	Download from Intelliserve. Raw data uploaded in real time. Finalized data uploaded monthly.	Data file delivered periodically (up to once per week) via email or SPU FTP site.	Data delivered monthly via SPU FTP site.	Data delivered periodically by King County, by request.	Data delivered periodically by King County, by request.	Data delivered periodically by SPU, by request.
Data Use	Characterize hydrobrakes and hydraulic response during DWF and WWF. See Section 2.3 for more information. See Table 2-1 for individual monitor purpose.	Quantify CSO duration and volumes. Where suitable, also used for hydraulic response during DWF and WWF. See Section 2.3 for more information. See Table 2-1 for individual monitor purpose.	Data found to be unsuitable and not used. Monitor removed in July, 2008.	Wet well level and pump status information used to verify pump operation. Not used for dry or wet weather calibration.	Characterize the hydrologic response during DWF and WWF, of otherwise unmonitored portions of the basin.	Used for model pump configuration. Also used for wet weather initial calibration.	Where data quality and availability were suitable, used for dry and wet weather calibration. See Table 2-1 for individual monitor purpose.
Quality Issues	See Table 2-1 for individual monitor DWF and WWF quality.	See Table 2-1 for individual monitor DWF and WWF quality.	Data found to be unsuitable. See Table 2-1 and Section 3.2 for more details.	None. Adequate for pump station configuration.	None. QA/QC not performed.	None. QA/QC not performed.	Only one of three monitors had suitable data quality for use in model calibration. See Table 2-1 for individual monitor DWF and WWF quality.

3. Monitoring Results

3.1 Rainfall Monitoring Data—Rain Gage 18

48.22 inches of rain fell at Rain Gage 18 during the monitoring period, with a maximum of 1.58 inches on a single day (November 6, 2008). The maximum 12-month rolling average was 36.7 inches, which is slightly less than the 37.1 inch average for Seattle. Rain Gage 18 had 100 percent uptime for the monitoring period. Figure 3-1 shows the cumulative precipitation throughout the monitoring period, as well as daily total precipitation. For the purpose of storm selection and classification for Genesee CSO Flow Monitoring, an interevent time of 6 hours and a minimum storm depth of 0.3 inches were selected. Table 3-1 lists all storms using the interevent time and minimum storm depth, with events used for automated model calibration shaded in grey. The storm definition criteria were selected to facilitate rainfall analysis. They were chosen to limit the number of official storms to those that were likely to have a moderate hydrologic effect and to reduce the overall length of these storms so that the storm duration was representative of the actual hydrologic response. Calibration event durations selected for automated calibration do not match the storm durations in Table 3-1. Calibration event durations were selected to include portions of storms (or multiple storms) that best met modeling needs. Selection and definition of these storms is described in *Genesee Combined Sewer Overflow Reduction Project: Hydrologic and Hydraulic Modeling Report* (CH2M HILL 2010 publication pending). Storms for which overflows occurred are noted with the number of outfalls that overflowed.

Three overflows occurred in the monitoring period for storms that did not meet the interevent and minimum depth criteria described above. The dates of these overflows are January 14, 2008 (one overflow) and March 1, 2008 (two overflows). Precipitation information for storms less than 0.3 inches can be found in Appendix I. More information on the overflows listed in Table 3-1 can be found in Table 4-1. Similarly, one event used for calibration does not meet the interevent and minimum depth criteria. This calibration event used included three small storms between February 29, 2008 and March 2, 2008.

Storm frequency was determined using an extrapolation of the storm statistics developed in Table 5 and Table E-17 of *Analysis of Precipitation-Frequency and Storm Characteristics for the City of Seattle* (MGS Engineering Consultants, Inc. 2003). Storm frequencies less than 6 months were extrapolated using regional storm patterns scaled to less frequent storms, developed by CH2M HILL. Details of the composite depth-duration-frequency curves can be found in Appendix I. Table 3-1 lists the maximum storm recurrence interval for a variety of duration intervals for each of the storms over 0.3 inches in depth. The largest of these storms (greater than 2-month recurrence interval) are plotted on top of depth-duration-frequency curves for RG 18 in Figure 3-2. A list of storms with frequency reported at multiple durations can be found in Appendix I.

An additional rain gage within the Genesee Area was installed after the flow monitoring period, and is discussed in Section 5.1.2.

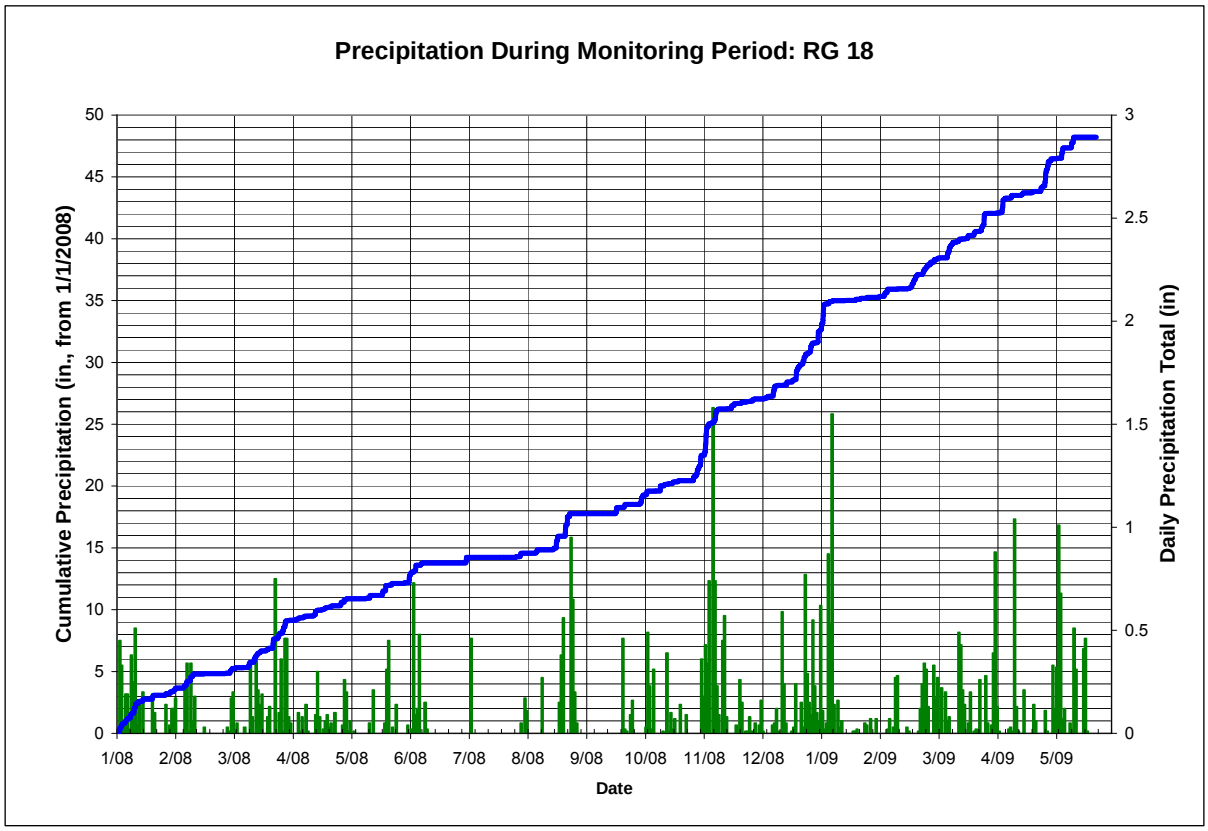


FIGURE 3-1: RAIN GAGE 18 - CUMULATIVE AND DAILY PRECIPITATION

TABLE 3-1: PRECIPITATION SUMMARY
Rain Gage 18: Summary of Storms from January 1, 2008 to May 31, 2009

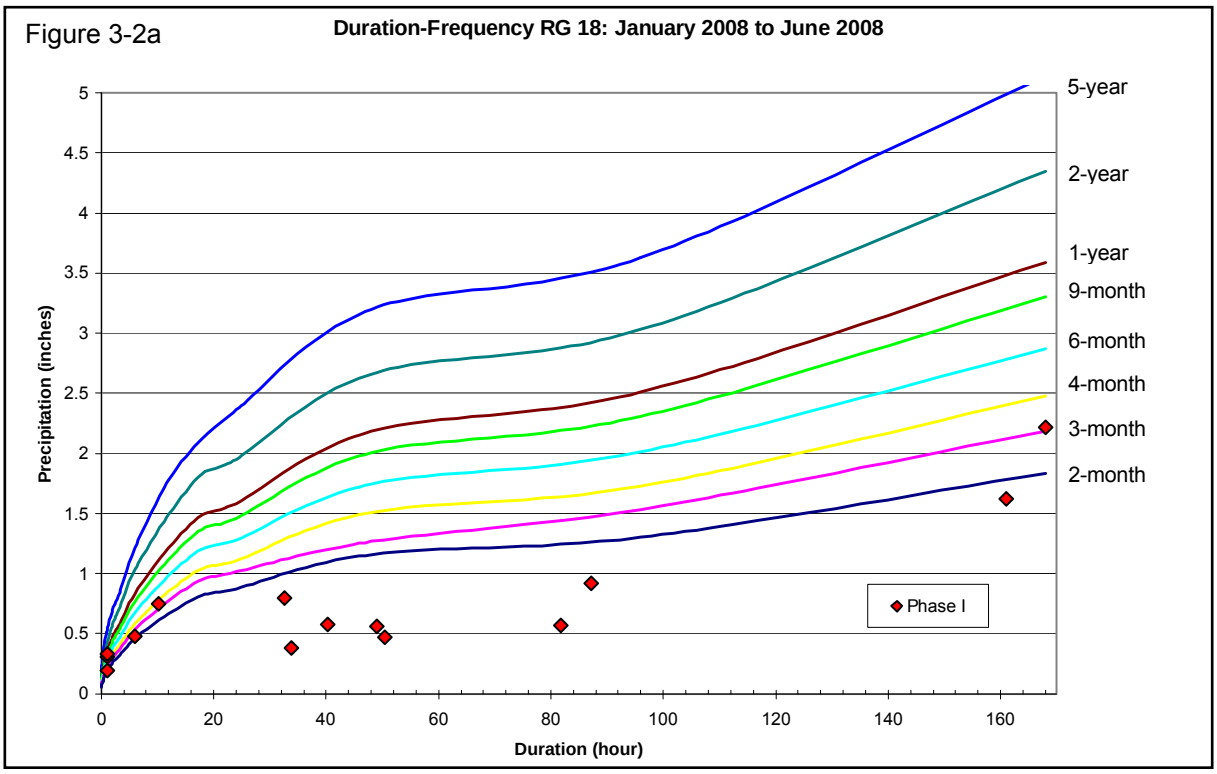
Start Date/Time	Storm Precipitation (inch)	Storm Duration (hours)	Max Freq.-Duration (hours)*	Max Freq.-Depth (inch)	Max Freq. (month)	Overflows
1/2/08 2:40	0.36	5.3	5.3	0.36	<2	
1/2/08 14:05	0.42	29.8	29.8	0.42	<2	
1/8/08 0:55**	0.31	8.0	8.0	0.31	<2	
1/9/08 21:05**	0.47	12.7	12.7	0.47	<2	
1/10/08 16:50	0.33	12.8	12.8	0.33	<2	1
2/6/08 14:00	0.35	11.7	11.7	0.35	<2	
2/8/08 13:55	0.35	11.3	11.3	0.35	<2	
3/13/08 6:30	0.59	33.8	33.8	0.59	<2	
3/23/08 4:55	0.75	10.3	12.0	0.75	2	1
3/25/08 14:25	0.31	15.8	15.8	0.31	<2	
3/29/08 15:50	0.50	11.2	168.0	2.22	3	1
4/14/08 14:20	0.30	8.0	8.0	0.30	<2	
5/19/08 23:30	0.36	10.3	10.3	0.36	<2	
5/21/08 18:20	0.44	1.7	1.0	0.31	6	
6/2/08 22:50	0.62	13.7	13.7	0.62	2	
6/6/08 5:00	0.48	14.0	1.0	0.33	9	

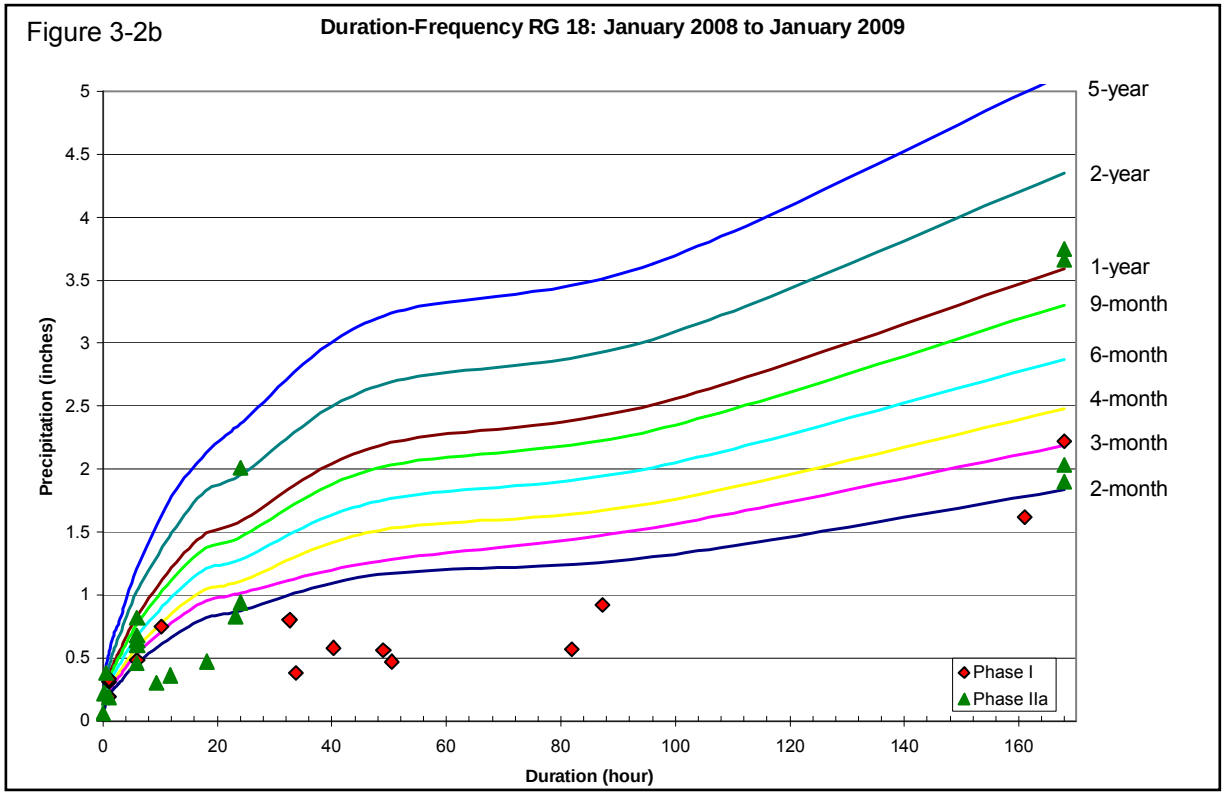
TABLE 3-1: PRECIPITATION SUMMARY
Rain Gage 18: Summary of Storms from January 1, 2008 to May 31, 2009

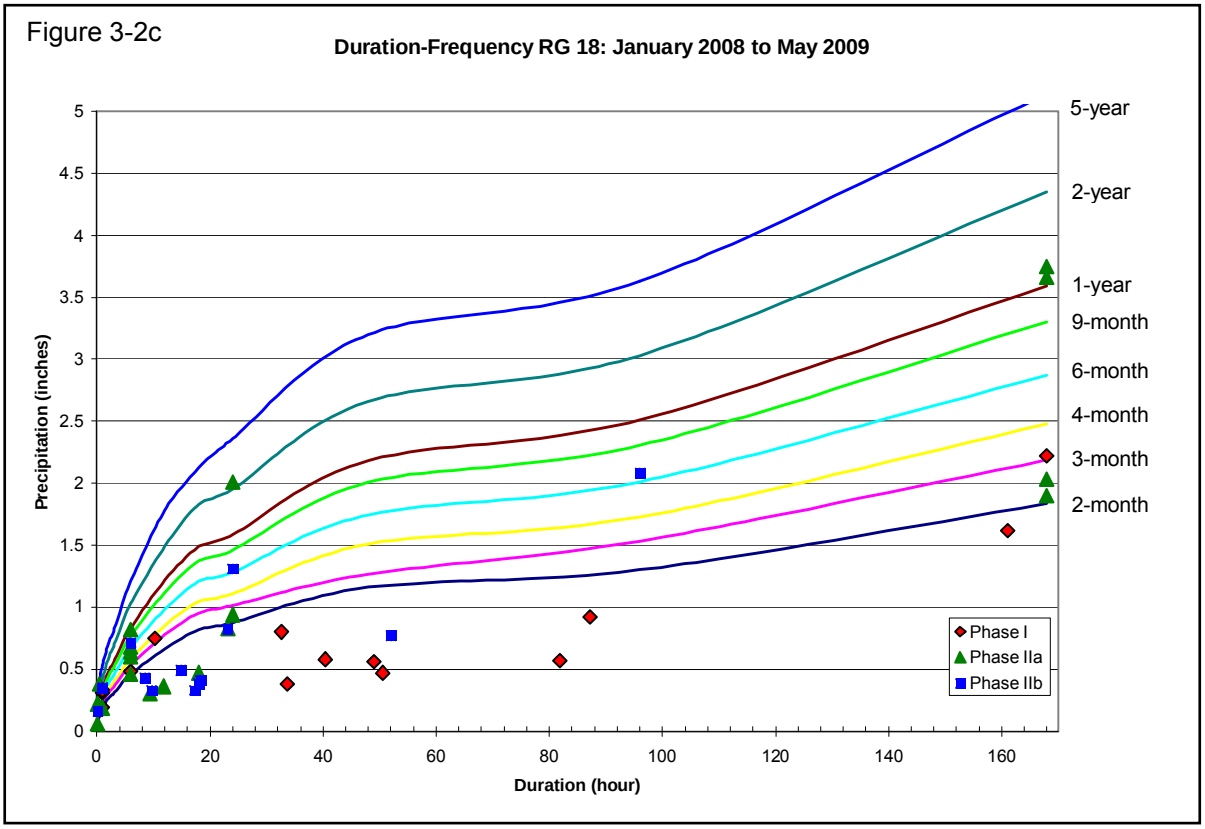
Start Date/Time	Storm Precipitation (inch)	Storm Duration (hours)	Max Freq.-Duration (hours)*	Max Freq.-Depth (inch)	Max Freq. (month)	Overflows
7/3/08 5:35	0.46	5.9	5.9	0.46	<2	
8/19/08 20:45	0.66	10.7	24.0	0.94	2	
8/24/08 12:50	0.95	10.8	6.0	0.64	4	1
8/25/08 12:20	0.65	8.4	0.5	0.38	24	
9/20/08 6:40	0.47	18.1	18.1	0.47	<2	
10/3/08 6:20	0.72	31.0	0.1	0.06	2	
10/6/08 8:10	0.31	15.0	15.0	0.31	<2	
10/13/08 18:50	0.40	6.6	0.2	0.22	24	
10/31/08 3:30	0.36	11.7	11.7	0.36	<2	
11/2/08 5:40	0.65	28.3	1.0	0.19	2	
11/3/08 18:35	0.86	14.2	6.0	0.60	4	1
11/6/08 1:35	2.26	32.4	24.0	2.01	24	3
11/11/08 0:00	1.02	45.6	168.0	3.66	12	
12/12/08 9:05	0.83	23.2	23.2	0.83	<2	
12/24/08 12:15	1.03	28.1	6.0	0.68	6	2
12/28/08 14:45	0.31	8.7	168.0	2.03	2	1
12/31/08 21:55	0.76	30.5	168.0	1.90	2	
1/4/09 16:40	0.91	15.8	6.0	0.82	9	
1/6/09 15:25	2.05	35.9	168.0	3.75	12	6
2/24/09 22:40	0.38	18.0	18.0	0.38	<2	
3/1/09 14:25	0.33	17.3	17.3	0.33	<2	
3/14/09 6:05	0.49	14.8	14.8	0.49	<2	
3/15/09 5:50	0.77	52.1	52.1	0.77	<2	
4/1/09 7:25	0.41	18.3	18.3	0.41	<2	
4/2/09 8:55	0.99	21.4	6.0	0.71	6	3
4/12/09 3:00	1.04	15.2	0.2	0.16	12	2
5/2/09 11:35	0.33	9.8	9.8	0.33	<2	
5/4/09 15:55	1.32	24.3	24.0	1.31	6	1
5/5/09 22:55	0.69	23.7	96.0	2.08	6	
5/13/09 14:20	0.82	23.1	23.1	0.82	<2	
5/18/09 20:00	0.43	8.5	8.5	0.43	<2	
5/19/09 19:45	0.45	4.8	1.0	0.35	12	
Gray Bar Indicates a Calibration Event						

* This is the duration of the maximum return interval period. Where none of the return intervals exceeded <2 months, this is the duration of the storm. Storm durations analyzed include 5 minute, 10 minute, 30 minute, 1 hour, 6 hour, 12 hour, 24 hour, 48 hour, 96 hour, and 168 hour. The maximum frequency occurring for any of the analyzed storm durations is reported in the Max Freq. column. The corresponding duration and depth are similarly reported. Cases where Max Freq. Duration exceeds the Storm Duration account for precipitation that occurred prior to the listed storm. The full analysis for each of these durations is included in Appendix I.
** Although separate events, these two storms were grouped together into a single calibration event.

FIGURE 3-2: RAIN GAGE 18 - STORM MAXIMUM DEPTH-DURATION-FREQUENCY







a) Phase I (January, 2008 to June, 2008). The lack of large return-interval storms resulted in the need to continue monitoring through Phase II in an effort to collect larger storms. b) Phases I & IIa (January, 2008 to January, 2009). These storms were available for model calibration. c) Phases I, IIa, & IIb (January, 2008 to May, 2009). These storms make up the entire flow monitoring period. Phase IIb is available for model validation.

3.2 Flow Monitoring Data

The following section gives an overview of the results for each site for the duration of the monitoring period from January, 2008 through May, 2009. Each site includes a description of site location, set-up, reoccurring problems encountered, and data suitability for modeling purposes. The tributary area (also known as "gross area") is reported, as well as a count of the number of upstream flow monitoring basins. Flow monitoring basins that do not include flow routed from an upstream monitoring location are identified as "terminal basins." The net and gross basin areas are also reported in Table 2-1. These descriptions were compiled based on results from the biweekly reviews, monitoring workshops, and data screenings. The monitoring identification code listed in parentheses is typically a combination of the overall Genesee Area (GEN = Genesee), NPDES Basin (37, 38, 40, 41A, 41B, 42, 43, or 165) and MH ID. Some monitors were initially assigned to the incorrect NPDES Basin. In these cases, the monitoring ID was not changed. The correct NPDES Basin number is listed in Table 2-1.

An evaluation of the flow monitoring data at each site was made based on the repeatability of data patterns, capability of the monitor to measure accurately due to local site conditions, presence and frequency of data gathering issues, overall monitor uptime, and review of the data by the modeling team. This data evaluation made a distinction between DWF and WWF, and if necessary between depth and velocity readings. Depending on the site

purpose, good depth data may be suitable at some locations. Cases where good data were not collected are usually the result of a difficult monitoring location, not poor monitoring practices. In some cases, moving monitor locations was considered to achieve better data. However, moving locations was often infeasible because of the need to gather data at difficult-to-monitor hydraulic structures such as hydrobrakes and weirs. This evaluation is included in both Tables 2-1 and 3-2. Flow monitor uptime as a percentage of time per month, is reported in Table 3-3. (Tables 3-2 and 3-3 can be found at the end of this chapter).

Additional details, including site reports and site maps, hydrographs, and scattergraphs can be found in Appendices A, C, and D, respectively. Table 2-1 summarizes the monitoring locations, and Table 3-2 summarizes the monitoring results. The finalized flow monitoring data for ADS sites can be found in a CD in Appendix L.

059-121 (Monitoring ID GEN38_059-121)

This temporary monitor measured velocity and depth and was located in the northwest corner of the Genesee Area along Rainier Avenue. Flows from this terminal basin flowed directly into the King County Hanford Street Trunk B. The tributary area for 059-121 was equivalent to 6% of the total area in the Genesee Area.

Data from this site experienced occasional hydraulic shifting, perhaps from debris, but maintained a stable WWF signature. The scattergraph from 059-121 did not follow Manning's curve at depths above 3 inches because flows through this pipe frequently shifted between super and subcritical flow, resulting in multiple depths for the same flow. A reoccurring downstream blockage resulted in 0.75 to 1.5 inches of standing water measured by the depth sensor at this site. Velocity data for this site were variable due to turbulent flow conditions caused by many influent lines in the MH. Data gathered at this monitor were deemed suitable for modeling and were used to load the Genesee model.

This monitor was removed from the Genesee Area in June, 2009.

059-131 (Monitoring ID GEN38_059-131)

This temporary monitor measured velocity and depth and was located in the northwest region of the Genesee Area along Rainier Avenue. Flows from this terminal basin flowed into flow monitoring basin 059-320 downstream. The tributary area for 059-131 was equivalent to 9% of the total area in the Genesee Area.

A daily industrial discharge of approximately 0.22 MG from a Darigold dairy factory was made into this flow monitoring basin, which was reflected in the monitoring data as a large spike in depth and velocity that lasted for several hours in the late afternoon or early evening. Raw data from this site experienced frequent velocity dropouts when depth readings were below 8 inches due to greasy debris possibly from the Darigold factory, or from the velocity sensor being exposed during very low flows. The velocity sensor at this site is rotated away from the bottom of the pipe in order to avoid fouling by shifting silt and debris. Depth data did not experience any dropouts. Finalized data had the dropout points corrected to the Manning's curve for the pipe. DWF and WWF data from this site were suitable for modeling and were used for loading the Genesee model.

This monitor was removed from the Genesee Area in June, 2009.

059-320 (Monitoring ID GEN38_059-320)

This temporary monitor measured velocity and depth and was located in the northwest region of the Genesee Area along Rainier Avenue. Flows from this terminal basin flowed into the downstream flow monitoring basin 059-498. The tributary area for 059-320 was equivalent to 7% of the total area in the Genesee Area.

This site experienced a temporary hydraulic shift, slowing the flow and deepening it by 1 to 2 inches. Raw data from this site experienced occasional velocity dropouts during night and other low flows. Depth data did not experience any dropouts. Finalized data had the dropout points corrected to the Manning's curve for the pipe. DWF and WWF data from this site were suitable for modeling and were used for loading the Genesee model.

This monitor was removed from the Genesee Area in June, 2009.

059-332 (Monitoring ID GEN38_059-332)

This temporary monitor measured velocity and depth, and was located in the center of the Genesee Area between Rainier Avenue and Genesee Park. Flows from this flow monitoring basin flowed into the downstream flow monitoring basin 059-498. The tributary area for 059-332 was equivalent to 23% of the total area in the Genesee Area and includes area and flow from one upstream flow monitoring basin.

The industrial discharge seen in the upstream flow monitoring basin 059-131 was seen in 059-332 as well. This site experienced significant hydraulic shifting most likely caused by greasy debris from the upstream industrial discharge, resulting in an indistinguishable scattergraph when viewed for the entire monitoring period. Raw data from this site experienced occasional velocity dropouts during night and other low flows. Likely backwater conditions are indicated by depth never falling below 5 inches. Depth data did not experience any dropouts. Finalized data had the dropout points corrected to the Manning's curve for the pipe. DWF and WWF data from this site were suitable for modeling and were used for loading the Genesee model.

This monitor was removed from the Genesee Area in June, 2009.

059-346 (Monitoring ID GEN38_059-346)

This temporary monitor measured velocity and depth and was located on the east side of the Genesee Area, along the shore of Lake Washington. This monitor was used to verify flows into "Structure A" over the horseshoe weir at 059-451 (see discussion of 059-451 for a description of the horseshoe weir), and the operation of the downstream pinch valve by comparing measured depths to those at the downstream permanent meter (059-451, MP2). Thus, 059-346 did not collect DWF data and did not have a tributary area. This monitor was incorrectly labeled, and is actually in MH 059-574. Continued monitoring at this site occurs under the corrected label GEN38_059574.

059-346 was a very difficult site to monitor due to the accumulation of significant greasy debris during infrequent weir overflows, and typically dry pipe conditions. The accumulation of solids was evident as periodic buildups of depth without corresponding flow, followed by a short burst of flow and a decrease in depth indicating the flushing off of the debris. This build up in depth typically resulted in depths of around 0.5 to 1 inches, but

resulted in a maximum depth of 3.8 inches in March, 2009. During the January 6, 2009 storm, data from the upstream monitor 059-451 indicated that the horseshoe weir overflowed. However, there was no corresponding depth and flow at 059-346, resulting in questions regarding the accuracy of the calibration of this meter. See Section 4.6.1 for a detailed discussion of this event and the resulting analysis. DWF was not measured at this site. WWF data were not suitable for modeling due to reasons described above.

This monitor was removed in June, 2009, but was replaced with a new monitor between the baffle and first weir wall of "Structure A" (see the detailed diagram for NPDES_38 MH 059-451 in Appendix A for monitoring locations in "Structure A"). This new monitor, installed in early June and renamed 059-574 (GEN38_059574), will remain in place after May, 2009 to obtain additional measurements that were not collected during this monitoring period due to physical site hydraulic characteristics.

059-371 (Monitoring ID GEN38_059-371)

This temporary monitor measured velocity and depth, and was located in the center of the Genesee Area between Rainier Avenue and Genesee Park. Flows from this terminal basin flowed into the downstream flow monitoring basin 059-498. The tributary area for 059-371 was equivalent to 4% of the total area in the Genesee Area.

This site frequently experienced velocity dropouts during night and low flows. Spurious raw velocity readings were also common at low flows, creating an upward hook or "finger" between 1 to 3 inches and 0.5 to 2.5 feet per second. Several adjustments were made to the set-up of this monitor to reduce or eliminate this hook, but none was successful. This site also experienced a backwater condition caused by a downstream blockage, creating 2.25 inches of standing water in the pipe. Finalized data had the dropout points and most of the spurious velocity readings corrected to the Manning's curve for the pipe. DWF and WWF data from this site were suitable for modeling and were used for loading the Genesee model.

This monitor was removed from the Genesee Area in June, 2009.

059-373 (Monitoring ID GEN38_059-373)

This temporary monitor was installed into the upstream end of the downstream pipe in MH 059-373 (often called a "reverse installation"), and measured velocity and depth. 059-373 was located in the southern part of the Genesee Area just south of Genesee Park. Flows from this terminal basin flowed into the downstream flow monitoring basin 059-498. The tributary area for 059-371 was equivalent to 7% of the total area in the Genesee Area.

This site experienced significant hydraulic shifting at depths below 3 inches caused by shifting silt conditions. Due to reverse installation, the MH is prone to more turbulent flow, adding to the scatter and velocity dropouts at depths below 3 inches. The site responded well to rainfall, and had a well-defined WWF response signature that is close to the theoretical Manning's curve. Finalized data had the dropouts corrected to the Manning's curve for the pipe. DWF and WWF data from this site were suitable for modeling and were used for loading the Genesee model.

This monitor was removed from the Genesee Area in June, 2009.

059-398 (Monitoring ID GEN38_059-398)

This temporary monitor measured velocity and depth, and was located in the eastern side of the Genesee Area, in the Lake Line along the shore of Lake Washington. 059-398 measured flows directly upstream of SPU Pump Station #5, and was the furthest downstream meter installed by ADS in the Lake Line in the Genesee Area. The tributary area for 059-398 was equivalent to 33% of the total area in the Genesee Area, which includes area and flow from 15 upstream monitors.

This site frequently experienced velocity dropouts during night and low flows at depths below 6 inches. Spurious velocity readings were also common at low flows below 6 inches in depth, creating an upward hook at the low-depth and low-velocity region in the scattergraph. 059-398 also had mass balance problems (where upstream flows are greater than downstream flows) with the upstream monitors at 059-407 and 059-404. Mass balance issues were resolved with a sensor replacement in April, 2008. However, this sensor replacement did not eliminate the spurious velocity readings at low flows. This site has experienced two instances of backwater conditions. The first was during the November 6-7th storm, which resulted in backwater conditions with a maximum depth of 14.2 inches. The second backwater condition occurred during the January 6, 2009 storm, and was the only instance of surcharging at 059-398. The surcharging was caused by the downstream SPU Pump Station #5 being overwhelmed by flows during the storm, and resulted in a maximum depth of 32 inches. See Section 4.6.1 for a more detailed description of the January 6, 2009 event and related analysis. Finalized data had the dropout points and most of the spurious velocity readings corrected to the Manning's curve for the pipe. DWF and WWF data from this site were suitable for modeling and were used for loading the Genesee model.

This monitor was removed from the Genesee Area in June, 2009.

059-404 (Monitoring ID GEN38_059-404)

This temporary monitor measured velocity and depth, and was located in the Lake Line on the eastern side of the Genesee Area, along the shore of Lake Washington. Flows from this flow monitoring basin flowed into the downstream flow monitoring basin 059-398. The tributary area for 059-404 was equivalent to 18% of the total area in the Genesee Area including flow and area from eight upstream flow monitoring basins.

059-404 measured highly repeatable data at depths below 6 inches, but depths above 6 inches resulted in two different site signatures depending on hydraulic conditions inside of the pipe. Prior to May, 2008, velocity readings at depths above 6 inches followed a much flatter pattern than after May, 2008. This site signature change was most likely due to a changing downstream constriction that resulted in backwater and surcharge conditions only during high flows. DWF and WWF data from this site were suitable for modeling and were used for loading the Genesee model.

This monitor was removed from the Genesee Area in June, 2009.

059-406 (Monitoring ID NPDES41B_059-406)

Permanent site 059-406 (NPDS41B) contains two monitoring locations; one for non-overflow data on the normally wet side of the weir and one for overflow data on the normally dry

side of the weir, both of which measure depth and velocity. The tributary area for 059-406 is 13% of the total area in the Genesee Area, including area and flows from four upstream flow monitoring basins in NPDES Basin 40. 059-406 is located near the shore of Lake Washington, and flows from this flow monitoring basin flow into the Lake Line and to the downstream flow monitoring basin 059-398. Overflow volumes reported for this site in the monthly CSO reports by SPU are quantified using the weir equation with depth data from this site. Overflow volumes are likely smaller than reported due to a flow restriction in the outfall due to a crushed pipe. Overflow frequencies are likely accurately reported.

DWF data from this site had initial difficulty balancing with the upstream monitor 059-407. However, this imbalance was caused by inaccurate flow data at 059-407, which was directly downstream of the hydrobrake at 059-490 and upstream of 059-406, not because of inaccurate flow data at 059-406. DWF and non-overflow WWF data from this site were suitable for modeling and were used for loading the Genesee model.

This site experienced 13 separate overflow events during the duration of the monitoring period. Greatest confidence is placed on the occurrence of overflow events, with less confidence placed on the volume reported. Additionally, according to *Outfall Evaluation Report: NPDES Permit Documentation* (Herrera 2006a), the outfall pipe for NPDES 41 (downstream of where NPDES 41A and B join together) is crushed. However, there is no scattergraphic evidence of pipe blockage, and the outfall is reported to be operable in current condition (albeit not as intended). It is possible that some overflows at 059-406 experienced backwater conditions due to the crushed pipe that caused water that would under normal pipe conditions overflow to re-enter the Genesee Area, resulting in larger reported overflow volumes than those that actually occurred.

This monitor will remain in the Genesee Area because it is a permanent monitoring site used to monitor CSOs for this NPDES Basin.

059-407 (Monitoring ID GEN40_059-407)

This temporary monitor measured velocity and depth and was located near the lake shore on the eastern side of the Genesee Area. 059-407 was located directly downstream of the hydrobrake at 059-490, and was directly upstream of NPDES 41B. 059-407 did not have additional net basin area, so its tributary area was the same as that for 059-490, equivalent to 13% of the total Genesee Area. This location did receive flow from four upstream flow monitoring basins.

Data from this site were repeatable and followed a fairly consistent pattern during both DWF and WWF. However, flows from this flow monitoring basin had occasional problems balancing with monitors upstream and downstream. DWF and WWF data from this site were suitable for hydrobrake stage-discharge curve creation. Flow and depth data from this site were used to develop the hydrobrake stage-discharge curve for the hydrobrake in 059-490, which is further discussed in Section 4.2.3. This site was not used to load the model.

059-407 has been left in the Genesee Area to continue gathering data on the performance of the upstream hydrobrake.

059-409 (Monitoring ID GEN40_059-409)

This temporary monitor measured velocity and depth, and was located in the eastern region of the Genesee Area, near the lake shore. Flows from this flow monitoring basin flowed into the downstream flow monitoring basin 059-490. This was a terminal basin with a tributary area equivalent to 6% of the total area in the Genesee Area.

This site experienced shifting between super and subcritical flow at depths of around 2 inches. This caused a considerable amount of scatter at lower depths. Data at depths higher than 2.5 inches follow a clear pattern. DWF and WWF data from this site were suitable for modeling and were used for loading the Genesee model.

This monitor was removed from the Genesee Area in June, 2009.

059-434 (Monitoring ID NPDES41A_059-434)

Permanent site 059-434 (NPDES 41A) contains two monitoring locations: one (MP1) on the upstream side of the weir and another (MP2) on the downstream side of the weir. The two monitoring locations both measure depth and velocity. The tributary area for 059-434 is very small, less than 1% of the total area in the Genesee Area, and is located in the eastern region of the Genesee Area near the shore of Lake Washington. Flows from this terminal basin flow into the Lake Line and to the downstream flow monitoring basin 059-398. Overflow volumes reported for this site in the monthly CSO reports by SPU are quantified using data from MP2.

DWF data from this site were typically repeatable and reliable, although data were influenced by slow low flows with depths frequently as low as 1.5 inches. The scattergraph for 059-434 did not follow a typical Manning's curve due to site hydraulics, including debris or a local sag in the sewer line. Because this is the only monitor within this NPDES Basin, DWF data from this monitor were required for flow loading and model calibration. DWF and WWF data from this site were suitable for modeling and were used for loading the Genesee model.

This site did not experience any overflows during the duration of the monitoring period. However, future overflow data should be used with caution because of the difficulty in calibrating and confirming readings from the monitor on the downstream side of the weir. This calibration is difficult because it is normally dry and flows cannot be verified. In addition, the overflow pipe for this outfall is crushed. For these reasons, greatest confidence is placed on the occurrence of overflow events, with less confidence placed on the volume reported. MP1 depths in excess of 3.8 inches (weir height with respect to MP1 sensors) are a good measure of when overflows occurred.

This monitor will remain in the Genesee Area because it is a permanent monitoring site used to monitor CSOs for NPDES Basin 41A.

059-436 (Monitoring ID GEN40_059-436)

This temporary monitor measured velocity and depth and was located in the eastern region of the Genesee Area, near the lake shore. Flows from this flow monitoring basin flowed into the downstream flow monitoring basin 059-490. This was a terminal basin with a tributary area equivalent to 5% of the total area in the Genesee Area.

This site experienced some amount of hydraulic shifting at depths below 3.5 inches, creating a scattered site signature at lower depths. Above 3.5 inches, the scattergraph indicates a predictable pattern. The shifting was typically due to debris and sediment. Variable velocity readings may have been caused by turbulent flow conditions in the pipe. Site 059-436 has also experienced consistent night and low flow dropouts. Most of the dropouts were corrected in the finalized data. DWF and WWF data from this site were suitable for modeling and were used for loading the Genesee model.

This monitor was removed from the Genesee Area in June, 2009.

059-443 (Monitoring ID GEN38_059-443)

This monitor is owned and maintained by King County and measures flow and depth along the Hanford Street Trunk B between SPU monitor 059-121 and the Rainier Avenue Lift Station. This is the furthest downstream monitor in the Genesee Area, and its tributary area is equivalent to 92% of the total Genesee Area, including flow and area from 23 upstream flow monitoring basins.

According to King County, QA/QC procedures were not performed on these data. However, based on data review, DWF and WWF data from this site were suitable for modeling and were used for loading portions of the Genesee model that are not tributary to any of the other upstream monitors. Limitations to using these and other non-reviewed data are discussed in Section 2.4.

Because this is a King County monitor, it will remain installed after May, 2009.

059-451 (Monitoring ID GEN38_059-451)

This temporary monitor measured velocity and depth, and was located on the northern part of Genesee Park. Site 059-451 was located directly downstream of the hydrobrake at 059-498, and was used to characterize flows coming through the upstream hydrobrake and flows at the horseshoe weir, which overflowed into "Structure A," MH 059-346, and NPDES 38. 059-451 did not have additional net basin area, so its tributary area was the same as that for 059-498, equivalent to 47% of the total area in the Genesee Area. This location received flow from six upstream flow monitoring basins. In addition to the site reports in Appendix A and schematic drawings in Figures 2-2 and 2-3, a local map of this and nearby related monitors is included in Figure 4-8.

MH 059-451 is the location of the *horseshoe weir*, a structure named due to its semi-circular shape, similar to a horseshoe or the letter "U." Normal flows go around this weir, into the grit chamber, and into the Hanford Street Trunk B. High flows go over the weir and into "Structure A."

Ultrasonic depth data from this site were significantly over-stated during several wet weather events until December, 2008, due to the monitor being too close to the turbulence caused by the upstream hydrobrake. The monitor was moved further downstream from 059-498 on December 4, 2008, resulting in greatly improved depth readings. However, as a consequence of this move, velocity and depth data measured a greater influence of the nearby SPU Pump Station #5, resulting in more scatter in the data. During finalization, WWF data prior to December, 2008 were adjusted to account for the over-stated depth data by using pressure depth instead of ultrasonic depth for wet weather events. Site 059-451 is

downstream of the industrial discharge in flow monitoring basin 059-131, and its effect is seen as a 2-hour spike in depth and flow, although more spread out than in upstream flow monitoring basins. 059-451 also experienced a backwater condition during some wet weather events, caused by a downstream constriction between 059-451 and the downstream monitor at 059-443. The cause of this restriction is unknown as of June, 2009, but is being investigated by SPU. The restriction may be caused by the grit chamber located in 059-450. High depths at 059-451 cause flow over the horseshoe weir and into "Structure A" (MH 059-346). Based on surveyed horseshoe weir height data, such an overflow occurred during the January 6, 2009 rain event. This overflow was not confirmed by data from 059-346. See Section 4.6.1 for a discussion of this event.

Overall, data from this site were repeatable and followed a fairly consistent pattern. DWF and WWF data from this site were suitable for model calibration. Flow and depth data from this site were used to develop the stage-discharge curve for the hydrobrake at 059-498.

Site 059-451 has been left in the Genesee Area to continue gathering data on the performance of the upstream hydrobrake, as well as to continue monitoring flows into "Structure A." Site 059-451 will also be used to measure the effects of changes such as cleanings, retrofits, and land use changes on system performance in NPDES Basin 38, as well as to measure any backwatering into NPDES 38 from Hanford Street Trunk B. Additional data from this location are also needed due to missing data during critical storm flow events during the monitoring period and changes to the downstream monitoring location setup at 059-346.

059-451 "A" (Monitoring ID NPDES38_059-451, "Structure A")

NPDES 38 is an overflow-only monitoring site with two monitoring points that both measure depth and velocity in "Structure A," which is located in the northern end of Genesee Park. Flows enter "Structure A" by flowing over the horseshoe weir at 059-451, and through a 72-inch storage pipe monitored by 059-346. "Structure A" consists of a 20-inch drop, a baffle wall, and two weirs. Between the two weirs is a connection to SPU's Pump Station 5. Downstream of the second weir is a 72-inch overflow pipe leading to a 36-inch outfall. MP1 is located in the upstream end of the overflow pipe, and measures depth and velocity of overflows. MP2 is located in the chamber between the overflow weir and the storage overflow weir, and measures depth in that chamber as well as velocity over the overflow weir. Flows into "Structure A" are either recirculated into SPU Pump Station #5, or if the pump station is already overwhelmed flows will back up into the upstream storage tank before overflowing as a CSO. After overflow events from the horseshoe weir, a pool of stagnant wastewater covered by a layer of grease often remains impounded in Structure A. This site does not collect DWF data and thus has no tributary area. Overflow volumes reported for this site in the monthly CSO reports by SPU are quantified using data from MP1. See Appendix A for a diagram of this complex site.

Permanent monitoring was initiated at this location prior to a MH identification number (MH ID) being assigned to the structure. The monitoring location was at first incorrectly identified with the upstream MH, 059-451. To maintain consistency in monitoring data, this incorrect identification was carried through the monitoring period. In order to reduce confusion between this monitoring location and the temporary monitor at 059-451 (just upstream of the horseshoe weir), this facility was temporarily referred to as "Structure A"

by the monitoring data review team. Since the beginning of the monitoring period, the MH that makes up "Structure A" has been assigned the identifier 059-574. This set of sensors was renamed to NPDES38_059574 after the conclusion of Phase II of monitoring. NPDES38_059574 is downstream of GEN38_059346 (placed on June 10, 2009). See Appendix A for a schematic of this site.

NPDES 38 measured one overflow during the duration of the monitoring period. This overflow occurred on January 8, 2009, when SPU Pump Station #5 was overwhelmed by incoming flows and backed up into "Structure A," causing an overflow (see Section 4.6.1 for an in-depth description of this event). During summer months, the sensors at MP1 experience submerged conditions due to high Lake Washington levels, up to 13.5 inches. WWF data from this site were suitable for model calibration. Due to the difficulty in calibrating and confirming the readings from the monitor data greatest confidence is placed on the occurrence of overflow events, with less confidence placed on the volume reported.

This monitor will remain in the Genesee Area because it is a permanent monitoring site used to monitor CSOs for NPDES Basin 38.

059-489 (Monitoring ID NPDES37_059-489)

Site 059-489 is a permanent monitor for NPDES 37 and contains an irregular monitor setup. 059-489 has three monitoring locations; MP1 measures pressure depth on the regular flow side of the weir for alarming purposes only; MP2 measures ultrasonic depth and velocity on the regular flow side of the weir; and NPDES37_O has a full set of depth and velocity sensors on the overflow side of the weir. The monitoring setup with three sets of sensors was established on May 30, 2008, prior to which only a full set of sensors at MP1 on the regular flow side of the weir were installed. The setup change occurred in order to make overflow alarming at NPDES 37 easier, and to reduce false positive alarms.

The tributary area for 059-489 is equivalent to 6% of the total area in the Genesee Area, and is located in the northern tip of the Genesee Area. Flows from this terminal basin flow into the Hanford Street Trunk B and to the downstream King County MH 059-443. Overflow volumes reported for this site in the monthly CSO reports by SPU are quantified using data from MP2.

Data from this site experienced scatter caused by low velocities and shifting hydraulic conditions, which resulted in a non-Manning's depth-velocity relationship. DWF and WWF data from this site were suitable for modeling and were used for loading the Genesee model. Further, these data were needed because this was the only monitor located in NPDES Basin 37.

This site did not measure any overflows during the duration of the monitoring period. However, future overflow data should be used with caution because of difficulty in calibrating and confirming the readings from the monitor. Greatest confidence is placed on the occurrence of overflow events, with less confidence placed on the volume reported.

This monitor will remain in the Genesee Area because it is a permanent monitoring site used to monitor CSOs for NPDES Basin 37.

059-490 (Monitoring ID GEN40_059-490)

This temporary monitor measured depth and velocity, and was located near the shore of Lake Washington, directly upstream from the hydrobrake located in the same MH. 059-490 contained two monitoring points: MP1 measured both depth and velocity in the downstream end of the upstream pipe, MP2 measured only depth in the hydrobrake chamber. The second monitoring point was added in February, 2008 to ensure accurate depth data for characterizing the performance of the hydrobrake. Flows from 059-490 flowed into the downstream flow monitoring basin at NPDES 41B (059-406). The tributary area for 059-490 was equivalent to 13% of the total area in the Genesee Area, including flow from three upstream flow monitoring basins.

Low flow data, beneath three inches of depth, followed a calibrated Manning's curve; however at greater depths, data from this site did not follow a typical Manning's curve. Because of the constriction downstream caused by the hydrobrake, which typically began limiting flow at depths above 4 inches, 059-490 frequently experienced significant surcharge conditions with depths greater than 100 inches on several occasions. These backups in flow occasionally caused overflows at the upstream CSO relief point at 059-491. Depth data from the two monitoring points in this site had difficulty matching requiring attention during data finalization. Velocity data from 059-490 were influenced by sediment and debris in the pipe, causing velocity dropouts and variable velocity readings. DWF data from this site were suitable for modeling and were used for loading the Genesee model. WWF depth data from this site were suitable for modeling and were used hydrobrake stage-discharge curve creation (see Section 4.2.3).

This monitor was removed from the Genesee Area in June, 2009.

059-491 (Monitoring ID NPDES40_059491)

059-491 (also known as NPDES 40) contains one monitoring point, located in the downstream end of the upstream pipe leading into the MH. This monitor is located on the eastern side of the Genesee Area near the lake shore. Flows from this monitor flow into the downstream flow monitoring basin 059-490. NPDES 40 is located directly downstream of a large pipe used for storage when the hydrobrake at 059-490 is activated. This is a challenging site to monitor; the combined sewer system overflows through an elevated, active storm sewer line within the structure. The tributary area for NPDES 40 is equivalent to 6% of the total Genesee Area including flow and area from one upstream flow monitoring basin. Overflow volumes reported for this site in the monthly CSO reports by SPU are calculated using the weir equation with depth data from this site.

The scattergraph for NPDES 40 shows the influence of the cunette bench in the MH, which occasionally caused anomalous returns of signals to the ultrasonic sensor and thus inaccurate depth spikes. The vertical line of data points at a depth of 6 inches in the scattergraph is spurious data. WWF velocity data frequently dropped out due to downstream hydrobrake activation. However, DWF and WWF data from this site were suitable for modeling and were used for loading the Genesee model.

This site measured three overflow events during the duration of the monitoring period. Due to site configuration, it was difficult to calibrate and confirm monitor overflow readings.

Greater confidence is placed on the CSO data indicating the occurrence of overflows rather than the volume calculated.

This monitor will remain in the Genesee Area because it is a permanent monitoring site used to monitor CSOs for NPDES Basin 40.

059-498 (Monitoring ID GEN38_059-498)

This temporary monitor measures depth and velocity, and is located in the northern part of Genesee Park near the lake shore. It is directly upstream of the hydrobrake located in the same MH. 059-498 has a tributary area equivalent to 47% of the total Genesee Area including area and flow from five upstream flow monitoring basins. Flows from this monitor flow through the hydrobrake, and either to the Hanford Street Trunk B during typical operation, or to the NPDES 38 overflow. During periods of wet weather, excessive flows fill the CSO Facility #12 storage, and overtop the hydrobrake weir at 059-498. SPU survey indicates that depths above 52.45 inches flow over the hydrobrake weir. See Sections 4.2.4 and 4.3.4 for a more in depth description of flows over the hydrobrake.

059-498 is downstream of the industrial discharge from the Darigold factory in flow monitoring basin 059-131. WWF velocity data from this site were inconsistent and unreliable due to low velocities created by the downstream hydrobrake, as well as sediment and debris from the industrial discharge upstream. During finalization, some velocity data were reconstituted based on depth data. This monitor was installed in order to characterize the performance of the hydrobrake at 059-498, and as such depth data were more important than velocity data. DWF and WWF depth data for this site were suitable for modeling and were used for hydrobrake stage-discharge curve creation (see Section 4.2.4). The DWF velocity data were suitable for modeling and used for loading the model. WWF velocity data were inconsistent and were not suitable for modeling.

A depth meter at this monitoring location will remain in place after May, 2009 to continue to characterize the hydrobrake at MH 059-498, and to measure utilization of the upstream storage tank. Additional data are needed at this monitor to better represent hydrobrake operations during large storm events, and to monitor the utilization of the large storage in NPDES Basin 38.

060W-012 (Monitoring ID GEN38_060W-012)

This temporary monitor measured depth and velocity, and was located in the Lake Line along Lake Washington in the southeast region of the Genesee Area. Site 060W-012 collected flows from seven upstream flow monitoring basins, including SPU Pump Station #6. Flows from this monitor flowed into the downstream flow monitoring basin 059-404. The tributary area for this flow monitoring basin was equivalent to 16% of the total Genesee Area.

Data from this site indicated that the Lake Line was frequently under-capacity, resulting in some backwater conditions at depths over 10 inches. Data from this site as well as the two upstream monitors, 060W-014 and 060W019, indicated a possible restriction in-between the monitors. Findings are discussed in Section 4.6.2.

Data from 060W-012 also see the influence of the upstream pump station, resulting in variable depth and velocity readings. DWF and WWF data from this site were suitable for modeling and were used for loading the Genesee model.

This monitor will remain in the Genesee Area to measure effects of changes (i.e., cleaning, retrofits, land use changes) on system performance.

060W-014 (Monitoring ID GEN42_060W-014)

This temporary monitor measured depth and velocity and was located in the southeast region of the Genesee Area, near the shore of Lake Washington. Site 060W-014 was located directly downstream of the hydrobrake at 060W-052 (NPDES 42), and was directly upstream of the Lake Line. Flows from the Lake Line entering this MH acted as the dominant flow, effectively overpowering flow from 060W-052. The Lake Line pipe entering 060W-014 is not monitored at this location. 060W-014 did not have additional net basin area, so its tributary area was the same as that for 060W-052, equivalent to 3% of the total Genesee Area. This location did receive flow from one upstream flow monitoring basin.

Data from this site indicated a downstream constriction resulting in frequent negative velocities. The sensor was reconfigured in September, 2008 to verify/measure the negative flows at this site.

The backwater condition noted in 060W-014, as well as at 060W-019, was most likely caused by a combination of a constriction in the Lake Line as well as flows exceeding the capacity of the Lake Line. A maintenance request for a line cleaning was submitted and was completed in April, 2009. Results from this cleaning did not reveal a significant change in site scattergraphic signature. Additional details are provided below in Section 4.6.2.

Site 060W-014 had difficulties balancing with other monitors due to its vicinity to the hydrobrake, as well as the difficulties in getting accurate velocity readings. However, during wet weather events this monitor gave better velocity measurements. DWF and WWF data from this site were suitable for modeling and were used for hydrobrake stage-discharge curve creation (see Section 4.2.2).

This monitor will remain in the Genesee Area to measure effects of changes (i.e., cleaning, retrofits, landuse changes) on system performance as well as characterize the hydrobrake at 060W-052.

060W-019 (Monitoring ID GEN42_060W-019)

This temporary monitor measured depth and velocity, and was located in the southeast region of the Genesee Area, near the shore of Lake Washington. Site 060W-019 was located directly downstream of the hydrobrake at 060W-047, and was directly upstream of the Lake Line. Site 060W-019 did not have additional net basin area, so its tributary area was the same as that for 060W-047, equivalent to 11% of the total Genesee Area. This location did receive flow from five upstream flow monitoring basins.

Similar to the data indicated at the nearby 060W-014, the data at this site indicated a downstream constriction, resulting in frequent negative velocities. The velocity sensor at this site was also reconfigured in September, 2008 to measure negative velocity. Described above in 060W014 and in greater detail in Section 4.6.2, cleaning of the presumed blockage in this vicinity did not yield a significant improvement in system performance.

This monitor is installed in the same MH receiving the discharge from Pump Station #6. Every effort was made to install the sensors in the upstream pipe away from the effects of

the force main discharge; however, it is likely the site configuration caused some of the negative flows decreasing the overall accuracy of the data at this site. DWF and WWF data from this site were suitable for modeling and were used to develop the stage-discharge curve for the hydrobrake at 060W-047.

This monitor will remain in the Genesee Area to measure effects of changes (i.e., cleaning, retrofits, land use changes) on system performance; in particular, to evaluate any improvements in system performance after the cleaning that was completed in the vicinity of this monitor in the main CSO line that connects to each Genesee Area overflow along the Lake Washington shoreline. This monitor will also remain in place to continue to characterize the hydrobrake at MH 060W-047.

060W-025 (Monitoring ID GEN43_060W-025)

This temporary monitor measured depth and velocity, and was located in the southeast region of the Genesee Area. Flows from this terminal basin flowed into the downstream flow monitoring basin 060W-049. The tributary area for 060W-025 was equivalent to 1% of the total area of the Genesee Area.

Depth and velocity data from this site were continuously affected by steep slope, low water levels, and debris. As a result, this site was removed in February, 2008 in favor of another monitoring meter upstream of this location (060W-026) that was expected to yield quality storm flow data (but not DWF data) and the permanent monitoring location downstream at NPDES 43 (MH ID 060W-049) that was expected to yield adequate quality DWF data. DWF and WWF data from this site were not suitable for modeling for reasons discussed above.

060W-026 (Monitoring ID GEN43_060W-026)

This monitor was a DataGator monitor that replaced the monitor at 060W-025. 060-026 was operated by Flow Monitoring and Analysis, Inc. (FM&A), and was the only one of the Genesee temporary sites not operated by ADS. This site was located in the southeast region of the Genesee Area, and had flow-only data available from February 7, 2008 through July 14, 2008, when the monitor was removed due to unreliable and inconsistent data quality. Flows from this terminal basin flowed into the downstream flow monitoring basin 060W-049 (NPDES 43). The tributary area for 060W-026 is equivalent to 1% of the total area of the Genesee Area.

Flow from this site was continuously affected by steep slope, low water levels, and debris. DWF from this site were suitable for diurnal curve creation. WWF data from this site were not suitable for modeling for reasons discussed above.

060W-047 (Monitoring ID GEN42_060W-047)

This temporary monitor measured depth and velocity, and was located in the southeast region of the Genesee Area just upstream of the hydrobrake in the same MH. Flows from this flow monitoring basin flowed into the downstream flow monitoring basin 060W-012. 060W-047 had a tributary area equivalent to 1% of the total area of the Genesee Area including flow from five upstream flow monitoring basins.

This site also experienced negative velocities, which the monitor was set up to record in September, 2008. The cause of the negative velocities was most likely a combination of the

downstream constriction in the Lake Line in the area of 060W-014 as well as the discharge of SPU Pump Station #6 into the MH downstream. Restrictions in the Lake Line near 060W-014 are discussed in more detail in Section 4.6.2.

The primary purpose of this monitor was to characterize the depths at the hydrobrake. Velocity readings were frequently overstated during wet weather events, resulting in significantly over-predicted flows (on the order of 80 mgd). This overestimate was caused by applying the peak velocity of flow through the hydrobrake to the entire depth profile. It was decided not to have these data revised to address the high flows because the primary purpose of this site was to characterize the driving head on the hydrobrake—dependent on the depth measurements at the hydrobrake.

DWF and WWF depth data from this site were suitable for modeling and were used for loading the Genesee model and to develop the stage-discharge curve for the hydrobrake at 060W-047. WWF velocity data were not suitable for modeling for reasons discussed above.

This monitor was removed from the Genesee Area in June, 2009.

060W-049 (Monitoring ID NPDES43_060W-049)

The site at MH 060W-049, NPDES 43, contains one monitoring point in the upstream end of the downstream pipe (a reverse installation), and is located in the southeast region of the Genesee Area near the lake shore. Flows from this flow monitoring basin flow through the NPDES 43 storage facility and into the downstream flow monitoring basin 060W-047. Site 060W-049 did not have additional net basin area, so its tributary area was the same as that for 060W-047, equivalent to 11% of the total area in Genesee Area. This location did receive flow from four upstream flow monitoring basins. Overflow volumes reported for this site in the monthly CSO reports by SPU are quantified using the weir equation with depth data from this site.

Data from this site indicate significant surcharging due to the downstream hydrobrake at 060W-047, as expected. Depth data show the hydrobrake activating at depths above about 5 inches. Velocity data did experience frequent velocity dropouts during low and night flows likely caused by silt and debris. These data points were corrected during data finalization. The silt and debris also resulted in significant spread in the scattergraph at depths below 5 inches, resulting in an unclear diurnal curve. WWF data from this site were suitable for modeling and were used for loading the Genesee model and for determining upstream water levels in the NPDES 43 storage facility. DWF data were not suitable for modeling for reasons discussed above.

This site experienced six overflow events during the duration of the monitoring period. Due to difficulties in calibrating and confirming monitor readings, greater confidence is placed on overflow occurrences rather than volume reported.

This monitor will remain in the Genesee Area because it is a permanent monitoring site used to monitor CSOs for NPDES Basin 43.

060W-052 (Monitoring ID NPDES42_060W-052)

NPDES 42 contains two monitoring locations: MP1 measures depth and velocity in the downstream end of the upstream pipe, and MP2 measures depth only via an ultrasonic

sensor inside of the chamber at 060W-052 (installed in September, 2008). NPDES 42 is located in the southeast region of the Genesee Area near the shore of Lake Washington. Flows from this terminal basin flow through the hydrobrake and enter the Lake Line where they flow into the downstream flow monitoring basin of 060W-012. NPDES 42 has a tributary area equivalent to 3% of the total area in the Genesee Area. Overflow volumes reported for this site in the monthly CSO reports by SPU are quantified using the weir equation with depth data from this site.

There were multiple purposes of data from this site:

- Characterize the driving head on the hydrobrake
- Measure the volume and duration of overflows at this site
- Evaluate storage utilization for the NPDES 42 detention facility located upstream
- Flow loading in the model.

This site also experienced negative velocities, which the monitor was set up to record in September, 2008. The cause of the negative velocities is most likely the downstream restriction in the Lake Line in the area of 060W-012. The Lake Line restriction is discussed in more detail in Section 4.6.2. As expected, this site experienced frequent surcharging due to the hydrobrake constricting flows, which typically activated at depths of approximately 2 to 3 inches. Silt and debris, along with the low velocities, made this a difficult site to collect quality velocity data from; however, depth data from NPDES 42 were suitable for characterization of the hydrobrake. DWF and WWF depth data from this site were suitable for modeling and were used for loading the Genesee model and to develop the hydrobrake stage-discharge curve (see Section 4.2.2). WWF velocity data are not suitable for modeling due to velocity dropouts caused by hydrobrake activation.

This site measured one overflow event during the duration of the monitoring period during the January 7, 2009 storm. Greatest confidence is placed on the occurrence of overflow events, with less confidence placed on the volume reported.

This monitor will remain in the Genesee Area because it is a permanent monitoring site used to monitor CSOs for NPDES Basin 42.

067-014 (Monitoring ID GEN43_067-014)

This DataGator monitor, also known as RainCatcher #1, was operated by Herrera, Inc. (Herrera 2006b), and had flow-only data available from January 26, 2008 to January 12, 2009. Site 067-014 was located in the southeast corner of the Genesee Area, and flowed into the downstream flow monitoring basin 060W-047. The tributary area for this terminal basin was equivalent to 1% of the total area of the Genesee Area. This monitor was installed for use on a different SPU project, but was used in the Genesee model. DWF data were suitable for developing a diurnal curve. WWF data from this site were not suitable for modeling because of monitor drift and unknown maintenance and operation. Limitations to using this and other non-reviewed data are discussed in Section 2.4.

067-024 (Monitoring ID GEN43_067-024)

This DataGator monitor, also known as Raincatcher #2, was operated by Herrera, Inc. (Herrera 2006b), and had flow-only data available from January 26, 2008 to January 12, 2009. 067-024 was located in the southeast corner of the Genesee Area and flowed into the

downstream flow monitoring basin 060W-047. 067-024 had a tributary area equivalent to 7% of the total area of the Genesee Area, including flow from one upstream flow monitoring basin. This monitor was installed for use on a different SPU project, but used in the Genesee model. DWF data were suitable for developing a diurnal curve. WWF data from this site were not suitable for modeling because of extended dropouts and unknown maintenance and operation. Limitations to using this and other non-reviewed data are discussed in Section 2.4.

067-029 (Monitoring ID GEN43_067-029)

This DataGator monitor, also known as Raincatcher #3, was operated by Herrera, Inc. (Herrera 2006b), and had flow-only data available from January 26, 2008 to January 12, 2009. 067-029 was located in the southeast corner of the Genesee Area, and flowed into the downstream flow monitoring basin 067-024. The tributary area for this terminal basin was equivalent to 6% of the total area of the Genesee Area. This monitor was installed for use on a different SPU project, but was used for the Genesee model. DWF and WWF data from this site were suitable for modeling and loading of the Genesee model.

067-078 (Monitoring ID NPDES165_067-078)

NPDES 165 contains two monitoring locations: one (MP1) on the upstream side of the weir, and another (MP2) on the downstream side of the weir. The two monitoring locations both measure depth and velocity. Flows from this flow monitoring basin flow into SPU Pump Station #6 and then enter the Lake Line. The tributary area for this terminal basin is less than 2% of the total area in the Genesee Area, and is located in the southeast tip of the Genesee Area. Overflow volumes reported for this site in the monthly CSO reports by SPU are quantified using the weir equation with depth data from this site.

Slow low flows, multiple hydraulic regimes, and silt affected DWF data at this monitor. Orifice effects also occur at water depths greater than 9 inches. DWF and WWF data from this site were suitable for modeling and were used for loading the Genesee model.

This site measured two overflow events during the duration of the monitoring period. One of these overflow events occurred in January, 2009 when Pump Station #6 was overwhelmed, indicated by both pumps on and wet well levels rising above the overflow level. Greatest confidence is placed on the occurrence of overflow events, with less confidence placed on the volume reported. The weir at NPDES165 was raised approximately 12 inches in September, 2008 in order to alleviate overflows, and is reflected in Table 2-3.

This monitor will remain in the Genesee Area because it is a permanent monitoring site used to monitor CSOs for NPDES Basin 165.

D059-191 (Monitoring ID GEN38_D059-191)

This temporary monitor measured velocity and depth, and was located in a stormwater pipe in MHD059-191 in Genesee Park near Pump Station #5 and the NPDES38 CSO outfall. This monitor was installed in order to give an approximation of stormwater flows in the Genesee Area.

Data from D059-191 were strongly influenced by standing lake water in the line, which resulted in constantly shifting depth readings according to the lake level. The velocity or depth measurements recorded at this site could not be verified because during rainfall events, the site could not be accessed by personnel due to the increased depth and velocities and depth of the MH. Although the depth readings tracked well with the lake levels and exhibited responses to wet weather in both depth and velocity, it was theorized that stratified velocity levels in the flow may have existed at the site. The velocity sensor was switched to a Pulse meter on December 12, 2008, to provide a more accurate measurement of the velocity profile in the pipe. The Pulse meter did not indicate the presence of stratified velocity, providing a greater level of confidence with previously monitored data. WWF data from this site were suitable for future stormwater modeling projects. Being a stormwater monitor, this site was not used in support of the Genesee CSO model.

This monitor was removed from the Genesee Area in June, 2009.

Pump Station #5 (Monitoring ID WW05)

SPU Pump Station #5 is located along the Lake Line at the northern tip of Genesee Park along the lake shore, downstream of monitor 059-398 and upstream of King County monitor 059-443. The pump station discharges directly into the Hanford Street Trunk B. Pump Station #5 typically receives flow from 33% of the total area of the Genesee Area—during extreme rainfall events system flows upstream of the NPDES Basin 38 Genesee Park area can overtop the weir at 059-451 diverting flow to the pump station. See Section 4.4.1 for more information about Pump Station #5.

Pump Station #6 (Monitoring ID WW06)

SPU Pump Station #6 is located in the southern tip of the Genesee Area along the lake shore, downstream of monitor 067-078 (NPDES 165) and upstream of monitor 060W-012. The pump station discharges directly into the Lake Line. Pump Station #6 typically receives flow from 2% of the total area of the Genesee Area. See Section 4.4.2 for more information on Pump Station #6.

Rainier Avenue Lift Station

The King County Rainier Avenue Lift Station is located in the northeast region of the Genesee Area, downstream of 059-121 and the King County monitor 059-443. This is the furthest downstream point in the Genesee Area that has monitored data. The Rainier Avenue Lift Station receives flow from 100% of the Genesee Area, including an area equivalent to 2% of the total area in the Genesee Area that is not tributary to any other monitoring location. See Section 4.4.3 for more information on the Rainier Avenue Lift Station.

TABLE 3-2: MONITORING RESULTS

Line	NPDES No.	MH ID	Data Collection Period	Suitability of Data for Modeling		Verified Pipe Height (inches)	Silt Depth (inches)	Recorded Depth (inches)			Recorded Velocity (ft/sec)			Recorded Flow Rate (mgd)		
				DWF	WWF			Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
1	38	059-121	1/1/08 to 5/31/09	Suitable	Suitable	22.88	0	0.4	1.5	20.3	0.0	1.5	4.2	0.0	0.1	1.4
2	38	059-131	1/4/08 to 5/31/09	Suitable	Suitable	41.75	4	7.2	8.6	40.4	0.0	0.7	2.6	0.0	0.5	3.7
3	38	059-320	1/1/08 to 5/31/09	Suitable	Suitable	23.00	0	0.0	1.9	21.5	0.0	0.7	3.0	0.0	0.1	1.8
4	38	059-332	1/1/08 to 5/31/09	Suitable	Suitable	38.63	0	5.1	7.4	35.0	0.0	0.9	4.1	0.0	0.7	8.6
5	38	059-346	7/9/08 to 5/31/09	N/A	Unsuitable	72.00	0	0.0	0.2	4.5	0.0	0.0	2.7	0.0	0.0	0.1
6	38	059-371	1/3/08 to 5/31/09	Suitable	Suitable	15.25	0.25	0.0	1.6	138.9	0.0	1.0	2.7	0.0	0.0	1.3
7	38	059-373	1/1/08 to 5/31/09	Suitable	Suitable	29.63	0.13	0.0	1.5	7.1	0.0	1.2	3.7	0.0	0.1	1.6
8	38	059-398	1/1/08 to 5/31/09	Suitable	Suitable	21.00	0.13	0.5	5.9	35.3	0.0	1.1	5.2	0.0	0.4	8.2
9	38	059-404	1/1/08 to 5/31/09	Suitable	Suitable	15.00	0	2.0	4.0	23.5	0.0	1.1	2.7	0.0	0.2	1.9
10	41B	059-406	1/1/08 to 5/31/09	Suitable	Suitable	15.00	0	0.2	8.1	29.1	-1.7	0.0	2.6	-1.0	0.0	1.6
11	41B	059-407	1/1/08 to 5/31/09	Suitable	Suitable	10.13	0	0.5	1.6	33.5	0.0	3.2	6.6	0.0	0.1	1.1
12	40	059-409	1/24/08 to 5/31/09	Suitable	Suitable	10.00	0	0.7	1.3	7.3	0.0	1.5	5.7	0.0	0.0	1.2
13	41A	059-434	1/1/08 to 5/31/09	Suitable	Suitable	15.13	0	0.0	0.1	16.9	0.0	0.0	2.6	0.0	0.0	0.0
14	40	059-436	1/24/08 to 5/31/09	Suitable	Suitable	14.00	0	-0.3	1.7	8.2	0.0	1.4	4.3	0.0	0.1	1.8
15	38	059-443	2/7/08 to 3/6/09	Suitable	Suitable	42.00	0	5.01	7.65	23.76	0.42	1.54	3.58	0.2	1.3	11.4
16	38	059-451	1/2/08 to 5/31/09	Suitable	Suitable	71.88	0	0.0	2.3	32.5	0.0	4.0	8.4	0.0	0.8	53.2
17	38	059-451 “A”	1/1/08 to 5/1/09	N/A	Suitable	72.00	0	0.0	1.2	76.0	0.0	0.0	2.5	0.0	0.0	19.4
18	37	059-489	1/1/08 to 6/1/09	Suitable	Suitable	18.63	0.75	1.3	4.0	13.3	0.6	1.4	4.5	0.0	0.1	2.4
19	40	059-490	1/1/08 to 5/31/09	Suitable	Suitable Depth Unsuitable Velocity	12.13	0	0.0	2.7	107.0	0.0	3.0	5.2	0.0	0.1	1.8
20	40	059-491	1/1/08 to 5/31/09	Suitable	Suitable	80.50	0.13	0.0	2.8	90.5	-2.6	1.3	3.7	-4.8	0.1	8.5
21	38	059-498	1/1/08 to 5/31/09	Suitable	Suitable	72.38	0	3.4	8.5	56.9	0.0	0.6	1.4	0.0	0.7	11.0
22	38	060W-012	1/1/08 to 5/31/09	Suitable	Suitable	14.75	0	0.0	3.1	24.9	-2.0	1.6	3.3	-0.3	0.2	1.9
23	42	060W-014	1/1/08 to 5/31/09	Suitable	Suitable	12.00	2.75	0.0	4.9	59.5	-4.9	0.8	5.7	-0.9	0.0	1.1
24	42	060W-019	1/1/08 to 5/31/09	Suitable	Suitable	12.25	0	0.0	1.4	92.9	-15.0	4.5	10.2	-2.3	0.1	4.1
25	43	060W-025	1/1/08 to 2/7/08	Unsuitable	Unsuitable	8.00	0	0.0	0.2	1.5	1.0	1.9	6.2	0.0	0.0	0.1
26	43	060W-026	2/7/08 to 7/14/08	Suitable	Unsuitable	8.00	0	NA	NA	NA	NA	NA	NA	-0.02	0.01	0.29
27	42	060W-047	1/1/08 to 5/31/09	Suitable	Unsuitable Velocity Suitable Depth	140.75	3	0.0	7.7	137.9	-5.4	0.8	5.7	-79.7	0.4	130.4
28	43	060W-049	1/1/08 to 5/31/09	Unsuitable	Suitable	24.38	0	0.0	2.0	72.7	0.0	3.0	6.2	0.0	0.2	5.4
29	42	060W-052	1/1/08 to 5/31/09	Suitable	Unsuitable Velocity Suitable Depth	51.88	0	0.0	2.7	64.5	-3.2	0.8	4.6	-5.1	0.1	15.9
30	43	067-014	5/4/06 to 6/09	Suitable	Unsuitable	8.0	0	NA	NA	NA	NA	NA	NA	-0.01	0.009	0.39
31	43	067-024	7/7/06 to 6/09	Suitable	Unsuitable	15.0	0	NA	NA	NA	NA	NA	NA	-0.07	0.16	2.30

TABLE 3-2: MONITORING RESULTS

Line	NPDES No.	MH ID	Data Collection Period	Suitability of Data for Modeling		Verified Pipe Height (inches)	Silt Depth (inches)	Recorded Depth (inches)			Recorded Velocity (ft/sec)			Recorded Flow Rate (mgd)		
				DWF	WWF			Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
32	43	067-029	6/07 to 6/09	Suitable	Suitable	15.0	0	NA	NA	NA	NA	NA	NA	0.03	0.12	1.96
33	165	067-078	1/1/08 to 5/31/09	Suitable	Suitable	8.00	0.25	0.0	0.2	3.7	0.0	0.0	4.7	0.0	0.0	0.5
34	38	D059-191	1/31/08 to 5/31/09	N/A	Suitable	96.00	0	5.9	22.5	94.6	-1.4	0.2	11.3	-39.1	0.6	112.3
35	38	Pump Station #5	11/5/07 to 5/31/09	Suitable	Suitable		0	0	49.44	136.9	NA	NA	NA	0	0.43	2.2
36	165	Pump Station #6	11/5/07 to 5/31/09	Suitable	Suitable		0	0	32.9	92.3	NA	NA	NA	0	0.03	0.65
37	38	Rainier Ave. Pump Station	1/1/08 to 2/1/09	Suitable	Suitable		0	110.0	113.7	115.0	NA	NA	NA	0.0	1.2	11.8

TABLE 3-3: MONITOR UPTIME

Line	MH ID	Date of First Project Data	Uptime (%)																	
			Average*	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09
1	059-121	1/1/08	99	100	100	100	100	100	100	100	100	100	100	100	100	92	100	100	99	100
2	059-131	1/4/08	100	89	100	100	100	100	100	100	100	98	100	100	100	100	100	100	100	100
3	059-320	1/1/08	96	100	100	100	99	100	100	84	81	97	100	83	100	100	100	97	100	100
4	059-332	1/1/08	96	100	100	84	100	100	100	100	100	99	100	55	99	100	100	100	100	100
5	059-346	7/9/08	97	0	0	0	0	0	100	98	100	100	100	100	100	69	100	100	100	100
6	059-371	1/3/08	96	73	100	87	80	90	100	100	79	100	100	100	100	100	100	100	100	100
7	059-373	1/1/08	99	100	100	94	100	100	100	100	98	100	100	100	98	100	94	100	100	100
8	059-398	1/1/08	98	100	100	82	89	100	100	100	100	100	100	100	97	100	100	99	99	97
9	059-404	1/1/08	100	100	100	100	100	100	100	100	100	100	99	100	100	100	100	100	100	100
10	059-406	1/1/08	99	100	100	93	100	99	100	100	100	100	100	100	100	100	100	100	100	90
11	059-407	1/1/08	100	100	100	99	100	100	100	100	100	100	100	99	100	100	100	100	100	100
12	059-409	1/24/08	100	100	97	100	100	100	100	100	100	100	100	100	98	100	100	100	100	100
13	059-434	1/24/08	95	95	83	95	88	55	100	100	100	100	100	93	100	100	100	100	100	100
14	059-436	1/24/08	98	93	97	100	84	100	100	100	100	100	100	100	98	98	91	100	100	100
15	059-451	1/1/08	100	57	99	99	99	100	100	100	100	100	100	100	100	100	100	100	100	100
16	059-451 (“Structure A”)	1/1/08	88	100	33	98	100	100	100	100	100	100	100	100	100	83	91	100	100	0
17	059-489	1/1/08	100	100	100	100	100	95	100	100	100	100	100	100	100	100	100	100	98	100
18	059-490 MP1	1/1/08	94	53	59	100	100	100	100	100	100	98	100	53	95	99	100	100	99	100
19	059-490 MP2	2/7/08	82	0	60	97	100	100	0	0	100	100	98	84	100	100	100	50	100	100
20	059-491	1/1/08	100	99	100	100	95	100	100	100	100	100	90	100	100	99	100	95	100	99
21	059-498	1/1/08	98	100	78	96	99	93	100	100	100	100	100	100	100	100	100	100	100	100
22	060W-012	1/1/08	97	100	99	100	100	100	100	100	100	93	94	82	90	100	100	100	100	100
23	060W-014	1/1/08	100	100	100	100	100	100	100	100	100	100	100	100	97	100	97	100	100	100
24	060W-019	1/1/08	99	100	100	100	99	100	100	100	100	100	100	100	93	96	98	98	99	100
25	060W-025	1/1/08	Not applicable. This monitor was removed in February, 2008.																	
26	060W-026	Feb 2008	Not applicable*																	
27	060W-047	1/1/08	97	99	99	98	99	100	100	99	100	100	84	91	95	96	97	97	96	100
28	060W-049	1/1/08	99	100	100	98	100	100	100	100	100	100	100	99	100	93	97	100	100	100
29	060W-052	1/1/08	94	100	100	99	99	99	100	97	97	100	100	94	100	61	89	97	68	100

TABLE 3-3: MONITOR UPTIME

Line	MH ID	Date of First Project Data	Uptime (%)																	
			Average*	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09
30	067-014*	May 2006	Not applicable*																	
31	067-024*	May 2006	Not applicable*																	
32	067-029*	May 2006	Not applicable*																	
33	067-078	1/1/08	89	100	45	85	100	7	100	100	100	100	100	96	100	97	100	100	100	100
34	D059-191	1/31/08	100	0	100	100	100	100	100	100	100	100	100	100	100	99	100	100	100	100
35	Pump Station #5*	N/A	Not applicable*																	
36	Pump Station #6*	N/A	Not applicable*																	
37	Rainier Ave. Lift Station*	N/A	Not applicable*																	
	Average		95	79	90	92	93	94	95	94	98	99	99	93	98	98	99	97	100	100

* This monitor is not an ADS meter, and does not have prepared uptime statistics

** Some monitors were not installed until after 1/15/2008. Initial downtime due to monitors setup adjustments are not taken into account in this average.

4. System Characterization During Monitoring Period

4.1 Combined Sewer Overflows

Twenty-six separate combined sewer overflows occurred during the flow monitoring period. Half of these occurred at NPDES 41B. These overflows are summarized in Table 4-1, which is derived from the information provided in the SPU monthly CSO Reports to Ecology. The permanent sites used to quantify overflow values are described in Section 2.3.1. The methods used to quantify overflows differ by site, and are included in Table 2-2.

The outfall of CSO 41, conveying overflows at both 41A and 41B, is severely damaged resulting in a flow restriction. CSOs at 41B are quantified by applying a weir equation based on depth over the weir. This method assumes free flow through the outfall, which is likely not the case due to the flow restriction. Because of this inconsistency between quantification method and physical pipe conditions, it is likely that CSO volumes over 41B are much smaller than reported. The frequency of CSOs is likely to be the same as that reported. Overflows at 41A are quantified using the both depth and velocity downstream of the overflow weir, and are thus not affected by the crushed pipe condition. Overflows at 41A were not reported during the study period.

4.2 Hydrobrake Performance

There are four hydrobrakes in the Genesee Area used to regulate flow and maximize inline and offline storage efficiency in the four NPDES Basin storage facilities. Using existing permanent monitors and supplemental temporary monitors, the relationship between differential head and flow through the hydrobrake were developed. This relationship is typically referred to as a "stage-discharge curve." See Section 2.3.2 for a description of hydrobrake operation and the measurement of differential head.

Each hydrobrake had a pair of monitors to determine the stage discharge curve. One monitor was placed directly upstream of the hydrobrake, usually in the same MH as the hydrobrake itself. A second monitor was placed as close as possible to the downstream side of the hydrobrake. Because of the backwater conditions created upstream by the hydrobrake during high flows, velocity measurements at many of the upstream monitoring sites tended to drop out during storm events. For this reason, flow through the hydrobrake was typically characterized by the downstream monitor. In some cases, the downstream monitor gave spurious velocity or depth readings due to interference from the jet of water coming out of the hydrobrake. These spurious readings were usually edited out during data finalization. For each hydrobrake, the best representation of depth and flow was used to develop the stage discharge curve recommended for model calibration (also called the "recommended model curve").

TABLE 4-1: OVERFLOW SUMMARY*

NPDES Site	Date	Overflow Volume	Overflow Duration	Precipitation Depth	Precipitation Duration
		Gallons	Hours: Minutes	inches	Hours
38	1/7/09 20:40	365,042	7:25	3.07	83.40
40	11/6/08 20:25	506,843	3:40	1.59	22.48
	1/7/09 18:35	1,999,630	13:45	3.07	87.65
	4/2/09 20:30	3,174	0:20	1.22	59.10
41B	1/10/08 21:40	17,018	21:30	0.72	24.67
	1/14/08 16:50	1	0:05	0.2	4.02
	3/1/08 18:35	9,664	0:55	0.38	27.33
	3/23/08 16:15	138,279	2:35	0.75	10.97
	3/29/08 23:50	150,492	4:00	2.22	38.05
	8/24/08 18:55	2,041	0:55	0.64	6.13
	11/4/08 8:25	6,906	2:55	2.03	101.00
	11/7/08 12:05	834,837	20:25	2.26	34.57
	12/27/08 9:00	647,048	50:45	2.26	166.88
	1/6/09 23:50	1,023,577	38:05	3.07	93.23
	4/2/09 18:20	98,278	12:15	1.44	68.73
	4/12/09 16:25	29,731	2:45	1.1	86.45
	5/5/09 5:10	99,312	37:10	2.41	102.65
42	1/7/09 20:50	6,351	4:45	3.02	80.9
43	11/6/08 22:00	975,976	2:45	1.35	20.48
	12/27/08 12:45	272,048	4:00	1.44	124.53
	12/28/08 17:25	19,451	0:50	1.99	149.28
	1/7/09 17:55	252,193	11:45	3.07	84.98
	4/2/09 19:40	3,884	0:55	1.22	58.85
	4/12/09 16:40	6,323	0:25	0.97	84.03
165	3/1/08 17:15	201	0:05	0.38	14.50
	1/7/09 20:45	4,555	3:45	3.02	79.82

* From SPU monthly CSO reports to Ecology

Due to changes in system performance caused by debris buildup and other unidentified causes, the stage-discharge curves tended to shift from one location on the graph to another. This shifting is represented by large scatter in the graphs. For the purpose of developing the hydraulic model, an estimation of the most-likely stage discharge curve was made based on the data available. Because the model was calibrated with data up through January, 2009, this estimation was made based only on data up through January, 2009. In some cases, such as at NPDES 42, data collected after January, 2009 suggest reason to adjust the model stage-discharge curve. Ultimately, the curve used in the model will be decided on by the modeling team.

In the following sections for each CSO facility and hydrobrake, the data from the entire flow monitoring period are graphed along with the manufacturer's design stage-discharge curve

and the recommended stage-discharge curve for model calibration. In addition, description of hydraulics and issues unique to the specific stage-discharge curve are reported.

Diagrams, maps, operating context and maintenance procedures for each of the CSO Facilities are provided in the *NPDES Permitted Combined Sewer Overflow (CSO) Mapbook* (Seattle Public Utilities, date unknown).

4.2.1 NPDES Basin 43, MH ID 060W-047, CSO Facility #9

The hydrobrake located in MH 060W-047 slows flow from NPDES Basin 43 into the Lake Line. This flow backs up into the CSO Facility #9 storage, which consists of 68 feet of 144-inch-diameter inline pipe, and is described in Section 4.3.1. After the CSO Facility #9 storage fills to capacity, flows are released to Lake Washington via the overflow weir at NPDES 43 (MH 060W-049). See Figure 4-1 for a map of CSO Facility #9.

The stage discharge curve is created using flow measurements from the downstream monitor 060W-019 and differential head between 060W-019 and 060W-047 (see Figure 4-2 and Table 4-2). Measurement of flow at 060W-019 is affected by discharge from Pump Station #6 and the Lake Line restriction (see Section 4.6.2), but is considered better overall quality than flow measurements at 060W-047, which are consistently over-predicted due to high-velocity measurements of the flow through the hydrobrake applied to the entire depth in the structure. CSO Facility #9 is inspected every 3 months, and cleaned when necessary. The latest cleaning prior to the monitoring period occurred on May 11, 2007.

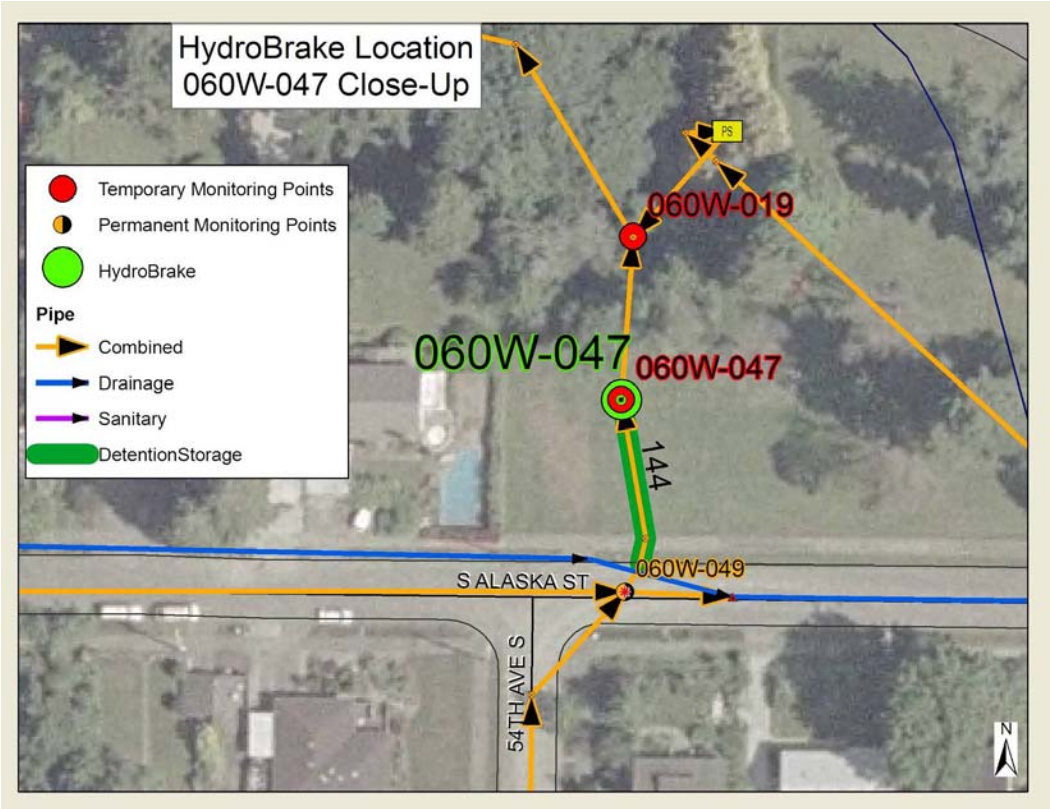


FIGURE 4-1: CSO FACILITY #9 MAP
Map showing CSO Facility #9, including storage, hydrobrake, and overflow weir (permanent monitoring point 060W-049)

Data for this hydrobrake indicate two distinct curves that occurred during different storms during the monitoring period. This hydrobrake is less restrictive for smaller, less intense storms, and more restrictive for larger, more intense storms. The team has decided to use the curve for the larger, more intense storms because these storms are most critical for model calibration in that they approximate the once-per-year overflow event. The result is that the model is less accurate for smaller, less intense storms.

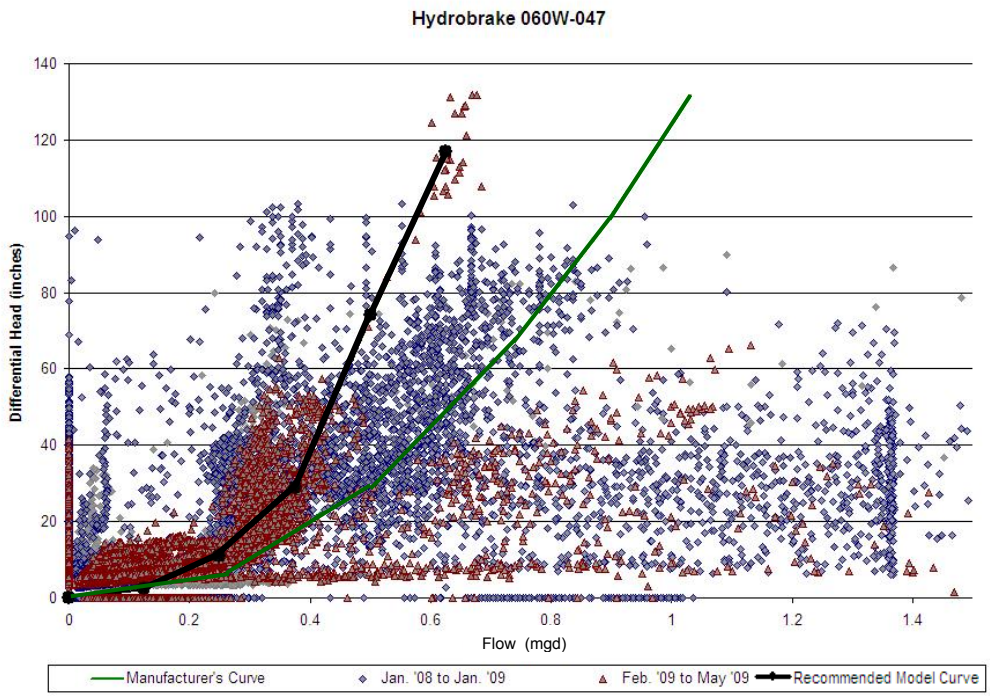


FIGURE 4-2: CSO FACILITY #9 STAGE-DISCHARGE CURVE
Hydrobrake stage-discharge curve for CSO Facility #9, hydrobrake at MH 060W-047

TABLE 4-2: CSO FACILITY #9 STAGE-DISCHARGE CURVE
Points defining the manufacturer's and recommended model stage-discharge curve for the hydrobrake in CSO Facility #9, hydrobrake at MH 060W-047

Manufacturer's Curve		Recommended Model Curve	
Differential Head (inch)	**Flow (mgd)**	**Differential Head (inch)**	**Flow (mgd)**
0.0	0.00	0.0	0
15.0	0.35	2.5	0.125
31.7	0.51	11.0	0.25
48.4	0.62	29.0	0.375
65.1	0.72	74.0	0.5
81.8	0.81	117.0	0.625
98.5	0.89		
115.2	0.96		
131.9	1.03		

4.2.2 NPDES Basin 42, MH ID 060W-052, CSO Facility #10

The hydrobrake located in MH 060W-052 slows flow from NPDES Basin 42 into the Lake Line. This flow backs up into the CSO Facility #10 storage, which consists of dual 54-inch-diameter offline pipes, with a total length of 151 feet, and is described in Section 4.3.2. After CSO Facility #10 storage fills to capacity, flows are released to Lake Washington via the overflow weir at NPDES 42 (MH 060W-052). See Figure 4-3 for a map of CSO Facility #10.

The stage-discharge curve is created using flow measurements from the downstream monitor in MH 060W-014 and differential head between 060W-014 and 060W-052 (see Figures 4-4 and 4-5, and Table 4-3). The monitor 060W-052 is a permanent monitor, with a secondary purpose for the stage-discharge calculation. The velocity (and thus flow) tended to drop out during storm events at 060W-052, forcing the use of flow measurements from the downstream monitor. Flow measurements at 060W-014 were affected by changing silt conditions and flow in the monitored pipe being overpowered by flow from the Lake Line (flow from Lake Line was not monitored at this MH). Comparison of hydraulic grade line between the two sites showed that head was sometimes higher downstream than upstream, resulting in reverse (or "negative") flow, and indicated a downstream Lake Line Restriction (see Section 4.6.2). The sensors at 060W-014 were configured to measure negative velocity. However, the negative velocity readings from this site were not positively confirmed in the field, and were determined to be caused by eddies crossing the sensor. Despite somewhat inconsistent flow data at 060W-014, these data were more consistent and reliable than flow data at 060W-052, and were used for stage discharge calculations. CSO Facility #10 is inspected every 3 months, and cleaned when necessary. The cleaning dates during the monitoring period are the following:

- July 23, 2008
- October 21, 2008
- April 7, 2009 (included CCTV)
- June 23, 2009

4.2.3 NPDES Basin 40, MH ID 059-490, CSO Facility #11

The hydrobrake located in MH 059-490 slows flow from NPDES Basin 40 into NPDES Basin 41B and the Lake Line. This flow backs up into CSO Facility #11 storage, which consists of 218 feet of 84-inch-diameter inline pipe, and is described in Section 4.3.3. See Figure 4-6 for a map of CSO Facility #11.

The hydrobrake located in MH 059-490 slows flow from NPDES Basin 40 into NPDES Basin 41B and the Lake Line. This flow backs up into CSO Facility #11 storage, which consists of 218 feet of 84-inch-diameter inline pipe, and is described in Section 4.3.3. After the CSO Facility #11 storage fills to capacity, flows are released over the double-sided suspended "half-pipe" weir at NPDES 40 (MH 059-491) into the drainage system and out to Lake Washington.

The stage-discharge curve is created using flow measurements from the downstream monitor in MH 059-407 and differential head between 059-407 and 059-490 (see Figure 4-7 and Table 4-4).

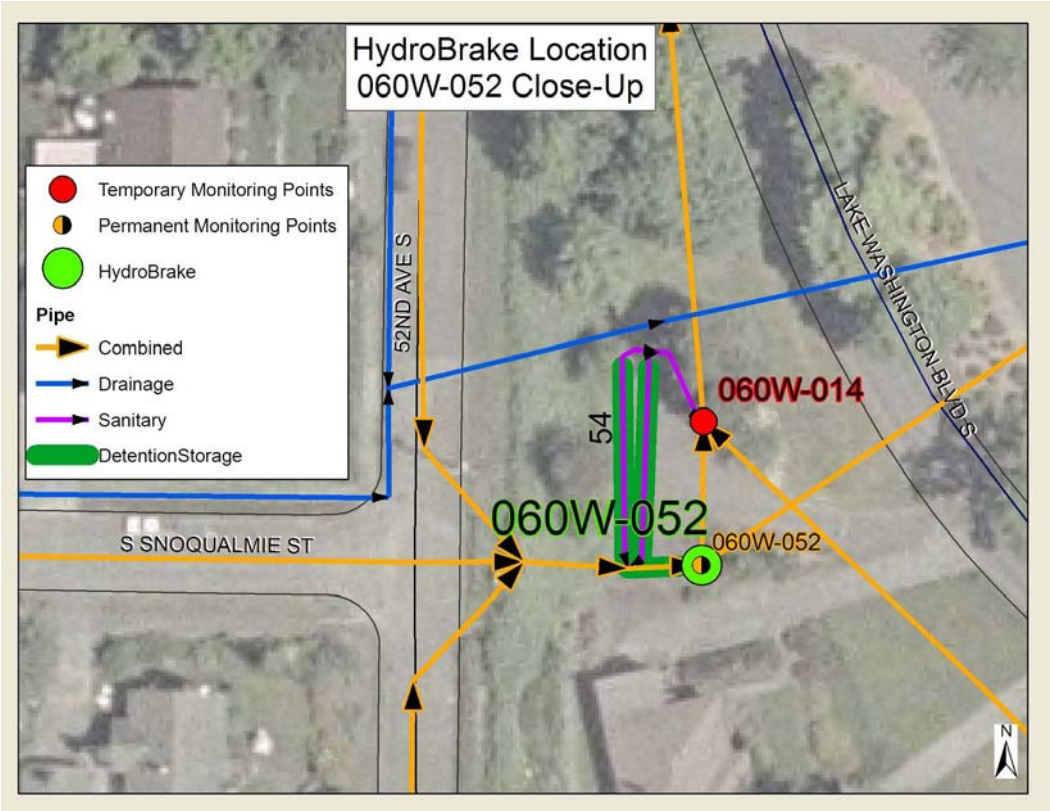


FIGURE 4-3: CSO FACILITY #10 MAP
Map showing CSO Facility #10, including storage, hydrobrake, and overflow weir (permanent monitoring point 060W-052)

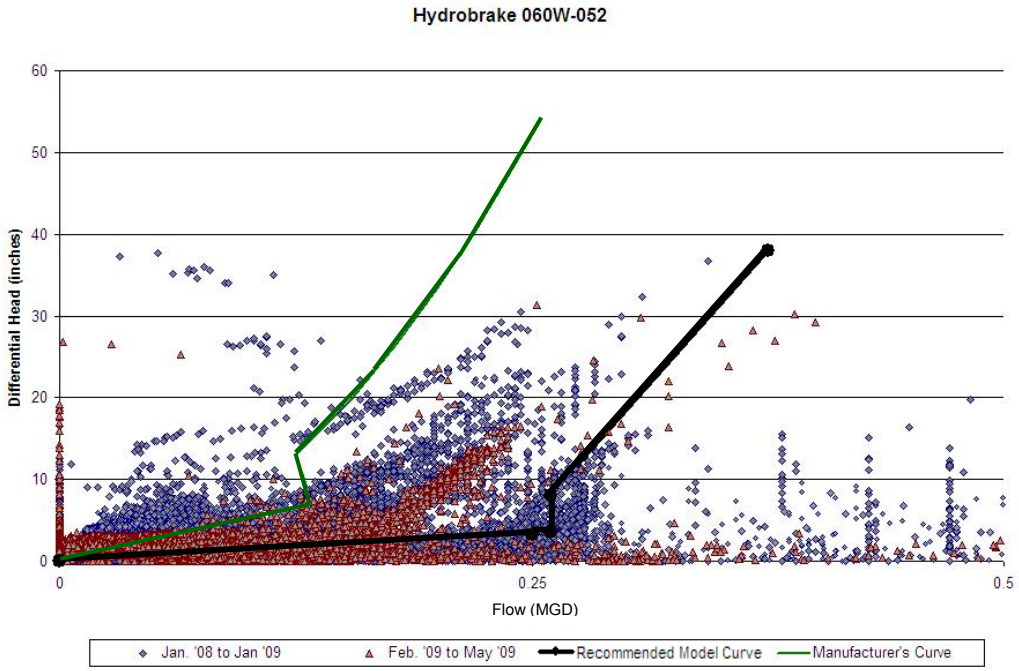


FIGURE 4-4: CSO FACILITY #10 STAGE-DISCHARGE CURVE
Hydrobrake stage-discharge curve for CSO Facility #10, hydrobrake at MH 060W-052

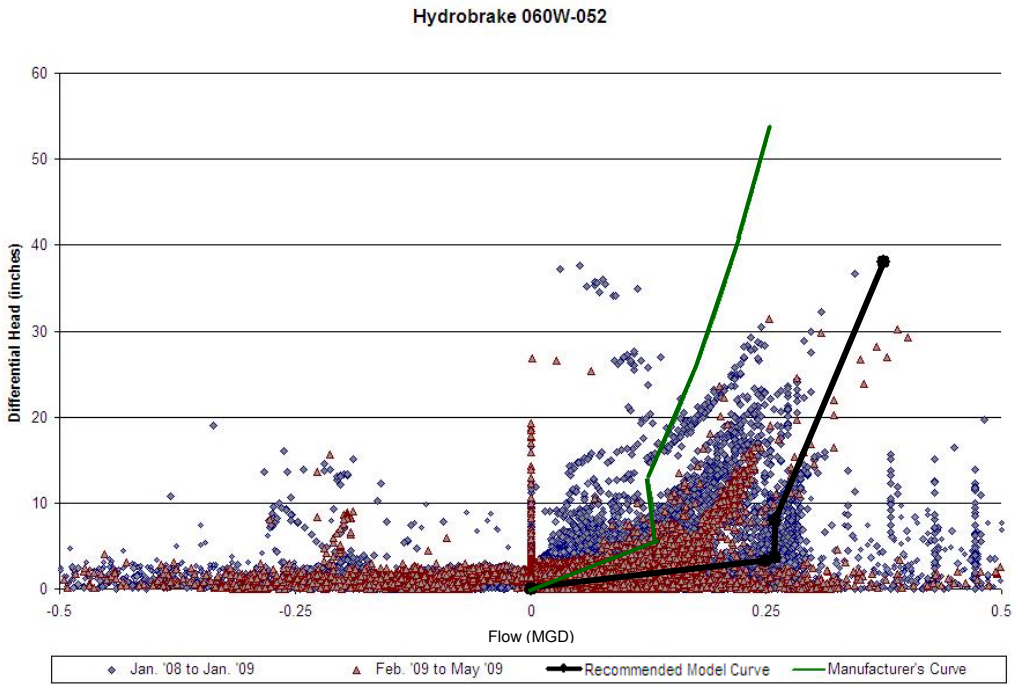


FIGURE 4-5: CSO FACILITY #10 STAGE-DISCHARGE CURVE
Hydrobrake stage-discharge curve for CSO Facility #10, hydrobrake at MH 060W-052. Reverse (or "negative") flow is shown. Reverse flow is determined by downstream head being higher than upstream head.

TABLE 4-3: CSO FACILITY #10 STAGE-DISCHARGE CURVE
Points defining the manufacturer's and recommended model stage-discharge curve for the hydrobrake in CSO Facility #10, hydrobrake at MH 060W-052

Manufacturer's Curve		Recommended Model Curve	
Differential Head (inch)	**Flow (mgd)**	**Differential Head (inch)**	**Flow (mgd)**
0.0	0.00	0.0	0.00
6.1	0.14	3.3	0.25
13.0	0.12	3.6	0.26
19.8	0.15	8.0	0.26
26.6	0.18	38.0	0.38
33.5	0.20		
40.3	0.22		
47.1	0.24		
53.9	0.25		

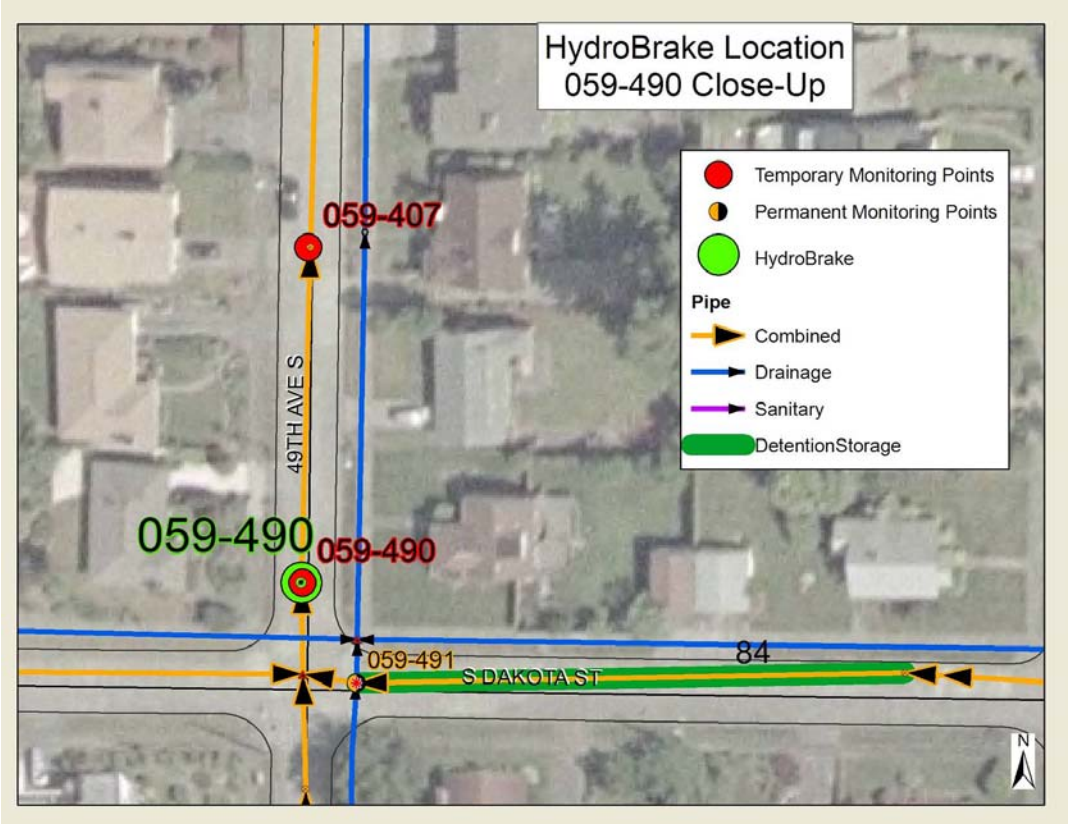


FIGURE 4-6: CSO FACILITY #11 MAP
Map showing CSO Facility #11, including storage, hydrobrake, and overflow weir (permanent monitoring point 059-491)

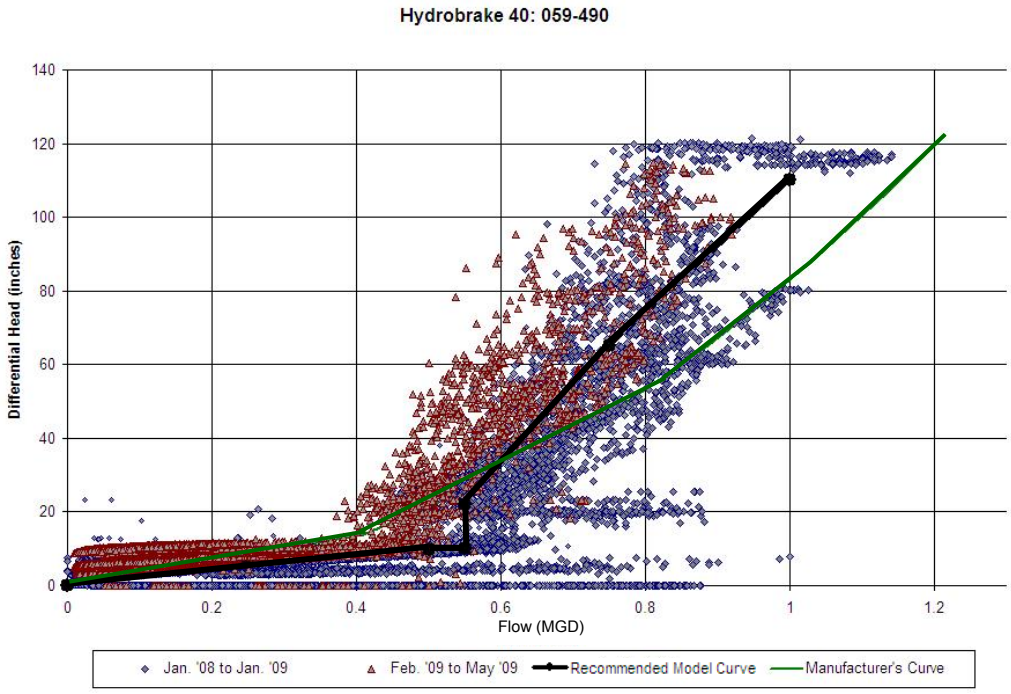


FIGURE 4-7: CSO FACILITY #11 STAGE-DISCHARGE CURVE
Hydrobrake stage-discharge curve for CSO Facility #11, hydrobrake at MH 059-490

TABLE 4-4: CSO FACILITY #11 STAGE-DISCHARGE CURVE
Points defining the manufacturer's and recommended model stage-discharge curve for the hydrobrake in CSO Facility #11, hydrobrake at MH 059-490

Manufacturer's Curve		Recommended Model Curve	
Differential Head (inch)	Flow (mgd)	Differential Head (inch)	Flow (mgd)
0	0	0	0
13.95	0.41	7	0.25
29.45	0.60	9.8	0.5
44.95	0.74	10	0.55
60.45	0.85	22	0.55
75.94	0.96	65	0.75
91.44	1.05	110	1
106.94	1.13		
122.44	1.21		

Two sets of sensors are placed at 059-490, with the second set (MP2) consisting of an elevated ultrasonic sensor placed much higher in the MH chamber to capture surcharged levels upstream of the hydrobrake during storm events. As with other hydrobrake upstream sites, velocity at 059-490 typically drops out during storm events, so flow from the downstream monitor was used. The flow at the downstream monitor (059-407) experienced occasional instances of imbalance with downstream sites, but was used because it was more reliable than flows at the upstream site. CSO Facility #11 is inspected every 3 months, and cleaned when necessary. The cleaning dates during the monitoring period are the following:

- January 8, 2008
- June 25, 2008
- July 9, 2008
- March 10, 2009

4.2.4 NPDES Basin 38, MH ID 059-498, CSO Facility #12

The hydrobrake located in MH 059-498 slows flow from NPDES Basin 38 before it passes the horseshoe weir, enters the grit chamber, and flows into the Hanford Street Trunk B. This flow backs up into CSO Facility #12 storage, which consists of 2,568 feet of 72-inch-diameter and 1,177 feet of 48-inch-diameter inline pipe, and is described in Section 4.3.4. After the CSO Facility #12 fills to capacity, flows are released over the 52.5-inch-tall weir over the hydrobrake. See Figure 4-8 for a map of CSO Facility #12.

The stage discharge curve is created using flow measurements from the upstream monitor in MH 059-498 (also identified as MH 059-498A), and differential head between 059-498 and 059-451 (see Figure 4-9 and Table 4-5). Flow is used from the upstream monitor, as opposed to the downstream monitor as with the other three hydrobrakes, because of unrealistically high depth and flow measurements at 059-451. These high depth measurements were caused by ultrasonic sensor interference because the sensor was placed too close to the

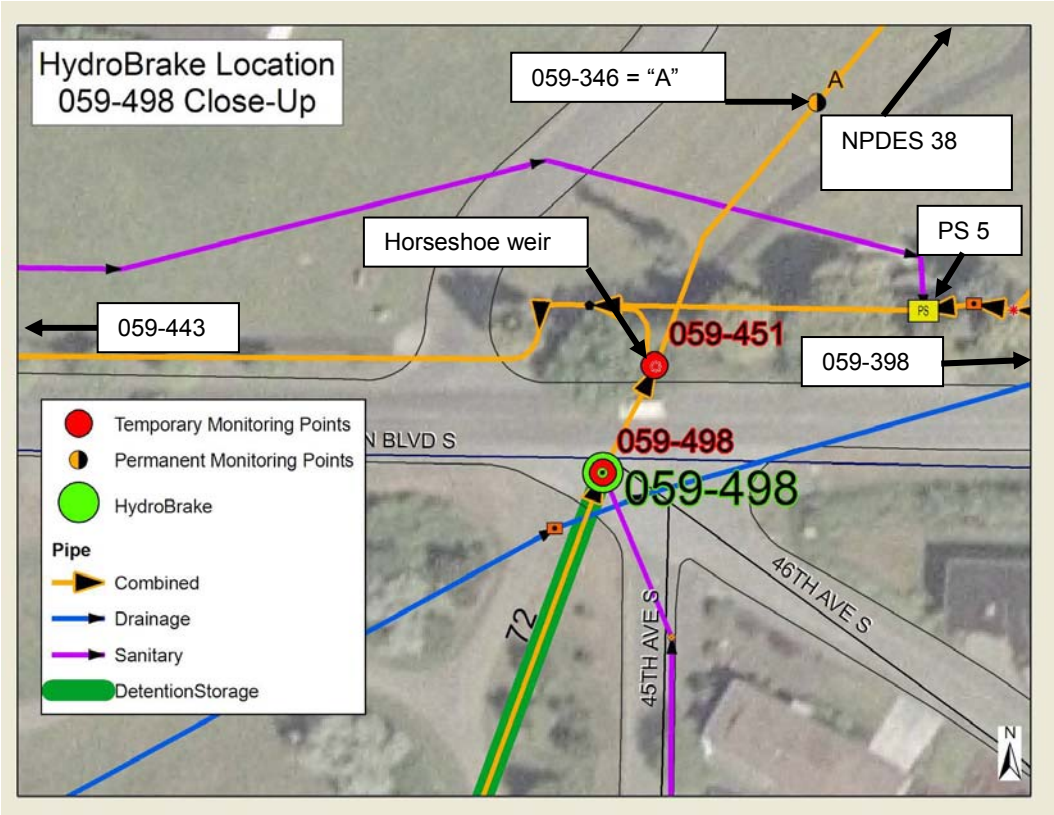


FIGURE 4-8: CSO FACILITY #12 MAP
Map showing CSO Facility #12, including storage, hydrobrake, and overflow weir (permanent monitoring point 059-346)

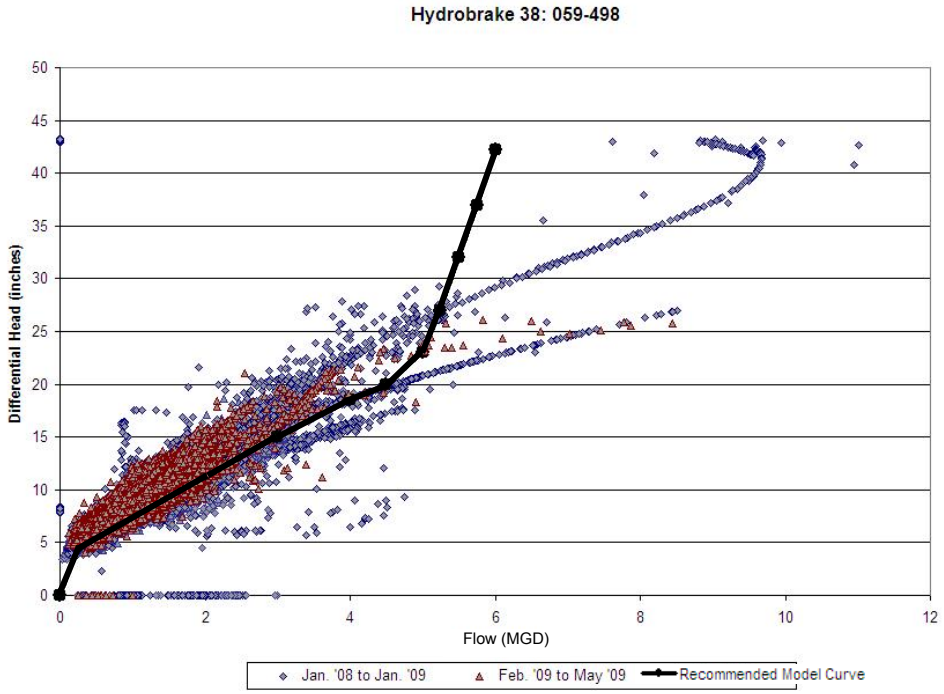


FIGURE 4-9: CSO FACILITY #12 STAGE-DISCHARGE CURVE
Hydrobrake stage-discharge curve for CSO Facility #12, hydrobrake at MH 060W-498

TABLE 4-5: CSO FACILITY #12 STAGE-DISCHARGE CURVE
Points defining the manufacturer's and recommended model stage-discharge curve for the hydrobrake in CSO Facility #12, hydrobrake at MH 059-498

Manufacturer's Curve		Recommended Model Curve	
Differential Head (inch)	**Flow (mgd)**	**Differential Head (inch)**	**Flow (mgd)**
A manufacturer's stage-discharge curve is not available for the hydrobrake in NPDES Basin 38, in MH 059-498		0	0
		4.7	0.25
		8	1
		11.5	2
		15	3
		18.5	4
		20	4.5
		23	5
		27	5.25
		32	5.5
		37	5.75
		42.2	6

hydrobrake. The monitoring configuration was adjusted in December, 2008, to be out of the interference influence of the hydrobrake. The manufacturer's stage-discharge curve is not available for this specific hydrobrake, highlighting the need to create one based on monitored data. This hydrobrake is minimally restrictive, rarely restricting flows or backing up into the Facility #12 storage. Nearly all the data points making up the high end of the stage-discharge curve have been reconstituted, resulting in lower confidence for this portion of the curve. The reconstituted points at the highest end of the stage-discharge curve with differential head up to 44 inches are associated with depths of 56.89 inches at 059-498. These high depths are up to 4.38 inches above the surveyed weir height, indicating flow over the hydrobrake weir on January 7, 2009, at 20:45. Unless downstream head can be decreased during future events, it is unlikely that any additional differential head can be achieved at this hydrobrake. Because the model curve had been defined by reconstituted data, the curve has been set to start restricting flows at approximately 5 mgd, after which most data points are reconstituted. The two monitors used for this hydrobrake will remain beyond Phase II in order to better define the stage-discharge curve, especially in the high differential head region of the curve. The cleaning dates during the monitoring period are the following:

- February 4, 2008
- March 9, 2009
- April 29, 2009

4.3 Storage Utilization at CSO Facilities

Each of the four CSO Facilities in the Genesee Area consists of a hydrobrake (see Section 4.2) and an associated storage volume. The hydrobrakes are designed to maximize the efficiency of these storage facilities prior to CSO overflow, effectively reducing the occurrence and volume of these overflows. See Figure 4-10 for schematic diagrams of each of the storage facilities. Close-up maps showing the location of the storage relative to hydrobrakes and weirs can be found in Section 4.2.

Each of these storage facilities has a monitor located in the downstream MH. The purpose of this monitor is to provide depth measurements upstream of the hydrobrake and to indicate the depth to which the storage is filled. An overflow weir controls the maximum depth to which the storage can be filled. The volume of the portion of the storage tank that fills below the overflow weir is known as the "active volume" (see Figure 4-11). The percentage of flow depth relative the maximum depth of the active volume is referred to as "Percent Active Storage Depth Utilized" (also known as "storage utilization"), and is reported for the major storms at each of the storage facilities in the sections below. This value is related to the volume of active storage filled, but is different in that Percent Active Storage Depth Utilized does not account for the circular shape of the pipe. Because of this, Percent Active Storage Depth Utilized does not equal percent pipe full based on cross-sectional area.

4.3.1 NPDES Basin 43, CSO Facility #9

Storage Facility #9, located in NPDES Basin 43, is controlled by the hydrobrake at MH 060W-047 and the weir in MH 060W-049. According to the SPU Survey in March, 2009, the weir crest in 060W-049 has an elevation of 44.48 feet (NAVD 88), or 133 inches above the flow monitoring sensor at 060W-047. The active storage is completely utilized prior to overflows at NPDES 43 (see Figure 4-12). Raising the weir at 060W-049 would allow more of the storage volume to become active storage, but may have other upstream consequences. As discussed in Section 4.2.1, the hydrobrake controlling this storage facility has a varying stage-discharge relationship where it is more restrictive for smaller storms and less restrictive for larger storms.

4.3.2 NPDES Basin 42, CSO Facility #10

CSO Facility #10 is controlled by the hydrobrake and weir, both located at MH 060W-052. The storage consists of dual, 54-inch offline pipes that are separated from the main line by a storage weir (elevation 29.67 feet, NAVD 88, according to the March, 2009 SPU Survey) and whose flow is released through a flap gate under the weir. A valve at the upstream end of the offline storage pipes allows the facility to drain and is typically closed. The 54-inch storage fills completely before flows go over the crest of the main weir in MH 060W-052 with an elevation of 30.19 (NAVD 88), or 63 inches above the flow monitoring sensor in 060W-052 (see Figure 4-13).

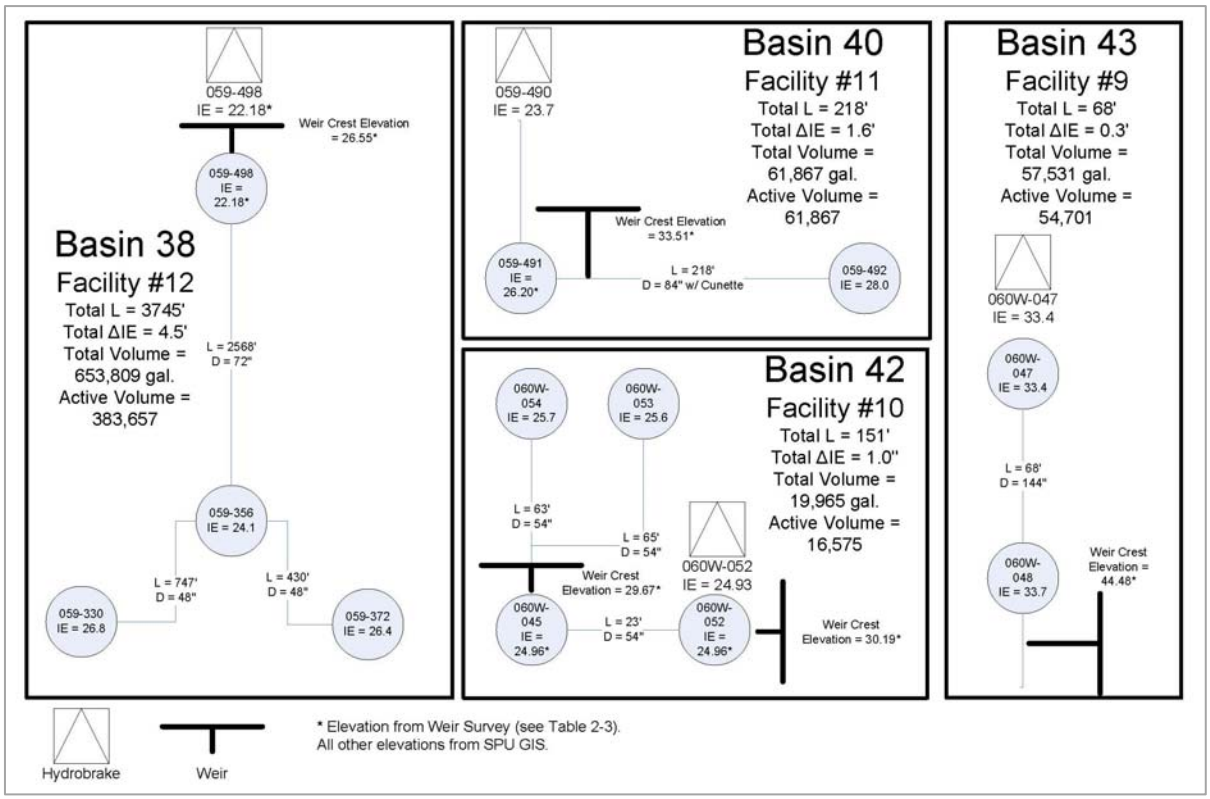


FIGURE 4-10: STORAGE FACILITIES IN THE GENESEE AREA

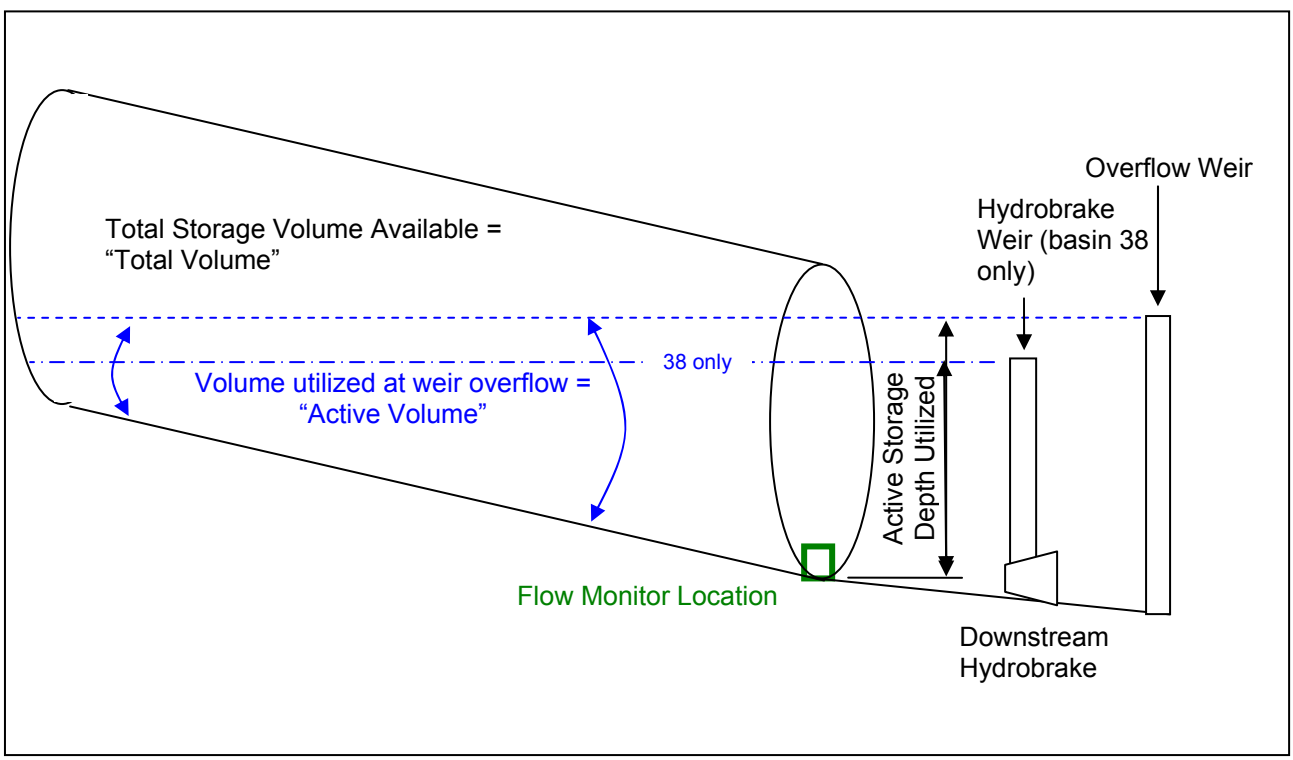


FIGURE 4-11: MEASUREMENT OF ACTIVE STORAGE DEPTH UTILIZED

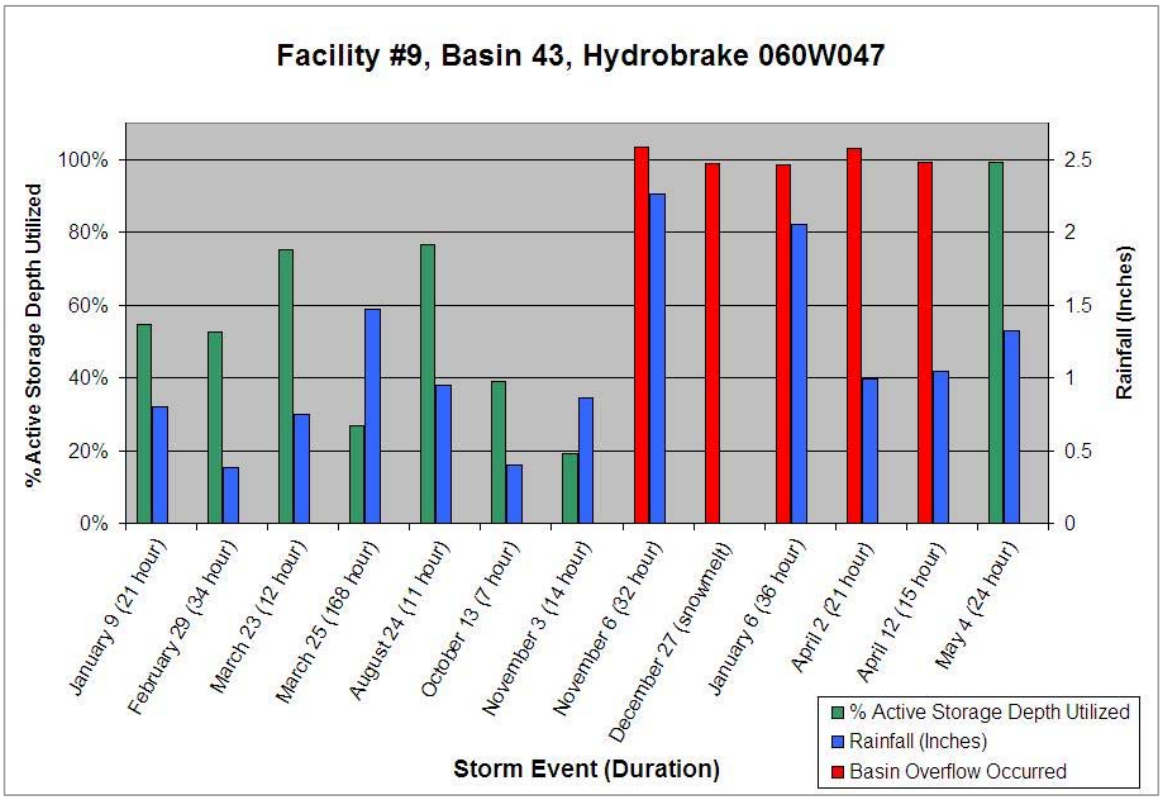


FIGURE 4-12: CSO FACILITY #9 STORAGE
Active Storage Depth Utilized for CSO Facility #9

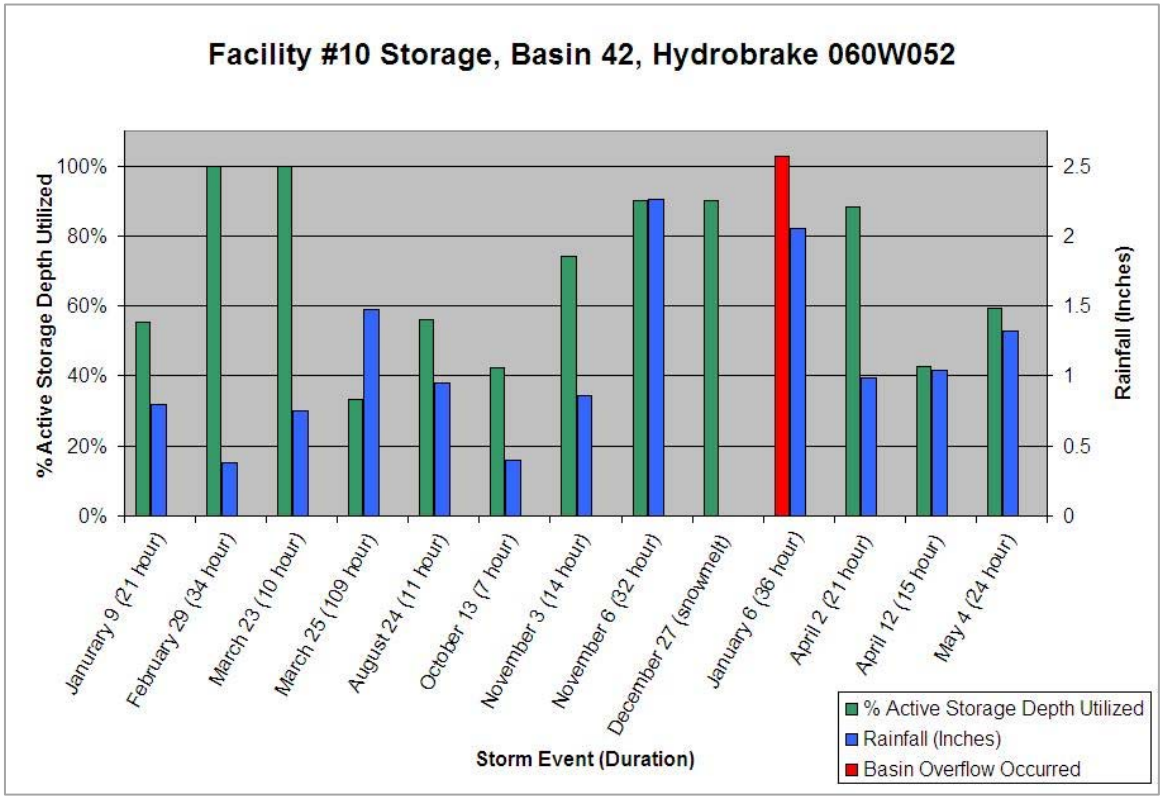


FIGURE 4-13: CSO FACILITY #10 STORAGE
Active Storage Depth Utilized for CSO Facility #10

4.3.3 NPDES Basin 40, CSO Facility #11

CSO Facility #11 is controlled by a hydrobrake in MH 059-490, two MHs downstream of the storage tank, and by a weir in MH 059-491. The weir in MH 059-491 is a raised half-pipe storm drain line flowing perpendicular to the CSO line. Active Storage Depth Utilized is measured by the permanent monitor located in 059-491. The crest of the weir has an elevation of 33.51 feet (NAVD 88), or 103.2 inches above the flow monitoring sensor in 059-490. The storage in this facility is completely utilized prior to NPDES Basin 40 overflow (see Figure 4-14).

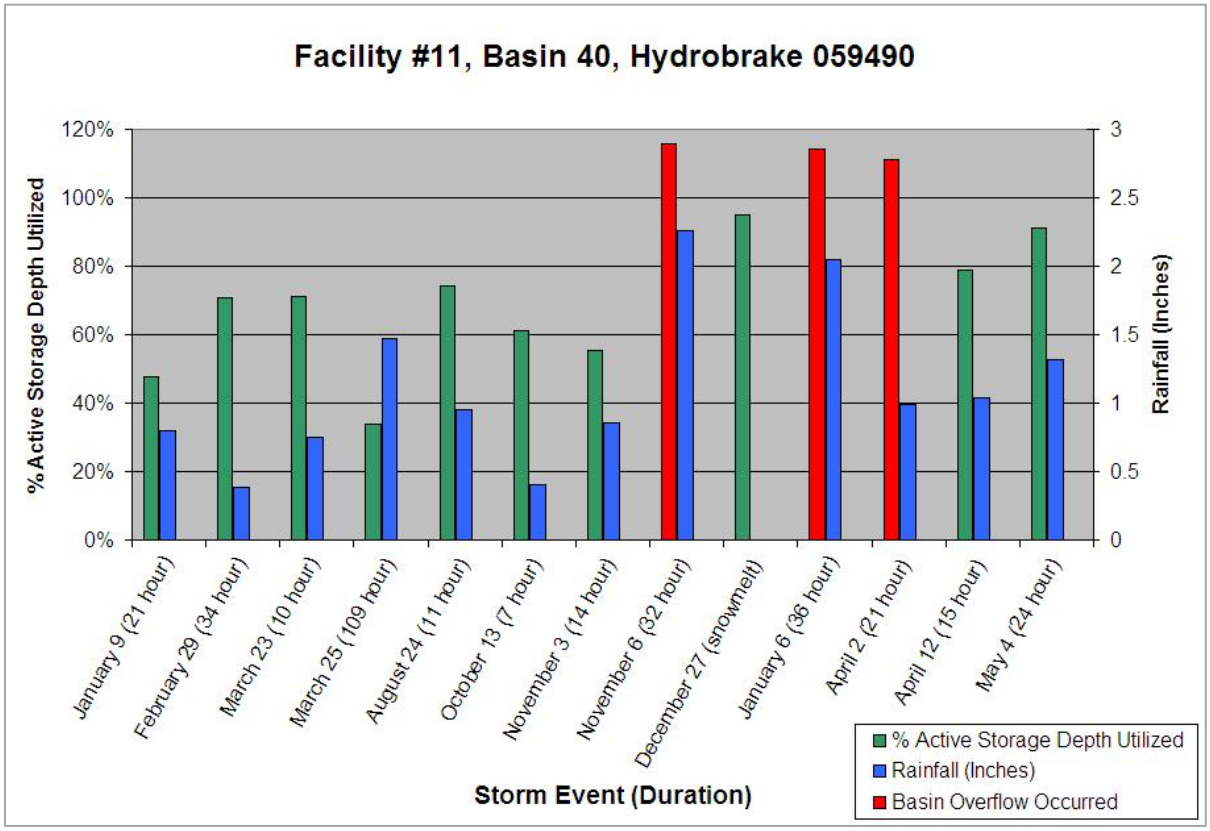


FIGURE 4-14: CSO FACILITY #11 STORAGE
Active Storage Depth Utilized for CSO Facility #11

4.3.4 NPDES Basin 38, CSO Facility #12

CSO Facility #12 is the largest of the storage facilities in the Genesee Area. This inline storage is controlled by the hydrobrake in MH 059-498 and a storage overflow weir above the hydrobrake. Flows normally flow through the hydrobrake and high-flow over the hydrobrake storage overflow weir, and flow downstream to the horseshoe weir in MH 059-451. The storage overflow weir crest has a height of 52.4 inches (elevation of 26.55 feet, NAVD 88) that corresponds to 73% of the 72-inch storage pipe. Flows over this weir do not necessarily constitute a CSO overflow. For a NPDES 38 CSO overflow to occur, flows would need to go over an additional three weirs (the horseshoe weir in 059-451, and two weirs in 059-574/059-342). Thus, the active volume is only 58% of the total storage volume (see Figure 4-11).

Depths at MH 059-498 exceeded the 52.45-inch weir height once during the monitoring period, at 20:45 on January 7, 2009, indicating flow over the hydrobrake weir. At this point, 100% of the active storage was utilized (see Figure 4-15).

The CSO Facility #12 Active Storage Depth Utilized is rarely above 60%. The unused storage in this facility may provide an opportunity for reducing other nearby NPDES Basin CSO frequencies. In addition, raising the weir at the hydrobrake in MH 059-498 could convert more of the total storage to active storage, but may have other upstream consequences.

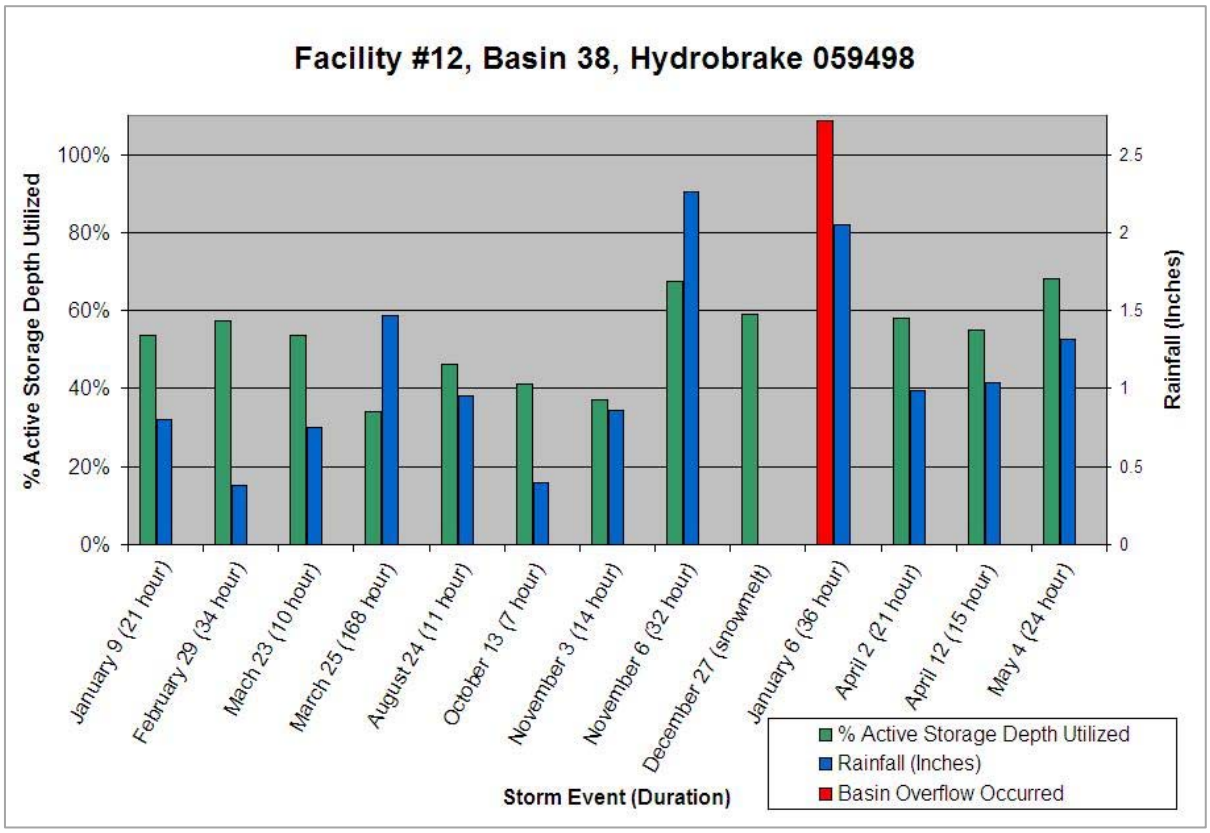


FIGURE 4-15: CSO FACILITY #12 STORAGE
Active Storage Depth Utilized for CSO Facility #12.

4.4 Pump Station Operation

Pump station capacity was measured using draw-down tests conducted by CH2M HILL and SPU on June 18, 2007.

4.4.1 Pump Station #5

Pump Station #5 is located in NPDES Basin 38, just north of Lake Washington Boulevard S at 46th Avenue S. It pumps flows from a portion of NPDES Basin 38 (formerly NPDES Basin 39), and NPDES Basins 40, 41, 42, 43, and 165. In addition to lifting flows from these NPDES Basins, Pump Station #5 pumps flows from NPDES Basin 38 that flow over the horseshoe weir, and either through the pinch valve under the first weir in Structure A at NPDES 38 or flow over the first weir at NPDES 38 (see NPDES38 059-451 "A" in Appendix A for a detailed drawing of "Structure A"). Data from monitor 059-398, just upstream from the

monitor on the Lake Line, indicate that during very high flows Pump Station #5 does not have capacity to pump peak flows, and flow backs up into the Lake Line. Other restrictions along the Lake Line are also evident and can cause sufficient backup and an overflow at NPDES 41B prior to any backup at Pump Station #5. These restrictions are discussed in more detail in Section 4.6.2. NPDES 38 is the point of overflow for Pump Station #5. Pump Station #5 overflowed on January 7, 2009. Pump Station #5 parameters used in the model are listed in Table 4-6.

The pump station contains two pumps with a combined capacity of 2.1 mgd based on drawdown tests performed by CH2M HILL in July, 2007. All data were collected using SPU's SCADA data available at the pump station.

SCADA data collected from Pump Station #5 applicable to the model included the following: wet well communication failure, high elevation, pump 1 and 2 run status, and level. Volumes through the pump station were calculated using the pump run status along with draw-down pump capacity data. Wet well level was used predominantly to verify pump operation during model calibration. Pump Station #5 SCADA data were not used explicitly for dry or wet weather model calibration.

TABLE 4-6: PUMP STATION #5
Parameters and Sources

Parameter	Value	Source
Wet well chamber floor elevation	8.2 feet[1]	As-built drawings[2]
Wet well chamber roof elevation	29.7 feet[1]	As-built drawings[2]
Wet well plan cross-section area	179.8 SF	Draw-down test[3]
Invert elevation of incoming pipe	16.77 feet[1]	As-built drawings[2]
Exiting force main invert (equal to pump centerline)	11.92 feet[1]	As-built drawings[2]
Pump #1 start and stop elevations	Start: 14.7 feet[1,4] Stop: 10.7 feet[1,4]	SCADA data on draw-down test[3]
Pump #2 start and stop elevations	Start: 15.2 feet[1,4] Stop: 10.7 feet[1,4]	SCADA data on draw-down test[3]
Pump station type	Fixed speed	Genesee Modeling Plan
Pump capacities	#1: 1.3 mgd # 1 and #2: 2.20 mgd[5]	Draw-down test[3]
Pump station reported overflow	19.04	Station Setpoints spreadsheet from SPU

[1]NAVD88

[2]"Charlestown Street et al. – Trunk Sewer etc." Sheets 20 – 22 (10/3/1930): Vault # 777-13

[3]Pump Station #5 Draw-down Test (7/24/2007)

[4]Start and stop elevations were determined from the SCADA data that were recorded during the draw-down test for Pump Station #5. SCADA data were recorded relative to the location of the sensor, which was assumed to be positioned 6 inches above the wet well chamber floor. Therefore, start and stop elevations were calculated by taking the SCADA data reading, adding 0.5 foot, and adding the determined chamber floor elevation of 8.2 feet.

[5]For pump #2, a pump capacity of 0.9 mgd will be used in InfoWorks.

4.4.2 Pump Station #6

Pump Station #6 is located in NPDES Basin 165, southeast of Lake Washington Boulevard S between 53th Avenue S and S Alaska Way. It controls the flow from NPDES Basin 165, and can overflow during storms if the pump station is overwhelmed. NPDES 165 is the point of overflow for Pump Station #6. Pump Station #6 overflowed on January 7, 2009. NPDES 165 had a 5-minute reported overflow on March 1, 2008, that did not correspond with elevated wet well levels at Pump Station #6, and is not associated with Pump Station #6 being overwhelmed. Pump Station #6 parameters used in the model are listed in Table 4-7.

TABLE 4-7: PUMP STATION #6
Parameters and Sources

Parameter	Value	Source
Wet well chamber floor elevation	13.54 feet[1]	As-built drawings[2]
Wet well chamber roof elevation	26.23 feet[1]	As-built drawings[2]
Wet well plan cross-section area	38.5 SF	Draw-down test[3]
Invert elevation of incoming pipe	18.7 feet[1]	As-built drawings[2]
Exiting force main invert (equal to pump centerline)	14.96 feet[1]	As-built drawings[2]
Pump #1 start and stop elevations	Start: 17.79 feet[1,4] Stop: 15.69 feet[1,4]	SCADA data on draw-down test[3]
Pump #2 start and stop elevations	Start: 18.79 feet[1,4] Stop: 15.69 feet[1,4]	SCADA data on draw-down test[3]
Pump station type	Fixed speed	Genesee Modeling Plan
Pump capacities	#1: 0.41 mgd #1 and #2: 0.65 mgd[5]	Draw-down test[3]
Pump station reported overflow	15.79	Station Setpoints spreadsheet from SPU

[1]NAVD88

[2]"Alaska Street, Charles Street, and Montlake Pump Stations," sheets 1-4 (9/21/1970): Vault # 777-120

[3]Pump Station #6 Draw-down Test (7/24/2007)

[4]Start and stop elevations were determined from the SCADA data that were recorded during the draw-down test for Pump Station #6. SCADA data were recorded relative to the location of the sensor, which was assumed to be positioned 6 inches above the wet well chamber floor. Therefore, start and stop elevations were calculated by taking the SCADA data reading, adding 0.5 foot, and adding the determined chamber floor elevation of 13.54 feet.

[5]For pump #2, a pump capacity of 0.24 mgd will be used in InfoWorks.

The pump station contains two pumps with a combined capacity of 0.65 mgd based on drawdown tests performed by CH2M HILL in July, 2007. All data were collected using SPU's SCADA system installed at the pump station.

SCADA data collected from Pump Station #6 were the same as the data from #5: wet well communication failure, high elevation, pump 1 and 2 run status, and level. Volumes

through the pump station were calculated using the pump run status along with draw-down pump capacity data. Wet well level was used predominantly to verify pump operation during model calibration. Pump Station #6 SCADA data were not used explicitly for dry or wet weather model calibration.

4.4.3 Rainier Avenue Lift Station (King County)

The Rainier Avenue Lift Station is operated by King County and receives flows from all of the NPDES Basins in the Genesee Area (NPDES Basins 37, 38, 40, 41, 42, 43, and 165). The combined capacity of the three variable frequency drive pumps located in the Rainier Avenue Lift Station is not known at the time of this report; however, the highest flow seen in the SCADA data for the pump station is 11.8 mgd reported during the January, 2009 storm. All data for the pump station were gathered by the SCADA system. Rainier Avenue Lift Station parameters used in the model are listed in Table 4-8.

TABLE 4-8: RAINIER AVENUE LIFT STATION
Parameters and Sources

Parameter	Value	Source
Wet well chamber floor elevation	11.65 feet[1]	As-built drawings[2]
Wet well chamber roof elevation	22.65 feet[1]	As-built drawings[2]
Wet well plan cross-section area	81.1 SF	As-built drawings[2]
Invert elevation of incoming pipe	16.5 feet[1]	SPU GIS
Exiting force main invert (equal to pump centerline)	14.82 feet[1]	As-built drawings[2]
Pump #1 start and stop elevations	Start: 16 feet[1,3] Stop: 15.5 feet[1,3]	SCADA data
Pump #2 start and stop elevations	Start: 16.5 feet[1,3] Stop: 15.5 feet[1,3]	SCADA data
Pump #3 start and stop elevations	Start: 17 feet[1,3] Stop: 15.5 feet[1,3]	SCADA data
Pump station type	Variable Frequency Drive	Genesee Modeling Plan
Pump #1 operating parameters Nominal flow Speed (min / nominal / max) Head – discharge curve	 2.16 mgd[4] 374.5 / 535 / 588.5 rpm See in InfoWorks	 Pump Data Sheet[5] and SCADA data Pump Data Sheet[5] Pump Data Sheet[5]
Pump #2 operating parameters Nominal flow Speed (min / nominal / max) Head – discharge curve	 6.05 mgd[4] 490 / 700 / 770 rpm See in InfoWorks	 Pump Data Sheet[5] Pump Data Sheet[5] Pump Data Sheet[5]

TABLE 4-8: RAINIER AVENUE LIFT STATION
Parameters and Sources

Parameter	Value	Source
Pump #3 operating parameters		
Nominal flow	6.48 mgd[4]	Pump Data Sheet[5]
Speed (min / nominal / max)	490 / 700 / 770 rpm	Pump Data Sheet[5]
Head – discharge curve	See in InfoWorks	Pump Data Sheet[5]

[1]NAVD88

[2]"Modernization, Rainier Avenue Pumping Station," Sheets 19 – 22 (4/1973): from King County

[3]Start and stop elevations were determined by analyzing Rainier Avenue Lift Station SCADA data. The SCADA data were not conclusive on the start elevations of pumps #2 and #3, and it was assumed that they turned on 0.5 and 1.0 foot above pump #1, respectively. SCADA data confirmed the operating capacity of pump #1 at 2.16 mgd, but there was insufficient data to confirm the operating capacities of pumps #2 and #3. SCADA data were available from 1/1/2008 to 3/1/2008. The maximum flow seen in the SCADA data were 5.21 mgd, the typical maximum flow was approximately 3.2 mgd, and the minimum flow was 1.86 mgd. The SCADA data for the Rainier Avenue Lift Station was in Metro datum elevations, which were converted to NAVD88 by subtracting 106.05 feet to convert it to old City of Seattle datum, and then adding 9.7 feet to convert it into NAVD88.

[4]Individual pump capacities are based on manufacturer pump curves. Pump curve for each is entered into model.

[5]Pump data sheet from Aurora Pumps (10/27/2000). Minimum and maximum speeds determined by taking 70% and 110% of nominal speed from pump data sheet, respectively.

SCADA data received for the Rainier Avenue Lift Station included the following: pump station total flow, wet well A level, and wet well B level. The levels in wet wells A and B were effectively the same. Readme files accompanying the data indicate that quality control procedures have not been performed on these data. However, the data appeared to be repeatable and consistent, and were used for both model pump configuration and wet weather initial calibration. Limitations to using these and other non-reviewed data are discussed in Section 2.4. Additional information about the Rainier Avenue Lift Station can be found in *Offsite Facilities and Miscellaneous Structures Manual, Volume 2, West Division* (Municipality of Metropolitan Seattle 1993).

4.5 Flow Balancing

Flow balancing is a method of checking flow monitoring data, and was performed on data from the Genesee Area multiple times during Phase I of data collection. Flow balancing consists of comparing flows between upstream and downstream monitors. Assuming that mass (and thus flow volume) are conserved, the sum of the flows at upstream meters should be less than or equal to the flow at a downstream meter. With suitable flow data, periods of imbalance, where downstream flow is greater than upstream flow, should be short and infrequent. Flow imbalances may be an indication of a monitor being in the wrong pipe, unaccounted for losses between upstream and downstream monitors, monitor bias, and other inconsistencies with the monitoring data. Flow imbalances serve as a red flag to direct more extensive reviews.

Flow balance analysis is performed and averaged over sufficiently long durations as to cancel out any effects of travel time. The Sliicer software tool published by ADS was used to perform this analysis on monitors within the ADS monitoring system. Inclusion of other

flows, such as those from King County, the RainCatchers Program, or SCADA data were performed using Microsoft Excel.

Initial flow balancing, performed after the first month of data collection, resulted in three sites that showed significant imbalance with upstream sites: 059-398, 060W-014, and 059-406 (see Figures 4-16 through 4-18). An example of a balanced site can been found in Figure 4-19, for MH 060W-012. Sites with imbalance issues were flagged for follow-up by the flow monitoring contractor and by the data screeners. Where possible, the cause of the imbalance was identified and the problem resolved. Flow balancing was performed at multiple stages in the monitoring period as part of CH2M HILL's review process. In addition to the flow balancing performed as part of CH2M HILL's QA/QC process, ADS performed flow balancing as part of the data finalization process. In many cases, flow imbalances disappeared after data had been finalized. Unresolved flow balance issues are one of the factors taken into account in the data suitability evaluation presented in Table 2-1 and Table 3-2. Instances of imbalance are noted in the "Data Suitability Notes" column of Table 2-1. Overall data suitability is a predominant factor in the determination of monitors recommended for model calibration (Table 5-1). Imbalance issues at 059-398 were identified early in the monitoring period, but became less of an issue as monitoring continued due to refinements made to both the upstream monitors and 059-398. Most remaining imbalance issues were resolved during data finalization.

Mass balance problems at 060W-014 were associated with velocity dropouts at the upstream monitor, 060W-052 during hydrobrake activation. For this reason, WWF velocity data at 060W-052 were considered unsuitable for modeling in Table 2-1 and Table 3-2, and flow data at this location are not recommended for model calibration (Table 5-1).

In the case of the imbalance at 059-406, additional flow confirmations performed as a result of the initial mass balance check resulted in a change in the velocity sensor gain (the relationship between peak and average velocity). This helped fix much of the imbalance problem. Additional review determined that inaccurate flows at the upstream monitor, 059-407, caused by influence from the NPDES Basin 40 hydrobrake, resulted in imbalance at 059-406. For this reason, data from 059-407 have been recommended for hydrobrake stage-discharge curve development only.

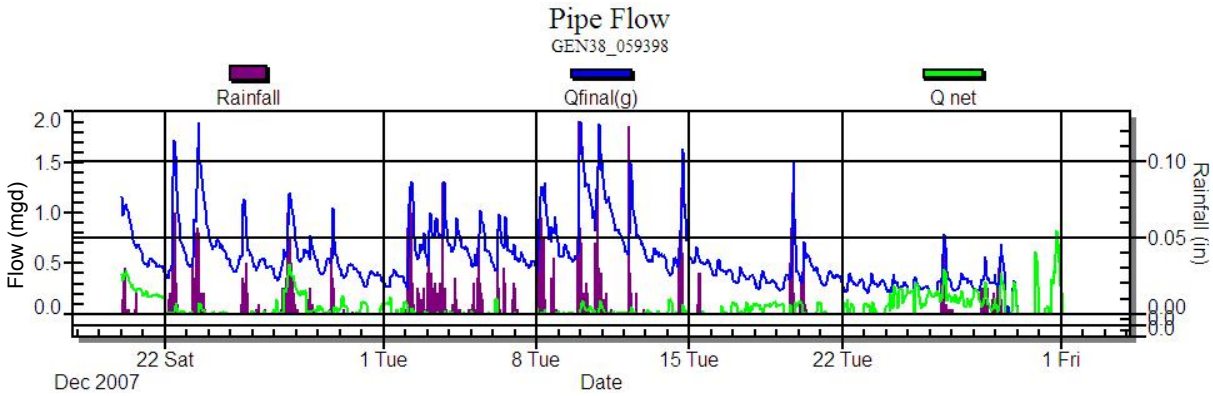


FIGURE 4-16: 059-398 MASS BALANCE
Flow Balance for 059-398 shows minor imbalance, indicated by Q net dropping below 0 mgd during some rainfall events.

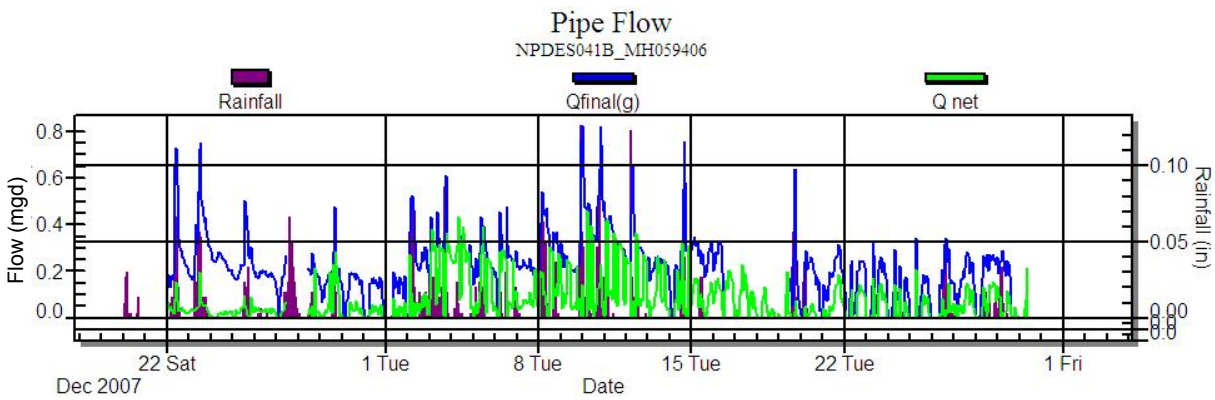


FIGURE 4-17: 059-406 MASS BALANCE
Flow Balance for 059-406 shows minor imbalance, indicated by Q net dropping below 0 mgd during some rainfall events.

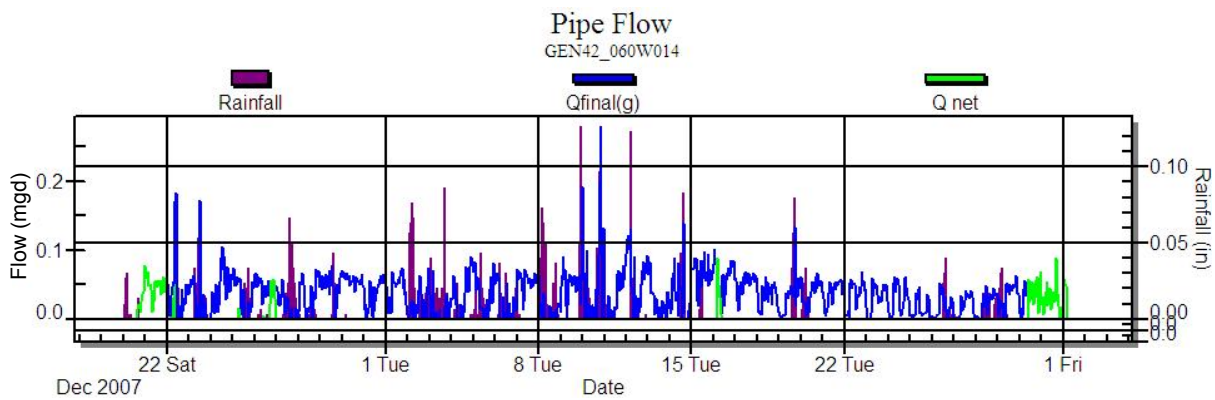


FIGURE 4-18: 060W-014 MASS BALANCE
Flow Balance for 060W-014 shows moderate imbalance, indicated by Q net dropping below 0 mgd during some rainfall events.

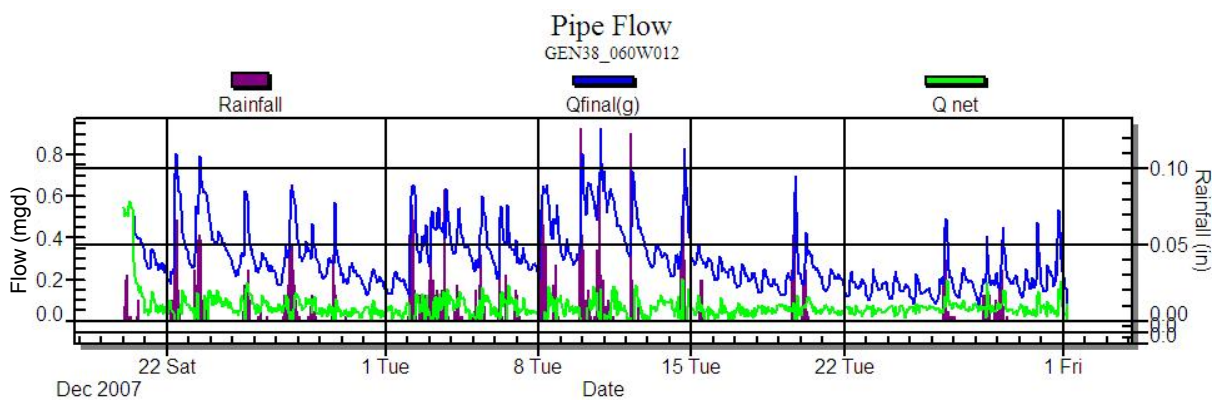
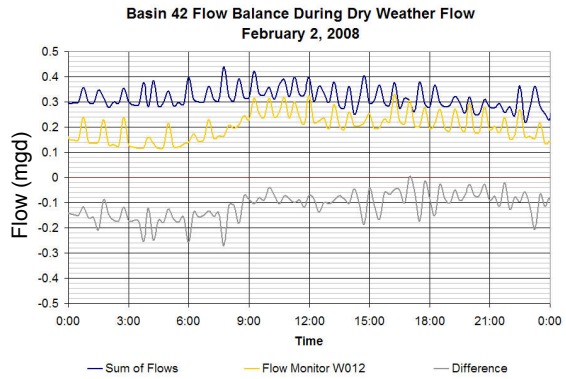


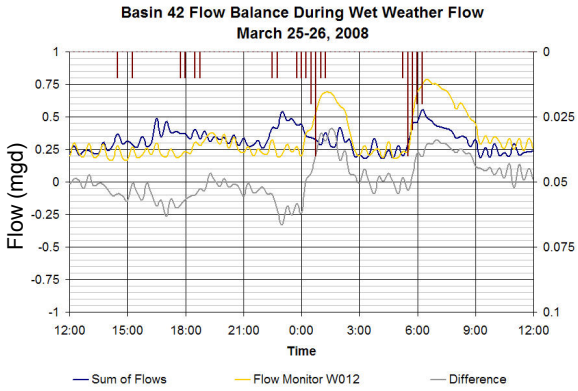
FIGURE 4-19: 060W-012 MASS BALANCE
Flow Balance for 060W-012 shows a fully balanced site indicated by positive Q net at all times.

Additional flow balancing was performed around the pump stations using spreadsheet graphing and through compiling total flow volumes from an example dry day (February 2, 2008) and an example wet period (March 25 and 26, 2008) in Figures 4-20 and 4-21.



Monitor	Volume (MG) 2-Feb-08
GEN42_060W019*	0.24
GEN42_060W014*	0.06
SPU PS#6***	0.02
Sum	0.32
GEN42_060W012*	0.24
Difference	-0.07

*Data from Flowview
**Data from SPU



Monitor	Volume (MG) 25-Mar-08
GEN42_060W019*	0.18
GEN42_060W014*	0.11
SPU PS#6***	0.03
Sum	0.32
GEN42_060W012*	0.34
Difference	0.02

*Data from Flowview
**Data from SPU

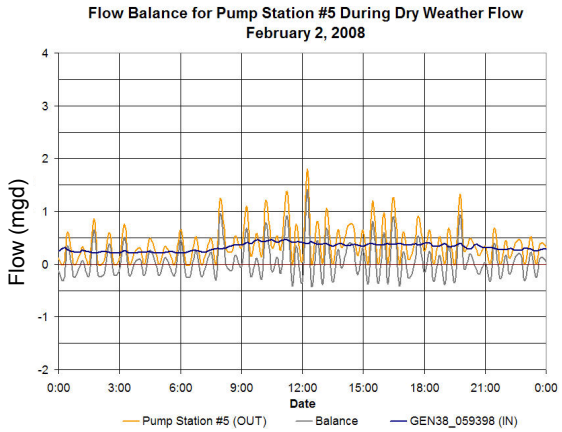
FIGURE 4-20: PUMP STATION #6 MASS BALANCE
Flow Balance for 060W-012, including flows from Pump Station #6 SCADA data, from an example dry day (February 2, 2008) and an example wet weather period (March 25 and 26, 2008). The negative difference during the dry weather period indicates an imbalance. The data during the wet weather period indicate balanced monitoring.

4.6 System Characterization Observations

4.6.1 NPDES 38 Overflow during January, 2009 Storm Event

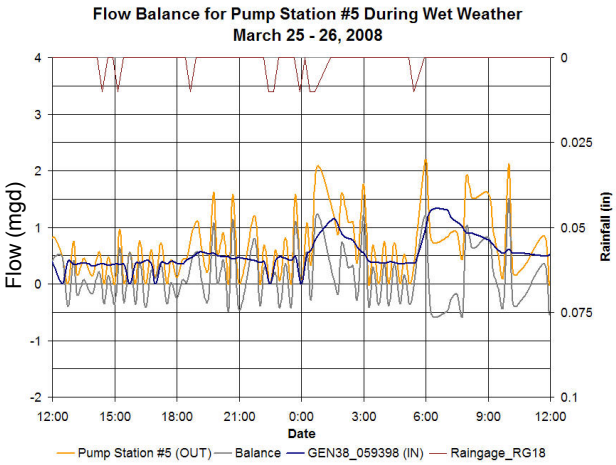
A 2.05-inch, 1-year storm on January 6, 2009, caused six separate CSO events, including the only overflow event at NPDES 38 during the monitoring period. While other 1-year storms have occurred during the monitoring period, this one had significant antecedent moisture conditions as a result of a 0.91-inch, 9-month storm on January 4, 2009, and snowmelt from late December, 2008. This was the only event in which the storage facility at 059-346 (also called "Structure A") was activated, and was thus subject to additional flow monitoring data analysis. Figure 4-22 shows monitored water elevations at six locations around this site, and helps show both the timing and interrelation of events. A close-up map of these locations can be found in Figure 4-8.

The cause of the January 7, 2009, overflow in NPDES Basin 38 was determined to be primarily backup from Lift Station #5, which was running at full capacity, with a smaller contribution by flows over the horseshoe weir at MH 059-451. Flows over the horseshoe weir were determined to be caused by a restriction between 059-443 and 059-451 and by the



Monitor	Volume (MG) 2-Feb-08
GEN38_059398*	0.32
NPDES038_MH059451**	N/A
Sum	0.32
SPU PS#5***	0.37
Difference	0.05

*Data from Flowview
**Data from Intelliserve
***Data from SPU



Monitor	Volume (MG) 25-Mar-08
GEN38_059398*	0.54
NPDES038_MH059451**	N/A
Sum	0.54
SPU PS#5***	0.53
Difference	-0.01

*Data from Flowview
**Data from Intelliserve
***Data from SPU

FIGURE 4-21: PUMP STATION #5 MASS BALANCE
Flow Balance at Pump Station #5 from an example dry day (February 2, 2008) and an example wet weather period (March 25 and 26, 2008). The negative difference during the wet weather period indicates a small imbalance. The data during the dry weather period indicates balanced monitoring.

filling of storage filling of storage in CSO Facility #12 above the capacity controlled by the weir above the hydrobrake at MH 059-498.

Monitor 059-346 reported 100% uptime during the early January wet weather event, and showed no flow during this time. A field visit by SPU and HDR after the January event observed high depths in the chamber upstream of the weir in Structure A, indicating that depth over the sensors 059-346 occurred. ADS diagnostic testing shows that the monitor was working correctly at the beginning of January and reported that the monitor data are correct. ADS maintenance on 059-346 in late January discovered large chunks of greasy debris, evidence of prior flow in that chamber. The team concluded, based on depth data at 059-451, the height of the horseshoe weir, and the SPU and HDR field visit, that flow in the storage tank upstream of Structure A did occur during the early January wet weather event.

The elevation and timing of flows were compared during the January event for the following points: 059-498 (upstream of the hydrobrake and hydrobrake weir in NPDES Basin 38); 059-451 (downstream of the hydrobrake in NPDES 38, upstream of horseshoe weir); 059-346 (over and downstream of horseshoe weir); 059-398 (upstream of Pump Station #5); Pump Station #5 wet well level; and NPDES 38 MP2. This comparison

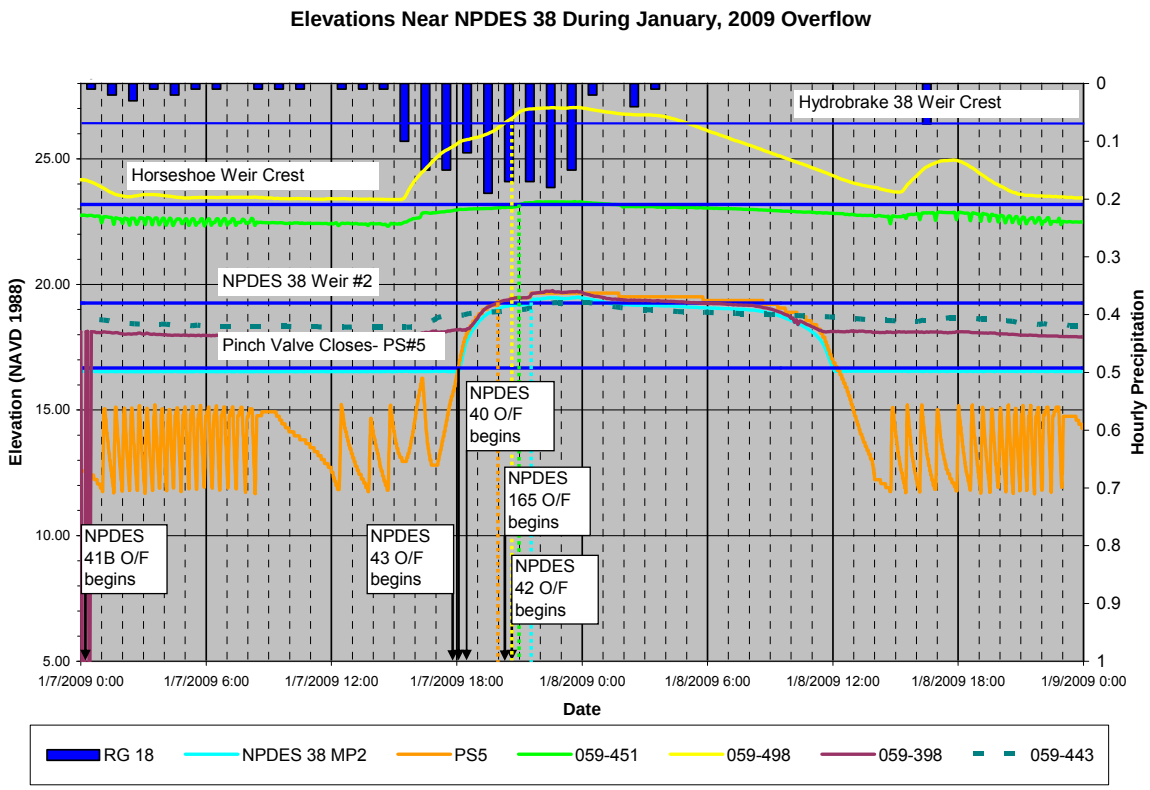


FIGURE 4-22: JANUARY, 2009 OVERFLOW INVESTIGATION
Monitored water elevation at 6 locations in early January, 2009 showing conditions during the NPDES 38 overflow event

highlighted the order in which overflows occurred in the Genesee Area in early January, 2009. The following conclusions were made:

- Hydrobrake 38 backed up flow into the large storage tank in Genesee Park, filling the capacity controlled by the hydrobrake weir (52.45 inches in a 72-inch pipe), and overflowing the hydrobrake weir by 4.4 inches at the peak of the storm.
- Flow backed up downstream of the horseshoe weir, caused by a backup or restriction in between 059-451 and 059-443, and causing flow over the horseshoe weir at 059-451
- The maximum level at 059-443 was 23.76 inches in a 42-inch pipe, indicating that the Hanford Street Trunk B was not surcharged during the January event, had additional capacity, and was not the cause of the backup that caused flows over the horseshoe weir. Also, the invert elevation (IE) of the Hanford Street Trunk B at this location is significantly below that of the IE at the horseshoe weir (22.05' vs 17.3' NAVD 88, respectively). Because the Hanford Street Trunk B was not surcharged at this location, the team concluded that operations at the downstream Rainier Avenue Lift Station did not cause this overflow at NPDES 38.
- Wet well levels at Pump Station #5 exceeded the pump station overflow point, were above the point at which the pinch valve in Structure A is designed to close, and caused an overflow at NPDES 38. At this time, the lift station was operating at full capacity. Field inspections after the early January storm have shown that the pinch valve may not

have been functioning properly, and instead was fixed in the closed position. Given the available data, it is impossible to determine with the operation of the pinch valve with certainty.

The following events occurred in chronological order:

1/6/09 23:50: NPDES 41B overflow began. NPDES 41B overflows more frequently than all the other overflow locations in the Genesee Area.

1/7/09 17:55: NPDES 43 overflow began. Storage was nearly completely utilized.

1/7/09 18:00: Elevation at the Pump Station #5 wet well exceeds the elevation for which the pinch valve at "Structure A" is designed to close. Subsequent investigation indicated that the pinch valve was stuck in a closed position for the entirety of this event. This level is indicated by the blue line in Figure 4-22 beneath the label "Pinch Valve Closes - PS#5."

1/7/09 18:35: NPDES 40 overflow began. Storage was completely utilized.

1/7/09 20:00: Elevation at the Pump Station #5 wet well exceeds the elevation of NPDES 38 Weir #2 (the last weir before overflow to Lake Washington). This is indicated by the vertical orange dotted line, at the intersection of the orange PS#5 and blue NPDES 38 Weir #2 lines.

1/7/09 20:40: NPDES 38 overflow began. Depth at downstream end of storage was 80% of total depth (see Section 4.3.4). Flows over the NPDES Basin 38 hydrobrake weir begin at 72.8% of downstream storage depth.

1/7/09 20:45: NPDES 165 overflow began. Pump Station #6 was operating at full capacity. Levels at the Pump Station #6 wet well indicate the overflow was caused by lack of capacity of Pump Station #6.

1/7/09 20:45 Depths at MH 059-498 exceed the height of the weir over the CSO Facility #12 hydrobrake, allowing unrestricted flows to 059-451. This corresponds to approximately 30 minutes of elevated velocity at 059-451.

1/7/09 20:50: NPDES 42 overflow began. Storage was completely utilized.

1/7/09 21:05: Elevation at 059-451 (upstream of the horseshoe weir, green line) exceeds the elevation of the horseshoe weir crest (blue line). This indicates flow over the horseshoe weir and into "Structure A." Because this occurs after the overflow of NPDES 38, it is not considered the primary cause of that overflow.

4.6.2 Lake Line Restriction

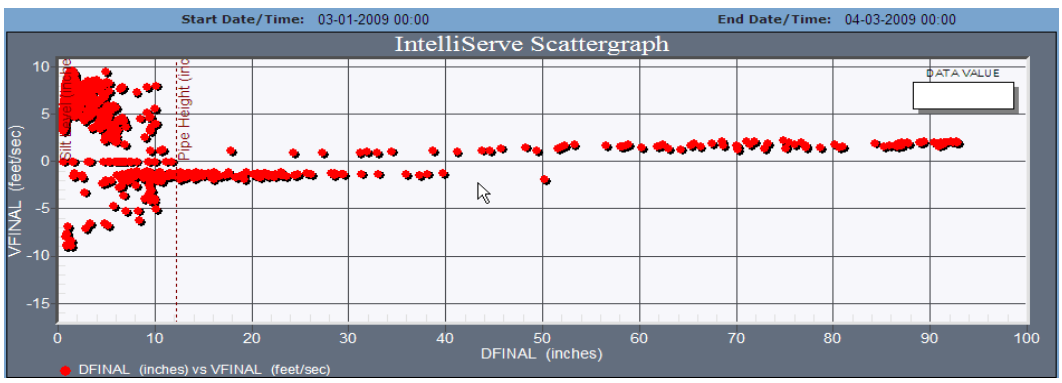
Early in the Genesee flow monitoring project, a potential restriction was identified along the Lake Line between 060W-019 and Pump Station #5. This restriction was first recognized in the scattergraphs for 060W-019 and 060W-014, which showed very high depths and low velocities during storm events, indicative of a restriction. The next downstream monitor from 060W-019 and 060W-014, 060W-012, did not exhibit the same restrictive pattern during medium-sized events, leading the team to conclude that the restriction was somewhere between 060W-012 and 060W-014. The evidence of a potential restriction was strengthened

by comparison of the hydrobrake stage-discharge curves for the hydrobrakes in NPDES Basin 42 and NPDES Basin 43 which showed downstream elevations occasionally higher than upstream elevations. Thus, this restriction affected the performance of these two hydrobrakes.

An SPU O&M personnel team jetted the pipe run from 060W-013 to 060W-012 on the afternoon of April 3, 2009 in order to remove the restriction. Initial observations included the level of water in 060W-013 and 060W-052 quickly lowering to below pipe crown immediately after the jetting. This observation led to the understanding that the obstruction was no longer present. SPU O&M videos confirm that there are no significant obstructions in the pipe, but that roots may have been present prior to jetting and may grow back. At the time of the jetting, SPU was considering options for increasing flow through this section of pipe.

Scattergraph comparisons prior to and after the jetting indicate little change in hydraulic conditions (see Figures 4-23 and 4-24). It is likely that this portion of the Lake Line is undersized. Additional conclusions regarding the capacity of this portion of pipe are deferred to the Genesee model.

Before



After

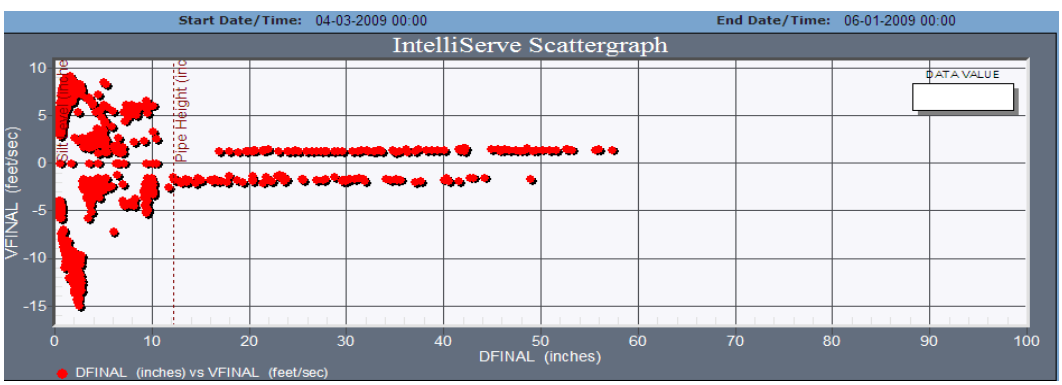
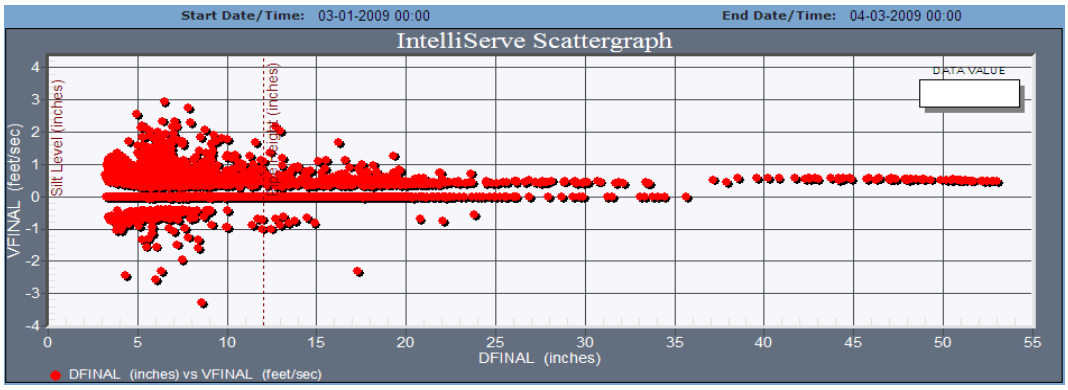


FIGURE 4-23: LAKE LINE CLEANING - 060W-014
Comparisons of scattergraphs at 060W-014 before and after the April 3, 2009, jetting indicate little to no change. The high depths and low velocities shown to the right of the graph indicate a downstream restriction.

Before



After

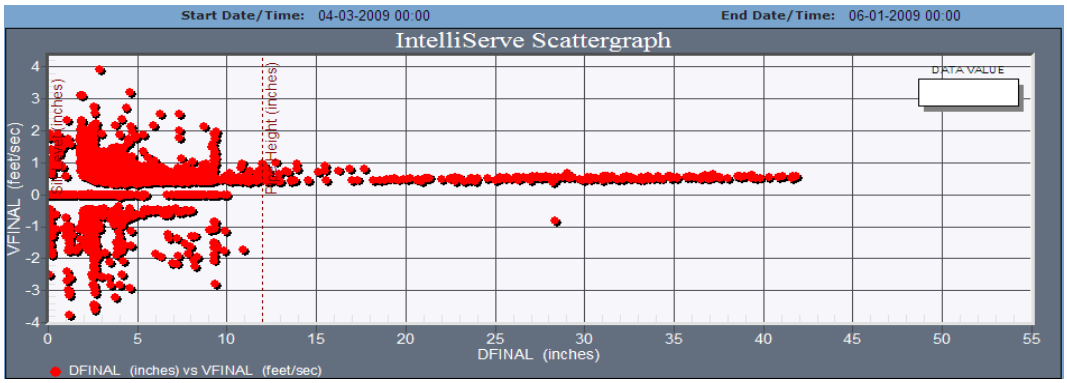


FIGURE 4-24: LAKE LINE CLEANING - 060W-019

Comparisons of scattergraphs at 060W-019 before and after the April 3, 2009, jetting indicate little to no change. The high depths and low velocities shown to the right of the graph indicate a downstream restriction.

5. Suitability of Data for Hydrologic and Hydraulic Modeling Efforts

Key objectives of the Genesee flow monitoring project were to support the calibration and validation of the Genesee hydraulic model. Calibration is the process of adjusting model parameters and comparing the simulated model results with data measured or observed in the field. For the Genesee model, depth and calculated flow (from the depth and velocity measurements) were the parameters targeted during model calibration. Validation is the simulation of flows and depths during rainfall events not used for calibration; it provides information on the repeatability of the model to accurately simulate the system under varying conditions. Model development and calibration is reported in *Genesee Combined Sewer Overflow Reduction Project: Hydrologic and Hydraulic Modeling Report* (CH2M HILL 2010 publication pending).

The flow monitoring data collected from January, 2008 through January, 2009 were those used for model calibration (also called Phase I and Phase IIa). Data from February, 2009 through May, 2009 will be used for model validation (also called Phase IIb). Below is a discussion of the dry and wet weather calibration and validations and recommendations on the suitability of the data to support hydraulic modeling.

5.1 Identification of Dry and Wet Weather Periods

5.1.1 Dry Weather Period

To calibrate the Genesee model, the model is first calibrated to dry weather. Simulation results are compared to monitor data for the system during dry periods—those periods without the influence of rainfall. DWF is simulated in the Genesee model by applying a diurnal pattern to a per capita flow value times the population within each catchment. The accuracy of the dry weather calibration is gauged primarily on the comparison of 1) volume or average flow rate, and 2) the daily diurnal pattern at each monitoring site. Effects of seasonal fluctuations in the data, due to groundwater infiltration, were also noted.

To select a representative period of DWF, the monitoring data were reviewed first for consistency and availability of suitable data. The largest impacts to the suitability of DWF data were during periods of particularly low flow. The water level would fall below the velocity sensor and a "velocity dropout" would occur. Data during these instances could generally be reconstituted from site verification data during finalization of the data and generally had little effect on the suitability of DWF data. CH2M HILL used *Sliicer*, a data processing tool created by ADS, to identify candidate dry weather days from the flow monitoring using the following general criteria:

- Dry day candidates had to pass two tests to be used in assembling the average dry day curves: 1) an antecedent rainfall test, and 2) a flow anomaly test.

- Antecedent rain had to less than 0.1 inches in the previous day, less than 0.4 inches in the previous 3 days and less than 1 inch in the previous 5 days. All days that passed the antecedent rainfall test were subjected to a second test to eliminate anomalies
- Of the dry days selected in antecedent rainfall test, only those with flows between 85% and 115% of the average dry day were selected as candidates for creating dry-day curves for each site

A difference between the wet and dry season DWF was observed in the biweekly and monthly data reviews, resulting in the division of the flow monitoring data into a wet season (January to mid-February, 2008) and a dry season (February to June, 2008). These periods were chosen based on visual differences in the hydrographs of Phase I data observed during data review. Despite these differences, it was decided that the Genesee hydraulic model would use the *Groundwater Infiltration* model to account for the seasonal fluctuation. As a result, candidate days from the dry season period that met the above criteria were selected. Each dry weather day candidate was reviewed for consistency, and outliers were removed from the dataset. During the analysis process, the following were determined for use in the model:

- Net average daily flow per flow monitoring basin (each monitoring basin's contributing flow)
- Separate diurnal pattern for weekdays (Mondays through Fridays) and for weekends (Saturdays and Sundays)

The average daily flows per monitoring basin and diurnal patterns are included in the *Genesee Combined Sewer Overflow Reduction Project: Hydrologic and Hydraulic Modeling Report* (CH2M HILL 2010 publication pending)

5.1.2 Wet Weather Rainfall

As summarized in the Table 3.1 precipitation table, there were 48 rainfall events that occurred from January, 2008 through May, 2009 that had a cumulative depth greater than 0.3 inches using an interevent time of 6 hours. This depth and interevent time were initial criteria to define distinct storms. Each of the 48 rain events is available to support model calibration and validation. Further screening of the rain events is described in Section 5.3.

Because RG18 is up to 2.1 miles away from parts of Genesee Area, it is possible that some storm events may not be measured at RG18 exactly as they fell across Genesee. This spatial heterogeneity is especially applicable for shorter-duration events (MGS Engineering Consultants 2003). Differences in rainfall at the rain gage and rainfall in portions of Genesee will create difficulties in model calibration because the primary driver for flow in the model is precipitation. The actual effects of rainfall spatial and temporal heterogeneity is analyzed during model calibration. After the completion of Phase II, an additional temporary rain gage was installed at a Seattle Parks and Recreation building in Genesee Park, at 4316 S Genesee Street. SPU plans to replace the temporary monitor at this location with a permanent monitor in the near future.

5.2 Monitoring Stations Recommended for Model Calibration

The monitoring locations used for model development and calibration were selected based on one or more of the following purposes: flow loading, develop hydrobrake performance curve, and CSO volume and flow rate. At each of these locations, the depth and/or flow measured at the site is used during model calibration. Table 5-1 lists the monitors to be used along with the primary parameter to be used for GLUE automated calibration. This list may be modified during automated model calibration as necessary.

TABLE 5-1: INITIAL RECOMMENDATION ON MONITORS TO SUPPORT MODEL CALIBRATION

MH ID	Calibration Parameter
059-121	Flow
059-131	Flow
059-320	Flow
059-332	Flow
059-346 (“Structure A”)	N/A- Overflows only
059-371	Flow
059-373	Flow
059-398	Flow
059-404	Flow
059-406 (NPDES41B)	Flow, Depth
059-407	N/A (Hydrobrake)
059-409	Flow
059-434 (NPDES41A)	Flow, Depth
059-436	Flow
059-443	Flow
059-451	Flow, Depth (Hydrobrake)
059-451 (“Structure A—NPDES38)	N/A- Overflows only
059-489 (NPDES37)	Flow/Depth
059-490	N/A- (Hydrobrake)
059-491 (NPDES40)	Flow, Depth
059-498	N/A (Hydrobrake)
060W-012	Flow
060W-014	Flow (Hydrobrake)
060W-019	Flow (Hydrobrake)
060W-025	N/A- Removed
060W-026	N/A- Removed
060W-047	N/A (Hydrobrake)
060W-049 (NPDES43)	Flow, Depth
060W-052 (NPDES42)	Depth (Hydrobrake)
067-014	N/A- Unsuitable due to monitor drifting
067-024	N/A- Unsuitable due to extended dropouts

TABLE 5-1: INITIAL RECOMMENDATION ON MONITORS TO SUPPORT MODEL CALIBRATION

MH ID	Calibration Parameter
067-029	Flow
067-078 (NPDES165)	Flow, Depth
D059-191	N/A (Storm Sewer)
Pump Station #5	N/A (Pump Station)
Pump Station #6	N/A Pump Station)
Rainier Avenue Lift Station	N/A (Pump Station)

5.3 Storms Recommended for Model Calibration

Of the 48 rainfall events monitored during the monitoring period with greater than 0.3 inches and an interevent time of 6 hours, 10 of the storms were included as potential calibration storms due to their cumulative depth and high-return frequency. These events, listed in Table 5-2 and highlighted in Table 3-1, are recommended for use in calibrating the model. The 10 calibration storms were selected to provide a variety of storm types for model calibration, including long, short, dry season and wet season storms. Special attention was paid to storms that approximate the once-per-year overflow event, including the November, 2008 and January, 2009 events.

TABLE 5-2: CALIBRATION STORMS

Storm Start Date/Time	Storm Precipitation (inch)	Storm Duration (hour)	Max Freq. (hour)*	Max Freq.-depth (inch)	Max Freq. (month)	Over-flows	Calibration Start Time**	Calibration End Time**
1/9/2008 21:05	0.47	12.7	12.7	0.47	<2	0	1/8/2008 0:00	1/10/2008 9:44
3/1/2008 16:35	0.13	2.3	2.3	0.13	<2	2	2/29/2008 12:00	3/2/2008 0:00
3/29/2008 15:50	0.5	11.2	168	2.22	3	1	3/28/2008 20:22	3/30/2008 8:22
5/21/2008 18:20	0.44	1.7	1.0	0.31	6	0	5/21/2008 18:00	5/22/2008 3:00
6/6/2008 5:00	0.48	14.0	1.0	0.33	9	0	6/6/2008 10:10	6/7/2008 0:00
8/24/2008 12:50	0.95	10.8	6	0.64	4	1	8/24/2008 12:25	8/25/2008 8:35
10/13/2008 18:50	0.4	6.6	0.2	0.22	24	0	10/13/2008 17:35	10/14/2008 0:35
11/6/2008 1:35	2.26	32.4	24	2.01	24	3	11/5/2008 23:15	11/8/2008 4:20
12/24/2008 12:15	1.03	28.1	6.0	0.68	6	2	12/24/2008 12:23	12/26/2008 0:23
1/6/2009 15:25	2.05	35.9	168	3.75	12	6	1/6/2009 13:50	1/9/2009 0:00

* See the footnote in Table 3.1 for an explanation of this heading
** These times do not correspond exactly to the storm start and end time as defined in Table 3-1, as described in the text above.

The calibration start/end times listed in the table denote the period of the event to be used during the automated calibration process. These start and end times may not correspond exactly to the storm start and end times. The calibration times were extended to capture antecedent moisture prior to the storm start, and to capture the hydrologic response lag after the storm. The calibration start and end times were determined using overall patterns in the flow monitoring data found across multiple meters.

Data suitability for both flow/velocity and depth was evaluated for each calibration storm. This was done to help justify monitor and storm weightings assigned during the calibration process. Suitability was quantified by establishing the following ratings:

0	Data suitable for modeling
1	Missing monitoring data or data dropouts. Data may not be suitable for modeling.
2	15-minute time step. However, data likely suitable for modeling.
3	Monitor over-predicted data. Data may not be suitable for modeling.
4	Questionable data. Data may not be suitable for modeling.
5	Monitor located in an overflow pipe, so no flow or depth was present under typical conditions

Table 5-3 and Table 5-4 show the ratings at each monitor for each calibration storm for depth and flow/velocity, respectively. Additional information on the calibration process can be found in *Genesee Combined Sewer Overflow Reduction Project: Hydrologic and Hydraulic Modeling Report* (CH2M HILL 2010 publication pending). Hydrographs for selected storms are included in Appendix C. Scattergraphs for the entire period are included in Appendix D.

Flow monitoring data collected from January, 2008 through January, 2009 are recommended for model calibration. Data collected from February, 2009 through May, 2009 include additional storms that are available for model validation. These candidate validation storms are listed in Table 5-5.

TABLE 5-3: CALIBRATION STORM DEPTH RATING

	Storm 1	Storm 2	Storm 3	Storm 4	Storm 5	Storm 6	Storm 7	Storm 8	Storm 9	Storm 10
Begin Date/Time	1/8 0:00	2/29 12:00	3/28 20:22	5/21 18:00	6/6 10:10	8/24 12:25	10/13 17:35	11/5 23:15	12/24 12:23	1/6 13:50
End Date/Time	1/10 9:44	3/2 0:00	3/30 8:22	5/22 3:00	6/7 0:00	8/25 8:35	10/14 0:35	11/8 4:20	12/26 0:23	1/9 0:00
059-121	0	0	0	0	0	0	0	0	0	4
059-131	0	0	0	0	0	0	0	0	0	0
059-320	0	0	0	0	0	0	0	0	0	0
059-332	0	0	1	0	0	0	0	0	0	0
059-346	1	1	1	1	1	5	5	5	5	4
059-371	0	0	1	0	0	0	0	0	0	0
059-373	0	0	0	0	0	0	0	0	0	0
059-398	0	0	1	0	0	0	0	0	0	0
059-404	0	0	0	0	0	0	0	0	0	0
059-406	0	0	0	0	0	0	0	0	0	0
059-407	0	0	0	0	0	0	0	0	0	0
059-409	0	0	0	0	0	0	0	0	0	0
059-434	0	0	0	0	0	0	0	1	0	0
059-436	1	0	0	0	0	0	0	0	0	0
059-443	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
059-451	1	1	0	0	0	0	1	0	0	0
059-451 "A"	0	0	0	0	0	0	0	0	0	1
059-489	0	0	0	0	0	0	0	0	0	4
059-490	1	0	0	0	0	0	0	0	0	0
059-491	0	0	0	0	0	0	0	1	0	1
059-498	0	0	0	0	0	0	0	0	0	0
060W-012	0	0	0	0	0	0	0	0	0	0
060W-014	0	0	0	0	0	0	0	0	0	0

TABLE 5-3: CALIBRATION STORM DEPTH RATING

	Storm 1	Storm 2	Storm 3	Storm 4	Storm 5	Storm 6	Storm 7	Storm 8	Storm 9	Storm 10
060W-019	0	0	0	0	0	0	0	0	0	0
060W-025	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
060W-026	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
060W-047	0	0	0	0	1	0	0	0	0	1
060W-049	0	0	0	0	0	0	0	1	0	0
060W-052	0	0	0	0	0	0	0	0	0	0
067-014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
067-024	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
067-029	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
D059-191	1	0	0	0	0	0	0	0	0	0
Pump Station #5	0	0	0	0	0	0	0	0	0	0
Pump Station #6	0	0	0	0	0	0	0	0	0	0
Rainier Avenue Lift Station	0	0	0	0	0	0	0	0	0	0

TABLE 5-4: CALIBRATION STORM VELOCITY/FLOW RATING

	Storm 1	Storm 2	Storm 3	Storm 4	Storm 5	Storm 6	Storm 7	Storm 8	Storm 9	Storm 10
Begin Date/Time	1/8 0:00	2/29 12:00	3/28 20:22	5/21 18:00	6/6 10:10	8/24 12:25	10/13 17:35	11/5 23:15	12/24 12:23	1/6 13:50
End Date/Time	1/10 9:44	3/2 0:00	3/30 8:22	5/22 3:00	6/7 0:00	8/25 8:35	10/14 0:35	11/8 4:20	12/26 0:23	1/9 0:00
059-121	0	0	0	0	0	0	0	0	0	0
059-131	0	0	0	0	0	0	0	0	0	0
059-320	0	0	0	0	0	0	0	0	0	0
059-332	0	0	1	0	0	0	0	1	0	0
059-346	1	1	1	1	1	1	5	5	5	4
059-371	0	0	1	0	0	0	0	0	0	0
059-373	0	0	0	0	0	0	0	0	0	0
059-398	0	0	1	0	0	0	0	0	0	0
059-404	0	0	0	0	0	0	0	0	0	0
059-406	0	0	0	0	0	0	0	0	0	0
059-407	0	0	0	0	0	0	0	0	0	0
059-409	1	0	0	0	0	0	0	0	0	0
059-434	0	1	0	1	1	0	0	1	0	0
059-436	1	0	0	0	0	0	0	0	0	0
059-443	2	2	2	2	2	2	2	2	2	2
059-451	3	1	0	0	0	0	1	3	0	0
059-451 "A"	5	5	5	5	5	5	5	5	5	0
059-489	0	0	0	0	1	1	0	0	0	4
059-490	1	0	0	0	0	1	1	1	1	1
059-491	1	1	1	1	1	1	1	1	0	1
059-498	0	0	0	0	0	0	0	0	0	1
060W-012	0	0	0	0	0	0	0	0	0	0

TABLE 5-4: CALIBRATION STORM VELOCITY/FLOW RATING

	Storm 1	Storm 2	Storm 3	Storm 4	Storm 5	Storm 6	Storm 7	Storm 8	Storm 9	Storm 10
060W-014	0	0	0	0	0	0	1	4	0	0
060W-019	0	0	0	0	0	0	1	0	0	0
060W-025	4	1	1	1	1	1	1	1	1	1
060W-026	1	4	4	4	4	1	1	1	1	1
060W-047	3	0	1	1	1	1	1	3	1	1
060W-049	0	0	0	0	0	0	0	1	0	1
060W-052	3	3	3	0	0	0	1	1	1	1
067-014	1	2	1	2	1	2	2	2	1	1
067-024	1	2	1	2	2	1	1	1	1	2
067-029	1	2	1	2	2	2	2	2	2	2
D059-191	1	0	0	0	0	0	0	0	0	0
Pump Station #5	0	0	0	0	0	0	0	0	0	0
Pump Station #6	0	0	0	0	0	0	0	0	0	0
Rainier Avenue Lift Station	0	0	0	0	0	0	0	0	0	0

TABLE 5-5: MODEL VALIDATION STORMS

Date	Storm Precipitation (inch)	Storm Duration (hour)	Max Freq. (hour)	Max Freq.-depth (inch)	Max Freq. (month)	Overflows
4/2/2009 8:55	0.99	21.4	6	0.71	6	3
4/12/2009 3:00	1.04	15.2	0.2	0.16	12	2
5/4/2009 15:55	1.32	24.3	24	1.31	6	1
5/5/2009 22:55	0.69	23.7	96	2.08	6	
5/19/2009 19:45	0.45	4.8	1	0.35	12	

6. Conclusions and Recommendations

Flow monitoring was conducted as part of the Genesee Combined Sewer Overflow (CSO) Reduction Plan, primarily to characterize the performance of the combined sewer system and existing facilities in order to support Genesee Area modeling and to verify NPDES Basin performance. A total of 21 temporary monitors were installed and maintained from January, 2008 through May, 2009 to supplement the 8 permanent monitors installed at the CSO outfalls. The following conclusions and recommendations are based on the 17 months of monitoring:

- Flow monitoring data were collected during 48 rainfall events greater than 0.3 inches cumulative depth (interevent time of 6 hours). These events include:
    - Two 2-year storms
    - Four 1-year storms
    - 20 storms between 2 month and 1 year
- Data were collected during seven model calibration storms. These events include:
    - Two 2-year storms
    - One 1-year storm
    - One 4-month storm
    - One 3-month storm
    - 2 storms less than 2 month
- Rainfall during monitoring period is representative of historical record based on storm recurrence interval evaluation.
- Twenty-six separate combined sewer overflows occurred during the flow monitoring period. Half of these occurred at NPDES 41B. These overflows are summarized in Table 4-1, which is derived from the information provided in the SPU monthly CSO Reports to Ecology.
- Data quality is suitable to support hydraulic model through development, calibration, and validation (see Chapter 5).
- Hydrobrake stage-discharge curves were developed for three of the four hydrobrakes. The fourth hydrobrake, located in CSO Facility #12 at NPDES Basin 38 (059-458), had a maximum differential head of 43 inches in a 72-inch inline storage pipe, corresponding to a total depth of 56.9 inches of depth at the hydrobrake and a storage tank approximately 60% full. This tank cannot be filled over 60% full given the current hydrobrake and weir configuration. Monitoring at this location continues beyond May, 2009 in order to better define the model curve.
- Available inline and offline storage was utilized at CSO Facilities #9, #10, and #11 during storm events. The storage facility in NPDES Basin 38 (CSO Facility #12) could be more fully used and will be evaluated during alternative analysis with the hydraulic model.

- During the monitoring period, the King County Rainier Avenue Lift Station pumped all incoming flow without restriction, in some cases exceeding the published firm capacity of the of 9 mgd by almost 3 mgd. Coordination with King County on the operational boundary constraints at this pump station will be necessary prior to alternatives analysis.
- An industrial discharge from the Darigold facility upstream of MH 059-131 was evident. King County issues and enforces an industrial discharge permit that allows Darigold to discharge into the King County system for treatment at a King County wastewater treatment plant. During permit renewals, the City provides input to King County with respect to the Darigold discharge duration, flow rate, and timing. If the model indicates the discharge as it now occurs impacts the system and contributes to overflows, Darigold has indicated it is open to modifying, within reason, discharge duration, timing and flow rate, with concurrence from King County.
- NPDES Basin 41 outfall was found to be crushed during field investigations by SPU O&M personnel, resulting in a flow restriction. The overflow volume calculated by the depth over the CSO outfall weir is likely to be an over-estimation. Occurrence of CSO events is considered valid. SPU is working to repair this outfall.
- The Lake Line from NPDES 165 downstream to Pump Station #5 is under capacity. Increasing the capacity of Pump Station #5 is likely to be needed if the Lake Line is to be upgraded. Recent improvements upstream of Pump Station #6 including root-cutting, insituform, and raising the weir at NPDES 165 in April, 2009, may eliminate the need to increase the capacity of Pump Station #6. The model will be used to verify the effects of improvements on NPDES 165.
- Investigations into a potential constriction along the Lake Line between 060W-019 and 060W-012 are inconclusive. SPU O&M personnel have cleaned this section of pipe; however, scattergraphs of flow data suggest persistent constrictions in the line. Subsequent review of 1985 as-built drawings reveal a sand-catcher just downstream of MH 060W-014 was to be abandoned by others. Regular cleanings of this section are recommended, as is continued flow monitoring and investigation as to source of the restriction. This should include a video inspection of the line.

Recommendations for future CSO monitoring include the following:

- On-going QA/QC review by multiple parties is essential to achieve suitable data
- It is critical to understand monitor purpose to guide site selection and ongoing data review. For the Genesee monitoring program, this purpose is listed in Table 2-2. Also related is the need to document which flow components are targeted at each site. For example, is the depth over the weir, flow through the outfall, and/or flow into the CSO diversion structure (including the DWF) the targeted flow monitoring values to measure?
- Site installation sheets and photos are needed early in the project detailing sensor location relative to weirs, bench, pinch valves, etc.

- Installation of a temporary rain gage near the center of the Genesee Area may result in better model calibration when permanent gages are not representative of precipitation in Genesee. Rain gage data from distances of up to 2.1 miles away from portions of Genesee resulted in a time shift between measured precipitation and measured flow response that was difficult to duplicate in model calibration.

7. References

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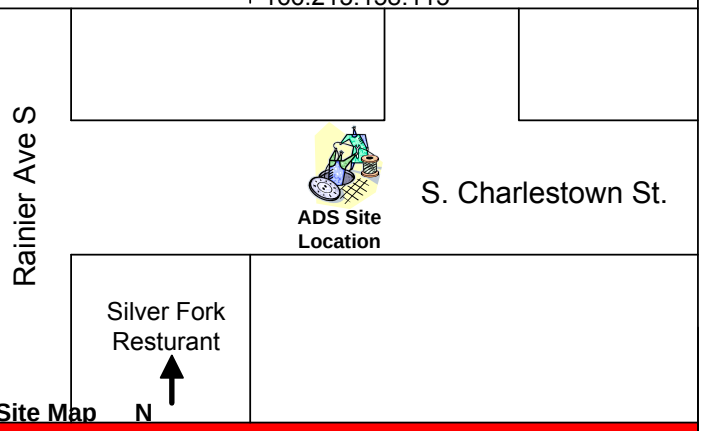
Appendix A: ADS Site Reports

ADS Site Report

Quality Form

Project Name:	Genesee	**City / State:**	Seattle, WA	**FM Initials:**	SK
Site Name:	GEN38_059121	**Monitor Series:**	5000AG	**Monitor S/N:**	20012
Address/Location:	3601 46th Ave S			**Manhole #**	059121
				Thomas Bros Map Page:	
				Pipe Height:	22.88"
Access: Drive	**Type of System:**	Sanitary [X]	Storm [ ]	Combined [ ]	**Pipe Width:** 25.25"
				IP Address:	166.213.158.115

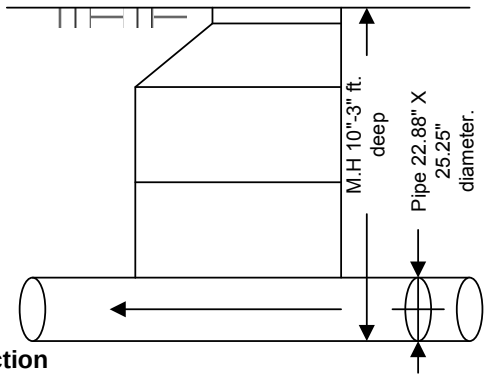


Investigation Information:

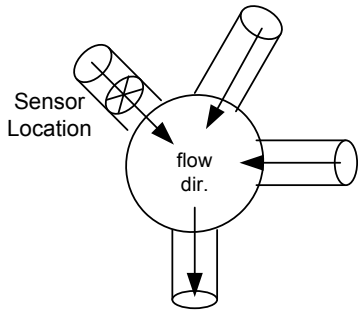
Date/Time of Investigation:	12-17-07 1140	**Manhole Depth:**	10'-3"
Site Hydraulics:	Fast Choppy Flow	**Manhole Material / Condition**	Precast / Fair
Upstream Input: (L/S, P/S)		**Pipe Material / Condition:**	Concrete / Fair
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X] Commercial [ ] Industrial [ ] Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**	
Depth of Flow:	2.88 +/- 0.38"	**Access Pole #:**	
Range (Air DOF):	+/-	**Distance From Manhole:**	Feet
Peak Velocity:	3.06 fps	**Road Cut Length:**	Feet
Silt:	0.00 Inches	**Trench Length:**	Feet

Manhole Information:

Other Information:



Cross Section



Planar

Installation Information	
Installation Type:	Special
Sensors Devices:	Ultra / Pressure/ Velocity
Surcharge Height:	0.00" Feet
Rain Guage Zone:	

Backup	Yes	No	?	Distance
Trunk	[ ]	[ ]	[ ]	
Lift / Pump Station	[ ]	[ ]	[ ]	
WWTP	[ ]	[ ]	[ ]	
Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

GEN38_059121

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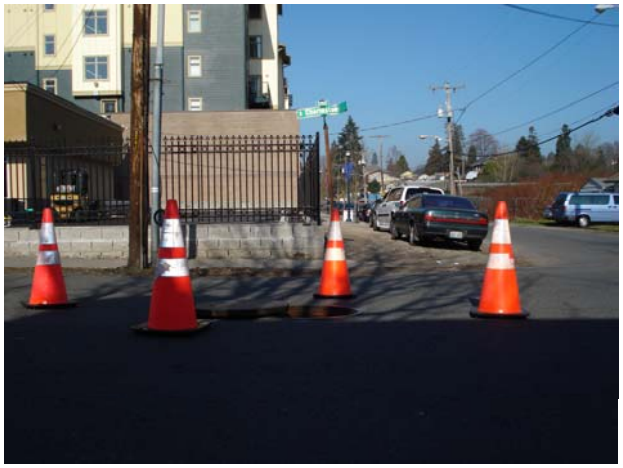
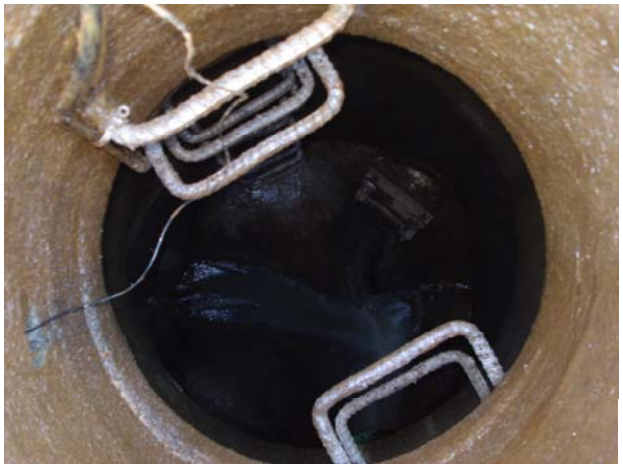
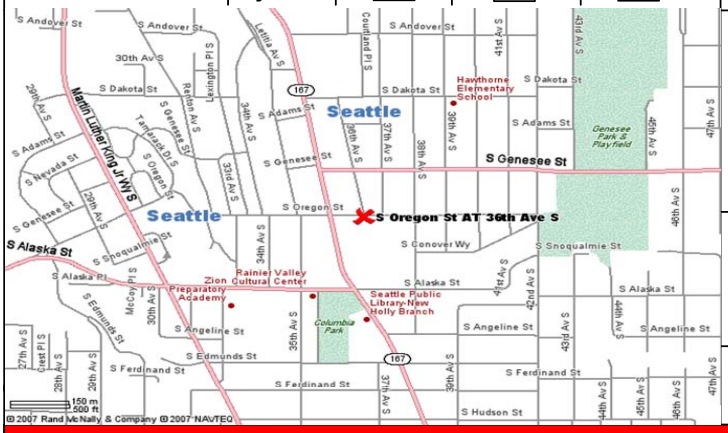


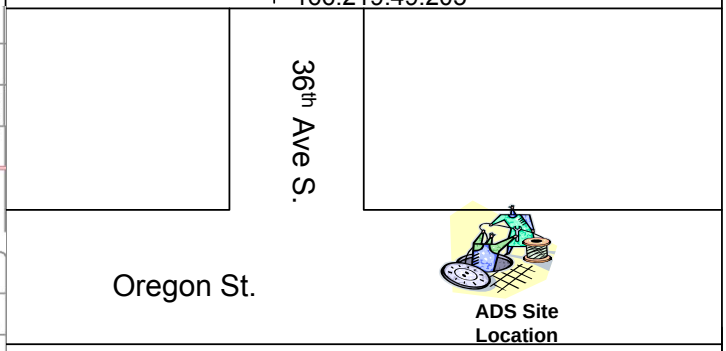


ADS Site Report

Quality Form

Project Name:	Genesee	**City / State:**	Seattle, WA	**FM Initials:**	SK
Site Name:	GEN38_059131	**Monitor Series:**	5000 AG	**Monitor S/N:**	20002
Address/Location:	Oregon St. & 36th Ave S.			**Manhole #**	059131
				Thomas Bros Map Page:	
				Pipe Height:	41.75 "
Access: Drive/Walk	**Type of System:**	Sanitary [X]	Storm [ ]	Combined [ ]	**Pipe Width:** 42.25 "
				IP Address:	166.219.49.205





Site Map N

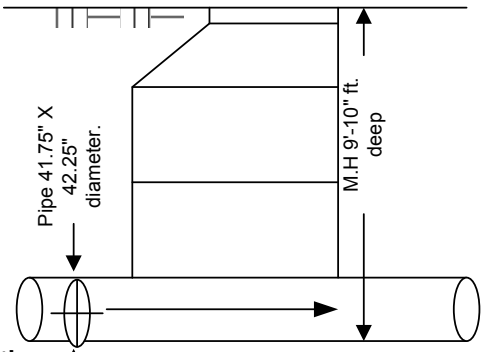
Investigation Information:

Date/Time of Investigation:	1-4-08 0730
Site Hydraulics:	Slow Smooth Flow
Upstream Input: (L/S, P/S)	
Upstream Manhole:	DNI
Downstream Manhole:	DNI
Depth of Flow:	9.50 +/- 0.38"
Range (Air DOF):	+/-
Peak Velocity:	.70 fps
Silt:	4.00 Inches

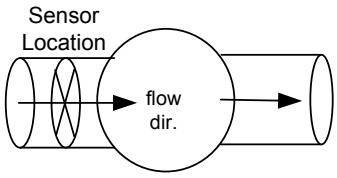
Manhole Information:

Manhole Depth:	9'-10"			
Manhole Material / Condition	Brick / Fair			
Pipe Material / Condition:	Brick / Fair			
Mini System Character:	Residential [X]	Commercial [ ]	Industrial [ ]	Trunk [ ]
Telephone Information:				
Access Pole #:				
Distance From Manhole:	Feet			
Road Cut Length:	Feet			
Trench Length:	Feet			

Other Information:



Cross Section



Planar N

Installation Information	
Installation Type:	Standard
Sensors Devices:	Ultra / Pressure / Velocity
Surcharge Height:	0.00" Feet
Rain Guage Zone:	

Backup	Yes	No	?	Distance
Trunk	[ ]	[ ]	[ ]	
Lift / Pump Station	[ ]	[ ]	[ ]	
WWTP	[ ]	[ ]	[ ]	
Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

Velocity sensor is rotated out of the silt. Its located at around the 8:00 position, however this does not prevent scrubs on the sensor.

GEN38_059131

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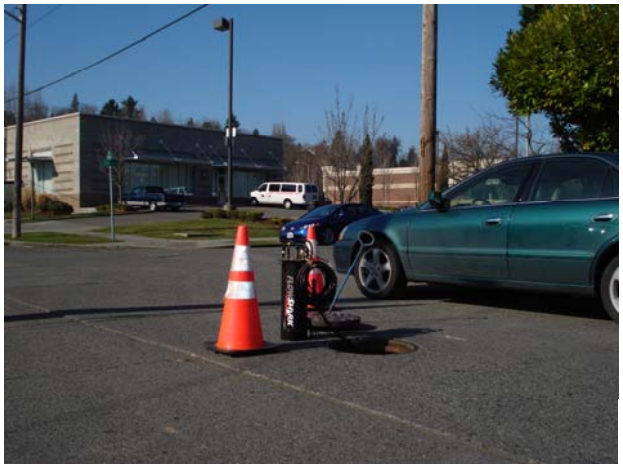


ADS Site Report

Quality Form

Project Name: Genesee	**City / State:** Seattle, WA	**FM Initials:** SK	
Site Name: GEN38_059320	**Monitor Series:** 5000 AG	**Monitor S/N:**	20037
Address/Location: 4420 Genesee St & 45th Ave		**Manhole #**	059320
		Thomas Bros Map Page:	
		Pipe Height:	23.00 "
Access: Drive	**Type of System:** Sanitary [X] Storm [ ] Combined [ ]	**Pipe Width:**	23.25 "
		IP Address:	166.219.49.197

Seattle Parks Department

45th Ave S

ADS Site Location

Genesee St.

Genesee Park

Site Map N

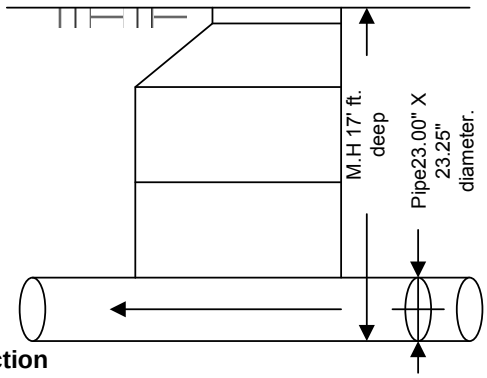
Investigation Information:

Date/Time of Investigation:	12-12-07 0917
Site Hydraulics:	Slow Smooth Flow
Upstream Input: (L/S, P/S)	
Upstream Manhole:	DNI
Downstream Manhole:	DNI
Depth of Flow:	1.88 +/- 0.38"
Range (Air DOF):	+/-
Peak Velocity:	.89 fps
Silt:	0.00 Inches

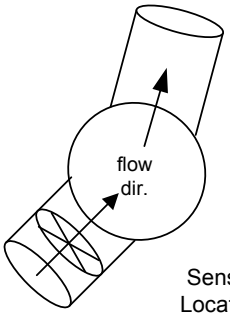
Manhole Information:

Manhole Depth:	17'			
Manhole Material / Condition	Brick / Fair			
Pipe Material / Condition:	Concrete / Fair			
Mini System Character:	Residential [X]	Commercial [ ]	Industrial [ ]	Trunk [ ]
Telephone Information:				
Access Pole #:				
Distance From Manhole:	Feet			
Road Cut Length:	Feet			
Trench Length:	Feet			

Other Information:



Cross Section



Planar N

Sensor Location

Installation Information	
Installation Type:	Regular
Sensors Devices:	Ultra / Pressure / Velocity
Surcharge Height:	0.00" Feet
Rain Guage Zone:	

Backup	Yes	No	?	Distance
Trunk	[ ]	[ ]	[ ]	
Lift / Pump Station	[ ]	[ ]	[ ]	
WWTP	[ ]	[ ]	[ ]	
Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

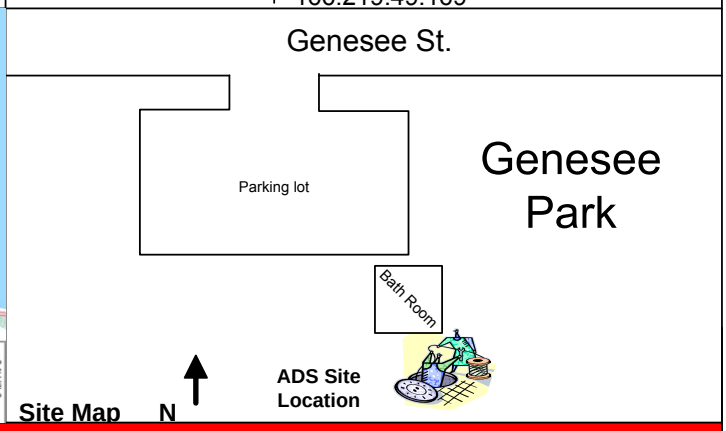
GEN38_059320

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

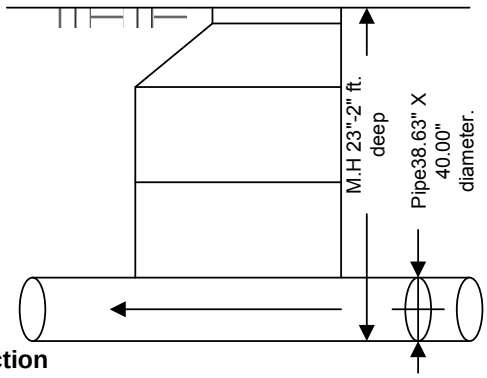
Project Name:	Genesee	**City / State:**	Seattle, WA	**FM Initials:**	SK
Site Name:	GEN38_059332	**Monitor Series:**	5000 AG	**Monitor S/N:**	20032
Address/Location:	Behind bathroom at Genesee park			**Manhole #**	059332
				Thomas Bros Map Page:	
				Pipe Height:	38.63 "
Access: Drive/Walk	**Type of System:**	Sanitary [X]	Storm [ ]	Combined [ ]	**Pipe Width:** 40.00 "
					IP Address: 166.219.49.169



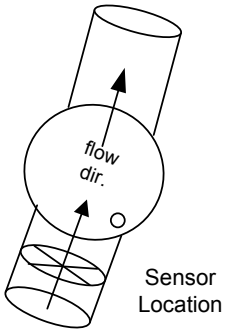
Investigation Information:

Date/Time of Investigation:	12-17-07 1110	**Manhole Depth:**	23'-2"
Site Hydraulics:	Slow Smooth Flow	**Manhole Material / Condition**	Precast / Fair
Upstream Input: (L/S, P/S)		**Pipe Material / Condition:**	Concrete / Fair
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X] Commercial [ ] Industrial [ ] Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**	
Depth of Flow:	9.88 +/- 0.38"	**Access Pole #:**	
Range (Air DOF):	+/-	**Distance From Manhole:**	Feet
Peak Velocity:	.72 fps	**Road Cut Length:**	Feet
Silt:	0.75 Inches	**Trench Length:**	Feet

Other Information:



Cross Section



Planar N

Installation Information	
Installation Type:	Regular
Sensors Devices:	Ultra / Pressure / Velocity
Surcharge Height:	0.00" Feet
Rain Guage Zone:	

Backup	Yes	No	?	Distance
Trunk	[ ]	[ ]	[ ]	
Lift / Pump Station	[ ]	[ ]	[ ]	
WWTP	[ ]	[ ]	[ ]	
Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

Drop line Above Incoming line

GEN38_059332

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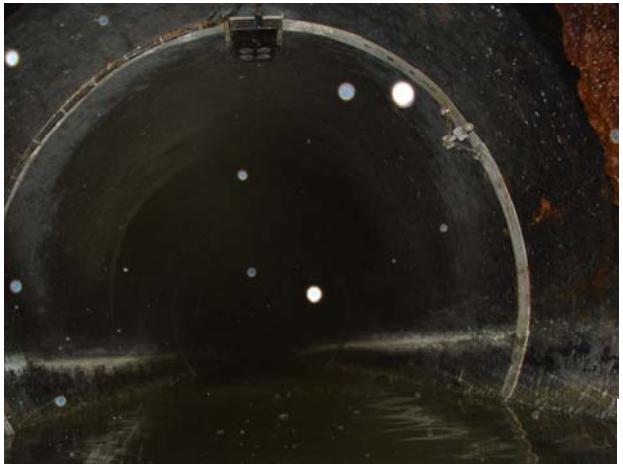


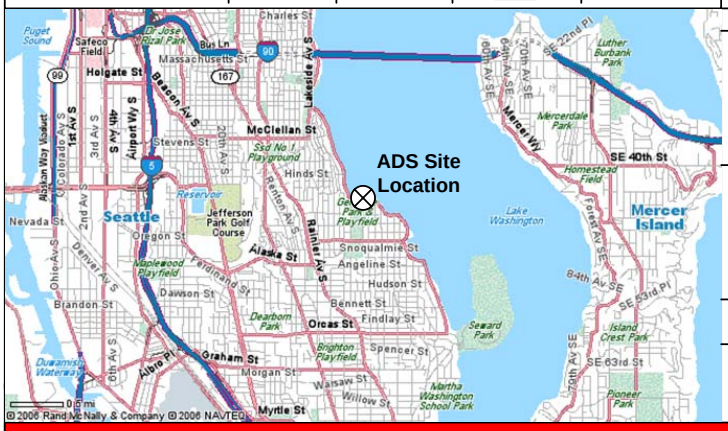
Note: GEN38_059346 was incorrectly labeled. See note on next page.

ADS ENVIRONMENTAL SERVICES®

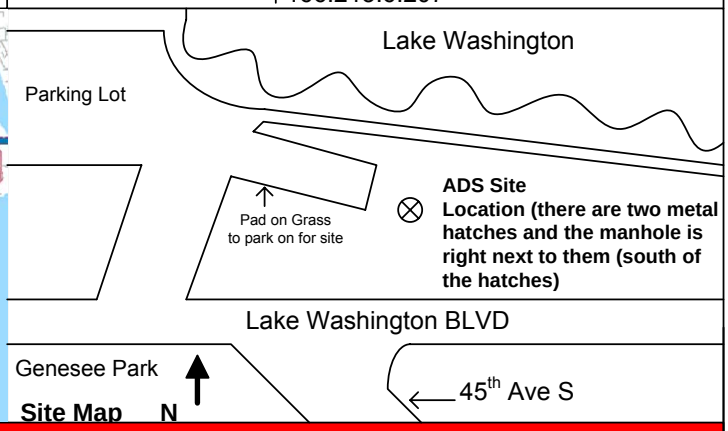
ADS Site Report

Quality Form

Project Name: Genesee	**City / State:** Seattle, WA	**FM Initials:** SW	
Site Name: GEN38_059346	**Monitor Series:** FS 5000 AG	**Monitor S/N:**	20946
Address/Location: Lake Washington BLVD @ 45th Av. S.		**Manhole #**	059-346
		Thomas Bros Map Page:	595 F4
		Pipe Height:	72.25"
Access: Drive / in grass	**Type of System:** Sanitary [ ] Storm [ ] Combined [X]	**Pipe Width:**	72.88"
		IP Address:	166.213.6.207

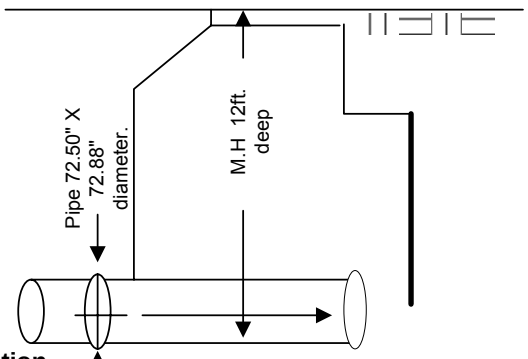


Site Map N

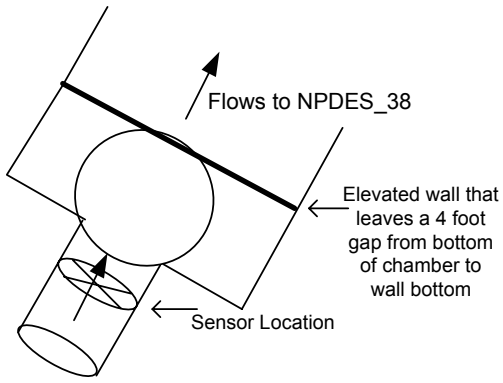


Investigation Information:		Manhole Information:				
Date/Time of Investigation:	7/9/2008 08:30	**Manhole Depth:**	12'			
Site Hydraulics:	Dry pipe	**Manhole Material / Condition**	Concrete / Good			
Upstream Input: (L/S, P/S)		**Pipe Material / Condition:**	Brick / Good			
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X]	Commercial [ ]	Industrial [ ]	Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**				
Depth of Flow:	0 +/-	**Access Pole #:**				
Range (Air DOF):	0 +/-	**Distance From Manhole:**	Feet			
Peak Velocity:	fps	**Road Cut Length:**	Feet			
Silt:	0 Inches	**Trench Length:**	Feet			

Other Information:



Cross Section



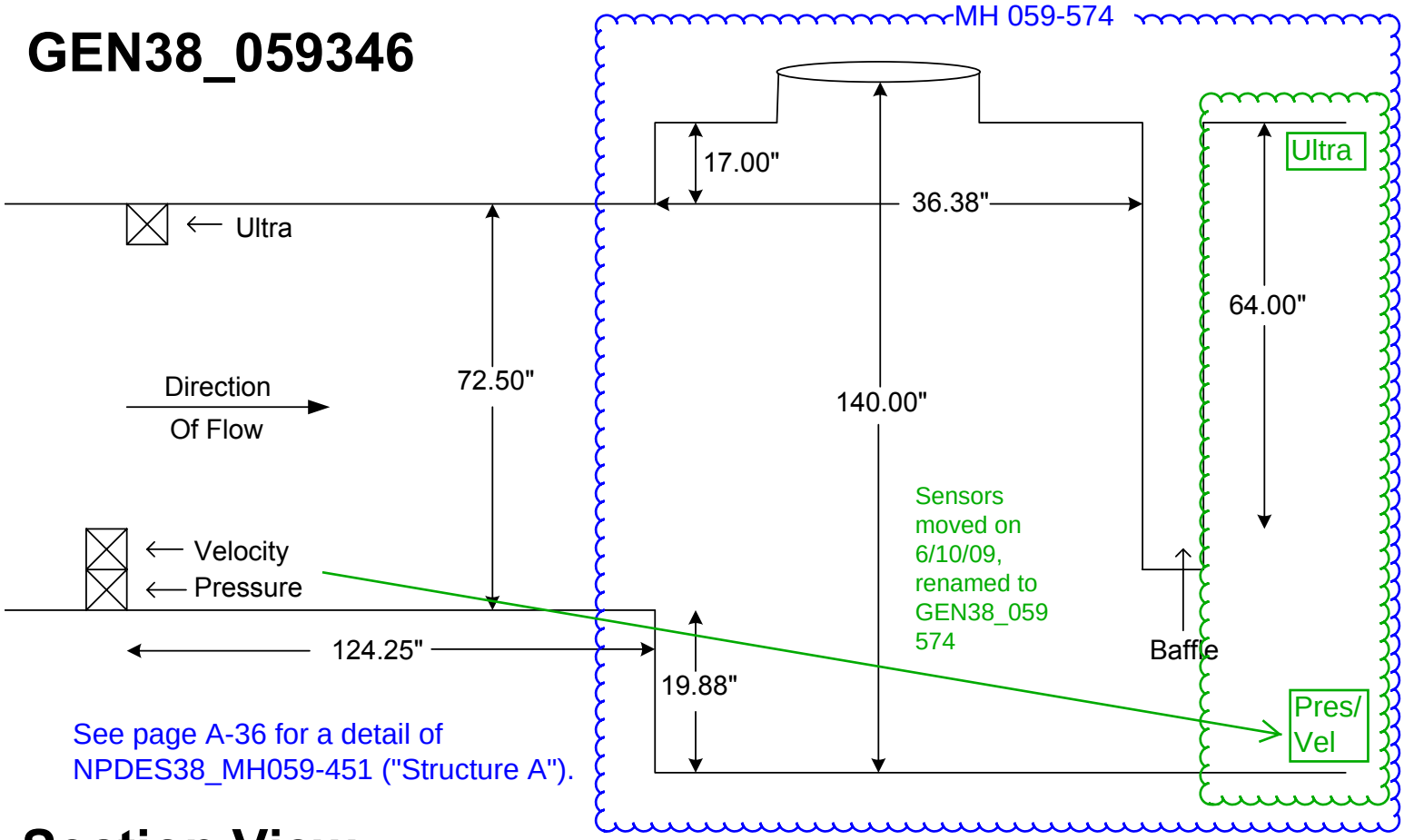
Planar N

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Special	Trunk	[ ]	[ ]	[ ]	
Sensors Devices:	Ultra / Pressure / Velocity	Lift / Pump Station	[ ]	[ ]	[ ]	
Surcharge Height:	0 " Feet	WWTP	[ ]	[ ]	[ ]	
Rain Guage Zone:		Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

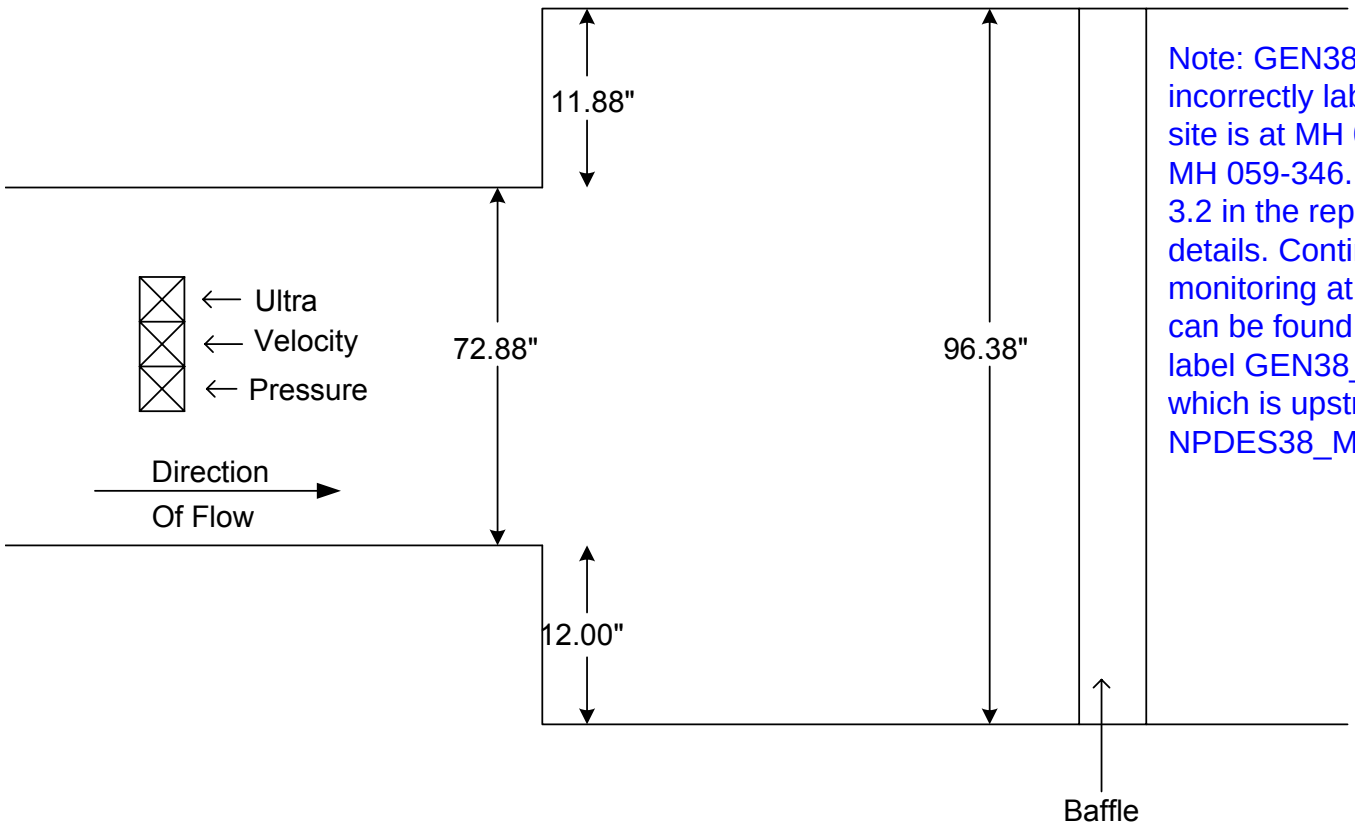
Sensors are located 10 feet up the inlet of the pipe

GEN38_059346



See page A-36 for a detail of NPDES38_MH059-451 ("Structure A").

Section View



Note: GEN38_059346 was incorrectly labeled. This site is at MH 059-574, not MH 059-346. See Section 3.2 in the report for more details. Continued monitoring at this location can be found under the label GEN38_059574, which is upstream of NPDES38_MH059574.

Top View

Not to Scale

Note: GEN38_059346 was incorrectly labeled. See note on previous page.

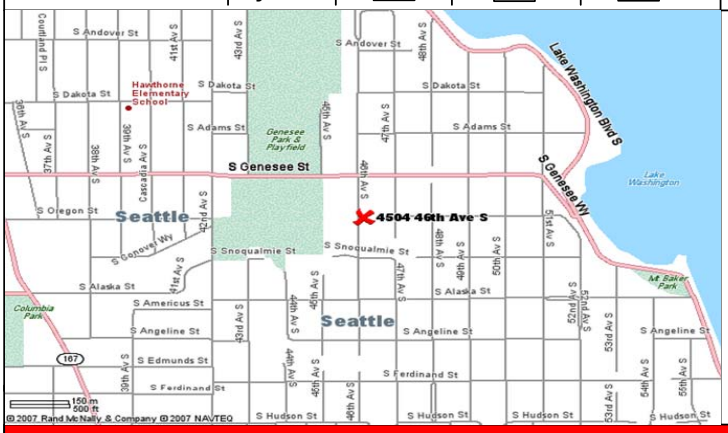
GEN38_059346

ADS ENVIRONMENTAL SERVICES®

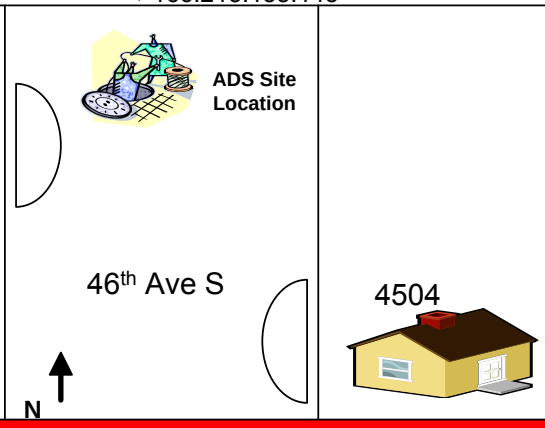
ADS Site Report

Quality Form

Project Name:	Genesee	**City / State:**	Seattle, WA	**FM Initials:**	SK
Site Name:	GEN38_059371	**Monitor Series:**	5000 AG	**Monitor S/N:**	20077
Address/Location:	4504 46th Ave S			**Manhole #**	059371
				Thomas Bros Map Page:	
				Pipe Height:	15.25 "
Access: Drive/Walk	**Type of System:**	Sanitary [X]	Storm [ ]	Combined [ ]	**Pipe Width:** 15.00 "
					IP Address: 166.213.158.145



Site Map



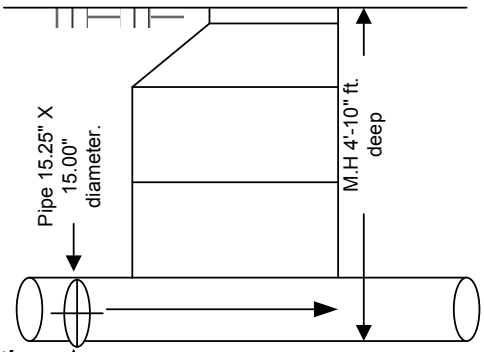
Investigation Information:

Date/Time of Investigation:	1-2-08
Site Hydraulics:	Slow Smooth Flow
Upstream Input: (L/S, P/S)	
Upstream Manhole:	DNI
Downstream Manhole:	DNI
Depth of Flow:	3.25 +/- 0.38"
Range (Air DOF):	+/-
Peak Velocity:	.76 fps
Silt:	0.25 Inches

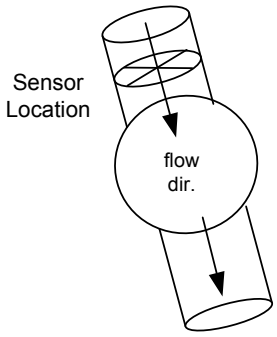
Manhole Information:

Manhole Depth:	4'-10"			
Manhole Material / Condition	Brick / Fair			
Pipe Material / Condition:	Brick / Fair			
Mini System Character:	Residential [X]	Commercial [ ]	Industrial [ ]	Trunk [ ]
Telephone Information:				
Access Pole #:				
Distance From Manhole:	Feet			
Road Cut Length:	Feet			
Trench Length:	Feet			

Other Information:



Cross Section



Planar N

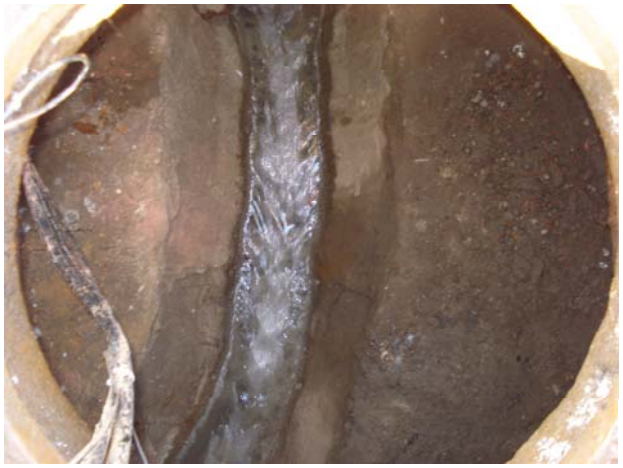
Installation Information	
Installation Type:	Standard
Sensors Devices:	Ultra / Pressure / Velocity
Surcharge Height:	0.00" Feet
Rain Guage Zone:	

Backup	Yes	No	?	Distance
Trunk	[ ]	[ ]	[ ]	
Lift / Pump Station	[ ]	[ ]	[ ]	
WWTP	[ ]	[ ]	[ ]	
Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

GEN38_059371

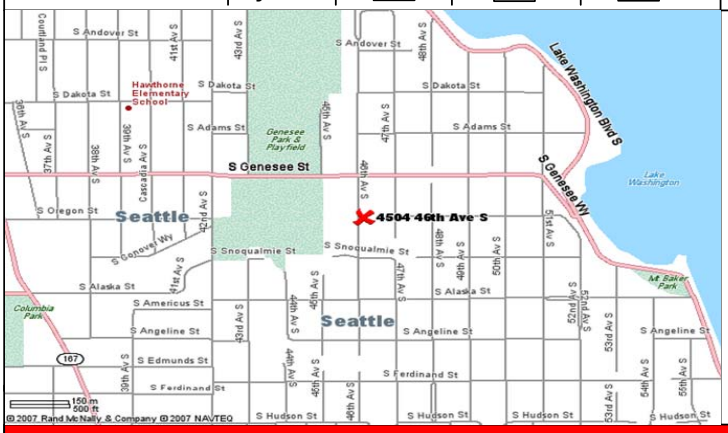
ADS ENVIRONMENTAL SERVICES®



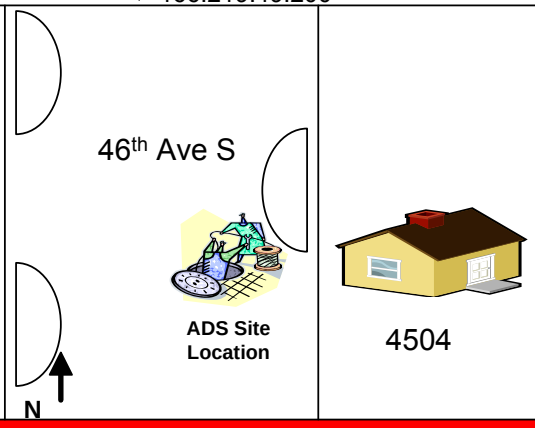
ADS Site Report

Quality Form

Project Name:	Genesee	**City / State:**	Seattle, WA	**FM Initials:**	SK
Site Name:	GEN38_059373	**Monitor Series:**	5000 AG	**Monitor S/N:**	20041
Address/Location:	4504 46th Ave S			**Manhole #**	059373
				Thomas Bros Map Page:	
				Pipe Height:	28.88 "
Access: Drive/Walk	**Type of System:**	Sanitary [X]	Storm [ ]	Combined [ ]	**Pipe Width:** 29.13 "
					IP Address: 166.219.49.200



Site Map



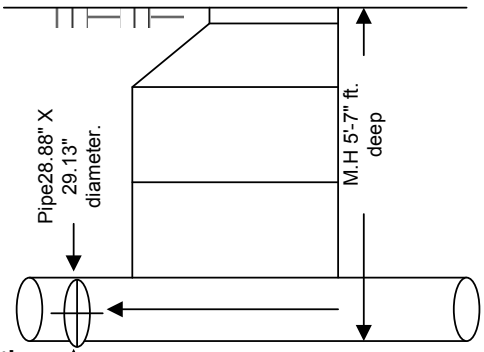
Investigation Information:

Date/Time of Investigation:	12-12-07 1408	**Site Hydraulics:**	Slow Smooth Flow
Upstream Input: (L/S, P/S)		**Upstream Manhole:**	DNI
Downstream Manhole:	DNI	**Depth of Flow:**	1.63 +/- 0.38"
Range (Air DOF):	+/-	**Peak Velocity:**	.70 fps
Silt:	0.00 Inches		

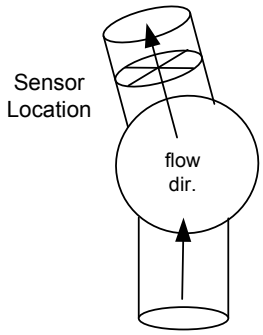
Manhole Information:

Manhole Depth:	5'-7"				
Manhole Material / Condition	Brick / Fair				
Pipe Material / Condition:	Clay / Fair				
Mini System Character:	Residential [X]	Commercial [ ]	Industrial [ ]	Trunk [ ]	
Telephone Information:					
Access Pole #:					
Distance From Manhole:	Feet				
Road Cut Length:	Feet				
Trench Length:	Feet				

Other Information:



Cross Section



Planar N

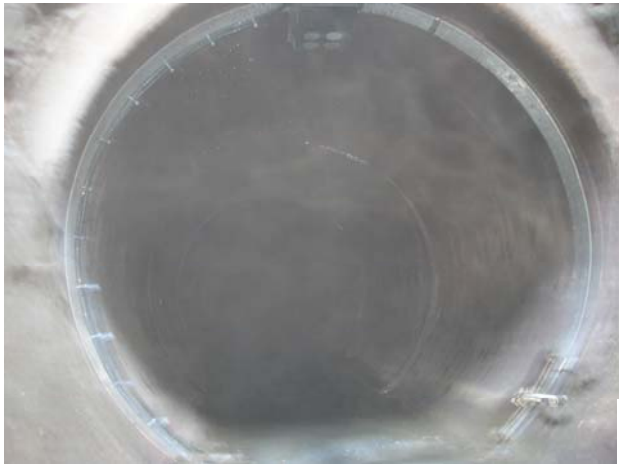
Installation Information	
Installation Type:	Reverse
Sensors Devices:	Ultra / Pressure / Velocity
Surcharge Height:	0.00" Feet
Rain Guage Zone:	

Backup	Yes	No	?	Distance
Trunk	[ ]	[ ]	[ ]	
Lift / Pump Station	[ ]	[ ]	[ ]	
WWTP	[ ]	[ ]	[ ]	
Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

GEN38_059373

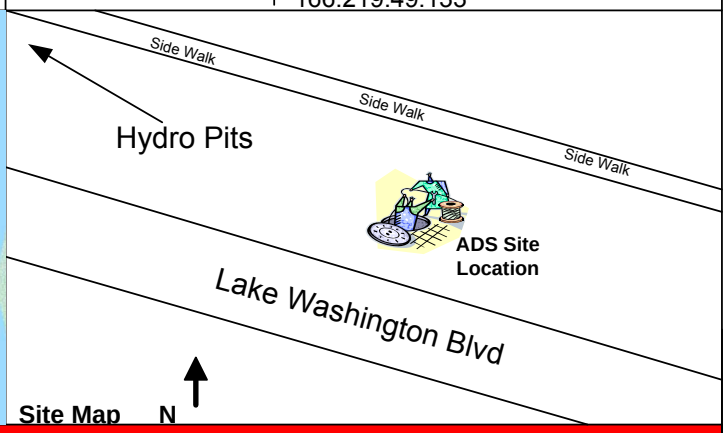
ADS ENVIRONMENTAL SERVICES®



ADS Site Report

Quality Form

Project Name:	Genesee	**City / State:**	Seattle, WA	**FM Initials:**	SK
Site Name:	GEN38_059398	**Monitor Series:**	5000 AG	**Monitor S/N:**	20023
Address/Location:	4610 Lake Washington Blvd			**Manhole #**	059398
				Thomas Bros Map Page:	
				Pipe Height:	21.00"
Access: Walk	**Type of System:**	Sanitary [X]	Storm [ ]	Combined [ ]	**Pipe Width:** 21.13"
					IP Address: 166.219.49.133

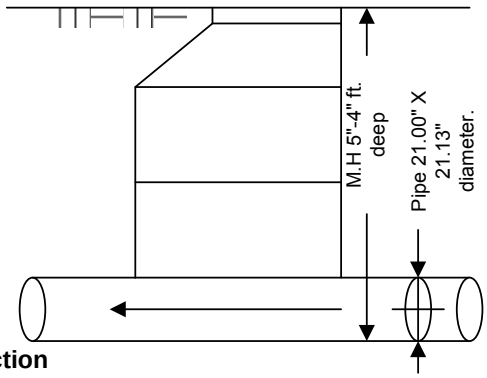


Site Map

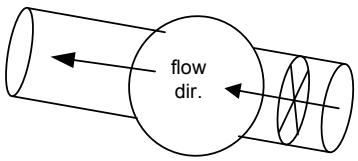
Investigation Information:

Date/Time of Investigation:	12-13-07 0830	**Manhole Depth:**	20'-8"
Site Hydraulics:	Slow Smooth Flow	**Manhole Material / Condition**	Concrete / Fair
Upstream Input: (L/S, P/S)		**Pipe Material / Condition:**	Concrete / Fair
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X] Commercial [ ] Industrial [ ] Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**	
Depth of Flow:	6.00" +/- 0.38"	**Access Pole #:**	
Range (Air DOF):	+/-	**Distance From Manhole:**	Feet
Peak Velocity:	.97 fps	**Road Cut Length:**	Feet
Silt:	0.00 Inches	**Trench Length:**	Feet

Other Information:



Cross Section



Sensor Location

Planar N

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Special	Trunk	[ ]	[ ]	[ ]	
Sensors Devices:	Ultra / Pressure	Lift / Pump Station	[ ]	[ ]	[ ]	
Surcharge Height:	0.00" Feet	WWTP	[ ]	[ ]	[ ]	
Rain Guage Zone:		Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

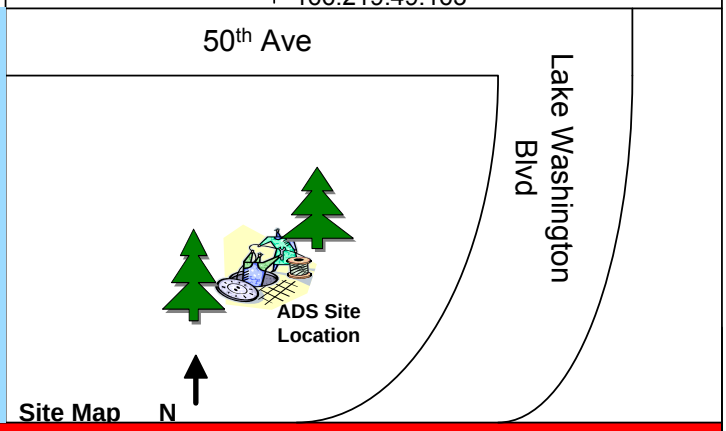
GEN38_059398

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

Project Name:	Genesee	**City / State:**	Seattle, WA	**FM Initials:**	SK
Site Name:	GEN38_059404	**Monitor Series:**	5000 AG	**Monitor S/N:**	20073
Address/Location:	50th Ave & Lake Washington Blvd			**Manhole #**	059404
				Thomas Bros Map Page:	
				Pipe Height:	15.00 "
Access: Drive/Walk	**Type of System:**	Sanitary [X]	Storm [ ]	Combined [ ]	**Pipe Width:** 14.63 "
					IP Address: 166.219.49.163

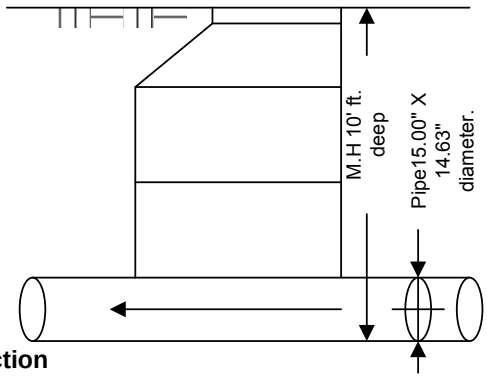


Site Map

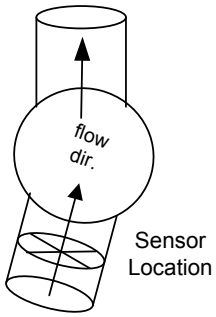
Investigation Information:

Date/Time of Investigation:	12-13-07 0804	**Manhole Depth:**	10'
Site Hydraulics:	Slow Smooth Flow	**Manhole Material / Condition**	Precast / Fair
Upstream Input: (L/S, P/S)		**Pipe Material / Condition:**	Concrete / Fair
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X] Commercial [ ] Industrial [ ] Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**	
Depth of Flow:	8.25 +/- 0.38"	**Access Pole #:**	
Range (Air DOF):	+/-	**Distance From Manhole:**	Feet
Peak Velocity:	2.06 fps	**Road Cut Length:**	Feet
Silt:	0.00 Inches	**Trench Length:**	Feet

Other Information:



Cross Section



Planar

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Regular	Trunk	[ ]	[ ]	[ ]	
Sensors Devices:	Ultra / Pressure / Velocity	Lift / Pump Station	[ ]	[ ]	[ ]	
Surcharge Height:	0.00" Feet	WWTP	[ ]	[ ]	[ ]	
Rain Guage Zone:		Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

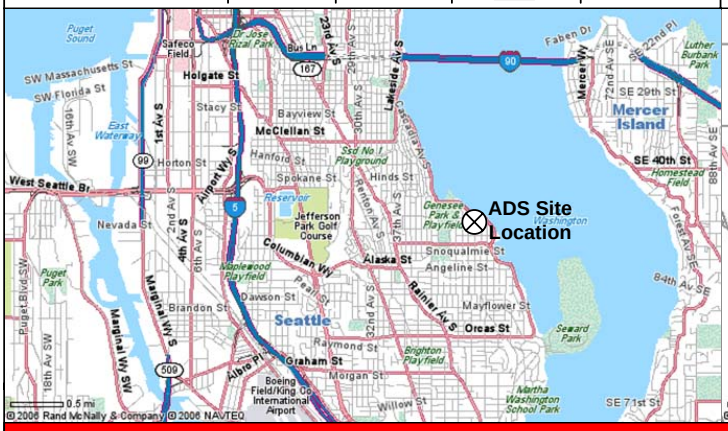
GEN38_059404

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

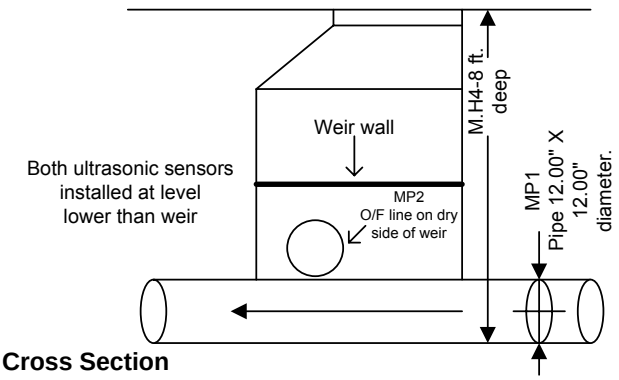
Project Name: Seattle - CSO	**City / State:** Seattle, WA	**FM Initials:** SW	
Site Name: NPDES 41B/SEA_059406	**Monitor Series:** 5000 BG	**Monitor S/N:**	19003
Address/Location: 4002 49th Av. S. @ Lake Washington BLVD S.		**Manhole #**	059-406
		Thomas Bros Map Page:	595 F4
		Pipe Height:	MP 1: 12.00" MP 2: 15.00"
Access: Drive	**Type of System:** Sanitary [ ] Storm [ ] Combined [X]	**Pipe Width:**	MP 1: 12.00" MP 2: 15.00"
		IP Address:	166.219.18.242



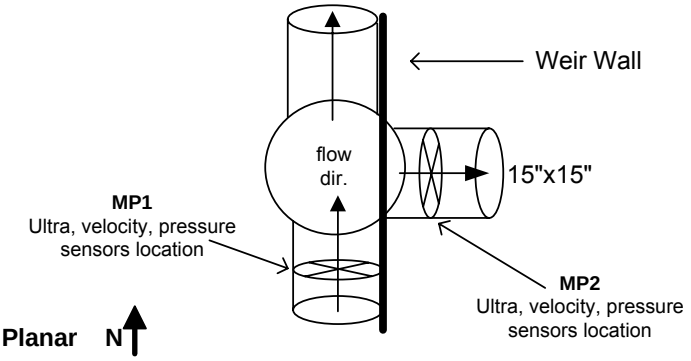
Investigation Information:

Date/Time of Investigation:	12/12/2006 13:19	**Manhole Depth:**	4' - 8"
Site Hydraulics:	Steady smooth flow	**Manhole Material / Condition**	Brick / Good
Upstream Input: (L/S, P/S)	No influence	**Pipe Material / Condition:**	Clay / Good
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X] Commercial [ ] Industrial [ ] Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**	
Depth of Flow:	9.13"+/- 0.25"	**Access Pole #:**	
Range (Air DOF):	3.63"+/- 0.25"	**Distance From Manhole:**	Feet
Peak Velocity:	1.73 fps	**Road Cut Length:**	Feet
Silt:	2.00 Inches	**Trench Length:**	Feet

Other Information:



Cross Section



Planar

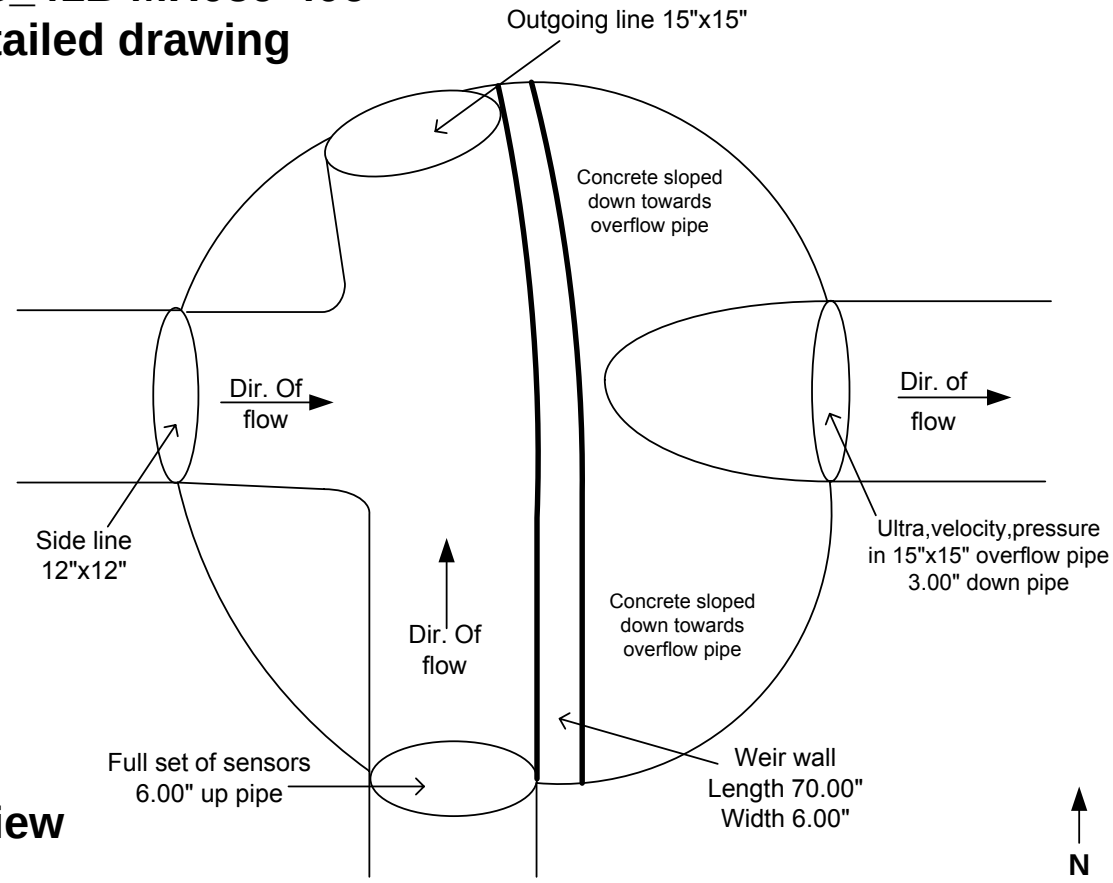
Installation Information		Backup	Yes	No	?	Distance
Installation Type:	MP1 Regular / MP2 Reverse	Trunk	[ ]	[X]	[ ]	
Sensors Devices:	Ultra / Pressure / Velocity	Lift / Pump Station	[ ]	[X]	[ ]	
Surcharge Height:	0.00"	WWTP	[ ]	[X]	[ ]	
Rain Guage Zone:	RG_15,16,18	Other	[ ]	[X]	[ ]	

Additional Site Information / Comments:

Weir Measurements: Length 70.00", Width 6.00". Height: Left 13.75", Center 14.00", Right 14.25" (heights measured from base of wall to respective points on top of wall).
Point of O/F 12.38" (what monitor reads when High High threshold is met).
Pressure (5 PSI, accuracy +/- 0.25% for range of 0.25 – 11.5 ft.)
Overflow quantification method: MP1 – Broad Crested Weir Equation. MP2 – Continuity Equation.

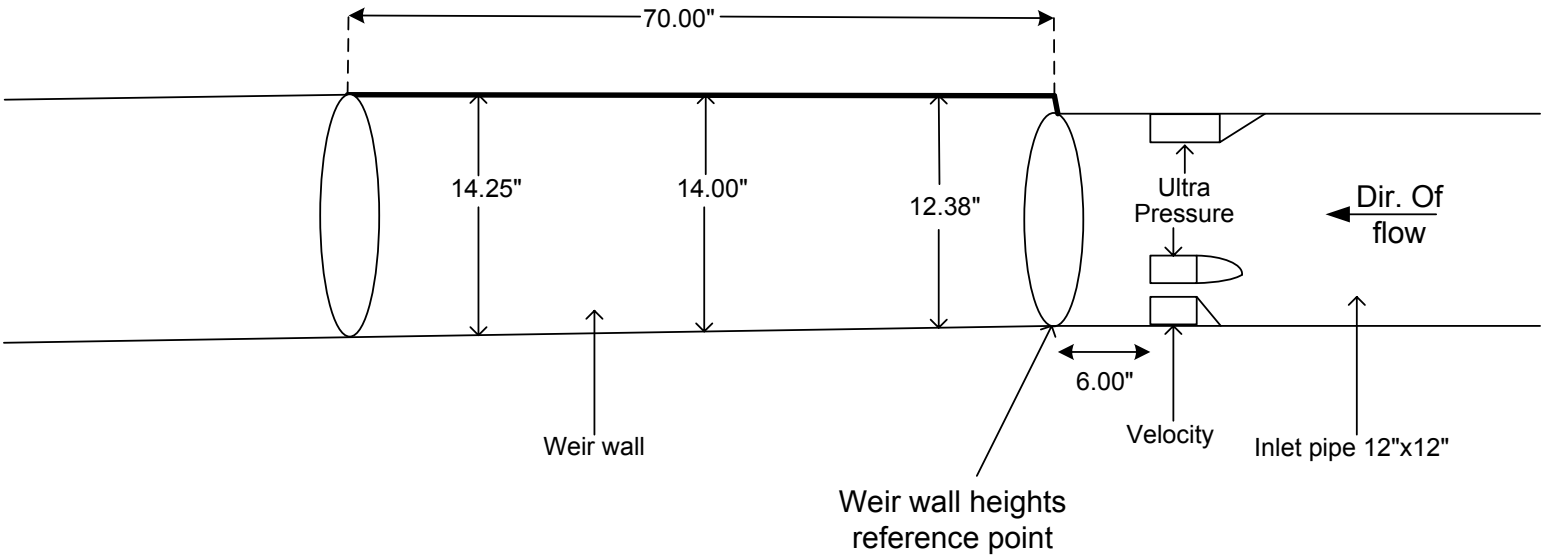
Rev.1 1/27/09

NPDES_41B MH059-406
Detailed drawing



Top View

Cross Section



Overflow quantity is quantified with the equation: If(Dfinal - O/F<0),0,2.62 x (weir length)* (((Dfinal - O/F)/12)^3/2)))

Not to scale
Rev. 1 10/17/08

NPDES_41B

MH 059-406

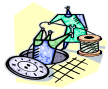
ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

Project Name:	Genesee	**City / State:**	Seattle, WA	**FM Initials:**	SK
Site Name:	GEN40_059407	**Monitor Series:**	5000 AG	**Monitor S/N:**	20040
Address/Location:	4021 49th Ave S.			**Manhole #**	059407
				Thomas Bros Map Page:	
				Pipe Height:	10.13"
Access: Drive	**Type of System:**	Sanitary [X]	Storm [ ]	Combined [ ]	**Pipe Width:** 10.13"
					IP Address: 166.213.158.157

4021



ADS Site Location

49th Ave S

(X) 059490

Dakota St. (X) NPDES

Site Map N

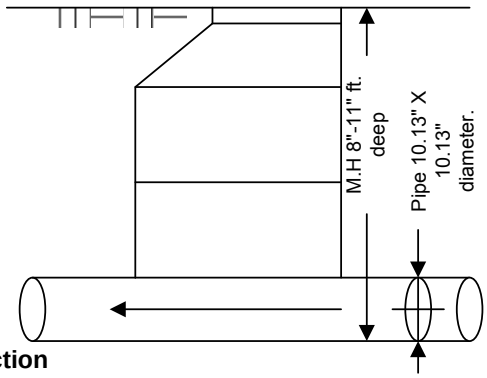
Investigation Information:

Date/Time of Investigation:	12-13-07 0730	**Site Hydraulics:**	Fast Smooth Flow
Upstream Input: (L/S, P/S)		**Upstream Manhole:**	DNI
Downstream Manhole:	DNI	**Depth of Flow:**	2.75 +/- 0.25"
Range (Air DOF):	+/-	**Peak Velocity:**	4.91 fps
Silt:	0.00 Inches		

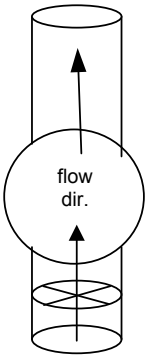
Manhole Information:

Manhole Depth:	8'-11"				
Manhole Material / Condition	Brick / Fair				
Pipe Material / Condition:	Concrete / Fair				
Mini System Character:	Residential [X]	Commercial [ ]	Industrial [ ]	Trunk [ ]	
Telephone Information:					
Access Pole #:					
Distance From Manhole:	Feet				
Road Cut Length:	Feet				
Trench Length:	Feet				

Other Information:



Cross Section



Planar N

Installation Information	
Installation Type:	Standard
Sensors Devices:	Ultra / Pressure/ Velocity
Surcharge Height:	0.00" Feet
Rain Guage Zone:	

Backup	Yes	No	?	Distance
Trunk	[ ]	[ ]	[ ]	
Lift / Pump Station	[ ]	[ ]	[ ]	
WWTP	[ ]	[ ]	[ ]	
Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

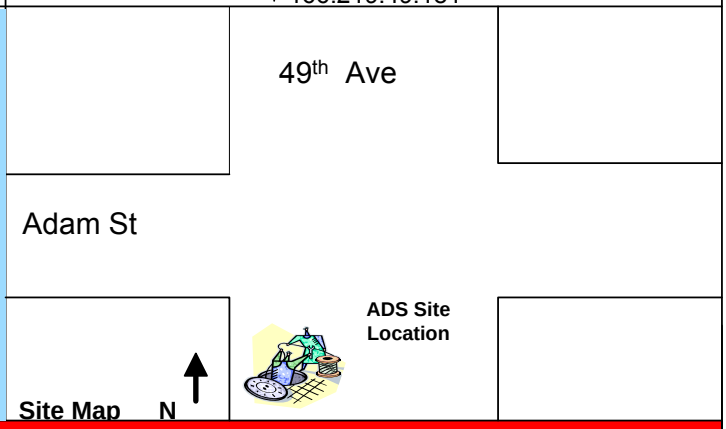
GEN38_059407

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

Project Name: Genesee	**City / State:** Seattle, WA	**FM Initials:** SK	
Site Name: GEN40_05909	**Monitor Series:** 5000 AG	**Monitor S/N:**	21169
Address/Location: 49th Ave and Adams		**Manhole #**	059409
		Thomas Bros Map Page:	595 F5 & F4
		Pipe Height:	10.00 "
Access: Drive	**Type of System:** Sanitary [X] Storm [ ] Combined [ ]	**Pipe Width:**	10.00 "
		IP Address:	166.219.49.181



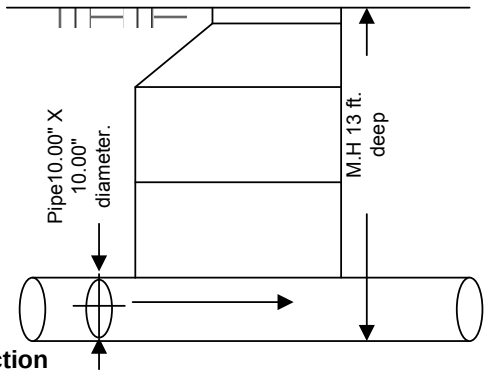
Investigation Information:

Date/Time of Investigation:	1-24-08 0830
Site Hydraulics:	Slow Smooth Flow
Upstream Input: (L/S, P/S)	
Upstream Manhole:	DNI
Downstream Manhole:	DNI
Depth of Flow:	1.38" +/- 0.25"
Range (Air DOF):	+/-
Peak Velocity:	1.57 fps
Silt:	0.00 Inches

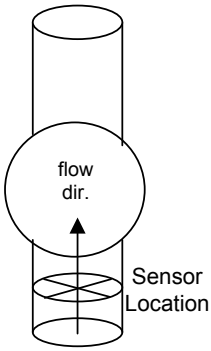
Manhole Information:

Manhole Depth:	12'				
Manhole Material / Condition	Concrete / Good				
Pipe Material / Condition:	Concrete / Good				
Mini System Character:	Residential [X]	Commercial [ ]	Industrial [ ]	Trunk [ ]	
Telephone Information:					
Access Pole #:					
Distance From Manhole:	Feet				
Road Cut Length:	Feet				
Trench Length:	Feet				

Other Information:



Cross Section



Planar N

Installation Information	
Installation Type:	Standard
Sensors Devices:	Ultra / Pressure / Velocity
Surcharge Height:	0.00" Feet
Rain Guage Zone:	

Backup	Yes	No	?	Distance
Trunk	[ ]	[ ]	[ ]	
Lift / Pump Station	[ ]	[ ]	[ ]	
WWTP	[ ]	[ ]	[ ]	
Other	[ ]	[ ]	[ ]	

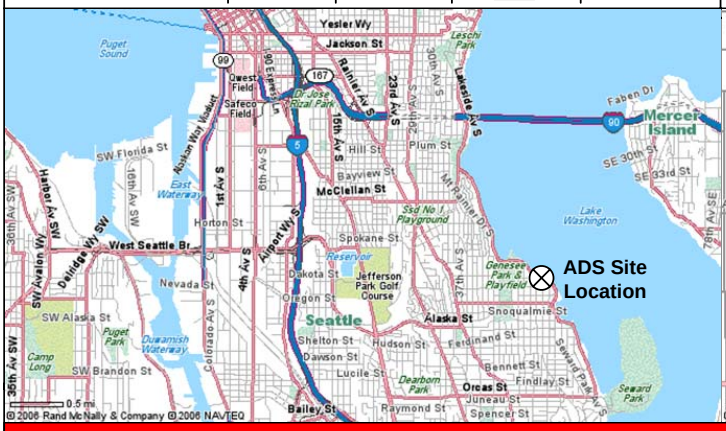
Additional Site Information / Comments:

GEN40_059409

ADS ENVIRONMENTAL SERVICES®

ADS Site Report — Quality Form

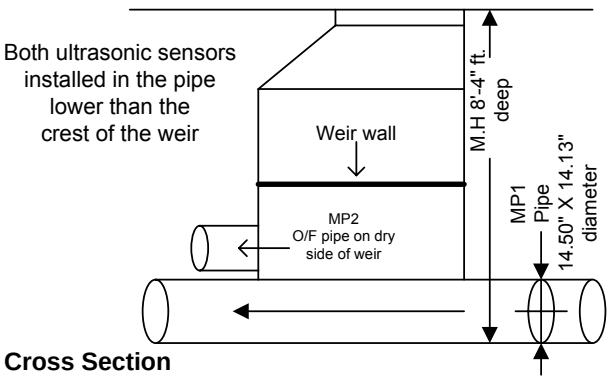
Project Name: Seattle - CSO	**City / State:** Seattle, WA	**FM Initials:** SW	
Site Name: NPDES 41A/SEA_059434	**Monitor Series:** 5000 BG	**Monitor S/N:**	19025
Address/Location: 3971 50th Av. S. @ S. Lake Wash. BLVD		**Manhole #**	059-434
		Thomas Bros Map Page:	595 F4
		Pipe Height:	MP1 14.50" / MP2 15.13"
Access: Drive	**Type of System:** Sanitary [ ] Storm [ ] Combined [X]	**Pipe Width:**	MP1 14.13" / MP2 15.50"
		IP Address:	166.219.18.218



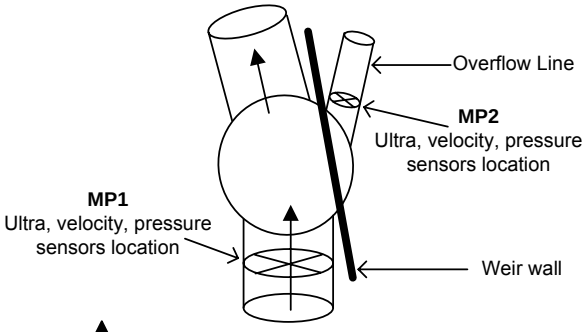
Investigation Information:

Date/Time of Investigation:	12/12/2006 14:45	**Manhole Depth:**	8' - 4"
Site Hydraulics:	Low smooth flow, sometimes hard to get velocity readings due to sensor not fully submerged	**Manhole Material / Condition**	Brick / Good
Upstream Input: (L/S, P/S)	No influence	**Pipe Material / Condition:**	Clay / Fair
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X] Commercial [ ] Industrial [ ] Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**	Doesn't apply
Depth of Flow:	0.38" +/- 0.25"	**Access Pole #:**	Doesn't apply
Range (Air DOF):	12.50" +/- 0.25"	**Distance From Manhole:**	Doesn't apply Feet
Peak Velocity:	1.50 fps	**Road Cut Length:**	Doesn't apply Feet
Silt:	0.00 Inches	**Trench Length:**	Doesn't apply Feet

Other Information:



Cross Section



Planar N

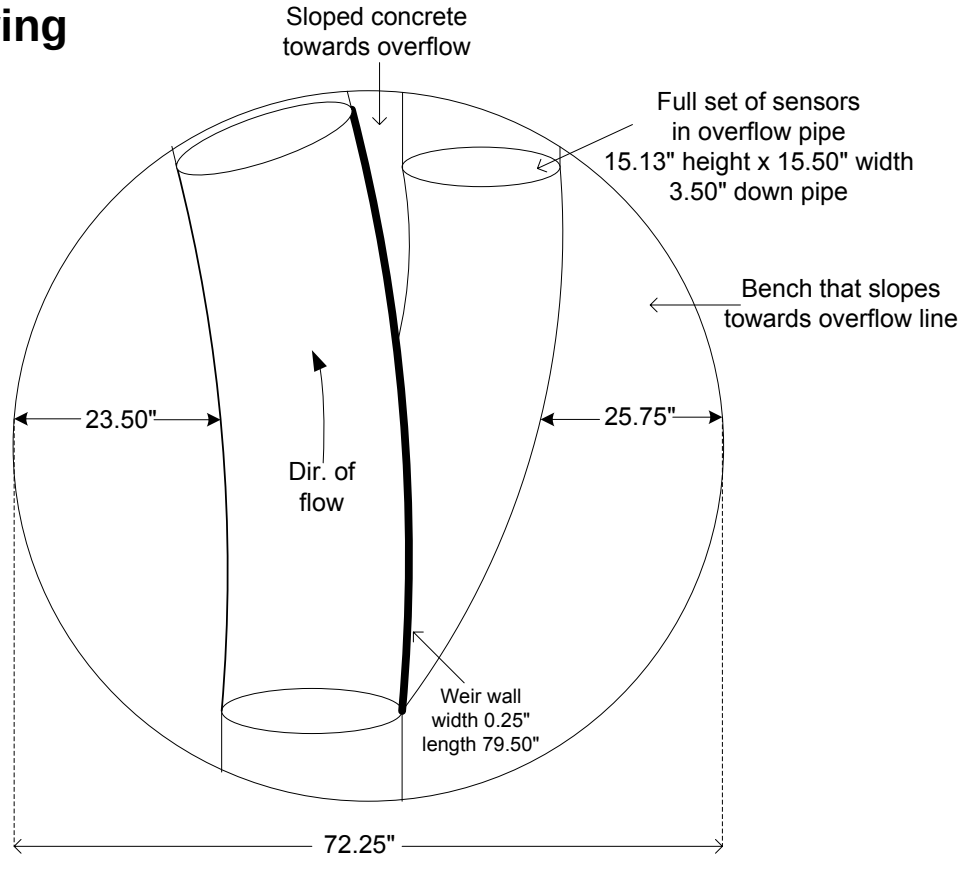
Installation Information		Backup	Yes	No	?	Distance
Installation Type:	MP1 Regular / MP2 Reverse	Trunk	[ ]	[X]	[ ]	
Sensors Devices:	Ultra / Pressure / Velocity	Lift / Pump Station	[ ]	[X]	[ ]	
Surcharge Height:	0.00"	WWTP	[ ]	[X]	[ ]	
Rain Guage Zone:	RG_15,16,18	Other	[ ]	[X]	[ ]	

Additional Site Information / Comments:

Weir wall: Height: Right side 5.38" Center: 5.50" Left side 8.25" (heights measured from base of wall to respective points on top of wall). Length 79.50", Width 0.25"
Overflow quantification method: MP1 – Broad Crested Weir Equation. MP2 – Continuity Equation.
Point of O/F 5.38" (what monitor reads when High High threshold is met).
Pressure (5 PSI, accuracy +/- 0.25% for range of 0.25 – 11.5 ft.)

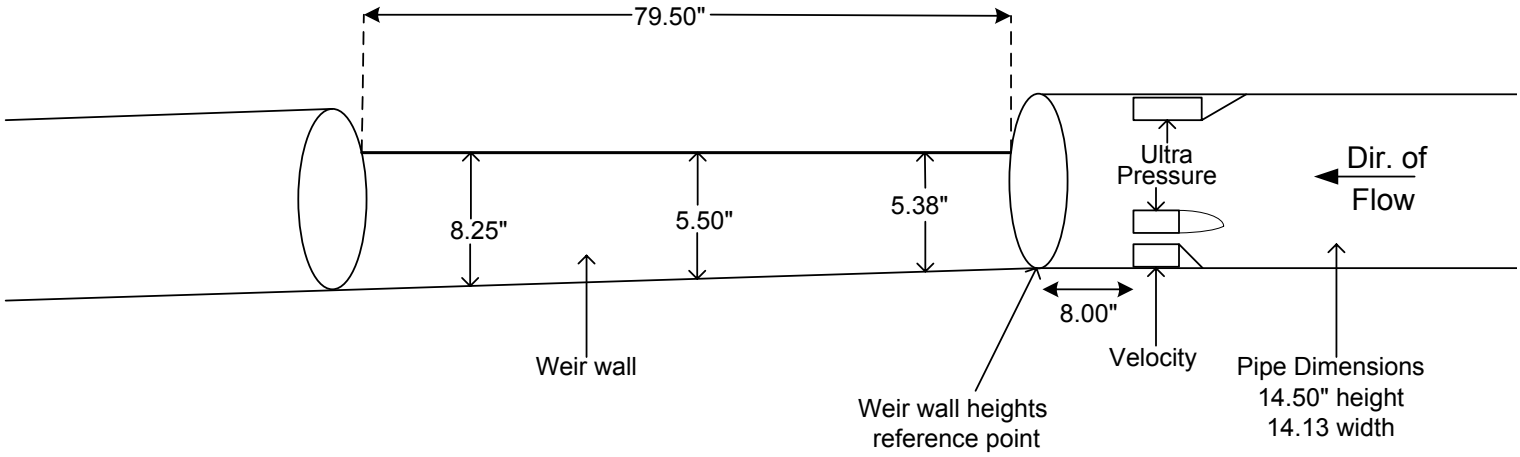
Rev.1 1/27/09

NPDES_41A MH059-434
Detailed drawing



Top View

Cross Section



Point of overflow 5.38"
Overflow quantified by Q-final
in monitoring point 2

Not to scale
Rev. 1 10/16/08

NPDES_41A

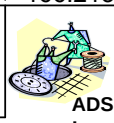
MH 059-434

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

Project Name:	Genesee	**City / State:**	Seattle, WA	**FM Initials:**	SK
Site Name:	GEN40_059436	**Monitor Series:**	5000 AG	**Monitor S/N:**	20025
Address/Location:	Corner of 50th Ave S & Adams St			**Manhole #**	059-436
				Thomas Bros Map Page:	595 F5
				Pipe Height:	14.00"
Access: Drive	**Type of System:**	Sanitary [X]	Storm [ ]	Combined [ ]	**Pipe Width:** 14.00"
					IP Address: 166.213.158.98



ADS Site Location

Adams St

50th Ave S

Site Map N

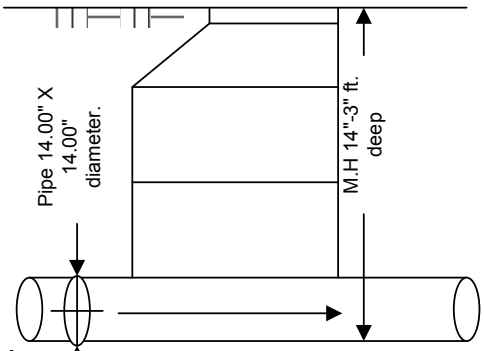
Investigation Information:

Date/Time of Investigation:	1-24-08 1215
Site Hydraulics:	Slow Smooth Flow
Upstream Input: (L/S, P/S)	
Upstream Manhole:	DNI
Downstream Manhole:	DNI
Depth of Flow:	1.75" +/- 0.38"
Range (Air DOF):	+/-
Peak Velocity:	1.36 fps
Silt:	0.00 Inches

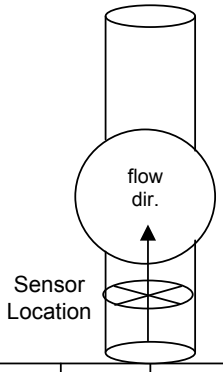
Manhole Information:

Manhole Depth:	14'-3"			
Manhole Material / Condition	Concrete / Good			
Pipe Material / Condition:	Concrete / Good			
Mini System Character:	Residential [X]	Commercial [ ]	Industrial [ ]	Trunk [ ]
Telephone Information:				
Access Pole #:				
Distance From Manhole:	Feet			
Road Cut Length:	Feet			
Trench Length:	Feet			

Other Information:



Cross Section



Planar N

Installation Information	
Installation Type:	Standard
Sensors Devices:	Ultra / Pressure/ Velocity
Surcharge Height:	0.00" Feet
Rain Guage Zone:	

Backup	Yes	No	?	Distance
Trunk	[ ]	[ ]	[ ]	
Lift / Pump Station	[ ]	[ ]	[ ]	
WWTP	[ ]	[ ]	[ ]	
Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

GEN40_059436

ADS ENVIRONMENTAL SERVICES®

059-443

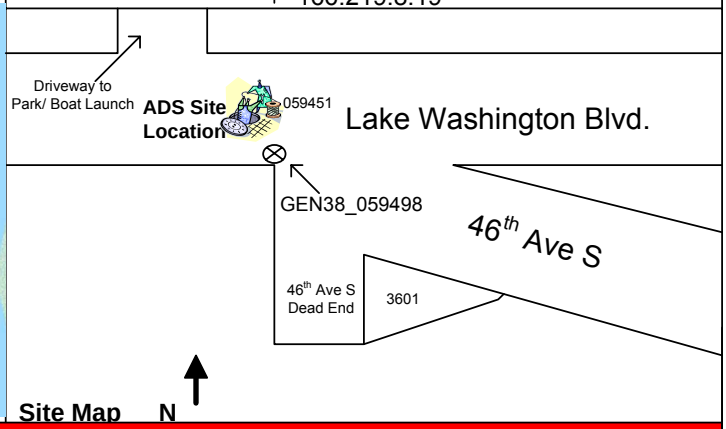
Not Available

059-443 is owned and operated by King County. A Site Report is not available for this site.

ADS Site Report

Quality Form

Project Name:	Genesee	**City / State:**	Seattle, WA	**FM Initials:**	SW
Site Name:	GEN38_059451	**Monitor Series:**	3601	**Monitor S/N:**	2018
Address/Location:	3601 46th Ave S			**Manhole #**	059451
				Thomas Bros Map Page:	595 F4
				Pipe Height:	71.88"
Access:	Drive	**Type of System:**	Sanitary [X] Storm [ ] Combined [ ]	**Pipe Width:**	72.13"
				IP Address:	166.219.8.19

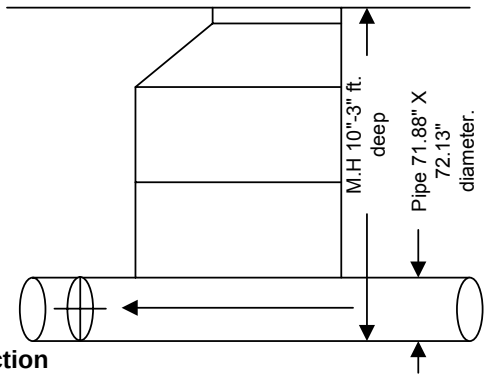


Site Map

Investigation Information:

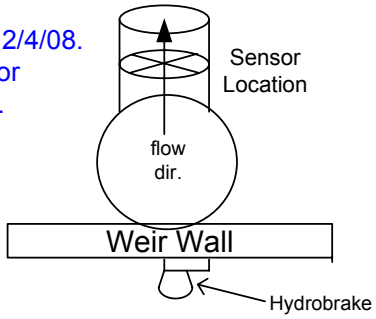
Date/Time of Investigation:	12-17-07 12:13	**Manhole Depth:**	10'-3"
Site Hydraulics:	Fast Choppy Flow	**Manhole Material / Condition**	Precast / Fair
Upstream Input: (L/S, P/S)	No influence	**Pipe Material / Condition:**	Concrete / Fair
Upstream Manhole:	Has hydrobrake with one inlet and one outlet	**Mini System Character:**	Residential [X] Commercial [ ] Industrial [ ] Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**	Doesn't apply
Depth of Flow:	8.13" +/- 0.38"	**Access Pole #:**	Doesn't apply
Range (Air DOF):	62.25" +/- 0.38"	**Distance From Manhole:**	Doesn't apply Feet
Peak Velocity:	6.60 fps	**Road Cut Length:**	Doesn't apply Feet
Silt:	0.00 Inches	**Trench Length:**	Doesn't apply Feet

Other Information:



Cross Section

These sensors were moved slightly downstream on 12/4/08. See section 3.2 for more information.



Planar N

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Special / Reverse	Trunk	[ ]	[X]	[ ]	
Sensors Devices:	Ultra / Pressure/ Velocity	Lift / Pump Station	[ ]	[X]	[ ]	
Surcharge Height:	0.00"	WWTP	[ ]	[X]	[ ]	
Rain Guage Zone:	RG_18	Other	[ ]	[X]	[ ]	

Additional Site Information / Comments:

Site is to capture depth/Q-final after the hydro brake

Rev. 1 12/1/08

GEN38_059451

ADS ENVIRONMENTAL SERVICES®

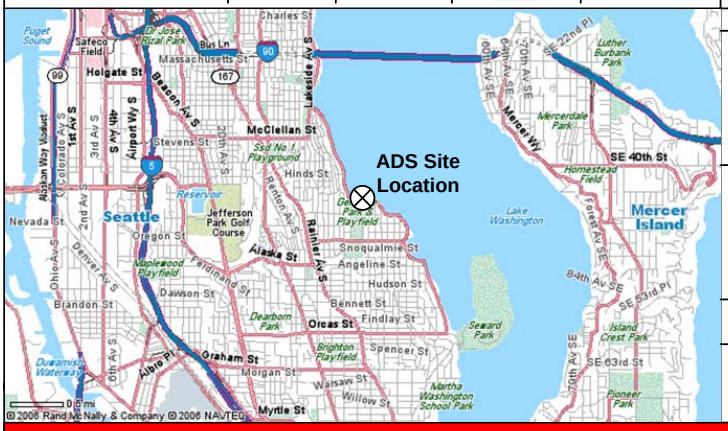
Note: NPDES_38 MH059451 was incorrectly labeled. See note on next page.

ADS ENVIRONMENTAL SERVICES®

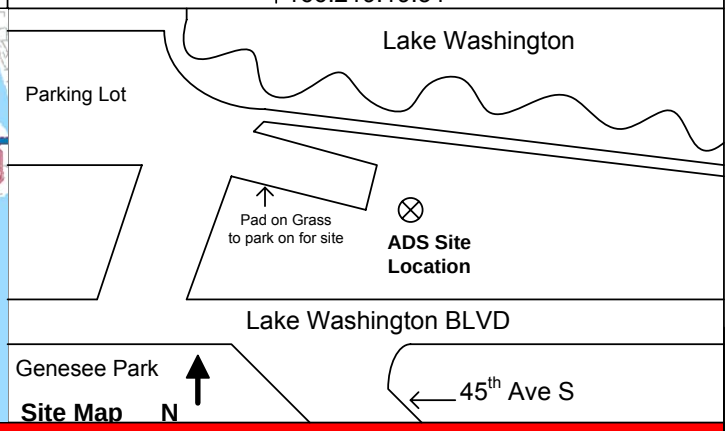
ADS Site Report

Quality Form

Project Name: Seattle - CSO	**City / State:** Seattle, WA	**FM Initials:** SW	
Site Name: NPDES 38/SEA_059451	**Monitor Series:** 5000 AG	**Monitor S/N:**	15097
Address/Location: Lake Washington BLVD @ 45th Av. S.		**Manhole #**	059-451
		Thomas Bros Map Page:	595 F4
		Pipe Height:	72.25"MP1 106.88" MP2
Access: Drive / in grass	**Type of System:** Sanitary [ ] Storm [ ] Combined [X]	**Pipe Width:**	72.50"MP1 48.00" MP2
		IP Address:	166.219.19.34



Site Map N

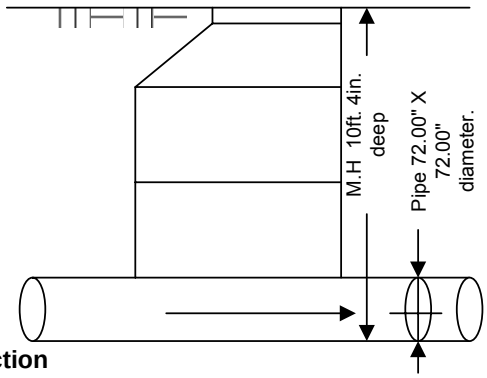


Investigation Information:

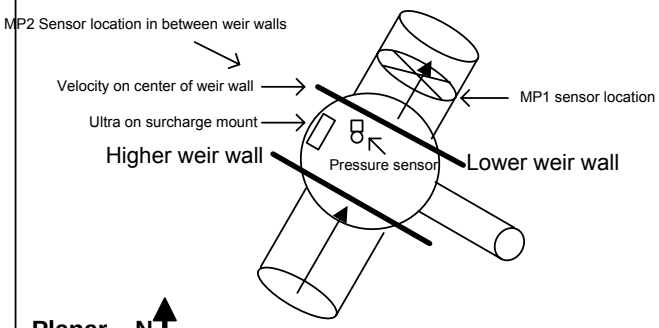
Date/Time of Investigation:	12/12/2006 11:52	**Manhole Depth:**	10' 4"
Site Hydraulics:	Dry pipe	**Manhole Material / Condition**	Concrete / Good
Upstream Input: (L/S, P/S)		**Pipe Material / Condition:**	Brick / Good
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X] Commercial [ ] Industrial [ ] Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**	
Depth of Flow:	0 +/-	**Access Pole #:**	
Range (Air DOF):	0 +/-	**Distance From Manhole:**	Feet
Peak Velocity:	fps	**Road Cut Length:**	Feet
Silt:	0 Inches	**Trench Length:**	Feet

Manhole Information:

Other Information:



Cross Section



Planar N

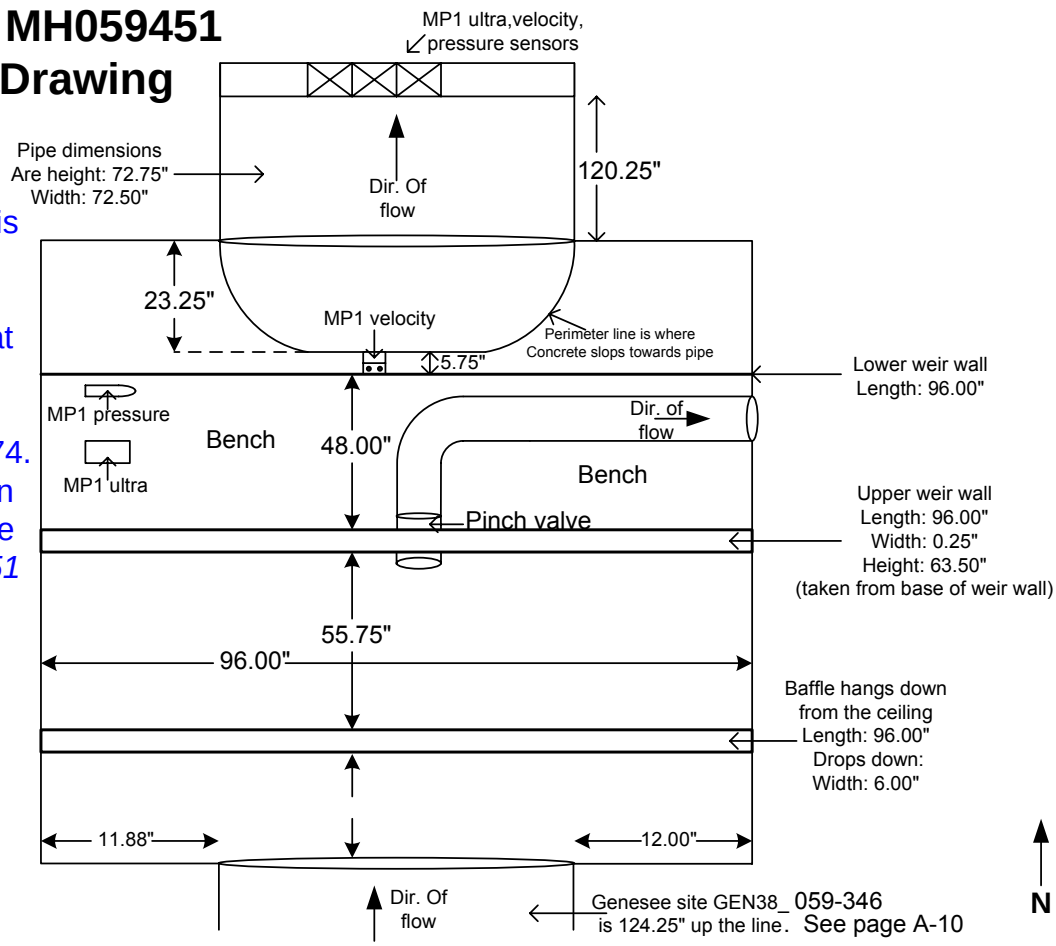
Installation Information		Backup	Yes	No	?	Distance
Installation Type:	MP 1 Reverse / MP 2 Special	Trunk	[ ]	[ ]	[ ]	
Sensors Devices:	Ultra / Pressure / Velocity (Both Mp's)	Lift / Pump Station	[ ]	[ ]	[ ]	
Surcharge Height:	0 " Feet	WWTP	[ ]	[ ]	[ ]	
Rain Guage Zone:		Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

Weir Measurements: Length 96.00", Width 6.00". Higher Weir Wall Height: Left 24.50", Center 24.50", Right 24.25". Lower Weir Wall Height: Left 31.00", Center 32.50", Right 37.00". MP2 is the alarming point high alarm 17.00" and high high at 32.50" .

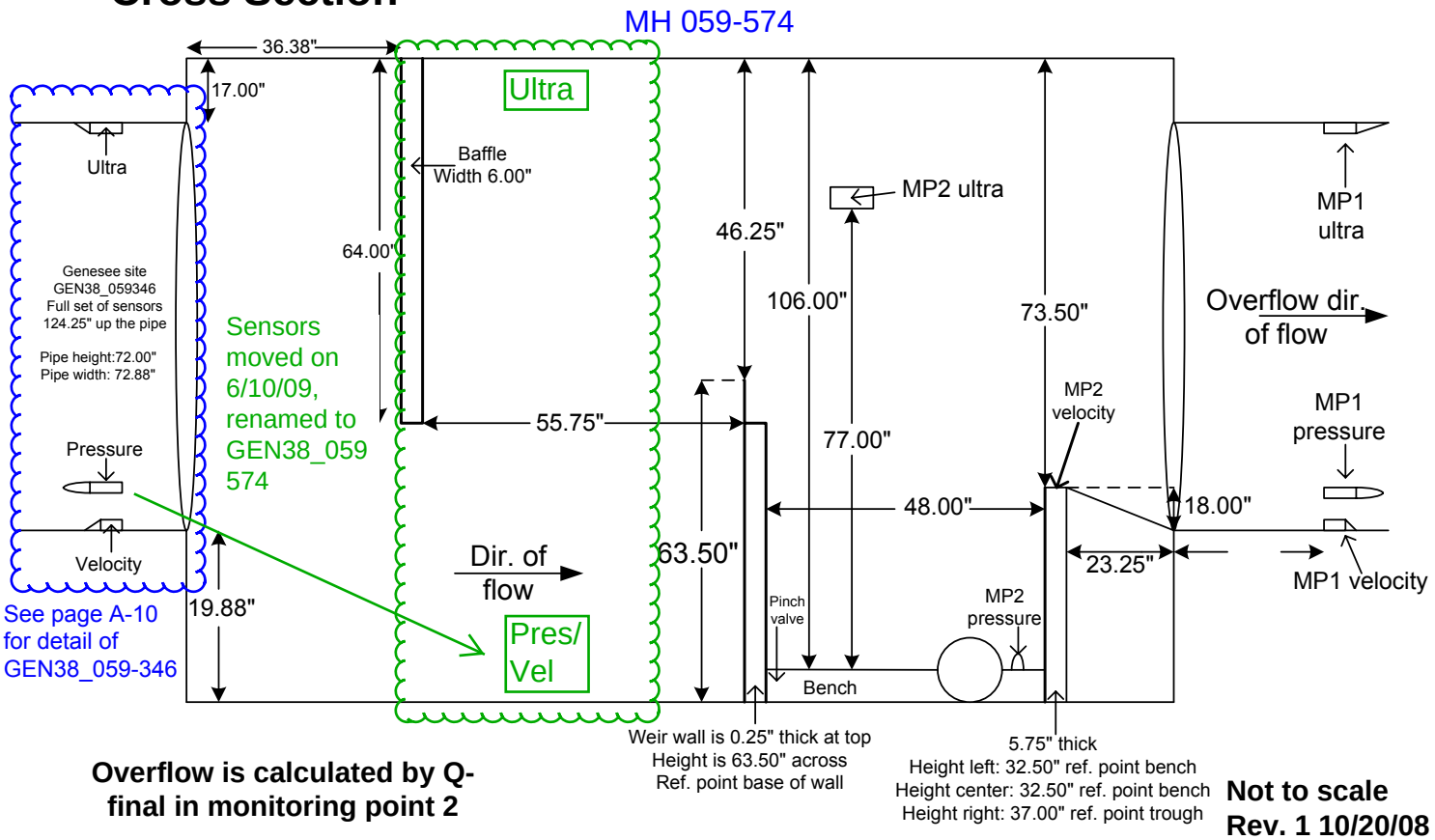
NPDES_38 MH059451 Detailed Drawing

Note: NPDES_38 MH059451 was incorrectly labeled. This site is at MH 059-574, not MH 059-451. Continued monitoring at this site can be found under the label "NPDES038_MH059574." This site is also known as "Structure A". Please see Section 3.2 *059-451 "A" (Monitoring ID NPDES38_059-451, Structure "A")* in the report for more details.



Top View

Cross Section



Overflow is calculated by Q-final in monitoring point 2

Not to scale
Rev. 1 10/20/08

Note: NPDES_38 MH059451 was incorrectly labeled. See note on previous page.

NPDES 38

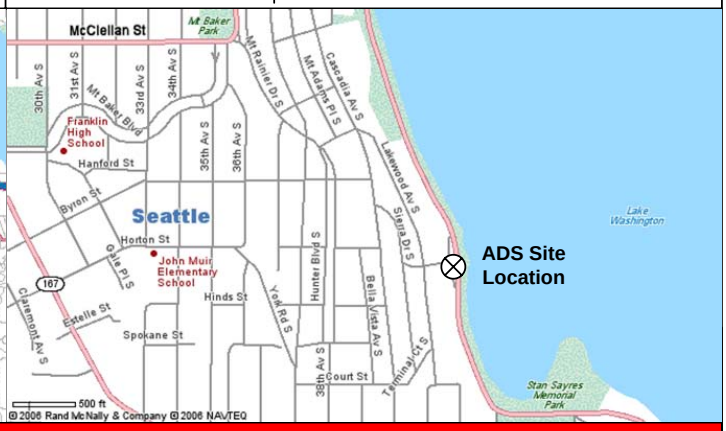
059451

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

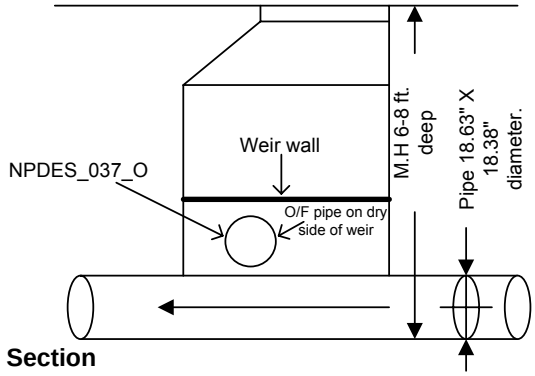
Project Name: Seattle - CSO	**City / State:** Seattle, WA	**FM Initials:** SW	
Site Name: NPDES 37/SEA_059489	**Monitor Series:** 5000 BG	**Monitor S/N:**	19003
Address/Location: 3300 BLK of S. Horton St. & Lake Washington BLVD S. (in grass between the two streets)		**Manhole #**	059-489
		Thomas Bros Map Page:	595 E3
		Pipe Height:	18.63"
Access: Drive / Walk	**Type of System:** Sanitary [ ] Storm [ ] Combined [X]	**Pipe Width:**	18.38"
		IP Address:	166.219.18.231



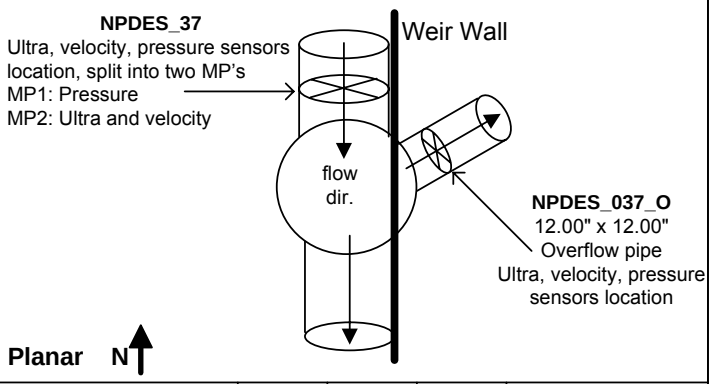
Investigation Information:

Date/Time of Investigation:	12/12/2006 10:51	**Manhole Depth:**	6' - 8"
Site Hydraulics:	Slow smooth flow	**Manhole Material / Condition**	Concrete / Good
Upstream Input: (L/S, P/S)	No influence	**Pipe Material / Condition:**	Clay / Good
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X] Commercial [ ] Industrial [ ] Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**	Doesn't apply
Depth of Flow:	2.88" +/- 0.25"	**Access Pole #:**	Doesn't apply
Range (Air DOF):	+/-	**Distance From Manhole:**	Doesn't apply Feet
Peak Velocity:	1.00 fps	**Road Cut Length:**	Doesn't apply Feet
Silt:	0.00 Inches	**Trench Length:**	Doesn't apply Feet

Other Information:



Cross Section



Planar

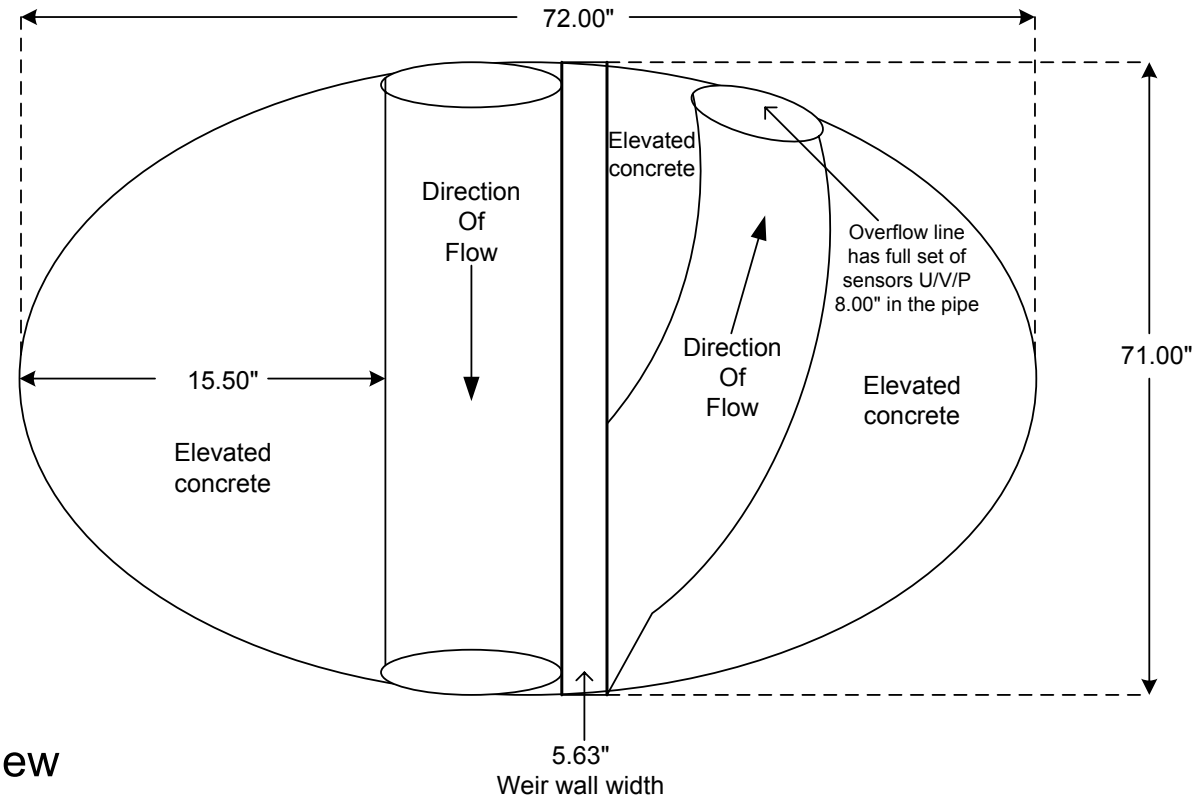
Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Regular	Trunk	[ ]	[X]	[ ]	
Sensors Devices:	Ultra / Pressure / Velocity	Lift / Pump Station	[ ]	[X]	[ ]	
Surcharge Height:	0.00"	WWTP	[ ]	[X]	[ ]	
Rain Guage Zone:	RG_15,16,18	Other	[ ]	[X]	[ ]	

Additional Site Information / Comments:

Weir measurements: Height: Left 16.38", Center 16.38", Right 16.50" (Reference point senor location), Width 5.63. Length 71.00".
Point of O/F 16.38" (what monitor reads when High High threshold is met).
Pressure (5 PSI, accuracy +/- 0.25% for range of 0.25 – 11.5 ft.)
Site split into two MP's due to spiking from site conditions so we can avoid false alarms

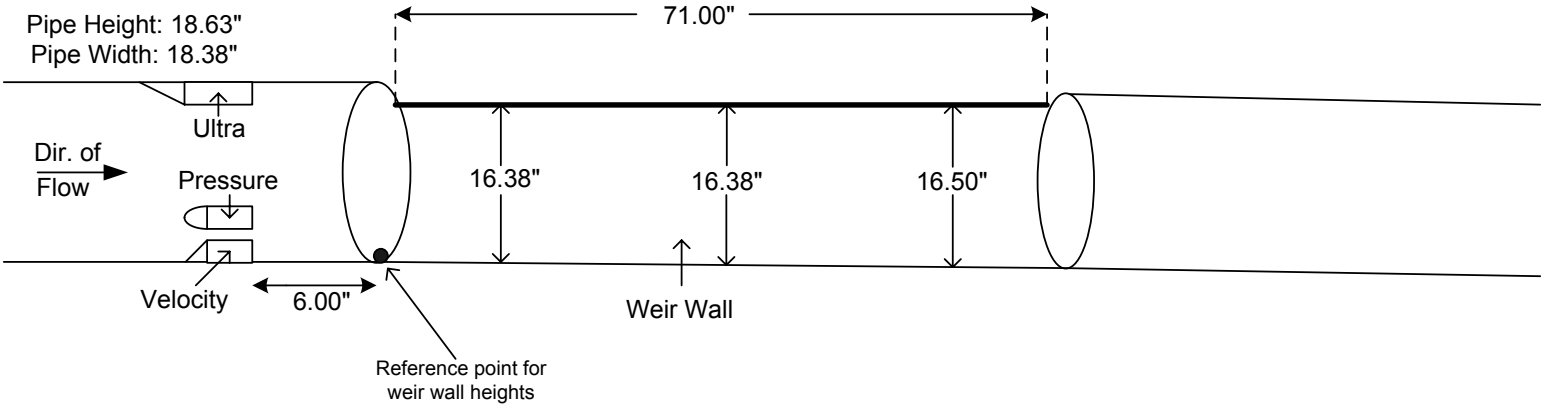
Rev.1 1/22/09

NPDES_37 MH059-489
Detailed Drawing



Top View

Cross Sectional



Overflow quantity is calculated by Q-final in monitoring point 2

Not to scale
Rev. 1 10/15/08

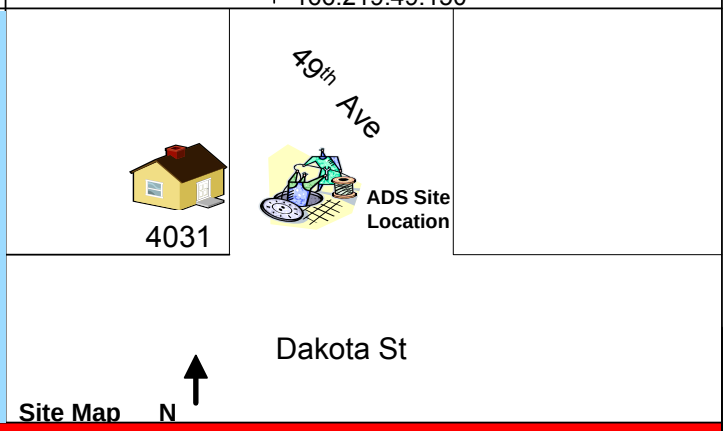
NPDES 37
059489

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

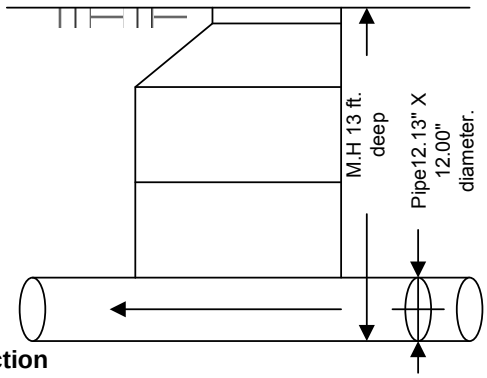
Project Name: Genesee	**City / State:** Seattle, WA	**FM Initials:** SK	
Site Name: GEN40_059490	**Monitor Series:** 5000 AG	**Monitor S/N:**	20019
Address/Location: 4031 49th Ave		**Manhole #**	059490
		Thomas Bros Map Page:	
		Pipe Height:	12.13 "
Access: Drive	**Type of System:** Sanitary [X] Storm [ ] Combined [ ]	**Pipe Width:**	12.00 "
		IP Address:	166.219.49.150



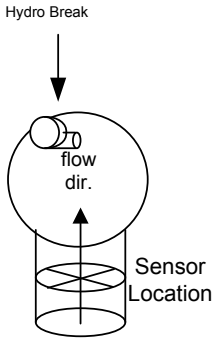
Site Map

Investigation Information:		Manhole Information:				
Date/Time of Investigation:	12-19-07 1205	**Manhole Depth:**	13'			
Site Hydraulics:	Fast Smooth Flow	**Manhole Material / Condition**	Precast / Fair			
Upstream Input: (L/S, P/S)		**Pipe Material / Condition:**	RCP / Fair			
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X]	Commercial [ ]	Industrial [ ]	Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**				
Depth of Flow:	2.63" +/- 0.25"	**Access Pole #:**				
Range (Air DOF):	+/-	**Distance From Manhole:**	Feet			
Peak Velocity:	4.70 fps	**Road Cut Length:**	Feet			
Silt:	0.00 Inches	**Trench Length:**	Feet			

Other Information:



Cross Section



Planar

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Regular	Trunk	[ ]	[ ]	[ ]	
Sensors Devices:	Ultra / Pressure / Velocity	Lift / Pump Station	[ ]	[ ]	[ ]	
Surcharge Height:	0.00" Feet	WWTP	[ ]	[ ]	[ ]	
Rain Guage Zone:		Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

Site has a Flap gate, If closed will damage sensors.

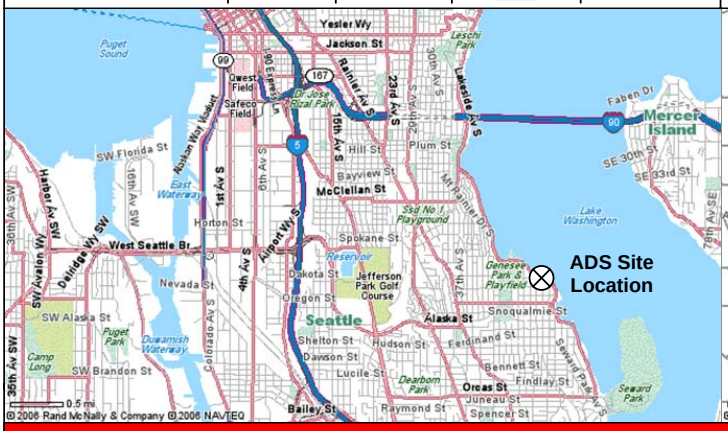
GEN40_059490

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

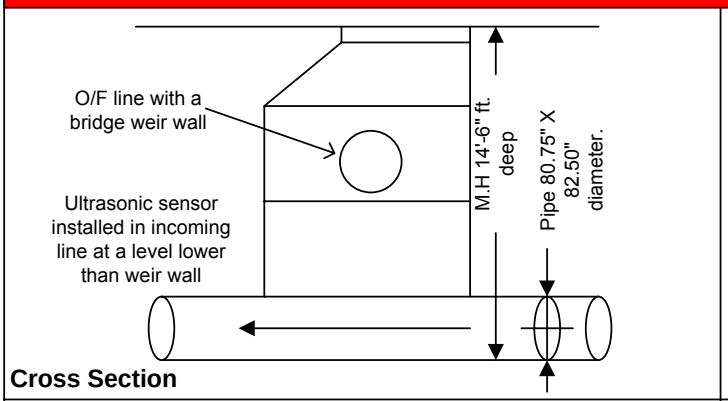
Quality Form

Project Name: Seattle - CSO	**City / State:** Seattle, WA	**FM Initials:** SW	
Site Name: NPDES 40/SEA_059491;D059279	**Monitor Series:** FS 5000 AG	**Monitor S/N:**	26117
Address/Location: 4102 S. Dakota Street @ 49 Av. S.		**Manhole #**	059-491
		Thomas Bros Map Page:	595 E4
		Pipe Height:	80.75"
Access: Drive	**Type of System:** Sanitary [ ] Storm [ ] Combined [X]	**Pipe Width:**	82.50"
		IP Address:	166.219.19.48

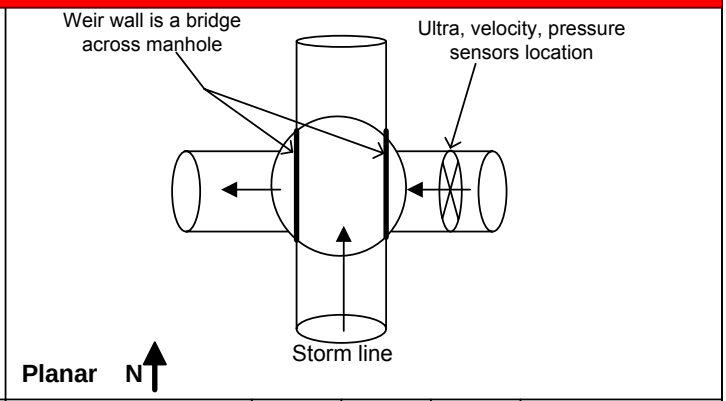


Investigation Information:		Manhole Information:				
Date/Time of Investigation:	12/12/2006 14:00	**Manhole Depth:**	14' - 6"			
Site Hydraulics:	Steady smooth flow	**Manhole Material / Condition**	Concrete / Good			
Upstream Input: (L/S, P/S)	No influence	**Pipe Material / Condition:**	Concrete / Good			
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X]	Commercial [ ]	Industrial [ ]	Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**	Doesn't apply			
Depth of Flow:	2.75" +/- 0.25"	**Access Pole #:**	Doesn't apply			
Range (Air DOF):	77.75" +/- 0.25"	**Distance From Manhole:**	Doesn't apply	Feet		
Peak Velocity:	1.50 fps	**Road Cut Length:**	Doesn't apply	Feet		
Silt:	0.00 Inches	**Trench Length:**	Doesn't apply	Feet		

Other Information:



Cross Section



Planar

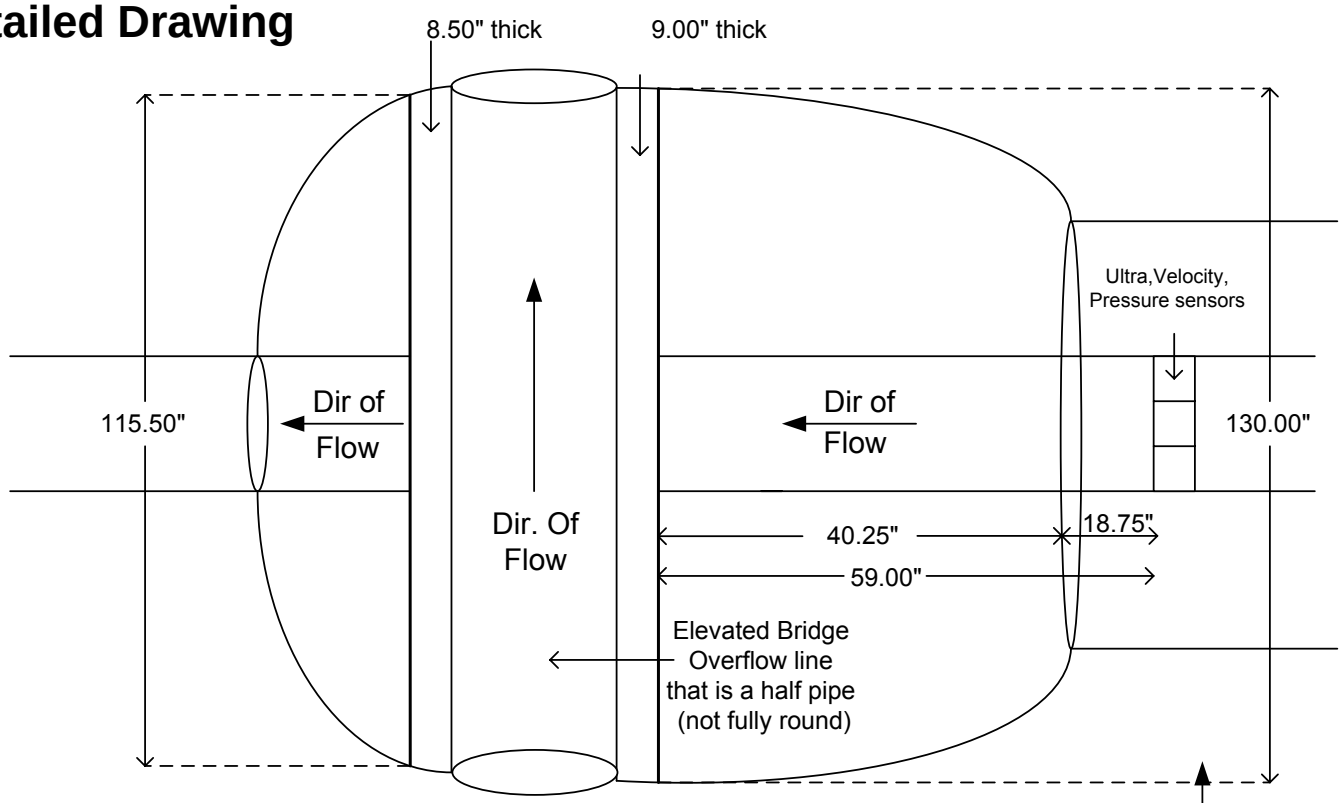
Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Special	Trunk	[ ]	[X]	[ ]	
Sensors Devices:	Ultra / Pressure / Velocity	Lift / Pump Station	[ ]	[X]	[ ]	
Surcharge Height:	0.00"	WWTP	[ ]	[X]	[ ]	
Rain Guage Zone:	RG_15,16,18	Other	[ ]	[X]	[ ]	

Additional Site Information / Comments:

Weir Measurements: Length 131.00". Width 6.00". Height: Left 71.88", Center 87.75", Right 72.50" (heights measured from base of wall to respective points on top of wall).
Point of O/F 87.63" (what monitor reads when High High threshold is met).
Pressure (15 PSI, accuracy +/- 0.25% for range of 0.25 – 34.5 ft.)

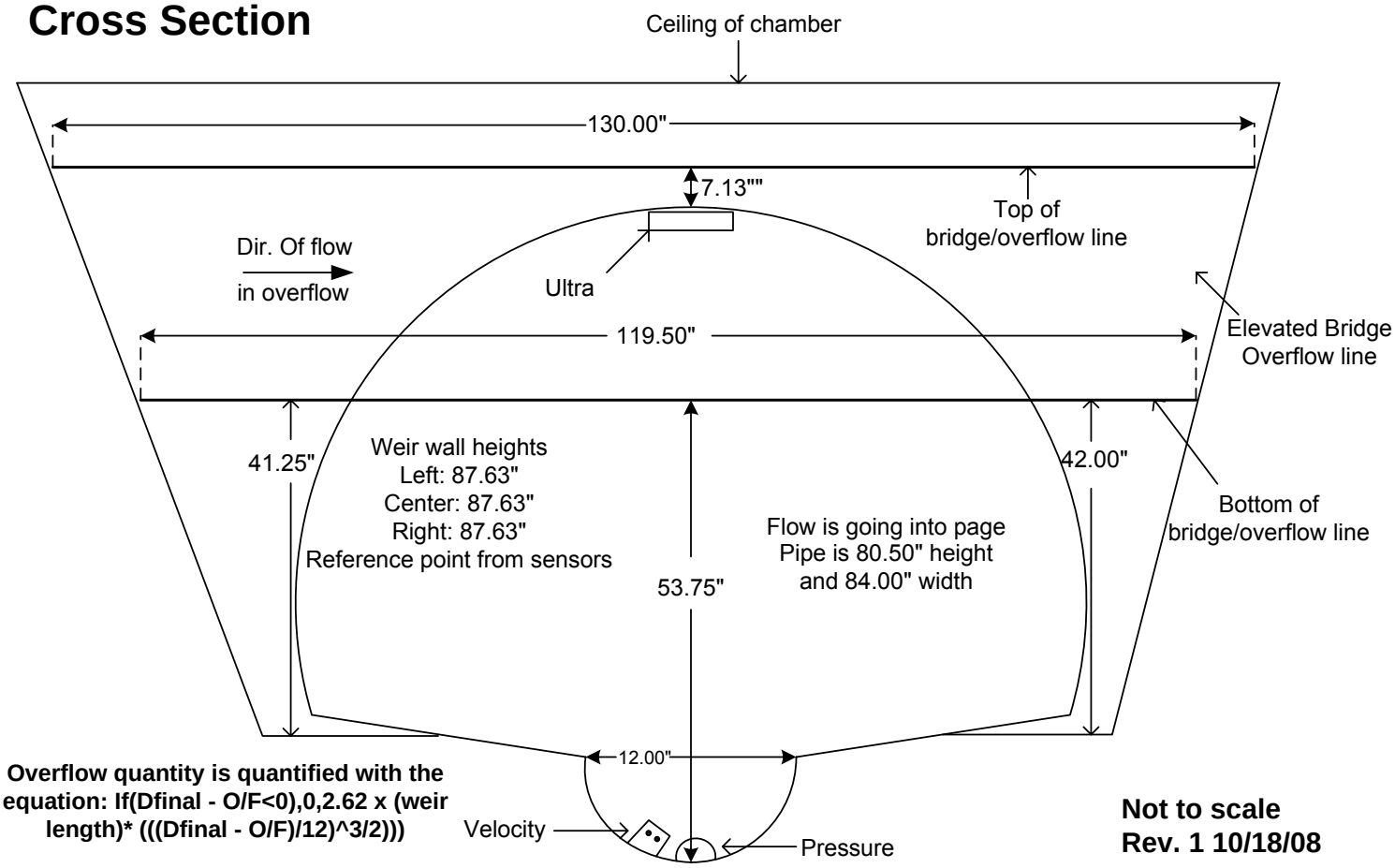
Rev.1 1/22/09

NPDES_40 MH059-491
Detailed Drawing



Top View

Cross Section



Overflow quantity is quantified with the equation: If(Dfinal - O/F<0),0,2.62 x (weir length)* (((Dfinal - O/F)/12)^3/2)))

Not to scale
Rev. 1 10/18/08

NPDES_40

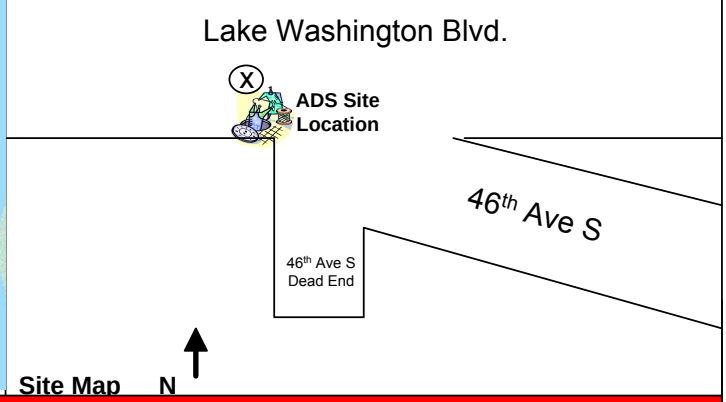
MH 059491

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

Project Name: Genesee	**City / State:** Seattle, WA	**FM Initials:** SK	
Site Name: GEN38_059498	**Monitor Series:** 5000 AG	**Monitor S/N:**	20020
Address/Location: 3601 46th Ave S		**Manhole #**	059498
		Thomas Bros Map Page:	
		Pipe Height:	72.38"
Access: Drive	**Type of System:** Sanitary [X] Storm [ ] Combined [ ]	**Pipe Width:**	72.38"
		IP Address:	166.219.49.192

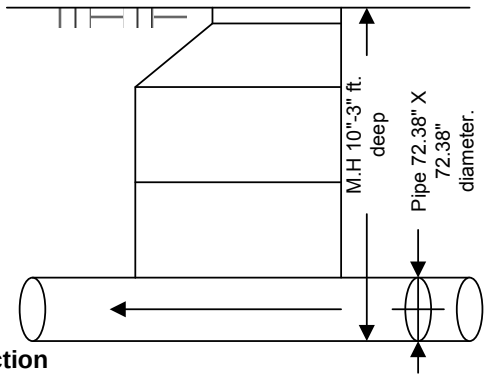


Site Map

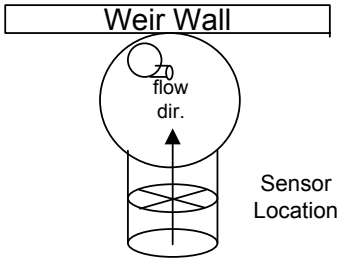
Investigation Information:

Date/Time of Investigation:	12-17-07 1213	**Manhole Depth:**	10'-3"
Site Hydraulics:	Slow Smooth Flow	**Manhole Material / Condition**	Precast / Fair
Upstream Input: (L/S, P/S)		**Pipe Material / Condition:**	Concrete / Fair
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X] Commercial [ ] Industrial [ ] Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**	
Depth of Flow:	17.00" +/- 0.38"	**Access Pole #:**	
Range (Air DOF):	+/-	**Distance From Manhole:**	Feet
Peak Velocity:	.87 fps	**Road Cut Length:**	Feet
Silt:	0.00 Inches	**Trench Length:**	Feet

Other Information:



Cross Section

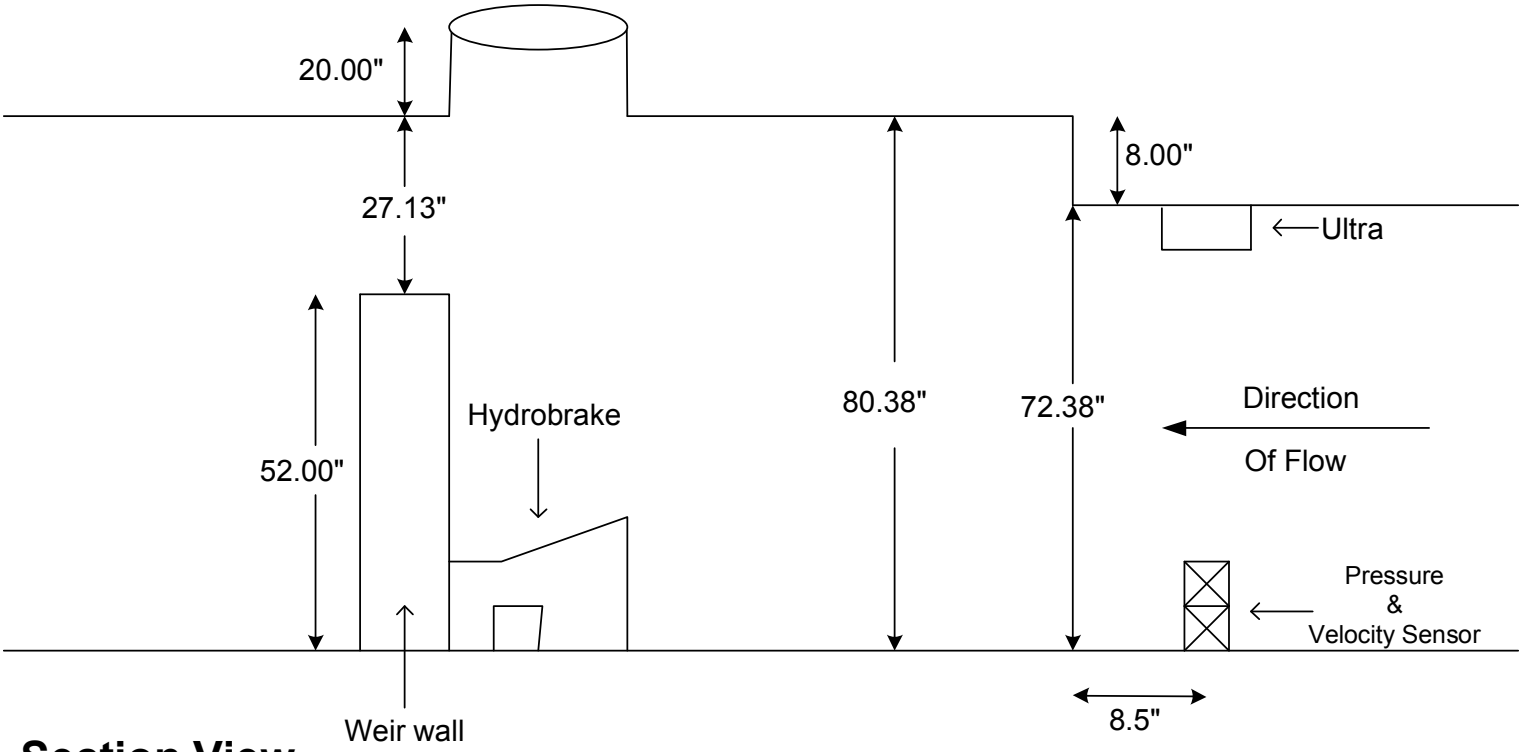


Planar N

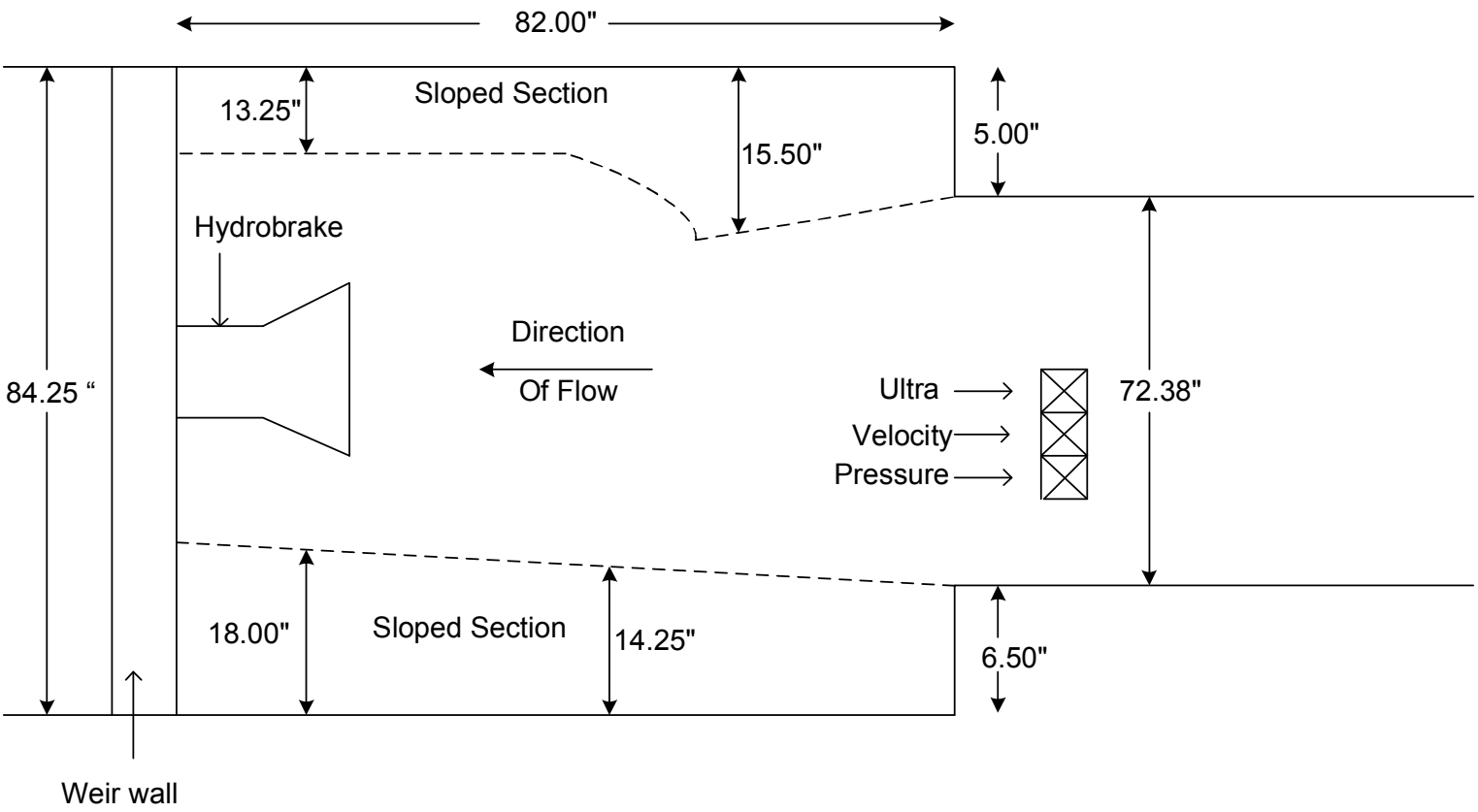
Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Special	Trunk	[ ]	[ ]	[ ]	
Sensors Devices:	Ultra / Pressure/ Velocity	Lift / Pump Station	[ ]	[ ]	[ ]	
Surcharge Height:	0.00" Feet	WWTP	[ ]	[ ]	[ ]	
Rain Guage Zone:		Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

GEN38_059498A



Section View



Top View

Not to Scale

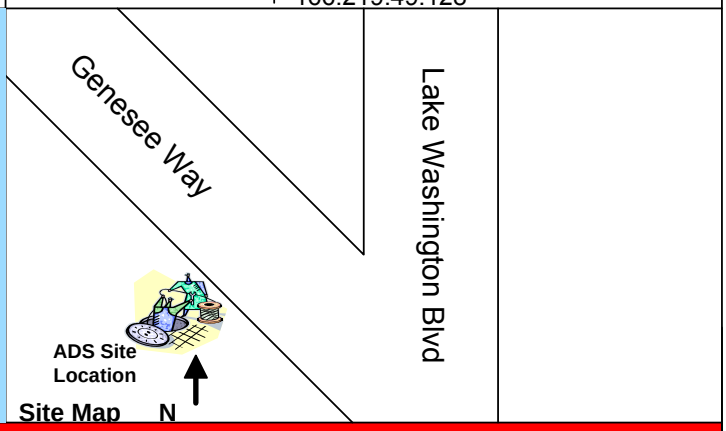
GEN38_059498

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

Project Name:	Genesee	**City / State:**	Seattle, WA	**FM Initials:**	SK
Site Name:	GEN38_060W012	**Monitor Series:**	5000 AG	**Monitor S/N:**	20011
Address/Location:	Lake Washington Blvd. & S. Genesee Way			**Manhole #**	060W012
				Thomas Bros Map Page:	
				Pipe Height:	14.75 "
Access: Drive/Walk	**Type of System:**	Sanitary [X]	Storm [ ]	Combined [ ]	**Pipe Width:** 14.88 "
					IP Address: 166.219.49.128

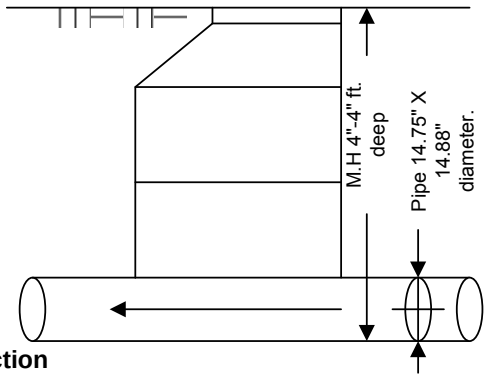


Site Map

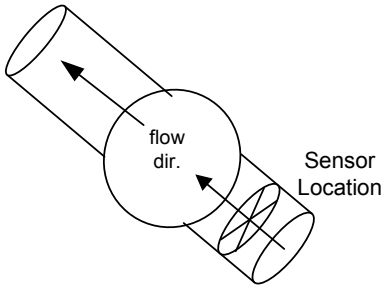
Investigation Information:

Date/Time of Investigation:	12-12-07 1441	**Manhole Depth:**	4'-4"
Site Hydraulics:	Slow Smooth Flow	**Manhole Material / Condition**	Brick / Fair
Upstream Input: (L/S, P/S)		**Pipe Material / Condition:**	Clay / Fair
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X] Commercial [ ] Industrial [ ] Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**	
Depth of Flow:	2.75" +/- 0.38"	**Access Pole #:**	
Range (Air DOF):	+/-	**Distance From Manhole:**	Feet
Peak Velocity:	1.54 fps	**Road Cut Length:**	Feet
Silt:	0.00 Inches	**Trench Length:**	Feet

Other Information:



Cross Section



Planar N

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Regular	Trunk	[ ]	[ ]	[ ]	
Sensors Devices:	Ultra / Pressure / Velocity	Lift / Pump Station	[ ]	[ ]	[ ]	
Surcharge Height:	0.00" Feet	WWTP	[ ]	[ ]	[ ]	
Rain Guage Zone:		Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

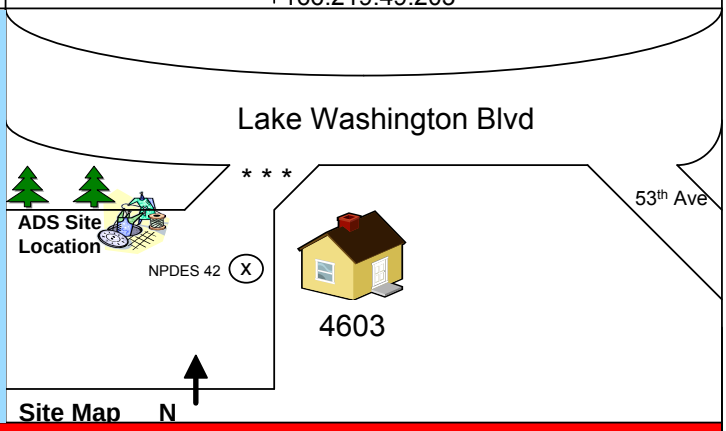
GEN38_060012

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

Project Name: Genesee	**City / State:** Seattle, WA	**FM Initials:** SK	
Site Name: GEN42_060W014	**Monitor Series:** 5000 AG	**Monitor S/N:**	20007
Address/Location: 4603 Lake Washington Blvd		**Manhole #**	060W014
		Thomas Bros Map Page:	
		Pipe Height:	12.00 "
Access: Drive/Walk	**Type of System:** Sanitary [X] Storm [ ] Combined [ ]	**Pipe Width:**	11.25 "
		IP Address:	166.219.49.203



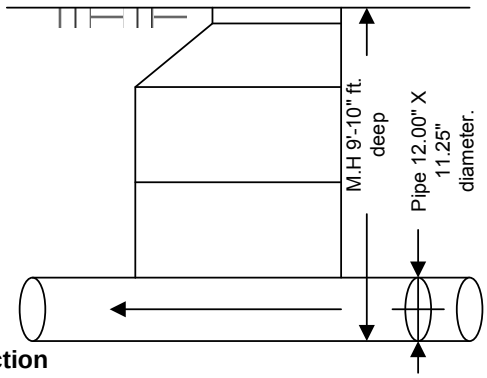
Investigation Information:

Date/Time of Investigation:	12-20-07 1430
Site Hydraulics:	Slow Smooth Flow
Upstream Input: (L/S, P/S)	
Upstream Manhole:	DNI
Downstream Manhole:	DNI
Depth of Flow:	7.00 +/- 0.25"
Range (Air DOF):	+/-
Peak Velocity:	.29 fps
Silt:	2.50 Inches

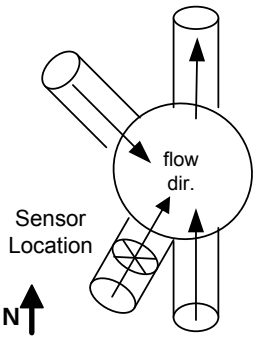
Manhole Information:

Manhole Depth:	9'-10"				
Manhole Material / Condition	Concrete / Fair				
Pipe Material / Condition:	Concrete / Fair				
Mini System Character:	Residential [X]	Commercial [ ]	Industrial [ ]	Trunk [ ]	
Telephone Information:					
Access Pole #:					
Distance From Manhole:	Feet				
Road Cut Length:	Feet				
Trench Length:	Feet				

Other Information:



Cross Section



Planar

Installation Information	
Installation Type:	Regular
Sensors Devices:	Ultra / Pressure / Velocity
Surcharge Height:	0.00" Feet
Rain Guage Zone:	

Backup	Yes	No	?	Distance
Trunk	[ ]	[ ]	[ ]	
Lift / Pump Station	[ ]	[ ]	[ ]	
WWTP	[ ]	[ ]	[ ]	
Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

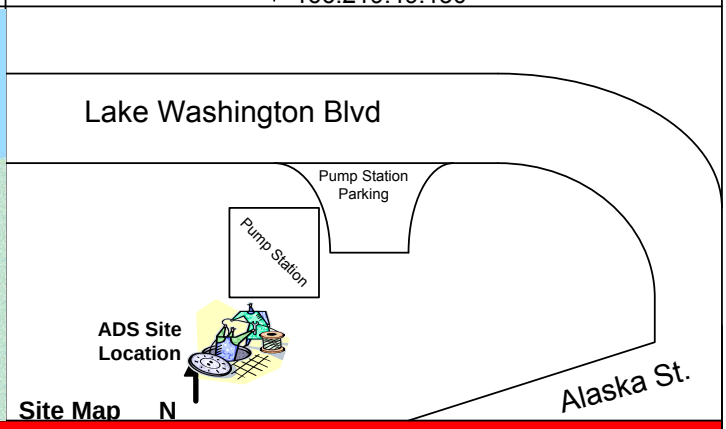
GEN42_060W014

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

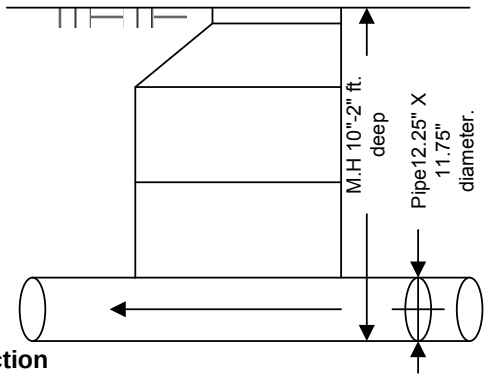
Project Name:	Genesee	**City / State:**	Seattle, WA	**FM Initials:**	SK
Site Name:	GEN42_060W019	**Monitor Series:**	5000 AG	**Monitor S/N:**	20034
Address/Location:	Just Before Alaska and Lake Washington Blvd. Behind the pump station			**Manhole #**	060W019
				Thomas Bros Map Page:	
				Pipe Height:	12.25 "
Access: Drive/Walk	**Type of System:**	Sanitary [X]	Storm [ ]	Combined [ ]	**Pipe Width:** 11.75 "
					IP Address: 166.219.49.130



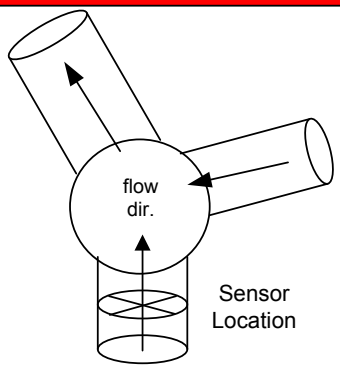
Investigation Information:

Date/Time of Investigation:	12-13-07 1115	**Manhole Depth:**	10'-2"
Site Hydraulics:	Fast Smooth Flow	**Manhole Material / Condition**	Concrete / Fair
Upstream Input: (L/S, P/S)		**Pipe Material / Condition:**	Concrete / Fair
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X] Commercial [ ] Industrial [ ] Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**	
Depth of Flow:	+/-	**Access Pole #:**	
Range (Air DOF):	10.75 +/- 0.38"	**Distance From Manhole:**	Feet
Peak Velocity:	6.22 fps	**Road Cut Length:**	Feet
Silt:	0.00 Inches	**Trench Length:**	Feet

Other Information:



Cross Section



Planar N

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Regular	Trunk	[ ]	[ ]	[ ]	
Sensors Devices:	Ultra / Pressure / Velocity	Lift / Pump Station	[ ]	[ ]	[ ]	
Surcharge Height:	0.00" Feet	WWTP	[ ]	[ ]	[ ]	
Rain Guage Zone:		Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

GEN42_060W019

ADS ENVIRONMENTAL SERVICES®

060W-025

Not Available

060W-025 was removed in February 2008 due difficult monitoring conditions.
A Site Report is not available for this site.

060W-026

Not Available

060W-026 is operated by Flow Monitoring & Analysis, Inc. It was removed in July 2008 due difficult monitoring conditions. A Site Report is not available for this site.

ADS Site Report

Quality Form

Project Name: Genesee	**City / State:** Seattle, WA	**FM Initials:** SK	
Site Name: GEN42_060W047	**Monitor Series:** 5000 AG	**Monitor S/N:**	20977
Address/Location: In Grass/ Alaska Way S & 54th Ave S		**Manhole #**	060W047
		Thomas Bros Map Page:	
		Pipe Height:	12.00" 140.50"
Access: Walk	**Type of System:** Sanitary [X] Storm [ ] Combined [ ]	**Pipe Width:**	12.00" 143.00"
		IP Address:	166.219.9.72

ADS Site Location

Alaska Way S.

(X) NPDES 43

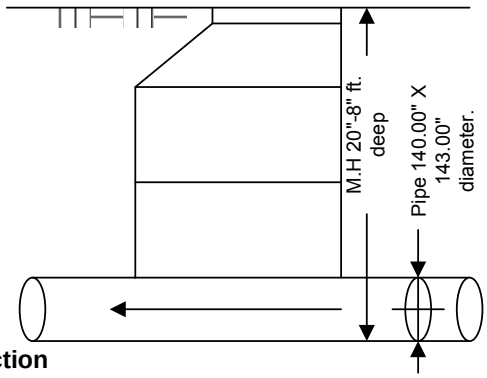
Site Map N

54th Ave S

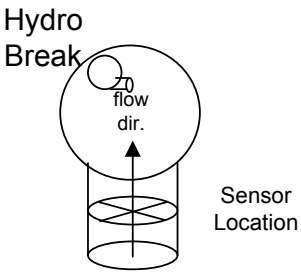
Investigation Information:

Date/Time of Investigation:	12-13-07 1100	**Manhole Depth:**	20'-8"
Site Hydraulics:	Slow Smooth Flow	**Manhole Material / Condition**	Concrete / Fair
Upstream Input: (L/S, P/S)		**Pipe Material / Condition:**	Concrete / Fair
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X] Commercial [ ] Industrial [ ] Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**	
Depth of Flow:	8.88" +/- 0.25"	**Access Pole #:**	
Range (Air DOF):	+/-	**Distance From Manhole:**	Feet
Peak Velocity:	fps	**Road Cut Length:**	Feet
Silt:	2.50 Inches	**Trench Length:**	Feet

Other Information:



Cross Section



Planar N

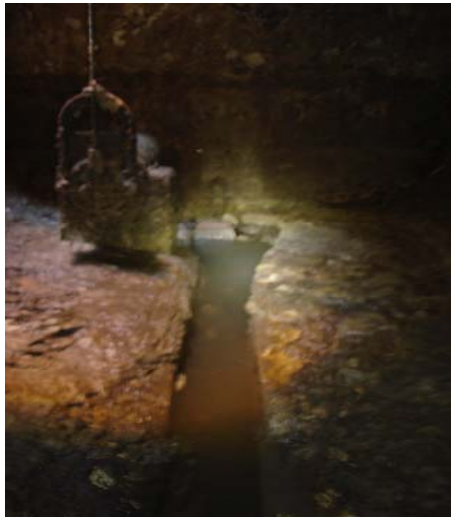
Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Special	Trunk	[ ]	[ ]	[ ]	
Sensors Devices:	Ultra / Pressure	Lift / Pump Station	[ ]	[ ]	[ ]	
Surcharge Height:	0.00" Feet	WWTP	[ ]	[ ]	[ ]	
Rain Guage Zone:		Other	[ ]	[ ]	[ ]	

Additional Site Information / Comments:

Q-net Pipe with ultra and pressure only

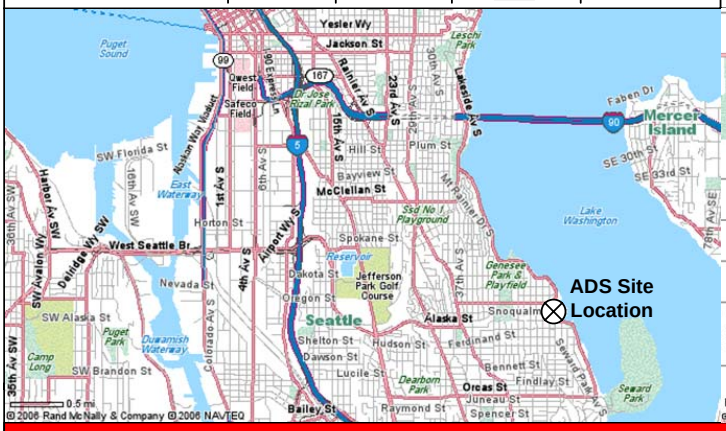
GEN42_060W047

ADS ENVIRONMENTAL SERVICES®



ADS Site Report — Quality Form

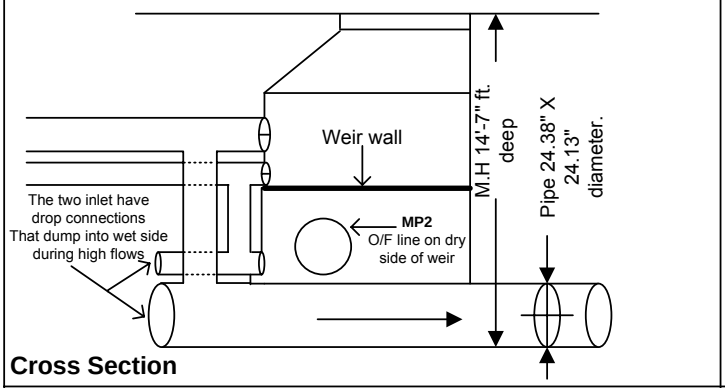
Project Name: Seattle - CSO	**City / State:** Seattle, WA	**FM Initials:** SW	
Site Name: NPDES 43/SEA_060W049	**Monitor Series:** 5000 BG	**Monitor S/N:**	19001
Address/Location: 5403 Alaska Street		**Manhole #**	060W-049
		Thomas Bros Map Page:	595 G5
		Pipe Height:	MP1 24.38" MP2 20.50"
Access: Drive	**Type of System:** Sanitary [ ] Storm [ ] Combined [X]	**Pipe Width:**	MP1 24.13" MP2 20.50"
		IP Address:	166.219.18.255



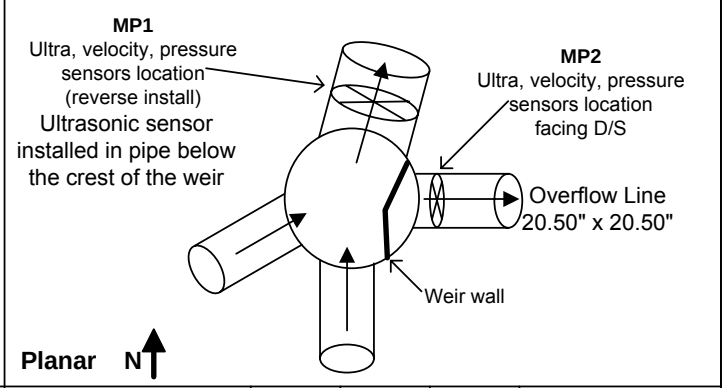
Investigation Information:

Date/Time of Investigation:	12/12/2006 16:11	**Manhole Depth:**	14' - 7"
Site Hydraulics:	Fast smooth flow (outgoing line)	**Manhole Material / Condition**	Concrete / Good
Upstream Input: (L/S, P/S)	No Influence	**Pipe Material / Condition:**	Concrete / Good
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X] Commercial [ ] Industrial [ ] Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**	Doesn't apply
Depth of Flow:	2.13" +/- 0.25"	**Access Pole #:**	Doesn't apply
Range (Air DOF):	20.75" +/- 0.25"	**Distance From Manhole:**	Doesn't apply Feet
Peak Velocity:	4.59 fps	**Road Cut Length:**	Doesn't apply Feet
Silt:	0.00 Inches	**Trench Length:**	Doesn't apply Feet

Other Information:



Cross Section



Planar

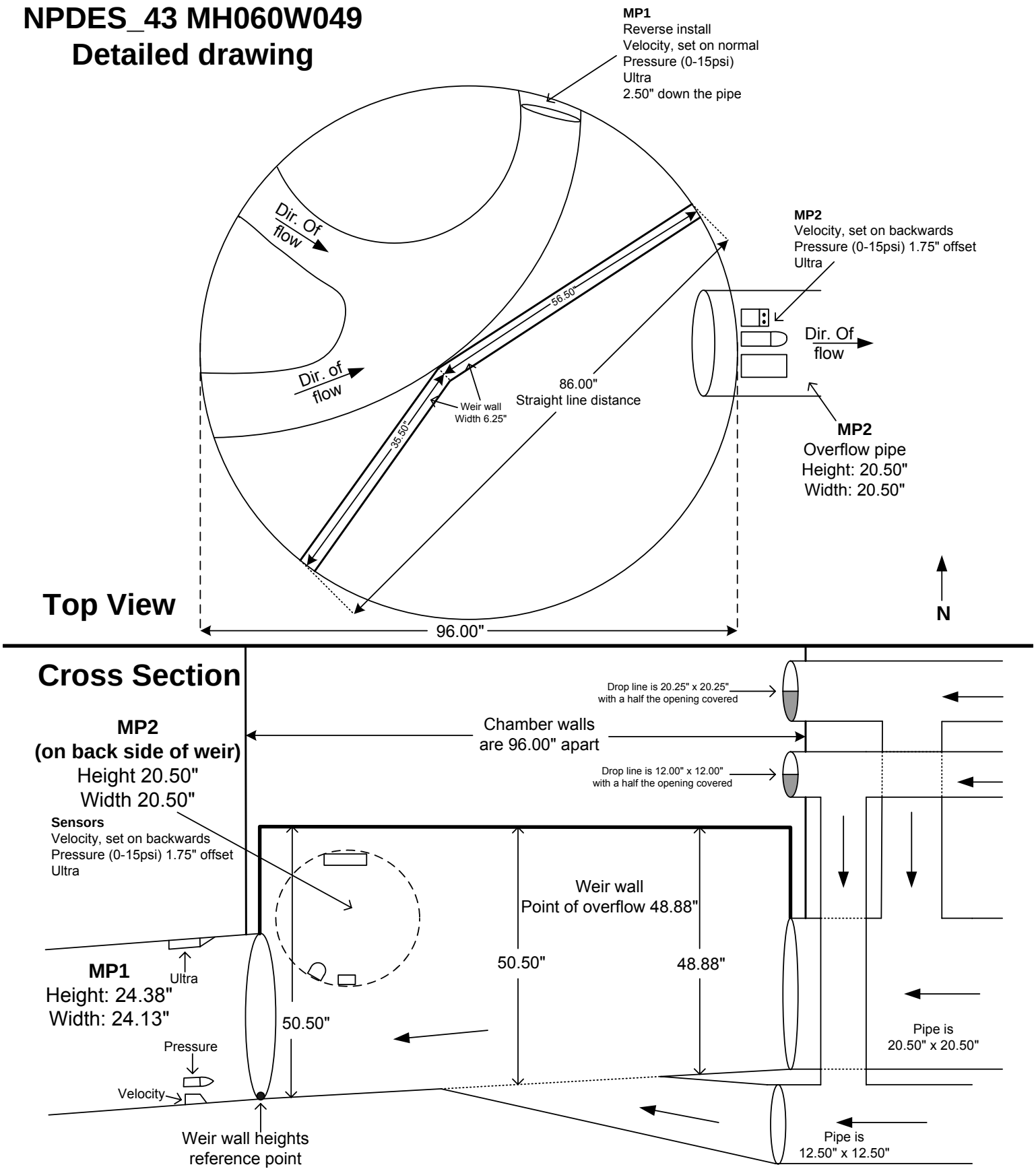
Installation Information		Backup	Yes	No	?	Distance
Installation Type:	MP1 Reverse / MP2 Sensors facing D/S	Trunk	[ ]	[X]	[ ]	
Sensors Devices:	Both MP's Ultra / Pressure / Velocity	Lift / Pump Station	[ ]	[X]	[ ]	
Surcharge Height:	0.00"	WWTP	[ ]	[X]	[ ]	
Rain Guage Zone:	RG_15,16,18	Other	[ ]	[X]	[ ]	

Additional Site Information / Comments:

Weir Measurements: Height: Left 50.0", Center 48.63", Right 48.25" (heights measured from base of wall to respective points on top of wall).. Length 92.00", Width 6.38".
Point of O/F 49.63" (what monitor reads when High High threshold is met). MP2 velocity is set on backwards
Pressure (15 PSI, accuracy +/- 0.25% for range of 0.25 – 34.5 ft.)
Overflow quantification method: Broad Crested Weir Equation.

Rev.2 4/14/09

NPDES_43 MH060W049
Detailed drawing



Overflow quantity is quantified with the equation: If(Dfinal - O/F<0),0,2.62 x (weir length)* (((Dfinal - O/F)/12)^3/2)))

Not to scale
Rev.2 4/20/09

NPDES_043

MH 060-W049

Inlet drop connections and MP1

View of inlets w/ drop connections

View of outlet pipe w/ MP1 sensors

Top pipe of drop connection

Bottom inlet of drop connection

NPDES_43

MH 060W-049

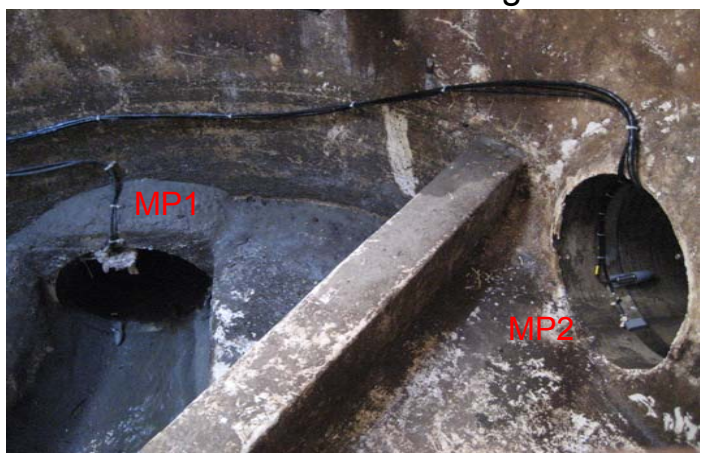
Mp1 & MP2 set up

ADS ENVIRONMENTAL SERVICES®

View of site looking north

View down manhole looking north

View of MP2 sensors

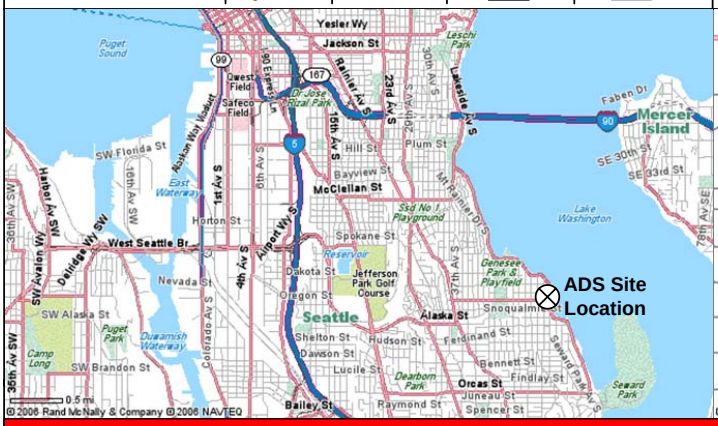


Relation of MP1 and MP2

ADS Site Report

Quality Form

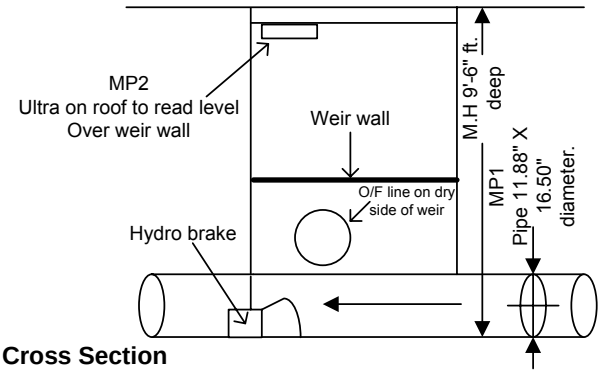
Project Name: Seattle - CSO	**City / State:** Seattle, WA	**FM Initials:** SW	
Site Name: NPDES 42/SEA 060W052	**Monitor Series:** 5000 AL	**Monitor S/N:**	15084
Address/Location: 4603 Lake Washington BLVD Nearest cross street, S. Snoqualmie St.		**Manhole #**	060W-052
		Thomas Bros Map Page:	595 G5
		Pipe Height:	Pipe: 54.00". Cunette: 11.88"
Access: Drive	**Type of System:** Sanitary [ ] Storm [ ] Combined [X]	**Pipe Width:**	Pipe: 54.00". Cunette: 16.50"
		IP Address:	166.219.19.49



Investigation Information:

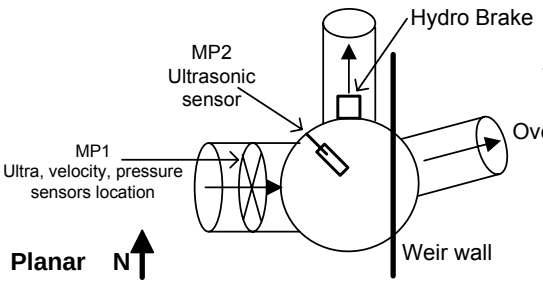
Date/Time of Investigation:	12/12/2006 15:24	**Manhole Depth:**	9' - 6"
Site Hydraulics:	Slow smooth flow	**Manhole Material / Condition**	Concrete / Good
Upstream Input: (L/S, P/S)	No influence	**Pipe Material / Condition:**	Concrete / Good
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X] Commercial [ ] Industrial [ ] Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**	Doesn't apply
Depth of Flow:	6.50" +/- 0.25"	**Access Pole #:**	Doesn't apply
Range (Air DOF):	46.00" +/- 0.25"	**Distance From Manhole:**	Doesn't apply Feet
Peak Velocity:	0.45 fps	**Road Cut Length:**	Doesn't apply Feet
Silt:	2.50 Inches	**Trench Length:**	Doesn't apply Feet

Other Information:



Cross Section

54" line with cunette that measures 11.88" in height and 16.50" in width. Pressure and velocity senors installed in cunette and ultra installed on surcharge mount over manhole invert



Planar

MP2 Installed in September, 2008. See section 3.2 for more information.

Installation Information	
Installation Type:	MP1 Special / MP2 Special
Sensors Devices:	MP1 Ultra / Pressure / Velocity MP2 Ultra only
Surcharge Height:	0.00"
Rain Guage Zone:	RG_15,16,18

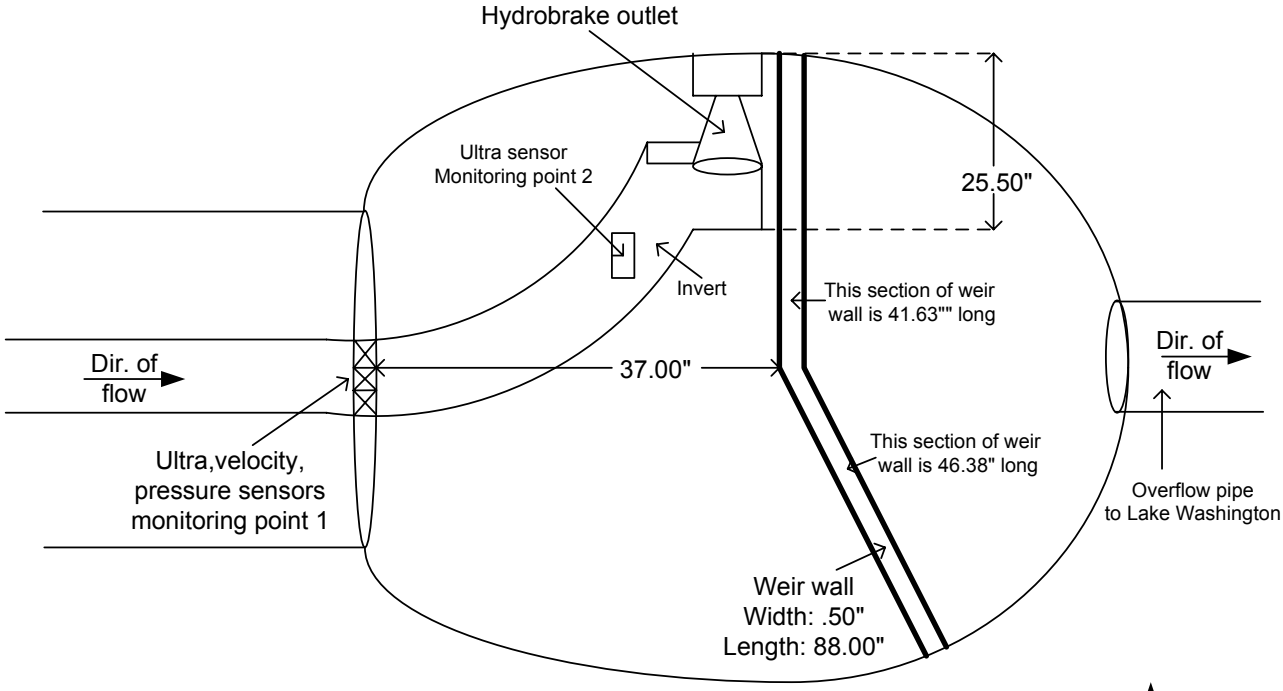
Backup	Yes	No	?	Distance
Trunk	[ ]	[X]	[ ]	
Lift / Pump Station	[ ]	[X]	[ ]	
WWTP	[ ]	[X]	[ ]	
Other	[ ]	[ ]	[X]	Hydro brake in MH

Additional Site Information / Comments:

Weir Measurements: Length 88.00", Width 0.50". Height: Left 64.75", Center 64.13", Right 49.13" (heights measured from base of wall to respective points on top of wall).
Point of O/F 64.00" (what monitor reads when High High threshold is met).
Pressure (5 PSI, accuracy +/- 0.25% for range of 0.25 – 11.5 ft.)
Overflow quantification method: Broad Crested Weir Equation.

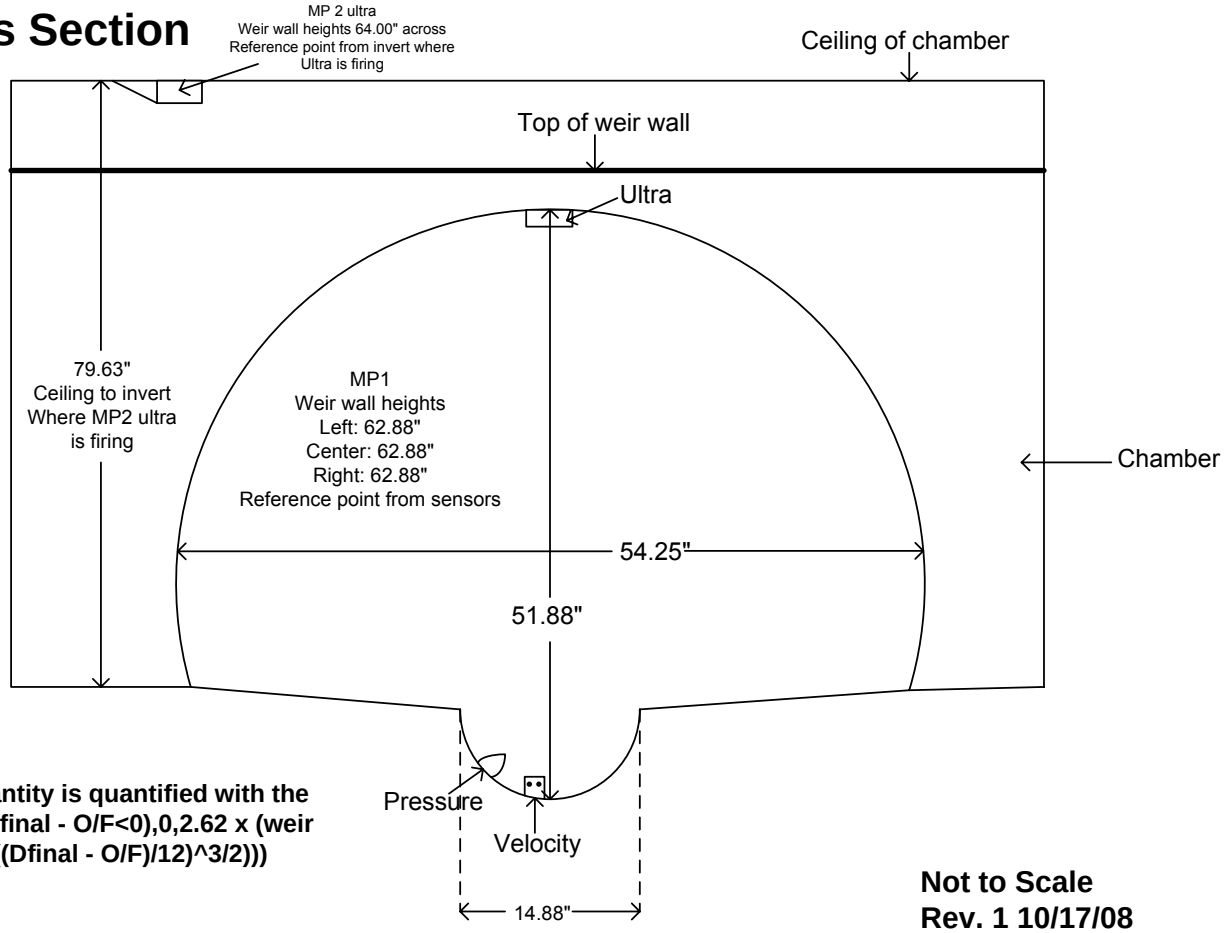
Rev.1 1/27/09

NPDES_42 MH060W052
Detailed Drawing



Top View

Cross Section



Overflow quantity is quantified with the equation: If(Dfinal - O/F<0),0,2.62 x (weir length)* (((Dfinal - O/F)/12)^3/2)))

Not to Scale
Rev. 1 10/17/08

NPDES_42

MH 060W-052

ADS ENVIRONMENTAL SERVICES®

067-014

Not Available

067-014 is operated by Herrera Environmental Consultants, Inc. through SPU's RainCatchers program. A Site Report is not available for this site.

067-024

Not Available

067-014 is operated by Herrera Environmental Consultants, Inc. through SPU's RainCatchers program. A Site Report is not available for this site.

067-029

Not Available

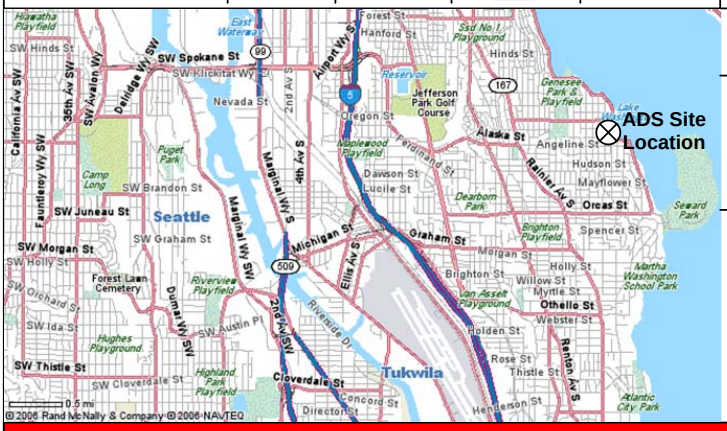
067-014 is operated by Herrera Environmental Consultants, Inc. through SPU's

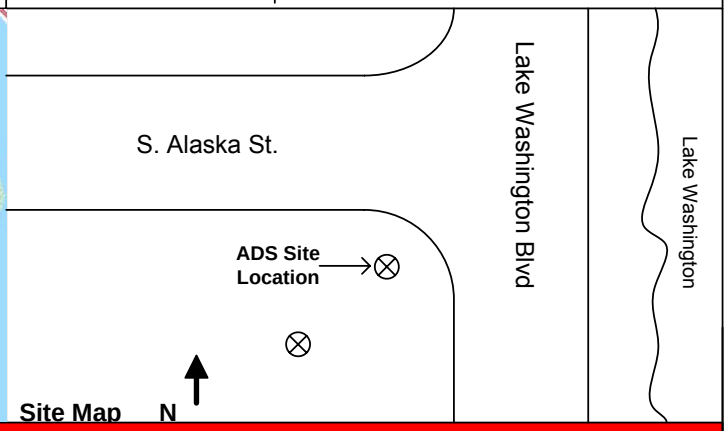
RainCatchers program. A Site Report is not available for this site.

ADS Site Report

Quality Form

Project Name: Seattle - CSO	**City / State:** Seattle, WA	**FM Initials:** SW	
Site Name: 165/SEA_067078;D067152	**Monitor Series:** 5000 BG	**Monitor S/N:**	19019
Address/Location: SW corner of S. Alaska St. & Lake Washington BLVD (site located off street in grass)		**Manhole #**	067-078
		Thomas Bros Map Page:	595 G5
		Pipe Height:	MP1 10.00" MP2 8.00"
Access: Drive	**Type of System:** Sanitary [ ] Storm [ ] Combined [X]	**Pipe Width:**	MP1 10.13" MP2 8.00"
		IP Address:	166.219.18.217



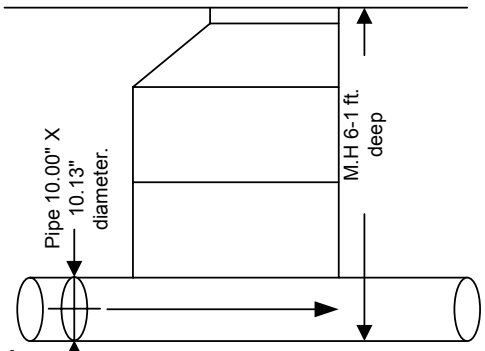


Site Map

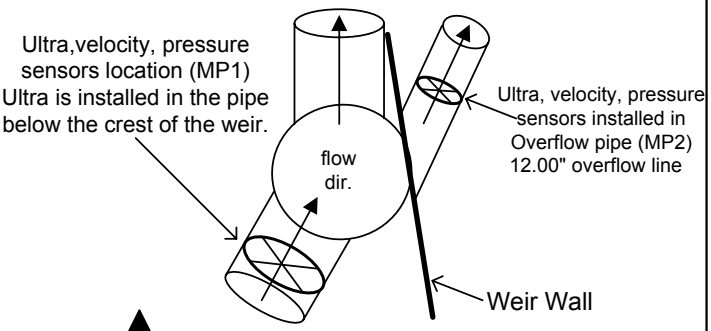
Investigation Information:

Date/Time of Investigation:	12/19/2006 08:22	**Manhole Depth:**	6' - 1"
Site Hydraulics:	Slow smooth flow	**Manhole Material / Condition**	Brick / Good
Upstream Input: (L/S, P/S)	Not Influenced	**Pipe Material / Condition:**	Concrete / Good
Upstream Manhole:	DNI	**Mini System Character:**	Residential [X] Commercial [ ] Industrial [ ] Trunk [ ]
Downstream Manhole:	DNI	**Telephone Information:**	Doesn't apply
Depth of Flow:	2.25"+/- 0.25"	**Access Pole #:**	Doesn't apply
Range (Air DOF):	+/-	**Distance From Manhole:**	Doesn't apply Feet
Peak Velocity:	1.55 fps	**Road Cut Length:**	Doesn't apply Feet
Silt:	0.50 Inches	**Trench Length:**	Doesn't apply Feet

Other Information:



Cross Section



Planar N

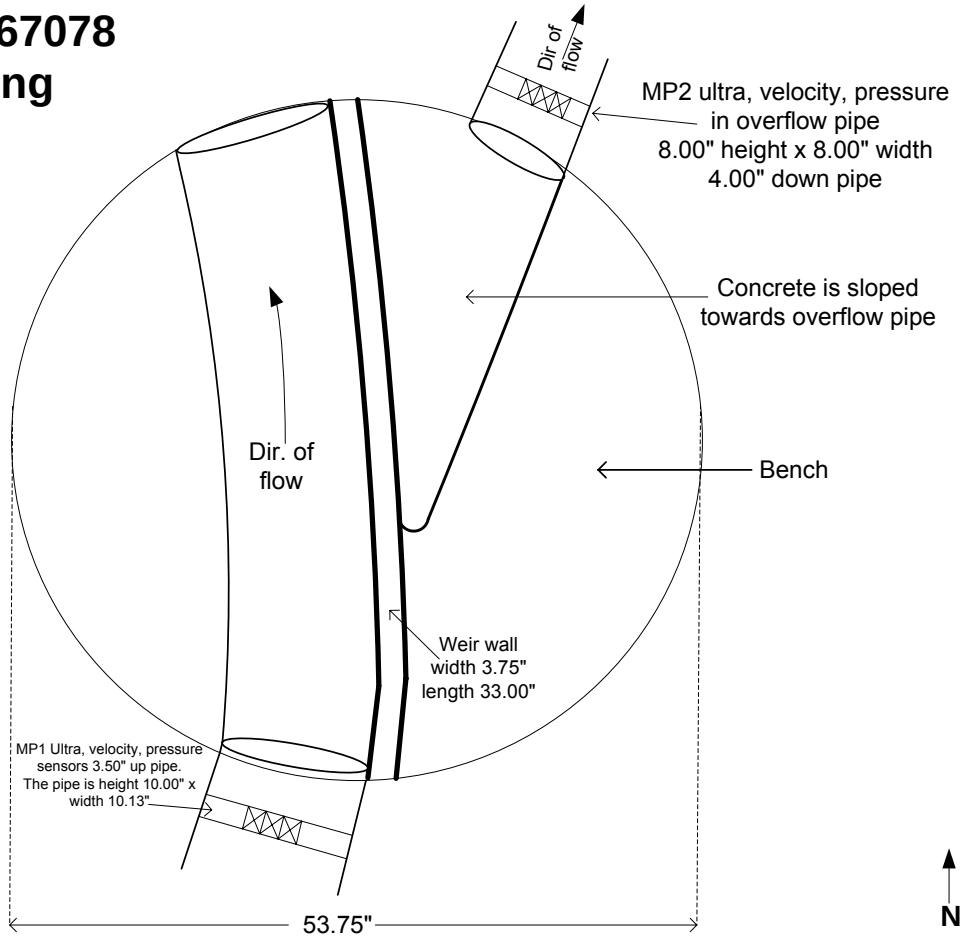
Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Regular	Trunk	[ ]	[X]	[ ]	
Sensors Devices:	Both MP's Ultra / Pressure / Velocity	Lift / Pump Station	[ ]	[X]	[ ]	
Surcharge Height:	4'-0"	WWTP	[ ]	[X]	[ ]	
Rain Guage Zone:	RG_15,16,18	Other	[X]	[ ]	[ ]	Silt in MH 4' away

Additional Site Information / Comments:

Weir Measurement: Height: Left 21.50", Center 21.00", Right 20.50" (reference point from sensor location). Length 33.00", Width 3.75".
Point of O/F 20.50" (what monitor reads when high high threshold is met)
Both MP's Pressure (5 PSI, accuracy +/- 0.25% for range of 0.25 – 11.5 ft.)

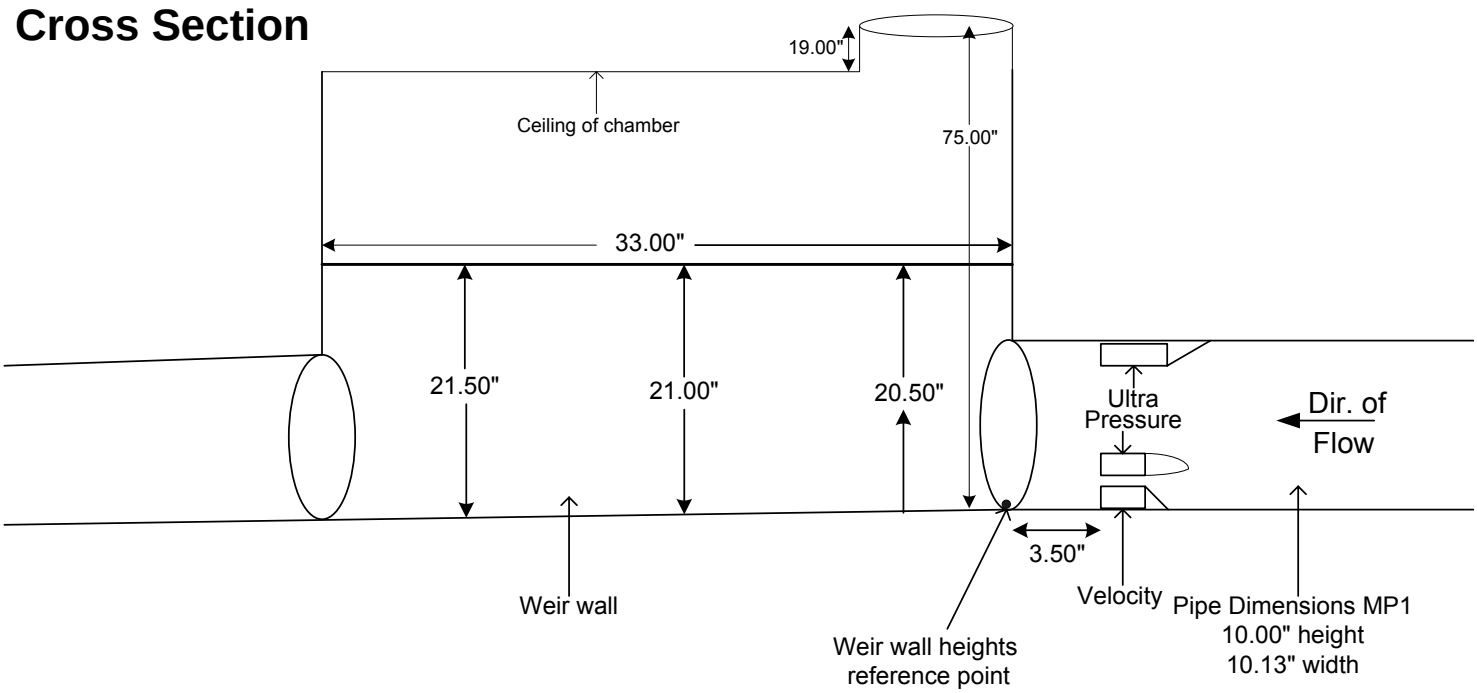
Rev.2 1/14/09

NPDES_165 MH067078
Detailed drawing



Top View

Cross Section



Point of overflow 20.50"
Overflow quantity is quantified with the equation:
If(Dfinal - O/F<0),0,2.62 x (weir length)* (((Dfinal - O/F)/12)^3/2)))

Not to scale
Rev. 1 10/16/08

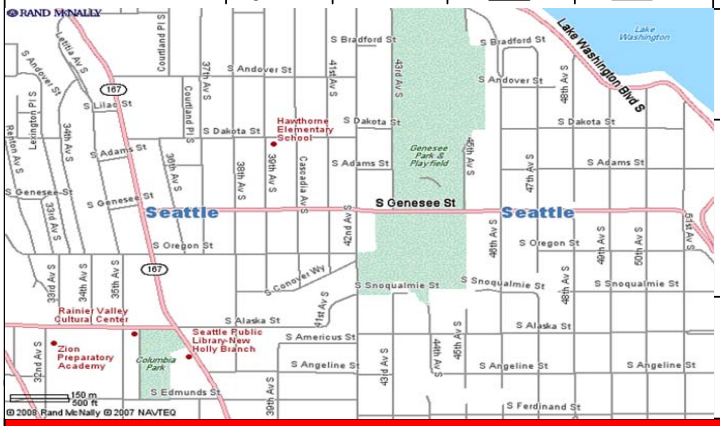
NPDES 165
067078;D067152

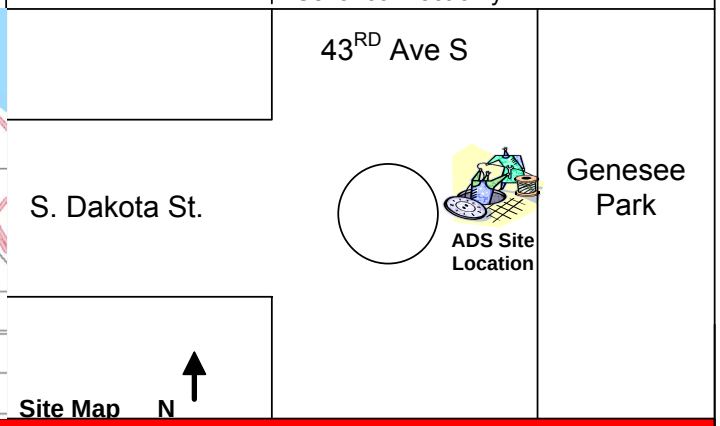
ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

Project Name:	Genesee	**City / State:**	Seattle, WA	**FM Initials:**	SW
Site Name:	GEN38_D059191	**Monitor Series:**	Portable FS Pulse	**Monitor S/N:**	0839PC404
Address/Location:	43Rd Ave S. and S. Dakota St.			**Manhole #**	D059-191
				Thomas Bros Map Page:	595 F4
				Pipe Height:	96.00"
Access: Drive	**Type of System:**	Sanitary [ ]	Storm [X]	Combined [ ]	**Pipe Width:** 96.00"
					IP Address: Serial connect only





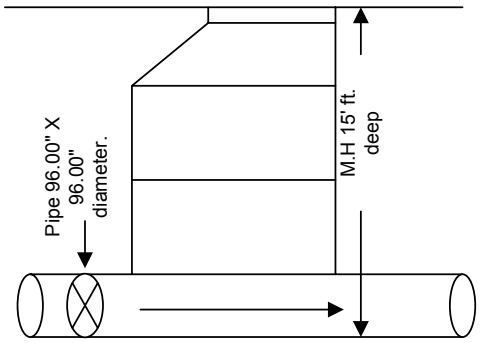
Investigation Information:

Date/Time of Investigation:	1/31/08 14:15
Site Hydraulics:	Smooth, Stagnant flow gains velocity during storm events
Upstream Input: (L/S, P/S)	No influence (storm drain)
Upstream Manhole:	DNI
Downstream Manhole:	DNI
Depth of Flow:	10.50"+/- 0.38"
Range (Air DOF):	+/-
Peak Velocity:	0 fps
Silt:	0.00 Inches

Manhole Information:

Manhole Depth:	15'			
Manhole Material / Condition	Concrete / Good			
Pipe Material / Condition:	Concrete / Good			
Mini System Character:	Residential [X]	Commercial [ ]	Industrial [ ]	Trunk [ ]
Telephone Information:	Doesn't apply			
Access Pole #:	Doesn't apply			
Distance From Manhole:	Doesn't apply	Feet		
Road Cut Length:	Doesn't apply	Feet		
Trench Length:	Doesn't apply	Feet		

Other Information:



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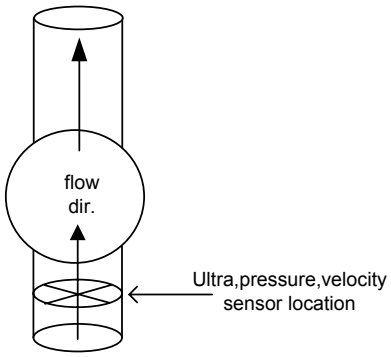


Planar N

Installation Information	
Installation Type:	Special
Sensors Devices:	Ultra / Pressure/ Velocity
Surcharge Height:	0.00"
Rain Guage Zone:	RG_16,18

Backup	Yes	No	?	Distance
Trunk	[ ]	[X]	[ ]	
Lift / Pump Station	[ ]	[X]	[ ]	
WWTP	[ ]	[X]	[ ]	
Other	[ ]	[X]	[ ]	

Additional Site Information / Comments:

Manual collects scheduled every Tuesday.
5 PSI Pressure (Range 0 to 11.50 feet accuracy +/- 0.5%)

Rev.1 1/5/09

GEN38_D059191

ADS ENVIRONMENTAL SERVICES®

Pump Station #5

Not Available

Pump Station #5 is owned and operated by SPU. A Site Report is not available for this site.

Pump Station #6

Not Available

Pump Station #6 is owned and operated by SPU. A Site Report is not available for this site.

Rainier Avenue Pump Station

Not Available

The Rainier Avenue Pump Station is owned and operated by King County. A Site Report is not available for this site.

Appendix B: Flow Meter Specifications

HARDWARE

FLOWSHARK™

The new FlowShark™ from ADS is an open channel flow monitor for use in sanitary, CSO and storm sewers. It is designed for the ultimate performance and versatility, including single pipe or dual pipe measurement, small and large pipe application and industry -leading data collection, analysis, management, and reporting access options.

ADS FlowShark Features:

- Supports two complete sensor arrays for a total of six sensors, measuring two monitoring points - ideal for CSO monitoring.
- Wireless or standard telemetry for field versatility.
- Two 4-20 mA inputs for industry standard water quality primary sensing instruments.
- Two 4-20 mA outputs for SCADA integration variables such as flow rate, depth, and velocity.
- A remarkable 18 month battery life for low cost of maintenance.
- Monitor-Level Intelligence (MLI™) improves sensor accuracy and allows FlowShark to operate in a wider range of hydraulic conditions.
- Superior noise reduction design for maximizing accoustic signal reception from depth and velocity sensors.
- Seven communication and reporting modes for accessing flow information including standard collection and reporting software, Web-based alarming, and FlowView Portal.
- Intrinsically Safe (IS) Certification, meeting U.S. and international standards for Class 1, Div 1, ATEX Zone 1. *
- Marine-grade aluminum canister ensuring maximum protection and reliability in harsh sewer environments.

Applications

The FlowShark is designed for a multitude of project applications, including:

- Billing
- Trending
- Capacity Analysis
- CSOs
- SCADA networks
- Annexation and planning studies
- SSO monitoring
- CMOM/Operations and Maintenance programs
- Storm sewer/water quality characterization
- I/I studies

About ADS ...

A leading technology and service provider, ADS® Environmental Services has established the industry standard for open channel flow monitoring and has the only ETV verified flow monitoring technology for wastewater collection systems. These battery-powered monitors are specially designed to operate with reliability, durability, and accuracy in sewer environments.

INNOVATION • FLEXIBILITY • AFFORDABILITY

ADS ENVIRONMENTAL SERVICES®

Available Sensors

The following ADS sensors work interchangeably with the FlowShark and all ADS flow monitors. Together they provide a complete flow monitoring system with the highest accuracy and reliability. Detailed specifications for each sensor are also available from ADS.

Quad-redundant Ultrasonic Level Sensor

This non-intrusive, zero-drift sensing method results in a stable, accurate & reliable flow depth calculation. Four independent ultrasonic transceivers allow up to twelve sensor pair configurations for independent crosscheck, which provides built-in confidence and reliability. Advanced software filtering helps compensate for adverse monitoring conditions such as waves, foam, debris, etc.

Function: Measures elapsed time for an ultrasonic signal to travel to the flow surface and back and records the distance to the flow surface. The sensor is composed of 4 independent piezoelectric crystals. Resident software evaluates sensor readings and discards aberrant data.

Range: Up to 12.5 ft (3.8 m) in typical installations.

Pressure Depth Sensor

This sensor is used to measure surcharge levels, or to provide a redundant depth reading when used in conjunction with the ultrasonic level sensor.

Function: Measures depth of flow by recording the difference in atmospheric and water pressure.

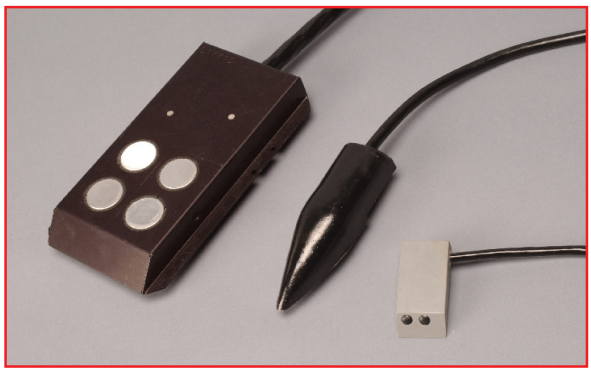
Range: 0.0-5.0 psi: up to 11.5 ft (3.5 m); 0.0-15.0 psi: up to 34.5 ft (10.5 m); 0.0-30.5 psi: up to 69.0 ft (21.0 m)

Peak Velocity Sensor

Readings from this sensor are used to calculate average flow velocity. Its miniature size and streamlined design minimize fouling and prevent flow disruption.

Function: An ultrasonic signal is transmitted out into the flow. The reflected signal is digitally analyzed for Doppler shift to measure the peak flow velocity.

Range: -15.0 to +15.0 ft/sec (-4.5 to +4.5 m/sec)



From left, Quadredundant ultrasonic level, pressure depth and peak velocity sensors.

Monitor Interfaces

Water Quality Sampler Interface
- Flow proportional or time-based

Rain Fall Measurement
- Tipping bucket

Analog Input
- PH, salinity, conductivity, other flow device

Analog Output
- Flow, ultrasonic level, pressure level, velocity

Product Specifications

Housing
0.13 in. (0.30 cm) thick seamless marine-grade aluminum with stainless steel hardware.

Dimensions
Cylinder is 20.0 in. long x 6.38 in. diameter (50.80 cm x 16.21 cm).

Weight
35 lbs.

Connectors
U.S. Military spec. MIL-C-26482 series 1, for environmental sealing, with gold plated contacts.

Electronics
Ultra-low power CMOS microprocessor-based architecture.

Power
Battery pack can power unit for more than 18 months at the standard 15-minute sample rate or can be powered with a DC power source (11-15vdc).

Measurement Intervals
A crystal oscillator timer activates depth intervals and velocity measurements at preset intervals such as 1.0, 2.0, 2.5, 5.0, 7.5, and 15 minutes. Time is synchronized to a central station computer.

Available Memory
2 Megabytes of available data storage, furnishing up to 12 months of data storage capacity with full sensor configuration at 15-minute sample rate.

Intrinsic Safety Certification *
U.S.: Class 1, Division 1, Groups C & D.
International: ATEX Zone 1.

Operating Temperature
32 degrees to 140 degrees F (0 degrees to 60 degrees C).

Warranty
One-Year Limited Warranty.

* Certification Pending

ADS ENVIRONMENTAL SERVICES®
A Division of ADS Corporation - Offices Worldwide
Corporate Office: 4940 Research Drive • Huntsville, AL 35805
Phone: 256-430-3366 • Fax: 256-430-6633 • Toll Free: 1-800-633-7246

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Document DSFLSK0705V1

HARDWARE

FLOWSHARK® PULSE

For Open Channels

The new FlowShark® Pulse for Open Channels from ADS® is a high performance liquid flow monitor for use in open channels of virtually any shape. It is designed for high accuracy and reliability, utilizing the most advanced velocity measurement technology available – gated cross correlation with digital pattern detection. Ease-of-use is also a design priority. Programming can be done completely on the built-in backlit display and data can be viewed and manipulated with any software that can read text files, such as Microsoft Excel.

FlowShark Pulse Features

- Profiling sensor measures average velocity by integrating up to 16 discrete point velocities in every sample
- Suitable for unusual or dynamic velocity profiles
- One analog input, 2 analog outputs, and 2 relays
- Built-in password protected Web server interface
- No calibration required
- No laptop required – all functions accessible from touchpad
- No software required – data stored on Compact Flash Card in ASCII format readily opened in Excel
- 128 MB memory card
- Combination up looking ultrasonic depth, gated cross correlation velocity, and pressure depth sensor
- 2 year warranty
- Cable lengths up to 820 feet
- All keypad functions and data collection available via Internet using standard modem connection to Web host

Applications

The FlowShark Pulse is designed for the most demanding permanent monitoring applications where measurement accuracy is critical or where hydraulic conditions are not suited for general purpose monitoring technologies.

- Billing applications where data is used to bill other parties for whom the servicing agency provides transportation and/or treatment services or to verify billing from outside agencies.
- System Management applications data is used for control systems, such as treatment plant operations, pump stations, inline storage controls, or collection system routing controls.
- Optional insertion sensor for closed pipe applications.

About ADS

A leading technology and service provider, ADS® Environmental Services has established the industry standard for open channel flow monitoring and has the only ETV verified flow monitoring technology for wastewater collection systems. These battery-powered monitors are specially designed to operate with reliability, durability, and accuracy in sewer environments.

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FlowShark Pulse Sensors

The FlowShark Pulse minimizes the cost and the footprint of underwater sensors by combining three sensor technologies within a single streamlined housing. This housing, measuring only 1.2"H x 1.6"W x 10"L contains the following sensors.

Submerged Ultrasonic Depth Sensor

The ultrasonic depth sensor transmits a high-frequency sound pulse along a vertical path from the sensor to the water surface. The water surface acts as a reflecting boundary to the sound pulse. The sensor measures the short time interval that the pulse of sound requires to travel to the water surface and reflect back to the sensor. The computed speed of sound is then used to calculate the depth of flow.

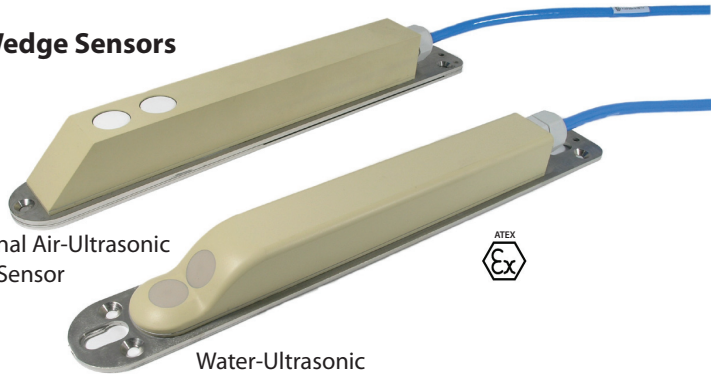
Pressure Depth Sensor

The pressure sensor is a piezoresistive device that converts the water pressure above the sensor to a depth of flow. The pressure sensor overrides the ultrasonic depth sensor in three conditions: (1) when the ultrasonic sensor cannot obtain a reliable measurement; (2) when the sensor cannot be installed on the bottom of the pipe; and (3) when the water column exceeds the height of the pipe, such as the case during surcharge conditions.

Gated Cross Correlation Velocity Sensor

The velocity sensor in the FlowShark Pulse is a state of the art advancement in velocity sensing technology. This complex technology tracks the movement of velocity particle signatures within 16 separate "gates" of the vertical cross section of the flow. These gates are integrated across a two-dimensional cross section in order to compute average velocity.

Wedge Sensors



Optional Air-Ultrasonic Level Sensor

Water-Ultrasonic Combination Sensor

FlowShark Pulse Specifications

- 100-240 volts AC or 24 volts DC power
- LAN/WAN Interface
- Polycarbonate enclosure weighing 6.3 lbs
- Back lit graphic display 128 x 128 pixels
- 18 button touchpad
- Data storage: 128 MB Compact Flash Card
- Maximum 4 bar operating pressure (58 psi)
- Cable length 33 feet extendable to 820 feet
- Temperature compensation to adjust for the speed of sound in water

Submerged Ultrasonic Depth Sensor
- Submerged ultrasonic transit time technology
- Range 0.16 to 6.56 ft.
- Accuracy +/- 0.08 inches

Pressure Depth Sensor
- Piezoresistive pressure technology
- Range 0 to 11.5 ft.
- Error less than 0.5% final value

Gated Cross Correlation Velocity Sensor
- Gated cross correlation with digital pattern recognition technology operating at 1 MHz
- Range -3.28 to 19.7 fps to maximum depths of 5.0 ft. (basic model) or 16.5 ft. (extended model)
- 16 scan layers
- Error less than 1%

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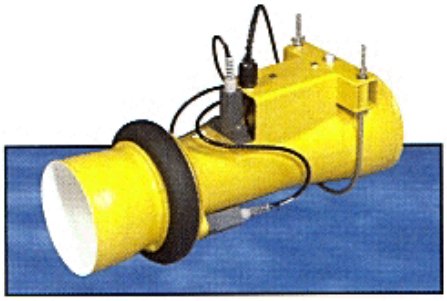
4940 Research Drive, Huntsville, AL 35805
Phone: 256-430-3366/ Fax: 256-430-6333
Toll Free: 1-800-633-7246

Specifications subject to change without notice.

Flow Meter System Specifications

Measurement Range
Performance Accuracy
Operating Temperature Range
Power Requirements
Electronics
Flow Tube
Operation
Calibration
Flow Conditions



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Measurement Range:

Pipe Size (inch)	Maximum Flow (GPM)
8	760
10	1400
12	2260
15	4130

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Performance Accuracy:

Flow Conditions	Accuracy: Percent of Maximum Flow
Open Channel	Forward Flow +/- 3% Reverse Flow +/- 3%
Full Pipe	Forward Flow +/- 3% * See Note Reverse Flow +/- 3%
Full Pipe Below Transition	+/- 10% * See Note
Open Channel (>90% submergence)	Forward Flow +/- 5% Reverse Flow +/- 5%

*Note: Up to 10' surcharge

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Operating Temperature Range:

Sensors 32° to 120°F (0° to 50°C)

Electronics - 5° to 120°F (- 17° to 50°C)

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Power Requirements:

Standard: Battery powered 8 each D-Cell alkaline; 1 each 9 volt alkaline (memory backup) (Minimum battery life of 90 days at 15 minute data logging intervals)

Optional: 115/ 230VAC ± 15%, 50/ 60Hz, 12VA, w/ 8 each D-Cell NiCd (primary backup) and 1 each 9 volt alkaline (memory backup)

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Electronics:

Enclosure	Material:	Lightweight structural foam resin
	Rating:	NEMA 6P submersible (6.0ft for 24 hours)
	Dimensions:	12-5/8" x 13-3/4" x 5-7/8" deep
	Weight:	15 lbs. (6.8 kg) including standard batteries, sensors, and 25 ft. cable
	Desiccant protected	
Sensors	Type:	Stainless steel submersible pressure transducers
	Cable:	25 ft. (7.6m) polyurethane outer jacket
	Housing:	Sealed, watertight PVC (submersible)
	Over Range:	11 psi (25 ft. Water)
	Air Intake:	Atmospheric pressure reference protected by hydrophobic filter

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Flow Tube: (weights and dimensions shown below)

Sizes: 8, 10, 12, and 15 inches (consult factory for additional flow tube sizes)
Material: fiberglass reinforced isophthalic polyester resin. Inside surface of white gelcoat.
Hardware: stainless steel, bubble level with aluminum e, sampler event, and rainfall

Communications

Data Retrieval:	IBM compatible computer
Transfer Protocol:	RS-232 at 9600 baud
Optional:	Modem at 1200 baud (9600 baud available)

Software: CalcuFlow™ 97 (for Windows® 95)

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Calibration:

NO FIELD CALIBRATION OR FLOW PROFILING REQUIRED
Flow tube pre-calibrated at a NIST traceable flow laboaratory.

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Flow Conditions:

Open channel, Full Pipe, Surcharged, Submerged, and Reverse

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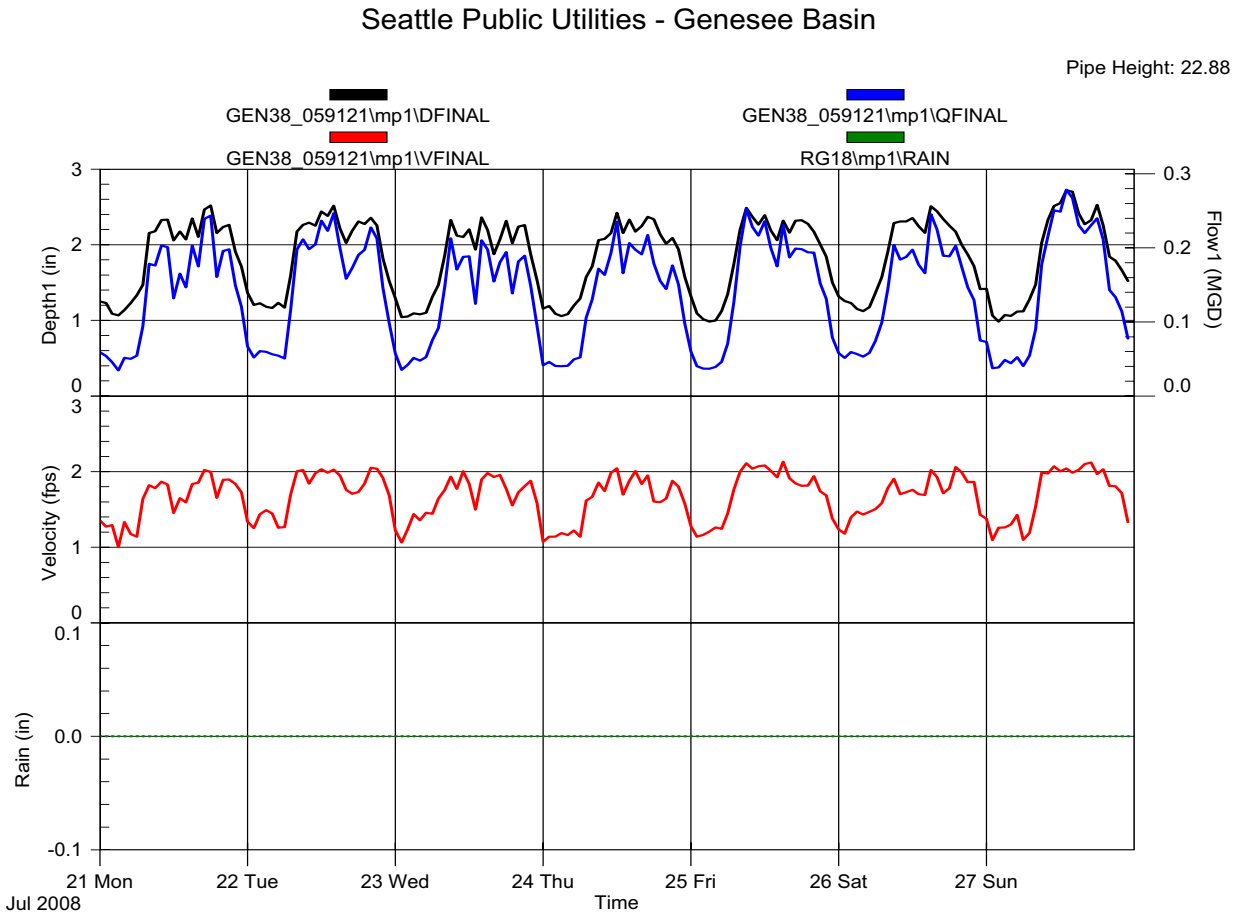
Appendix C: Flow Meter Hydrographs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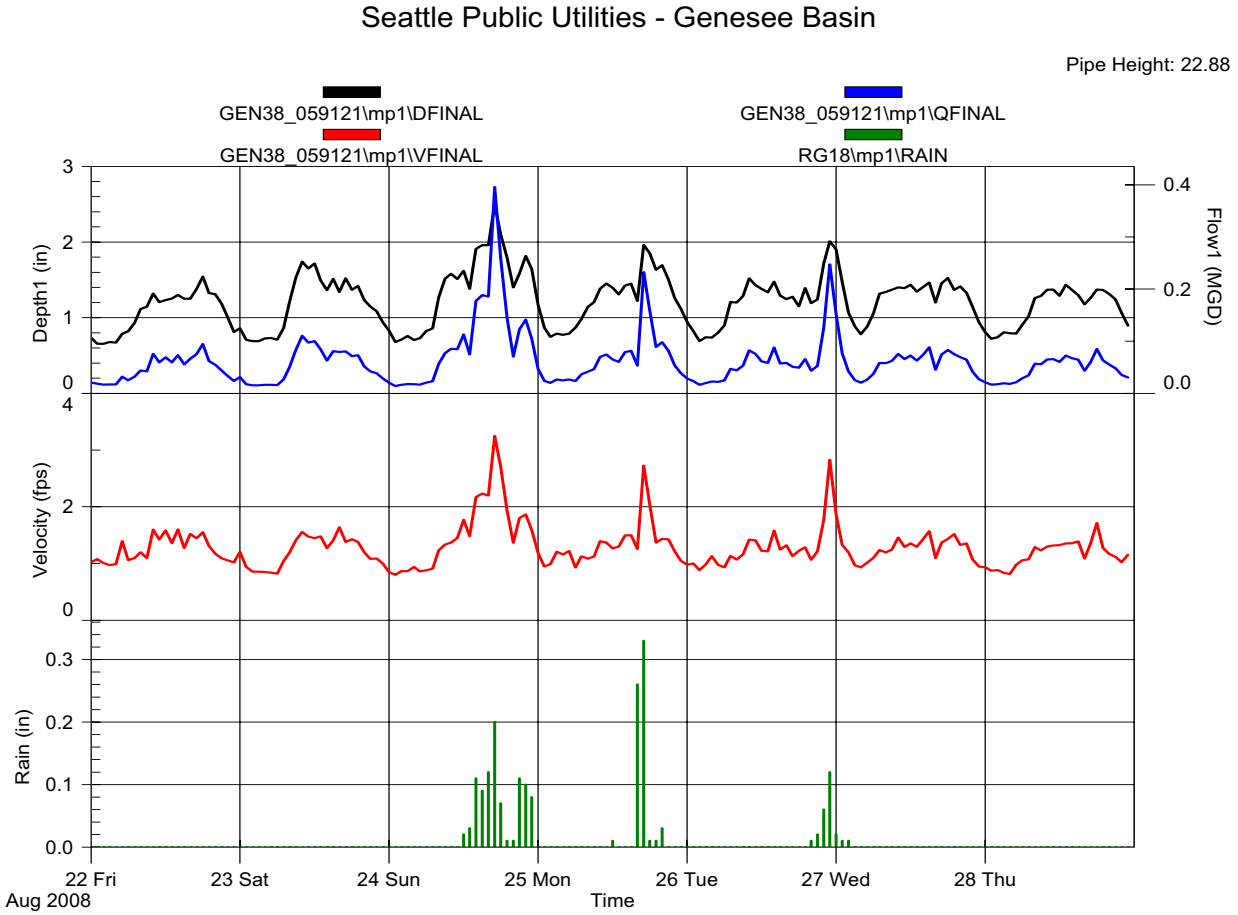
GEN38_059121\mp1\QFINAL
GEN38_059121\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
21 Mon
Jul 2008
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Time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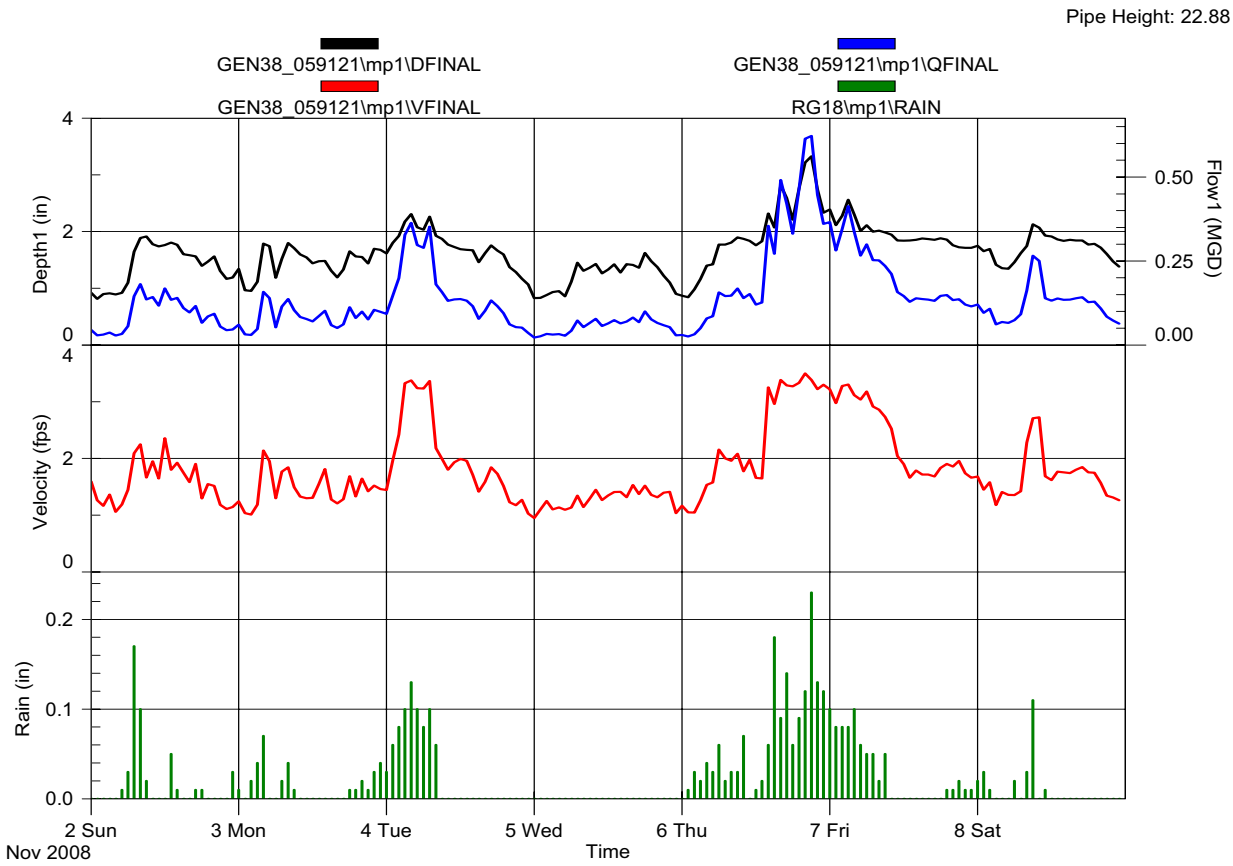
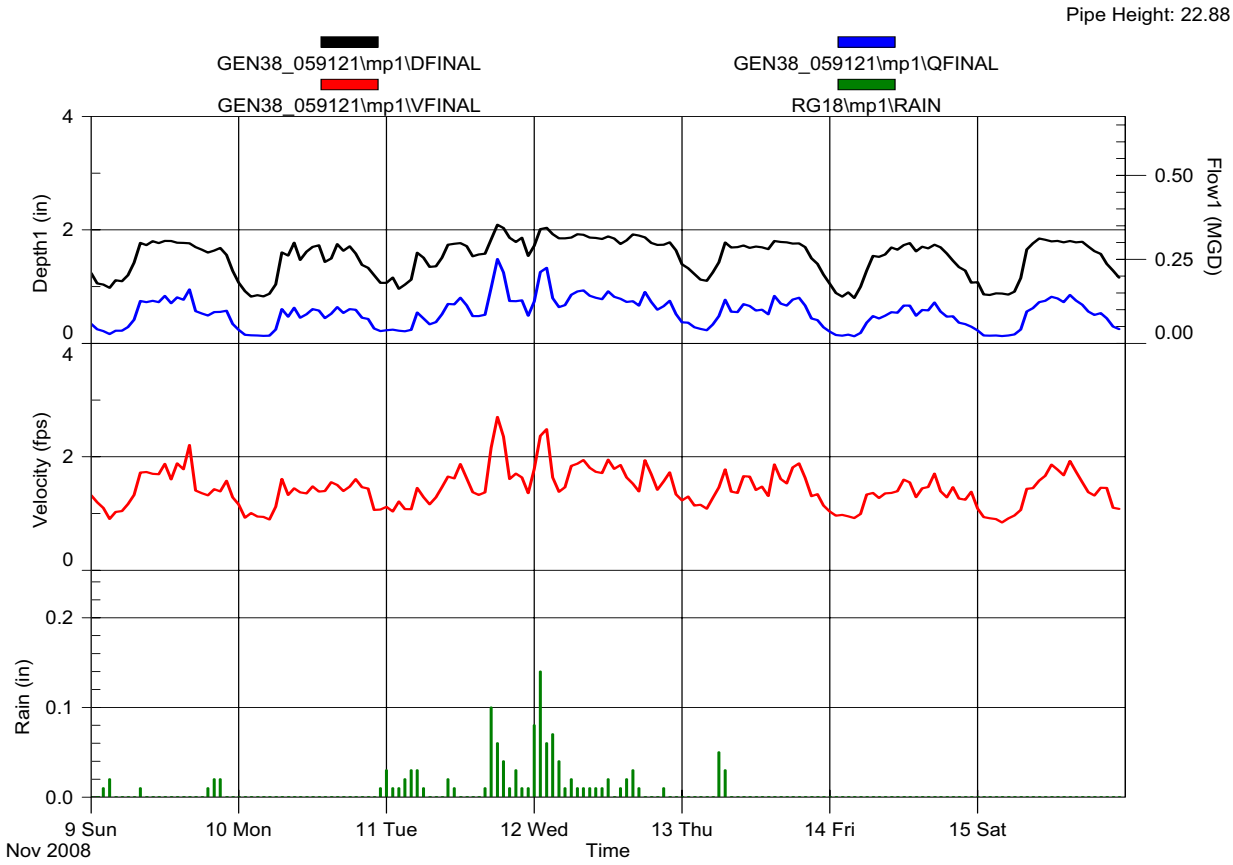
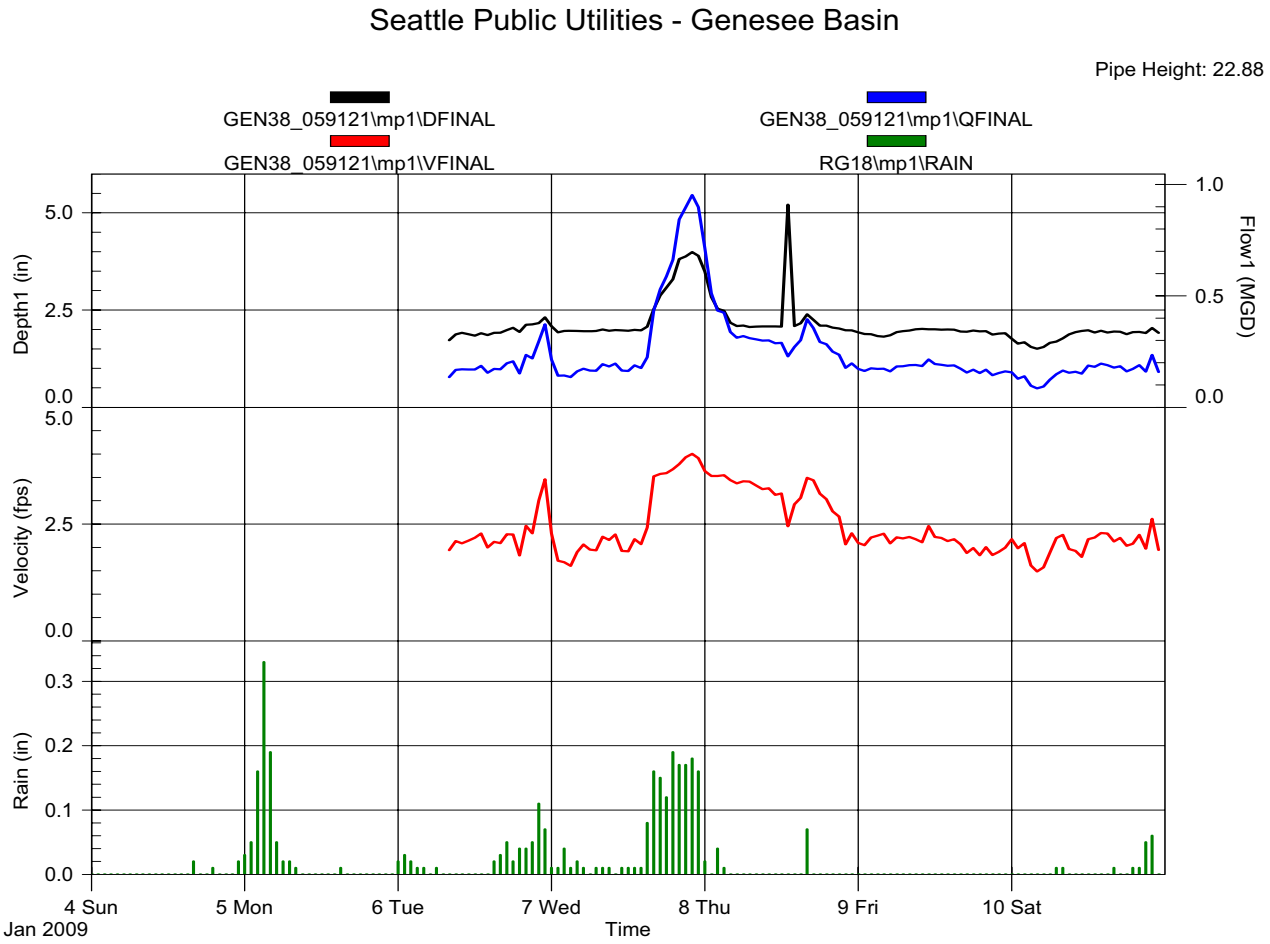
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
22 Fri
Aug 2008
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Time

Seattle Public Utilities - Genesee Basin



Seattle Public Utilities - Genesee Basin

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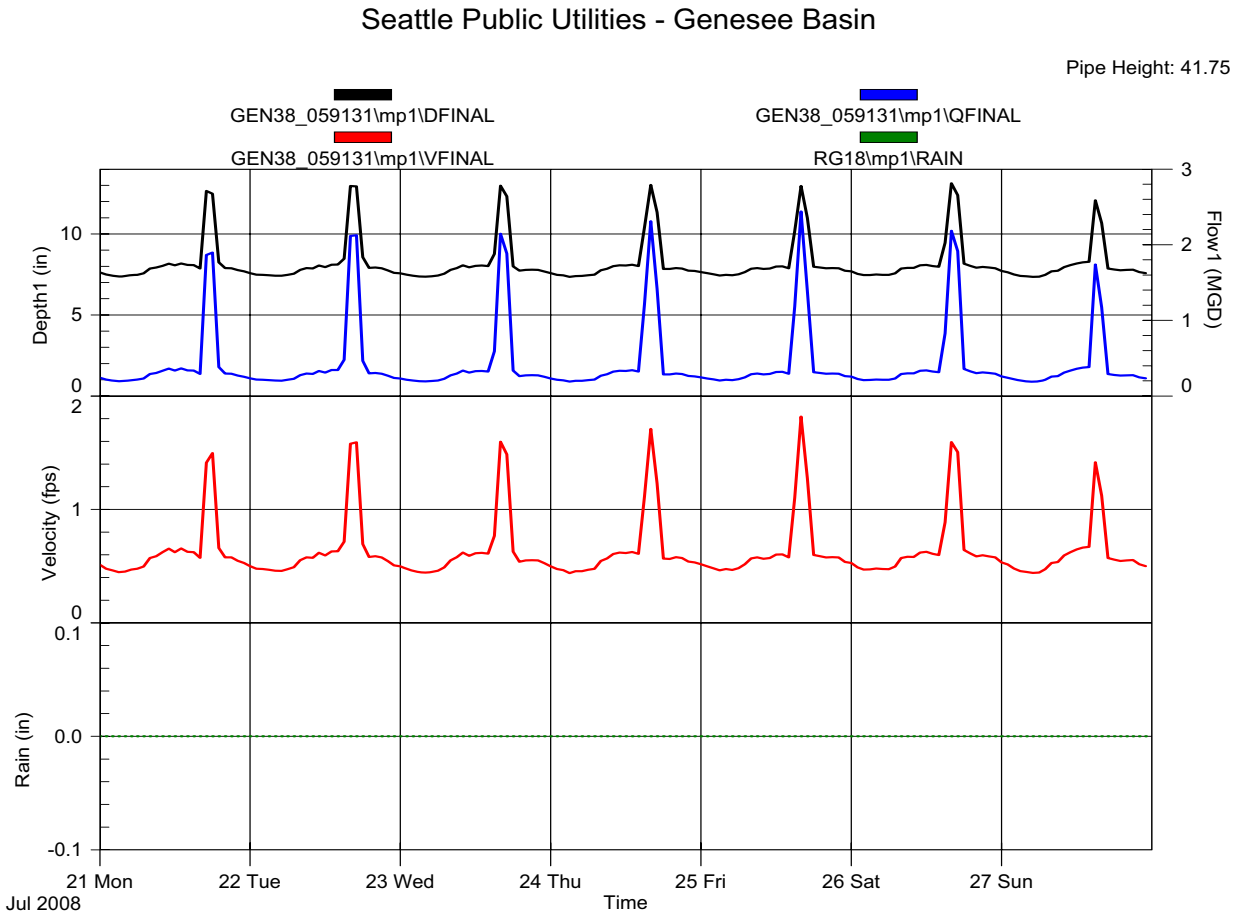
GEN38_059121\mp1\QFINAL
GEN38_059121\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
5.0
2.5
0.0
Flow1 (MGD)
1.0
0.5
0.0
Velocity (fps)
5.0
2.5
0.0
Rain (in)
0.3
0.2
0.1
0.0
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time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RG18\mp1\RAIN
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Velocity (fps)
Rain (in)
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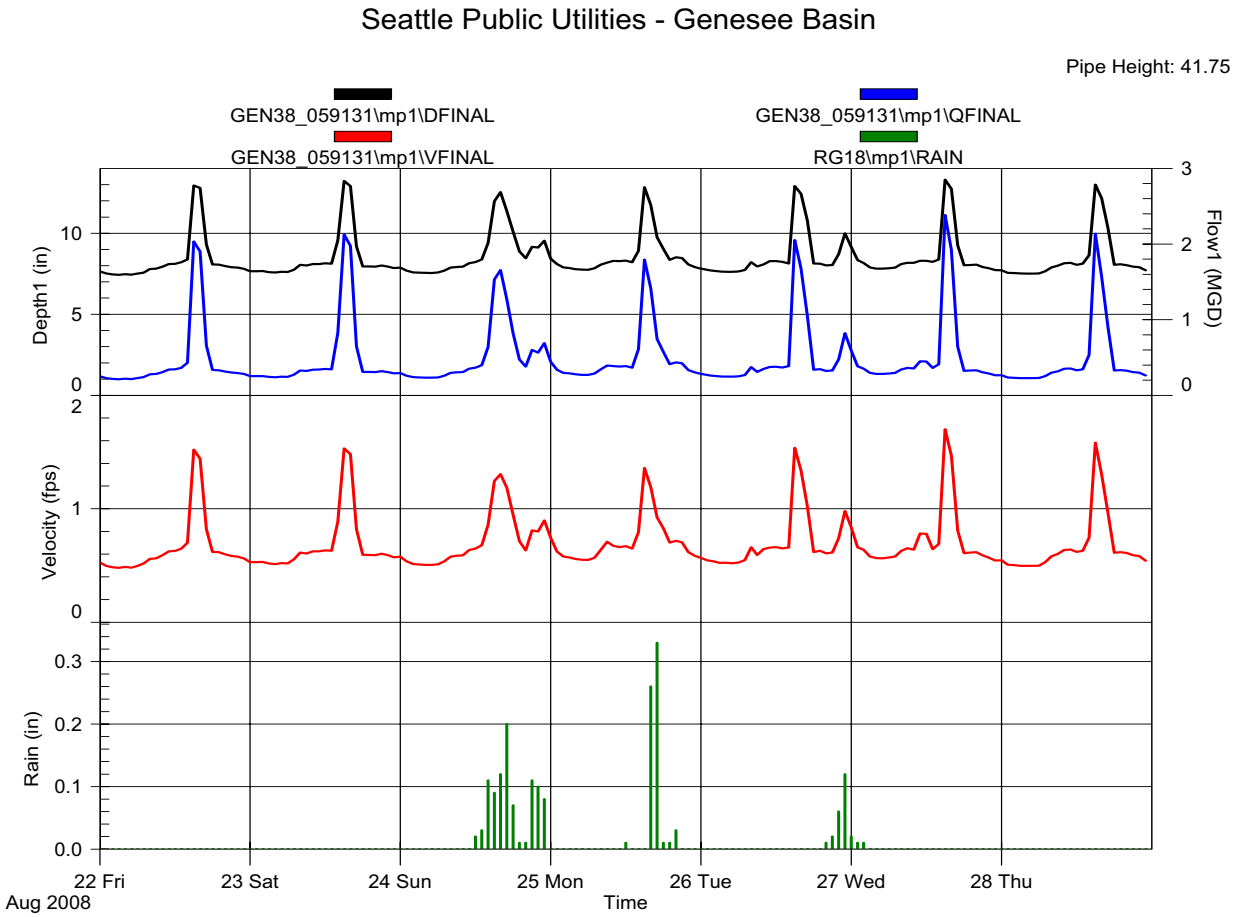
Time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RG18\mp1\RAIN
Depth1 (in)
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25 Mon
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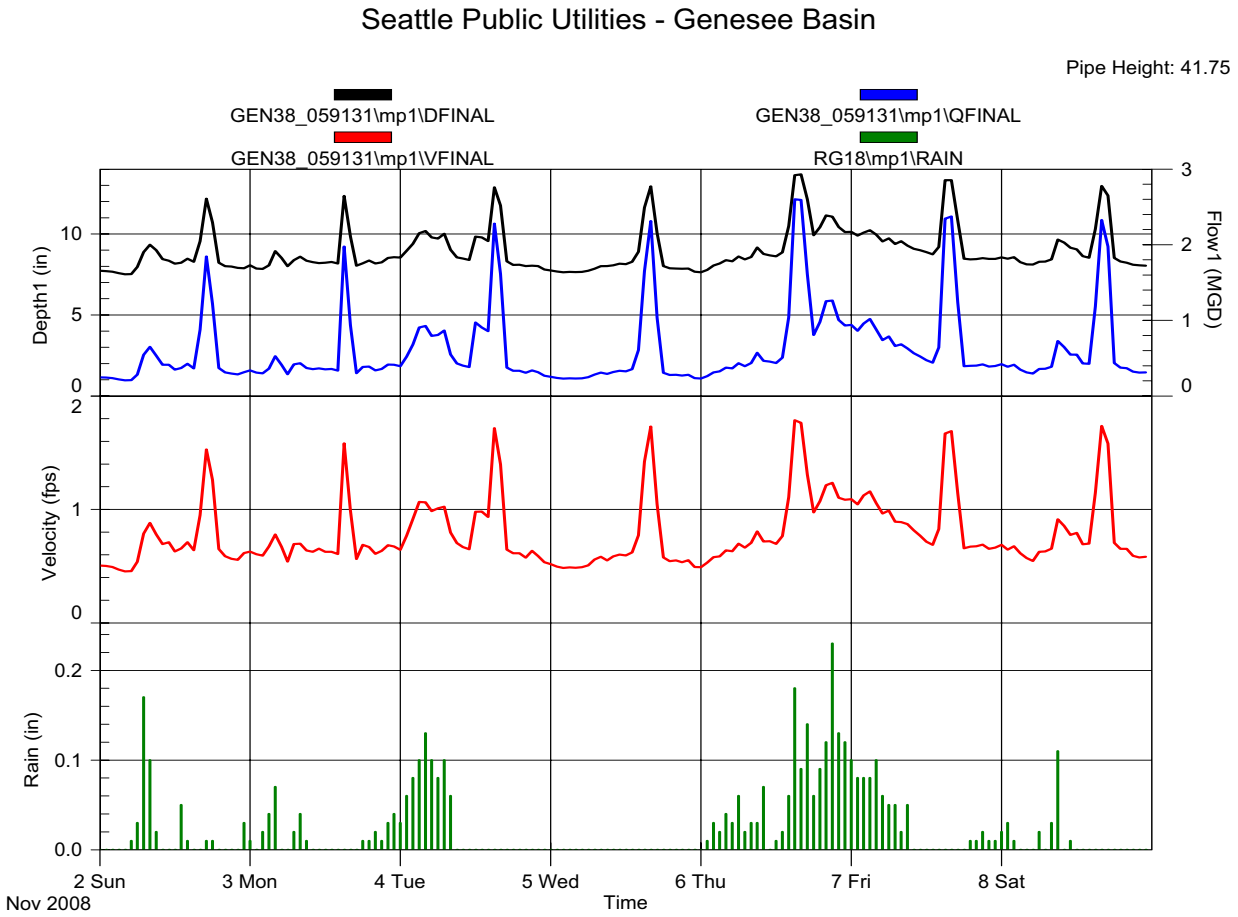
28 Thu
Time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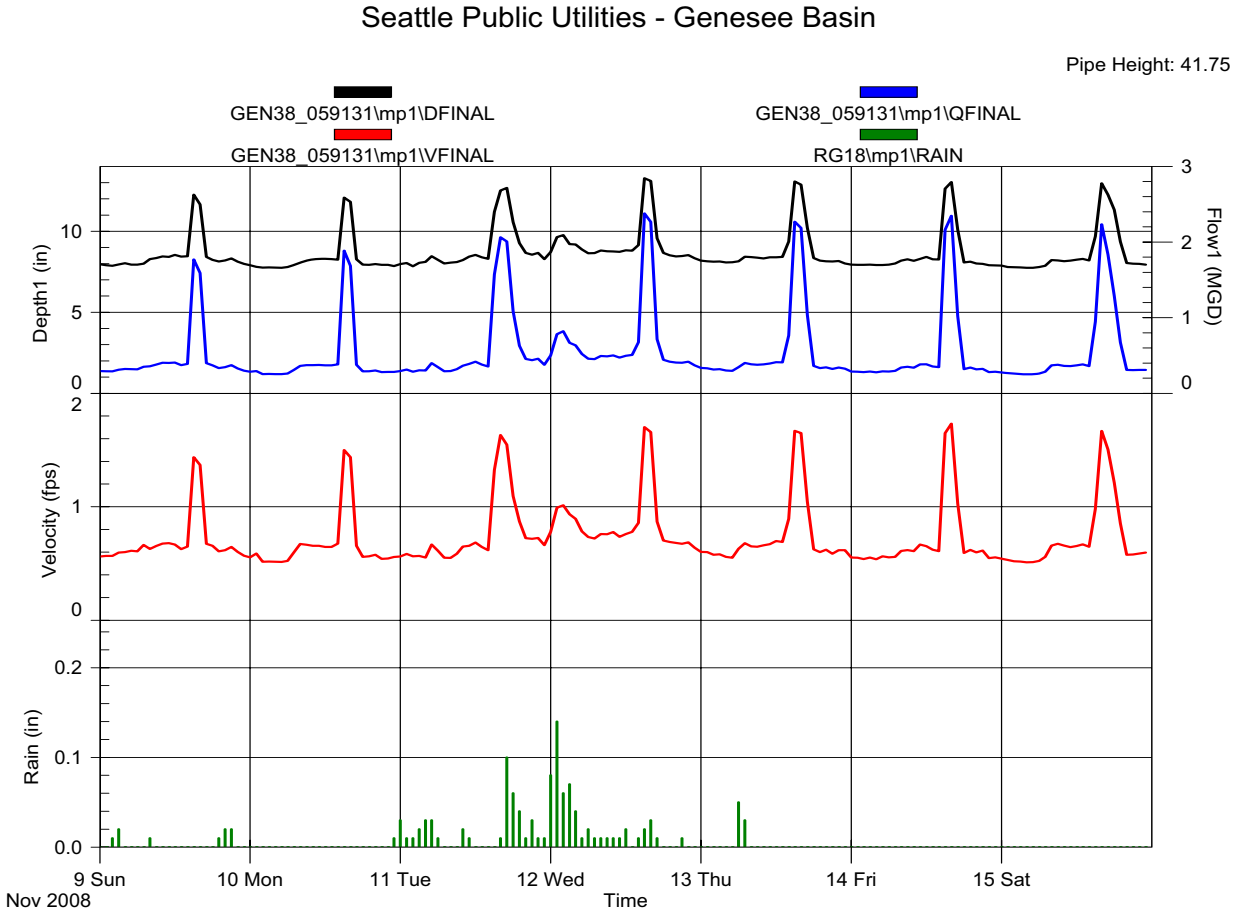
GEN38_059131\mp1\QFINAL
GEN38_059131\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
2 Sun
Nov 2008
3 Mon
4 Tue
5 Wed
6 Thu
7 Fri
8 Sat
Time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12 Wed
13 Thu
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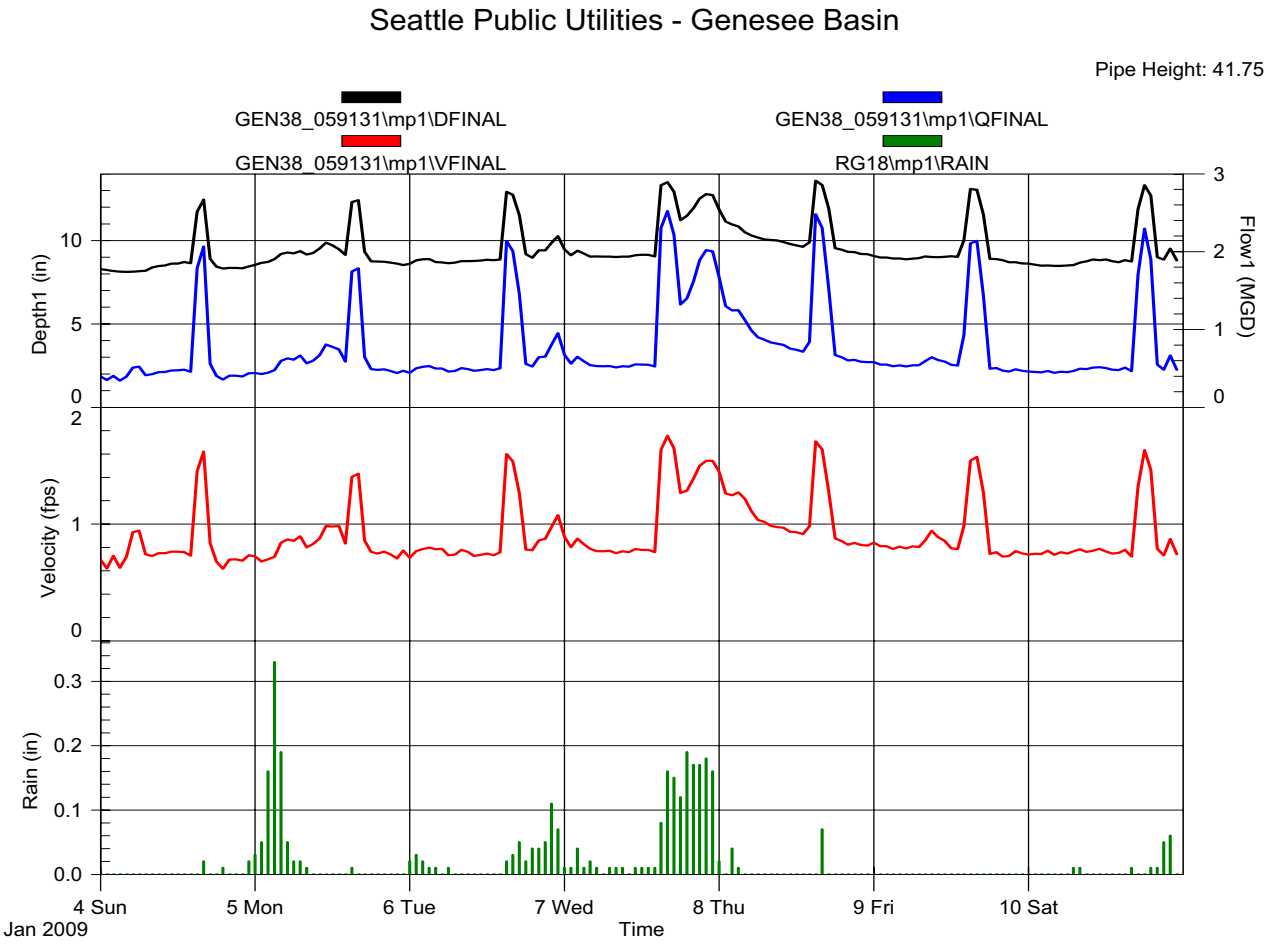
Time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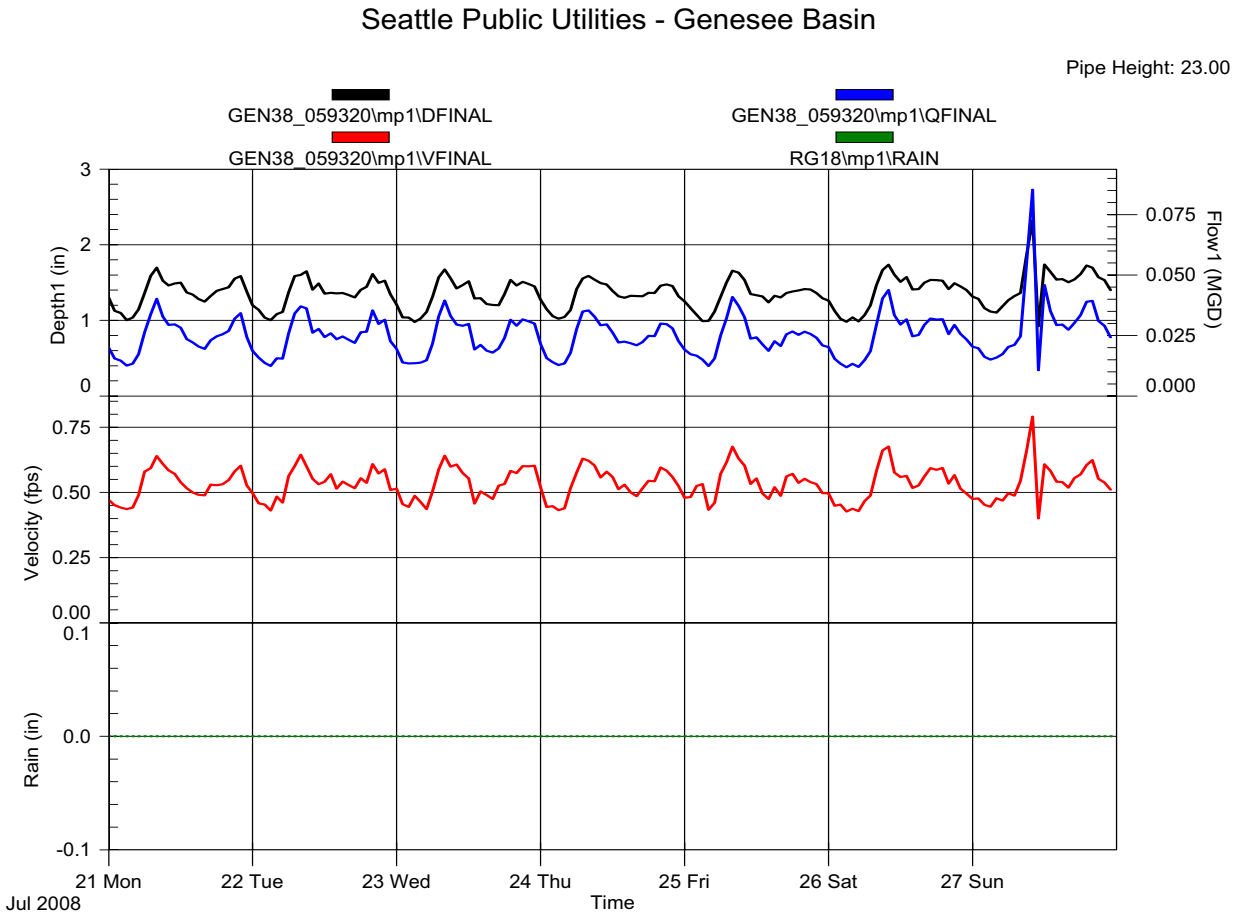
GEN38_059131\mp1\QFINAL
GEN38_059131\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time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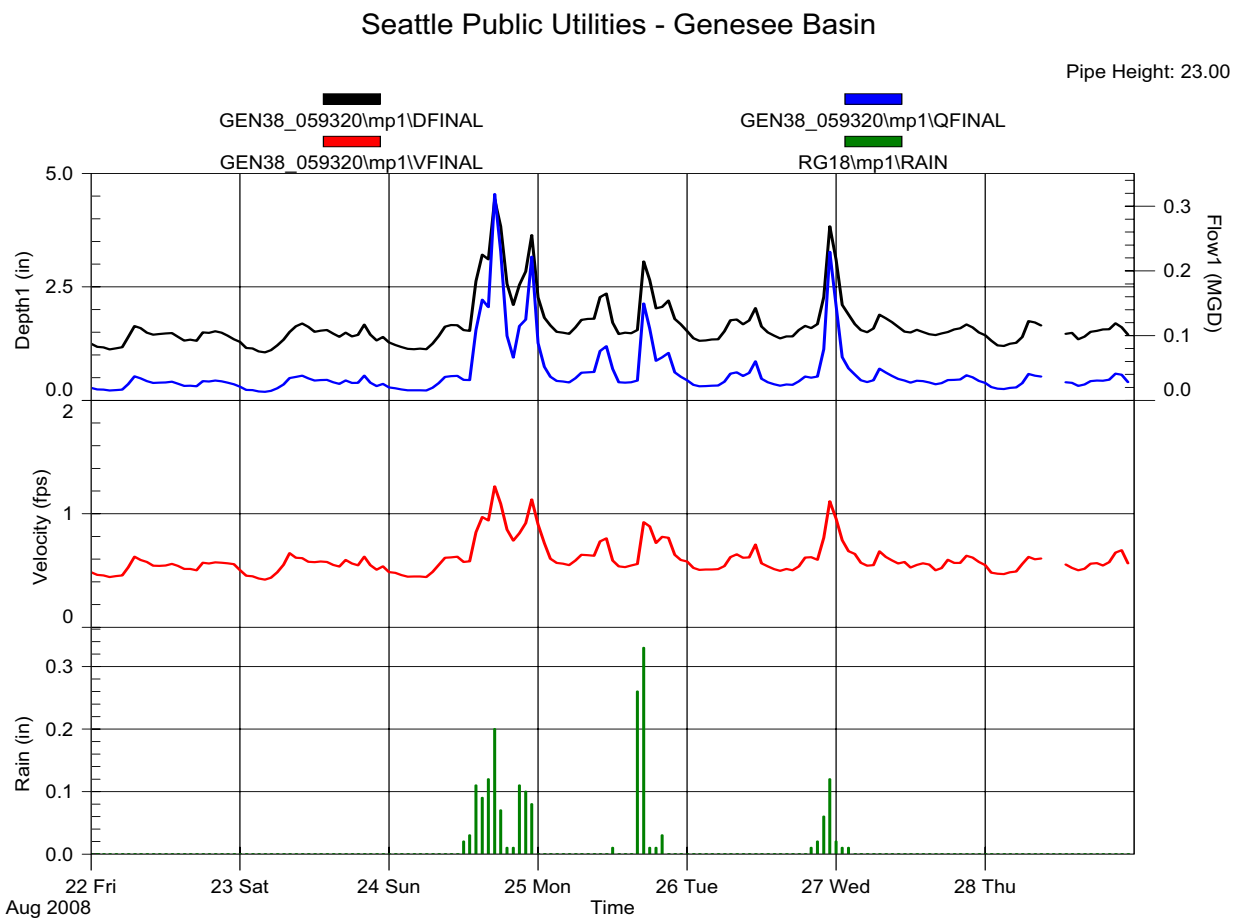
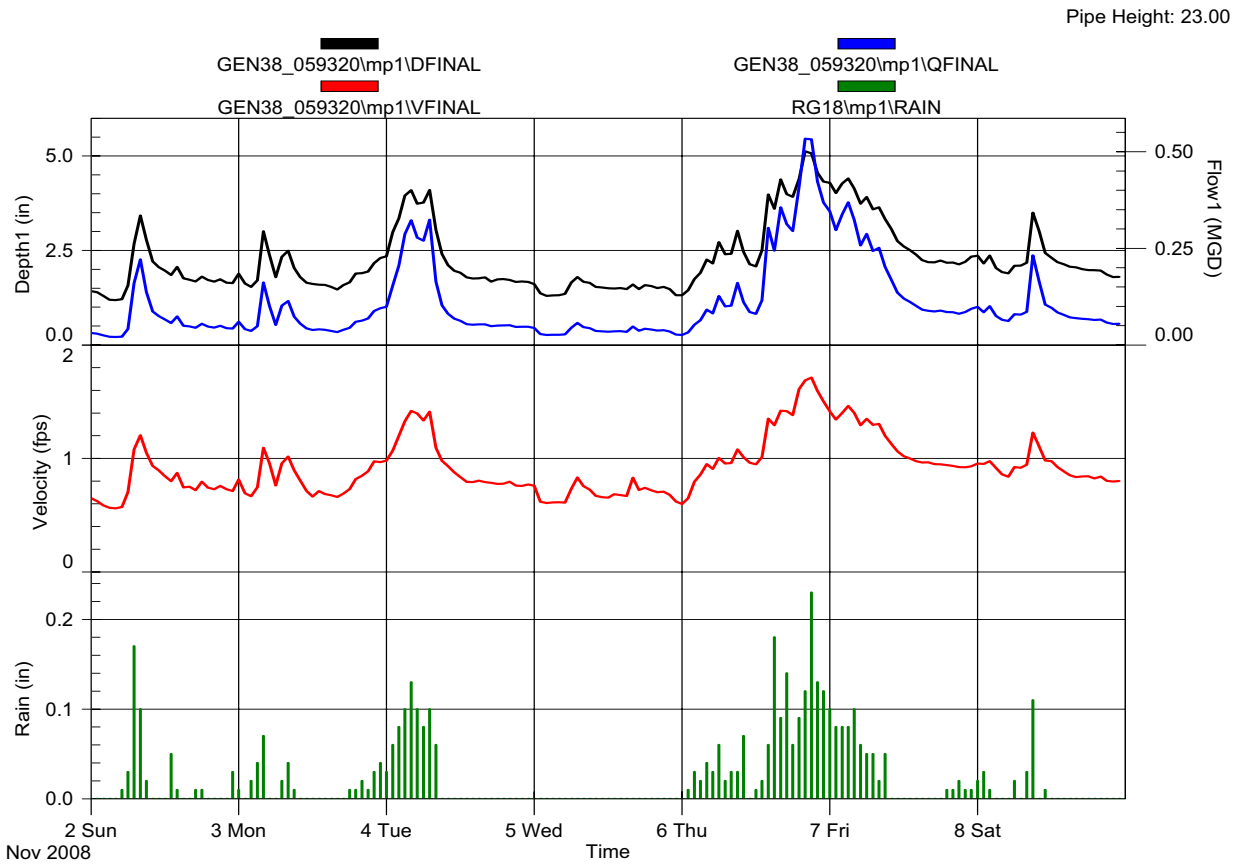
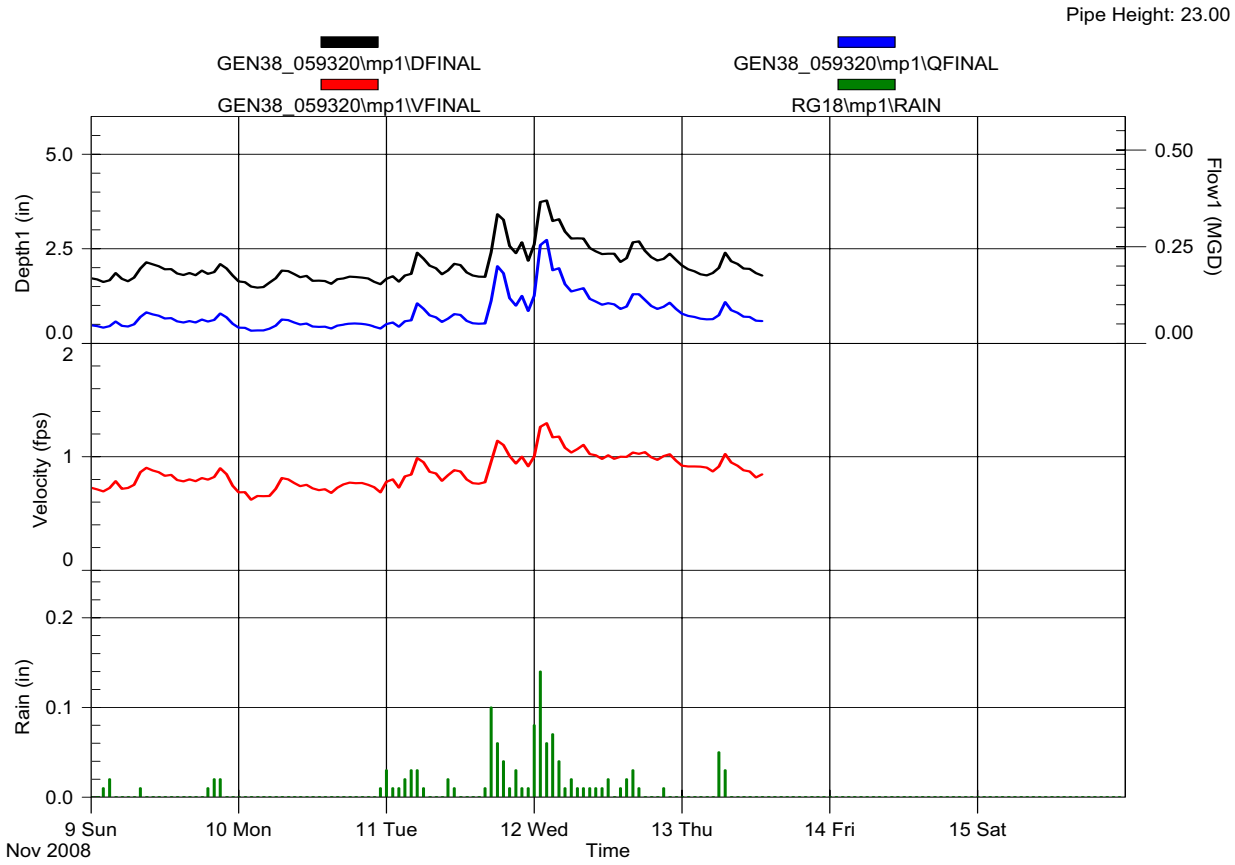
GEN38_059320\mp1\QFINAL
GEN38_059320\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
21 Mon
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Jul 2008
Time

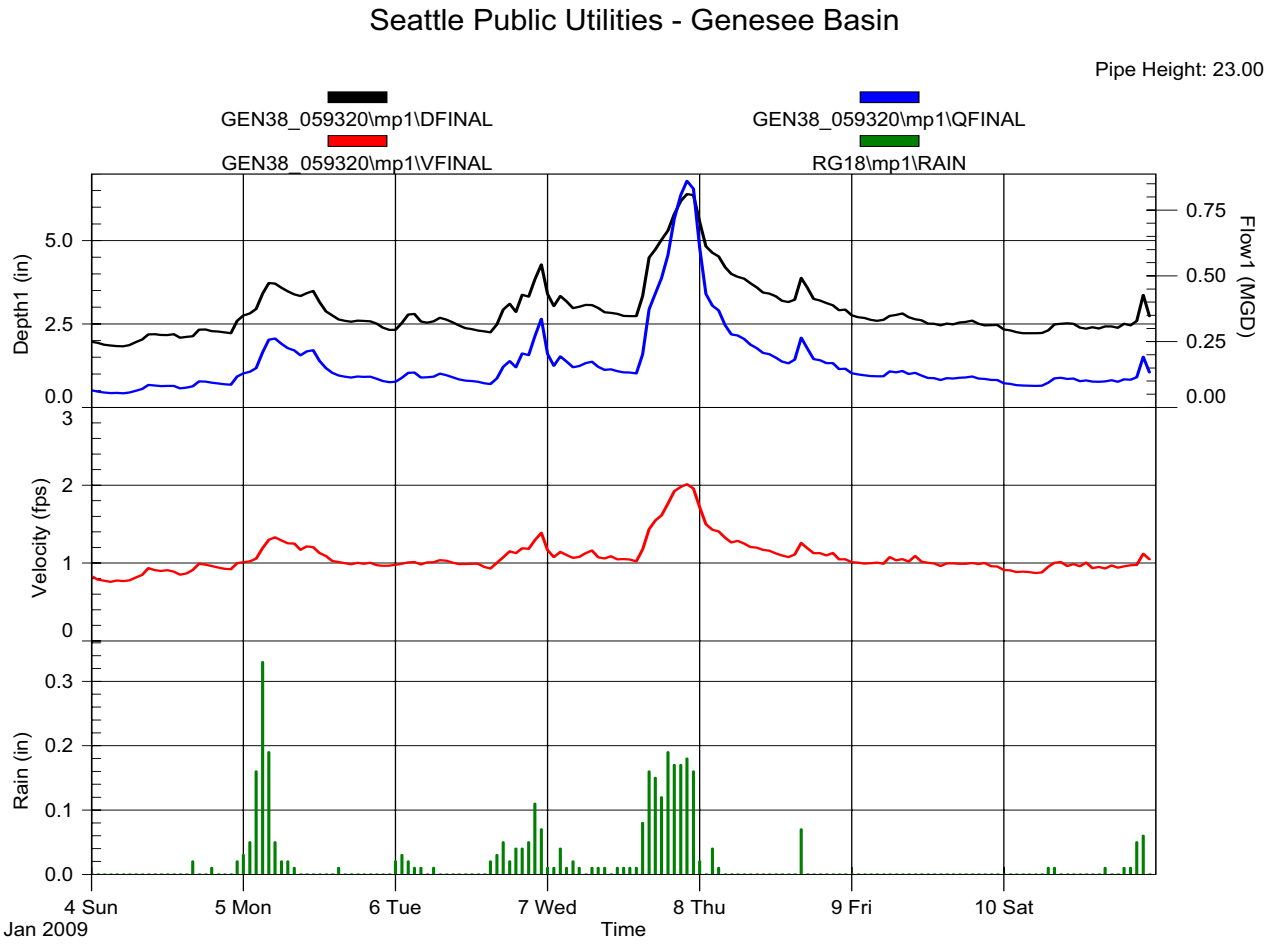

Seattle Public Utilities - Genesee Basin
Pipe Height: 23.00
GEN38_059320\mp1\DFINAL
GEN38_059320\mp1\QFINAL
GEN38_059320\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
22 Fri
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Aug 2008
Time

Seattle Public Utilities - Genesee Basin



Seattle Public Utilities - Genesee Basin




Seattle Public Utilities - Genesee Basin
Pipe Height: 23.00
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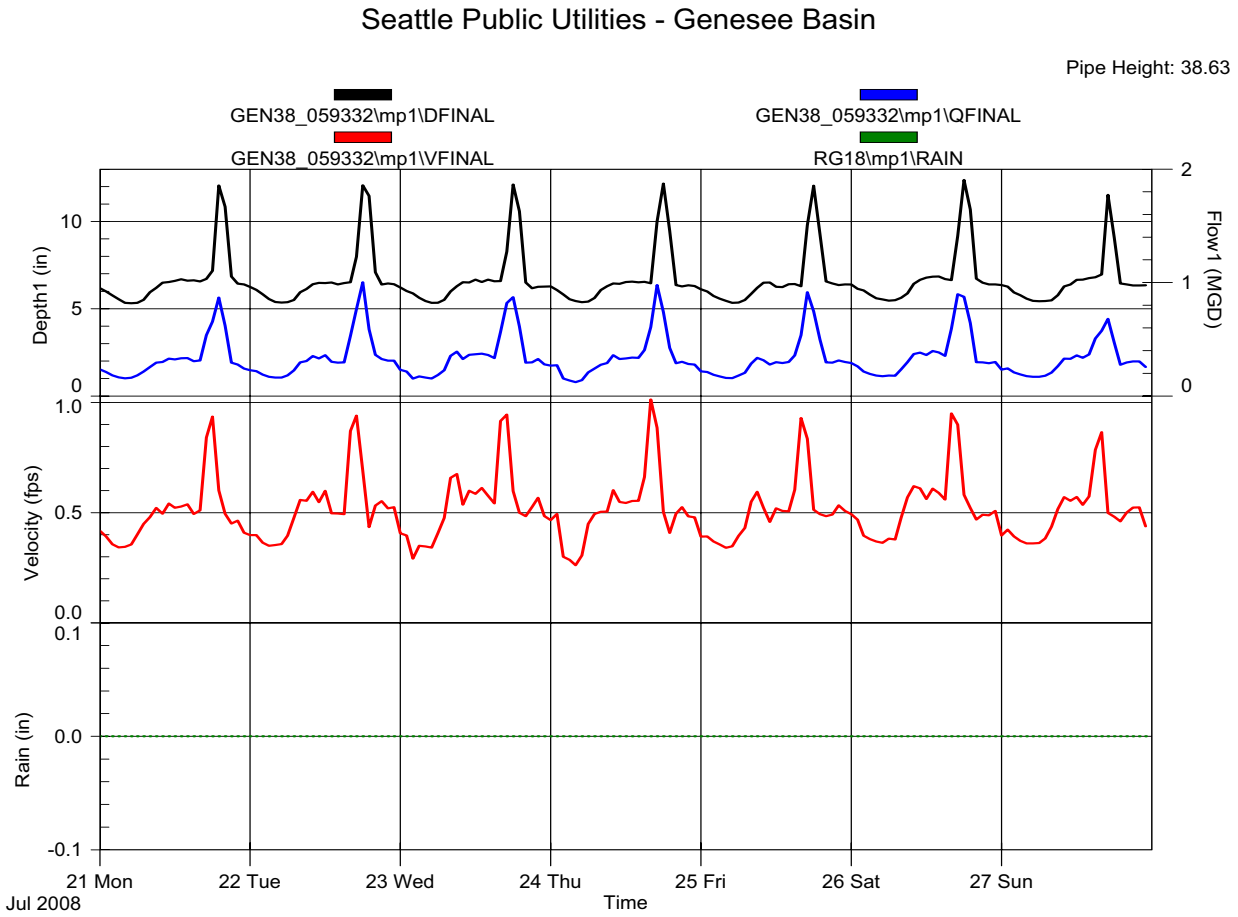
GEN38_059320\mp1\QFINAL
GEN38_059320\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
5.0
2.5
0.0
Flow1 (MGD)
0.75
0.50
0.25
0.00
Velocity (fps)
3
2
1
0
Rain (in)
0.3
0.2
0.1
0.0
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time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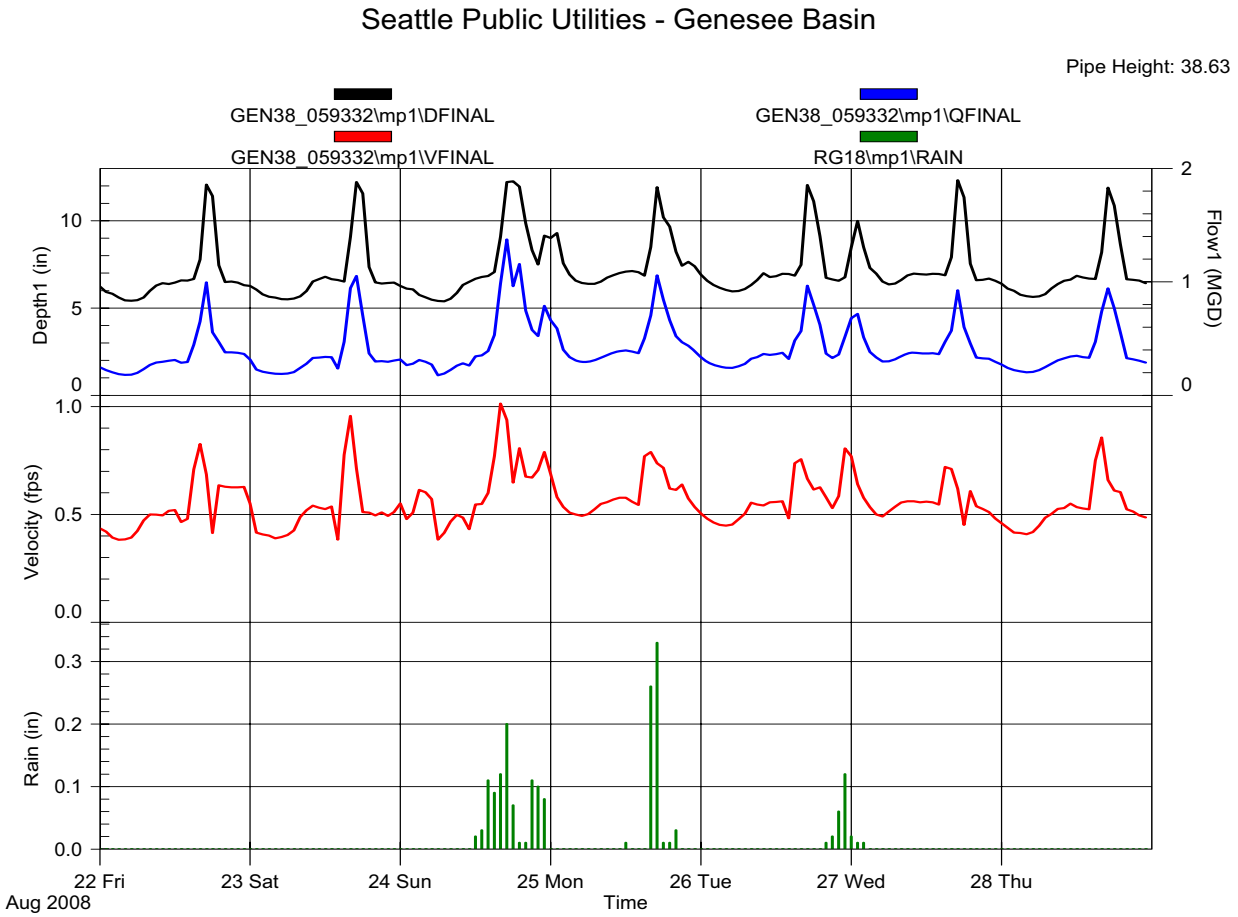
GEN38_059332\mp1\QFINAL
GEN38_059332\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
21 Mon
Jul 2008
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Time


Seattle Public Utilities - Genesee Basin
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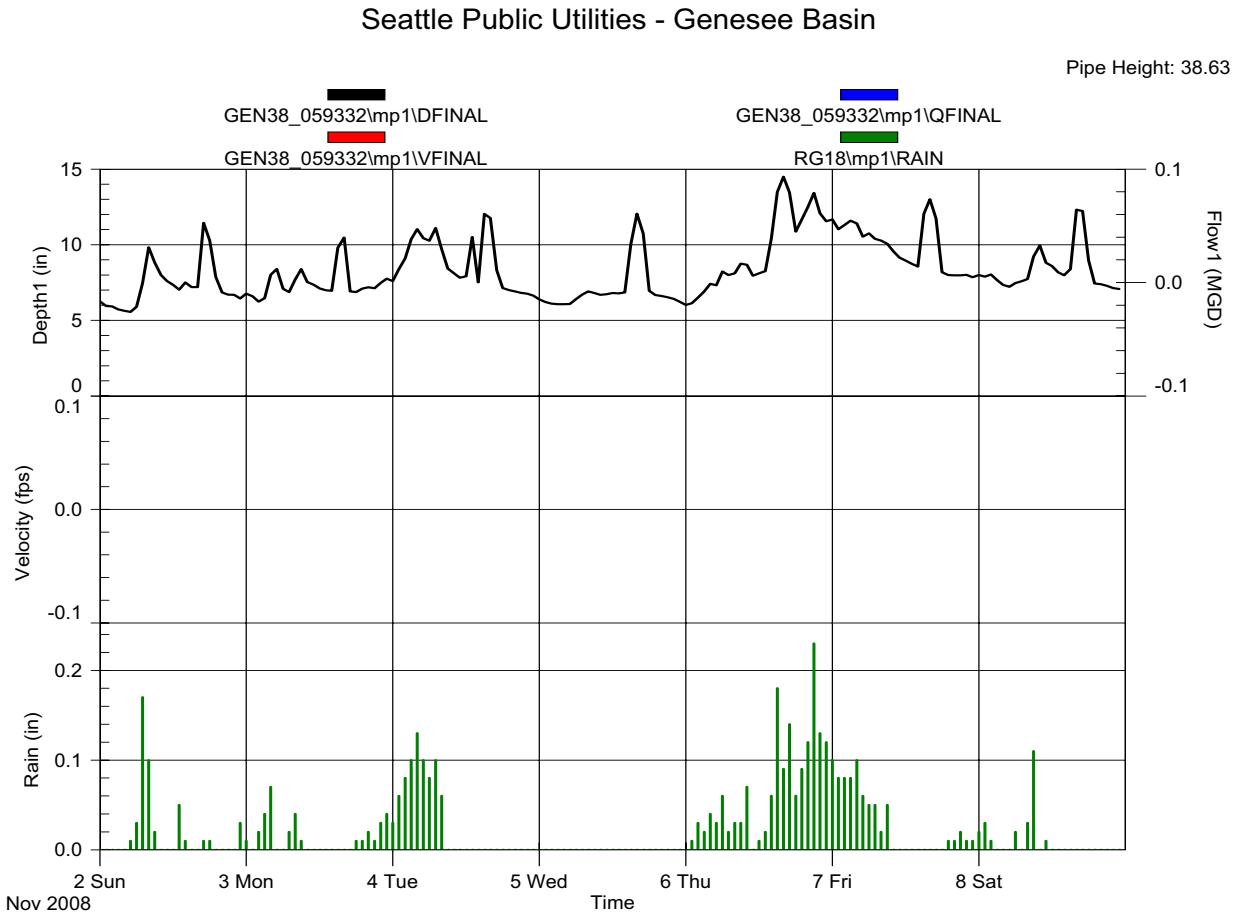
GEN38_059332\mp1\QFINAL
GEN38_059332\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
22 Fri
Aug 2008
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 38.63
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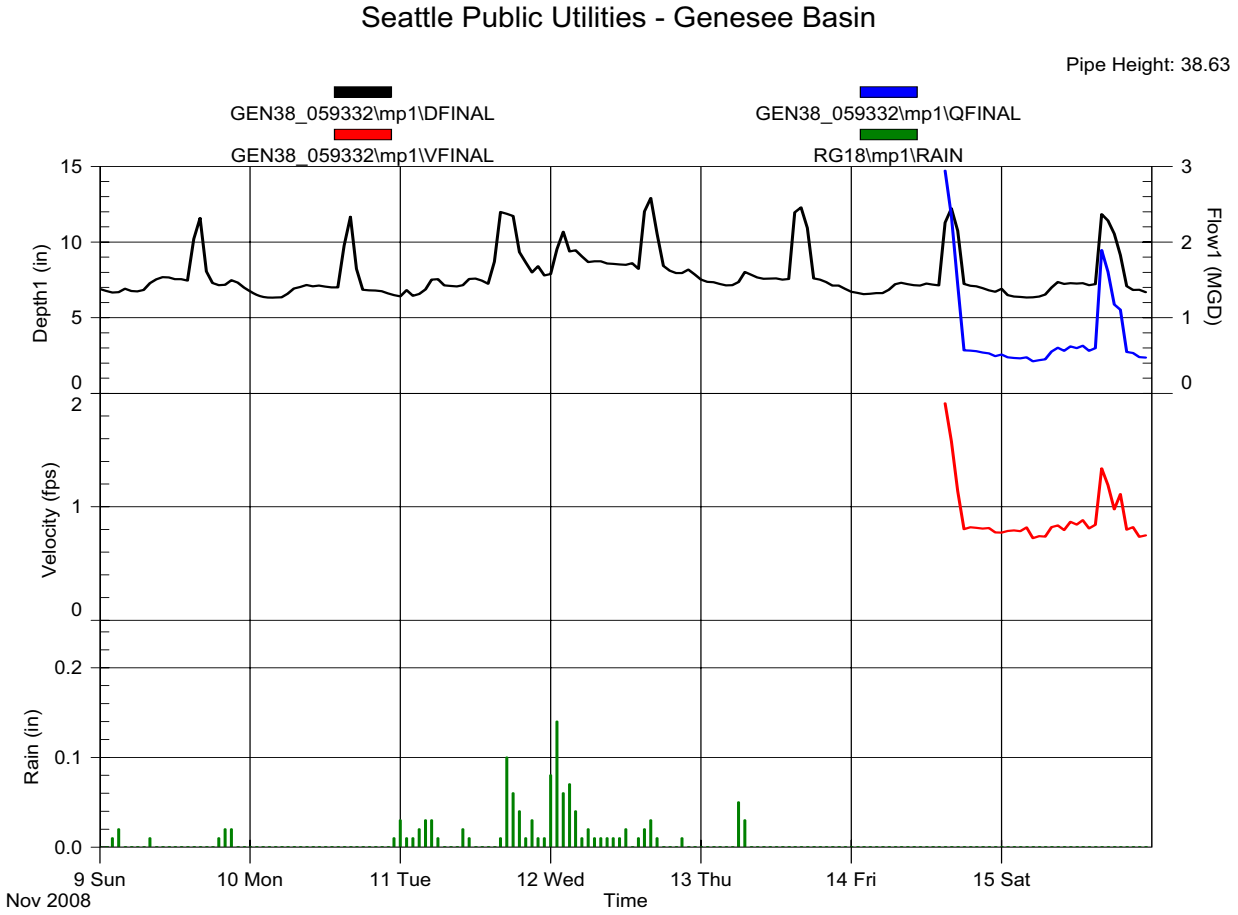
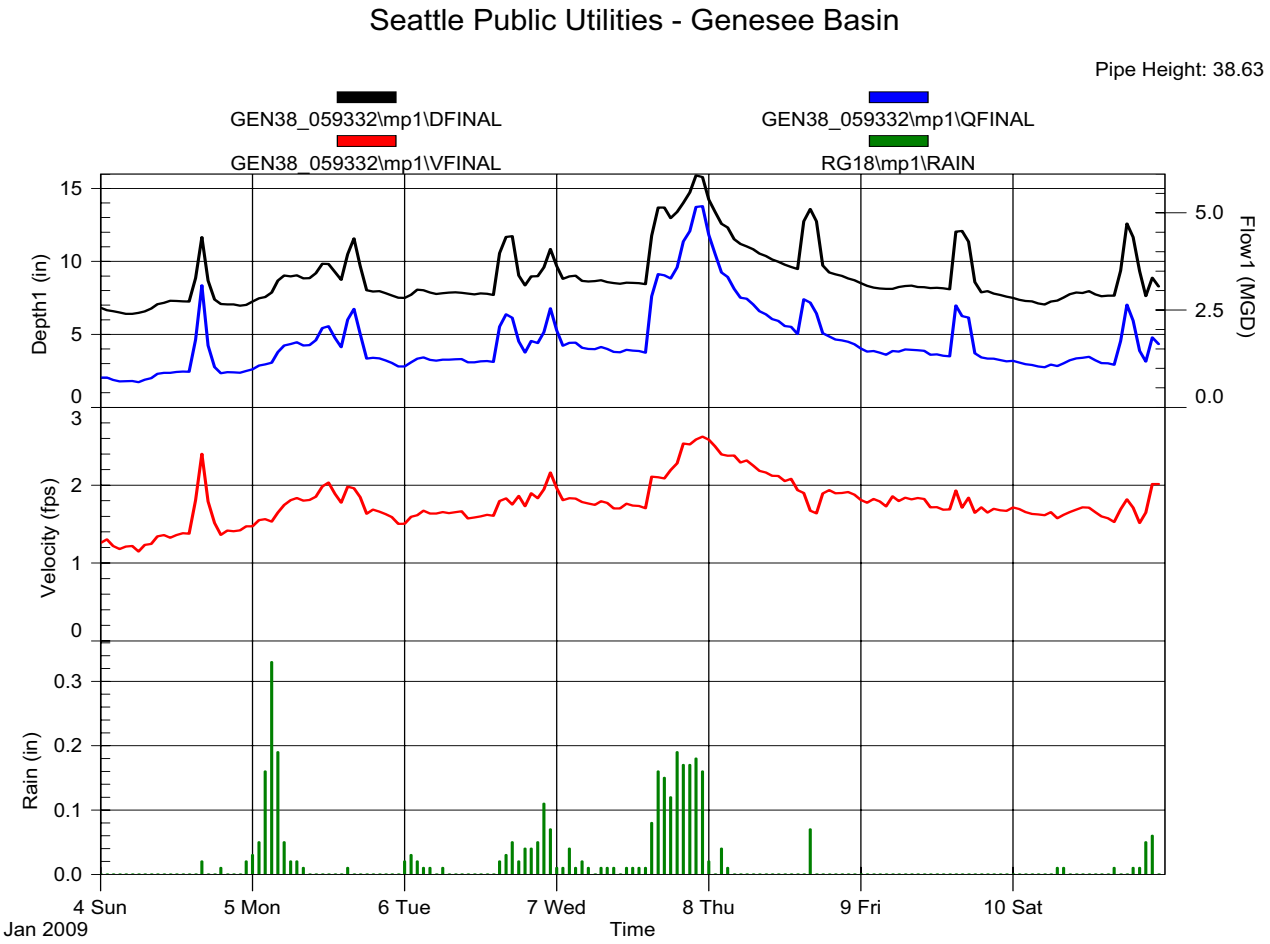
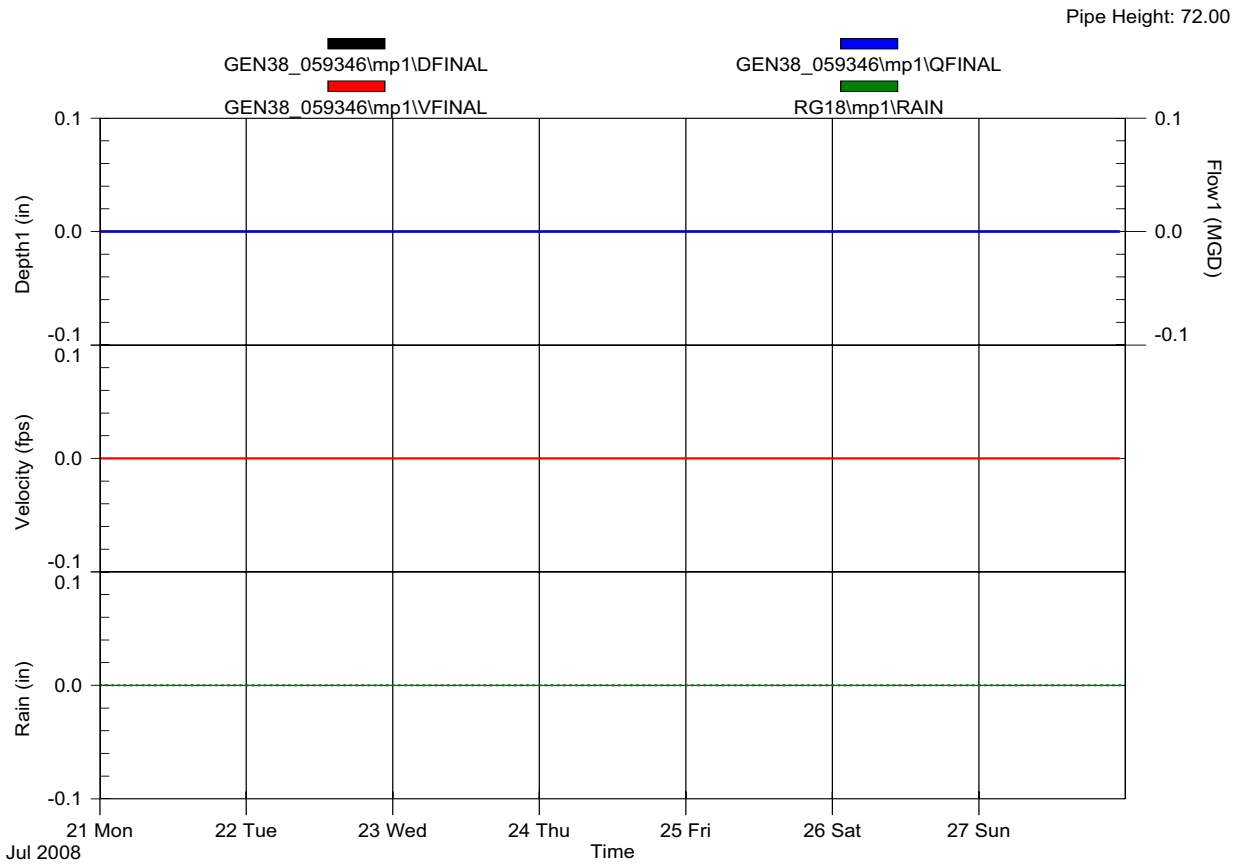
GEN38_059332\mp1\QFINAL
GEN38_059332\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
2 Sun
Nov 2008
3 Mon
4 Tue
5 Wed
6 Thu
7 Fri
8 Sat
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 38.63
GEN38_059332\mp1\DFINAL
GEN38_059332\mp1\QFINAL
GEN38_059332\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
9 Sun
Nov 2008
10 Mon
11 Tue
12 Wed
13 Thu
14 Fri
15 Sat
Time

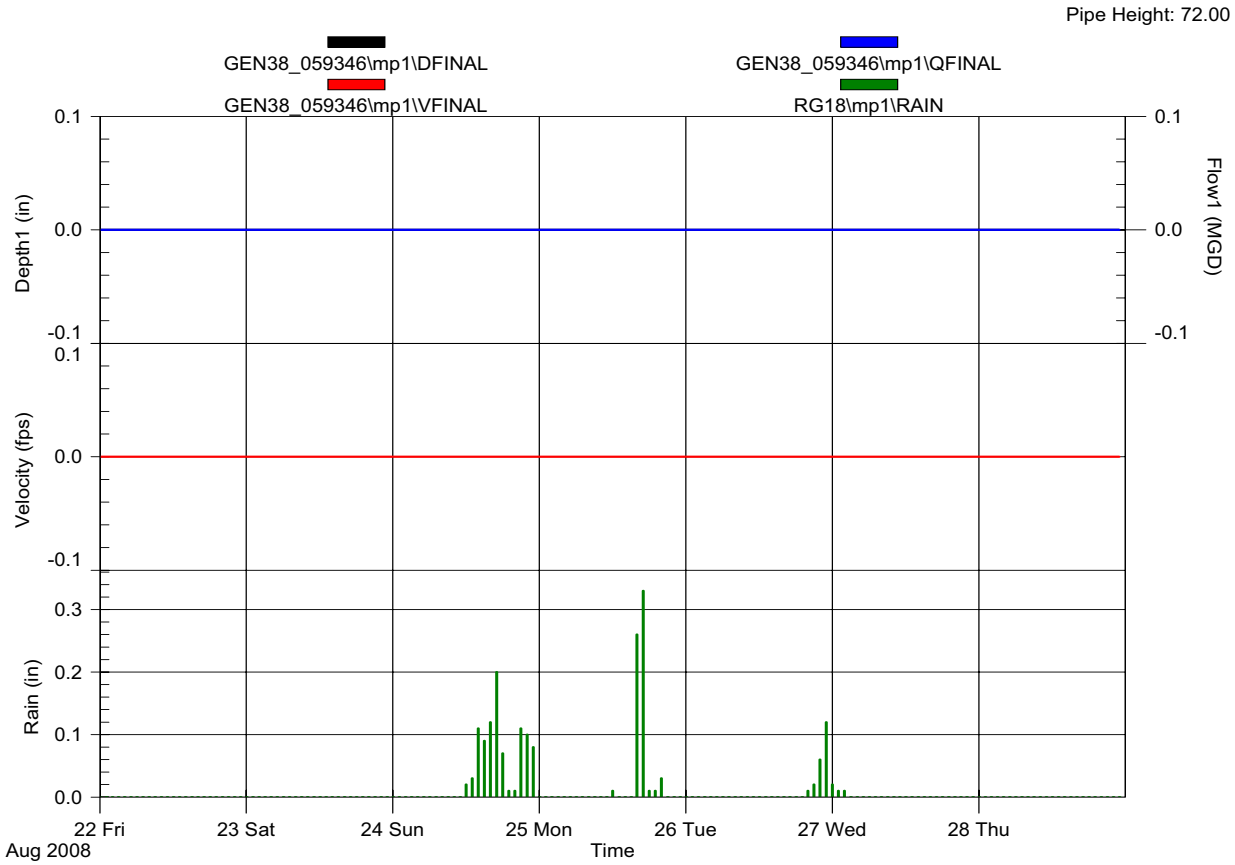

Seattle Public Utilities - Genesee Basin
Pipe Height: 38.63
GEN38_059332\mp1\DFINAL
GEN38_059332\mp1\QFINAL
GEN38_059332\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time

See note on page C-19

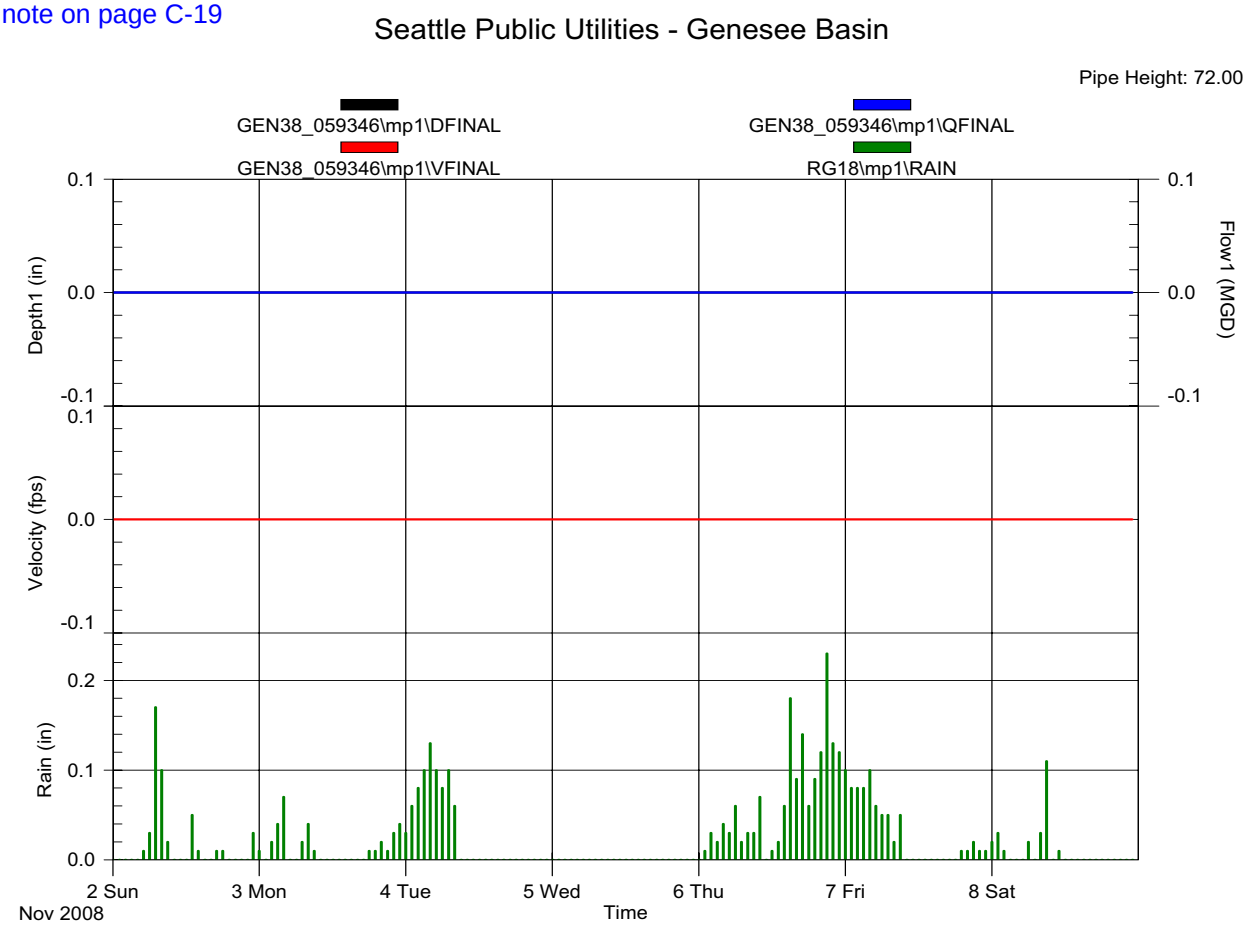
Seattle Public Utilities - Genesee Basin

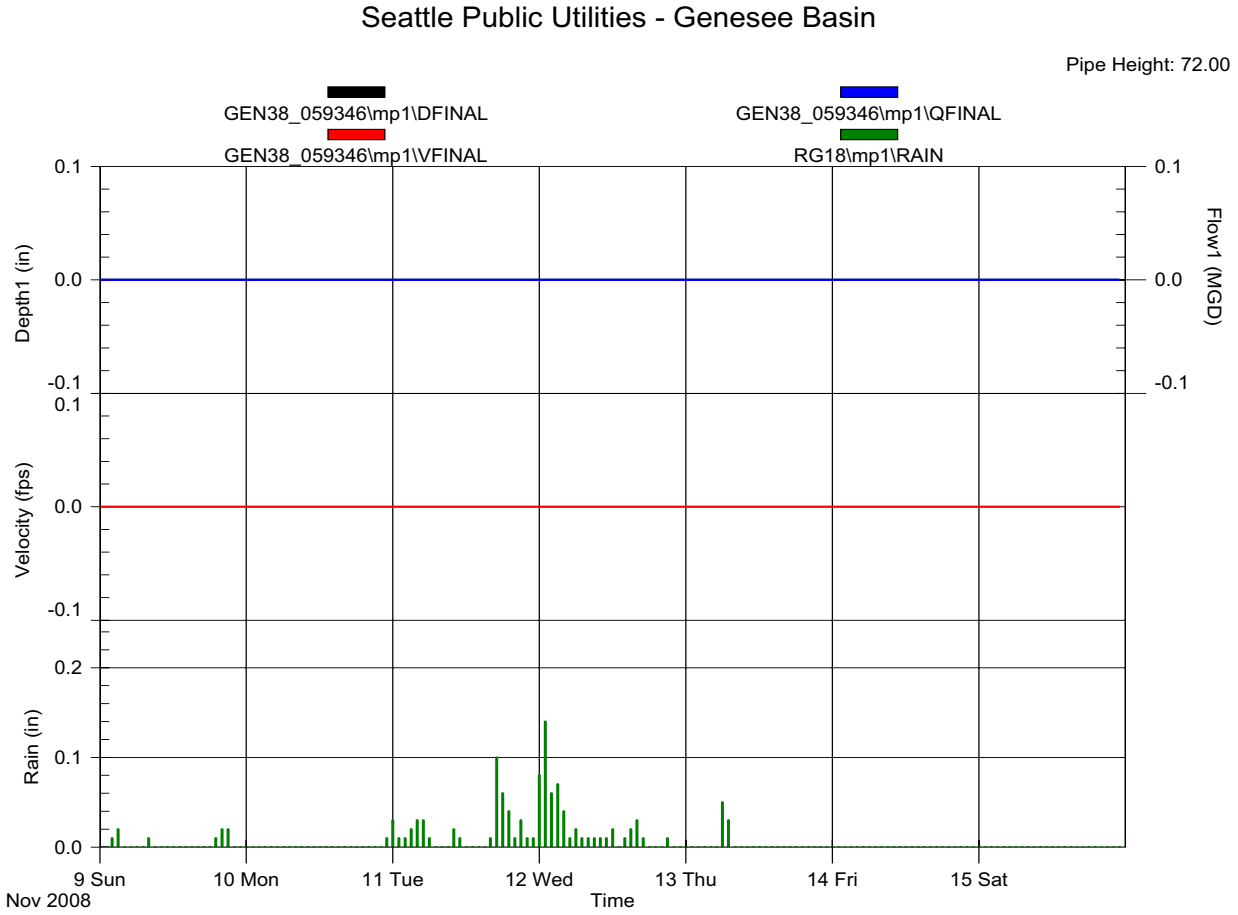


Seattle Public Utilities - Genesee Basin

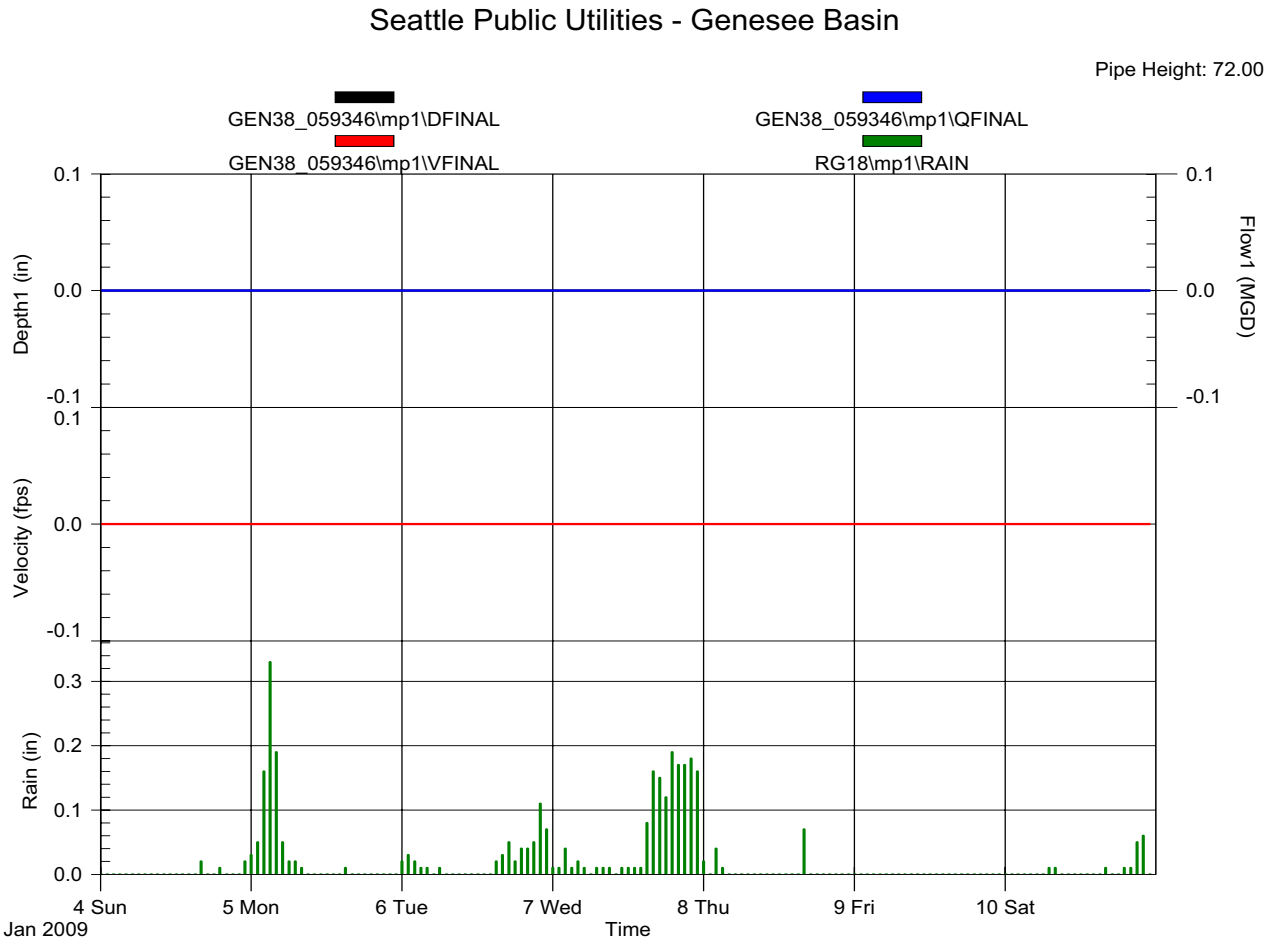


See note on page C-19

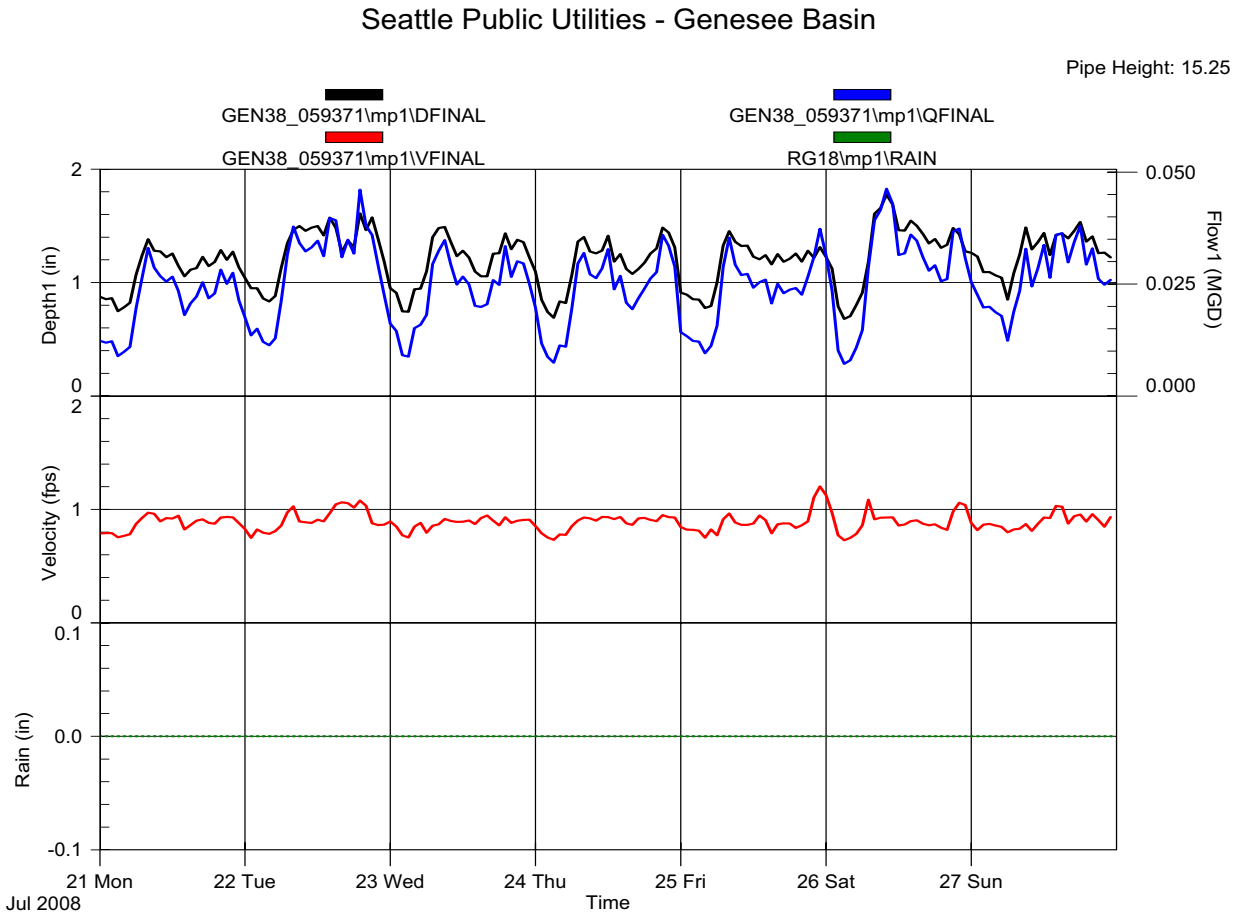


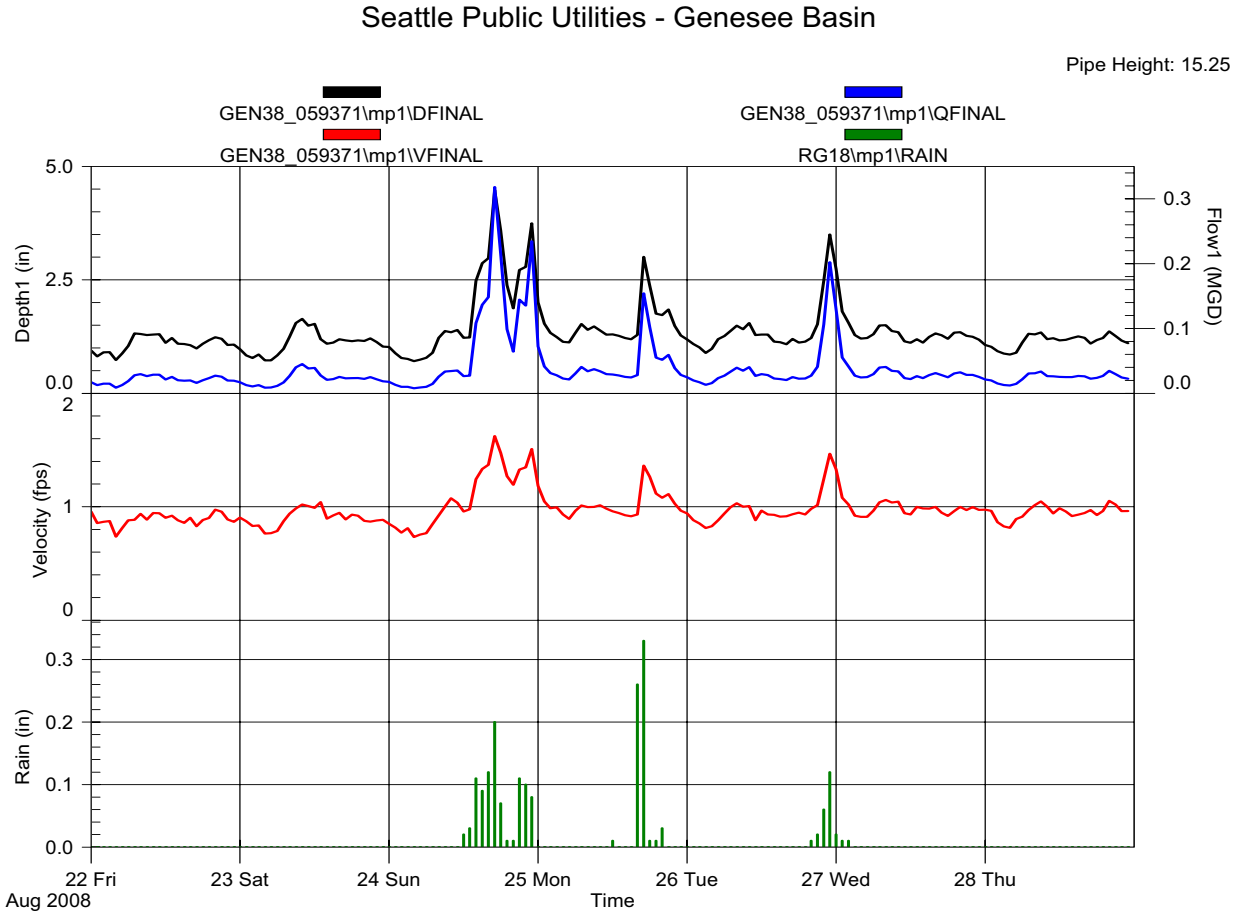


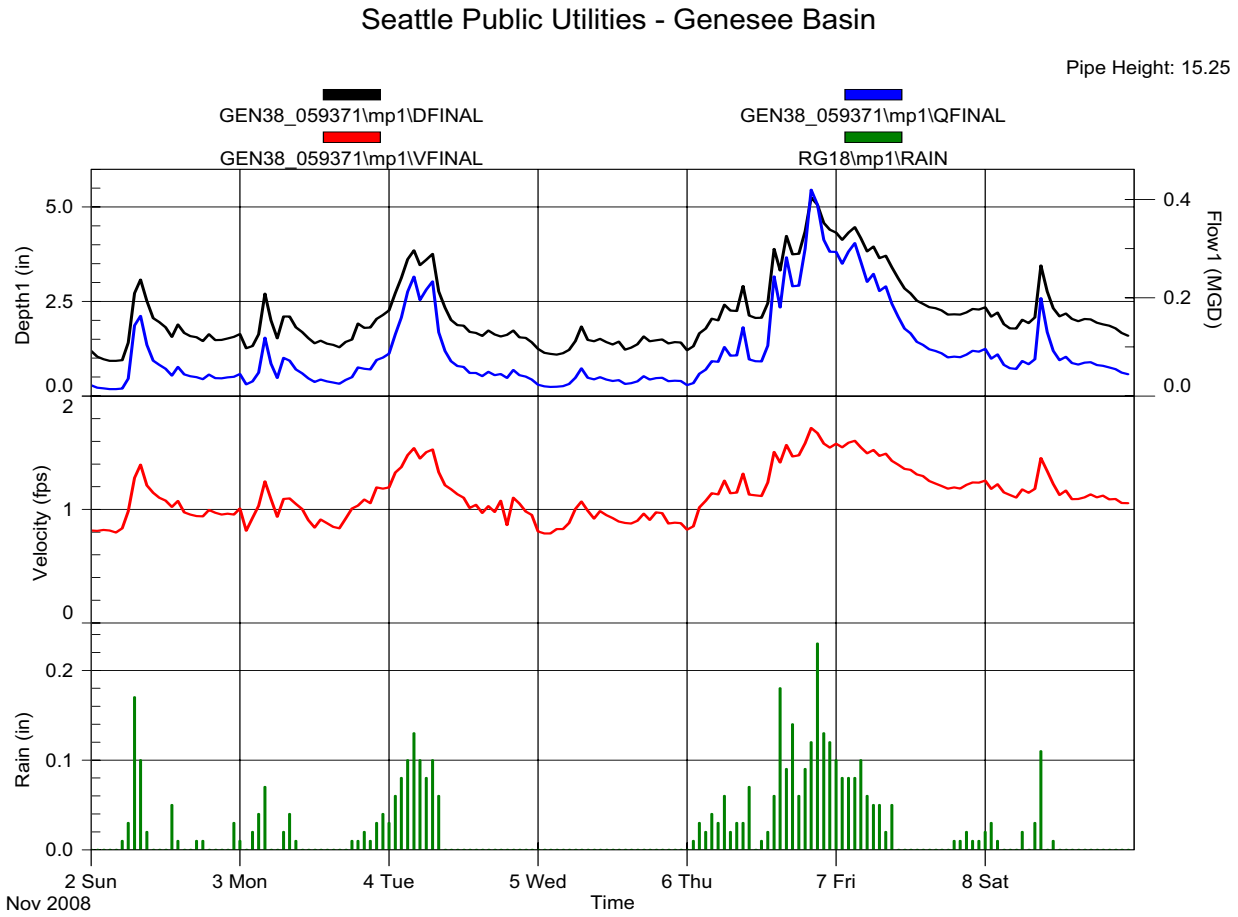
Note: GEN38_059346 was incorrectly labeled. This site is at MH 059-574, not MH 059-346. Continued monitoring at this location can be found under the label GEN38_059574, which is upstream of NPDES38_MH059574. See Section 3.2 in the report for more details.



Depth records at 059-451 (page C-61) during this storm indicate that flow went over the Horseshoe Weir, and should have been recorded at 059-346. See the discussion Section 4.6.1 of the Report for more details.


Seattle Public Utilities - Genesee Basin
Pipe Height: 15.25
GEN38_059371\mp1\DFINAL
GEN38_059371\mp1\QFINAL
GEN38_059371\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
21 Mon
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Jul 2008
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 15.25
GEN38_059371\mp1\DFINAL
GEN38_059371\mp1\QFINAL
GEN38_059371\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
22 Fri
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Aug 2008
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 15.25
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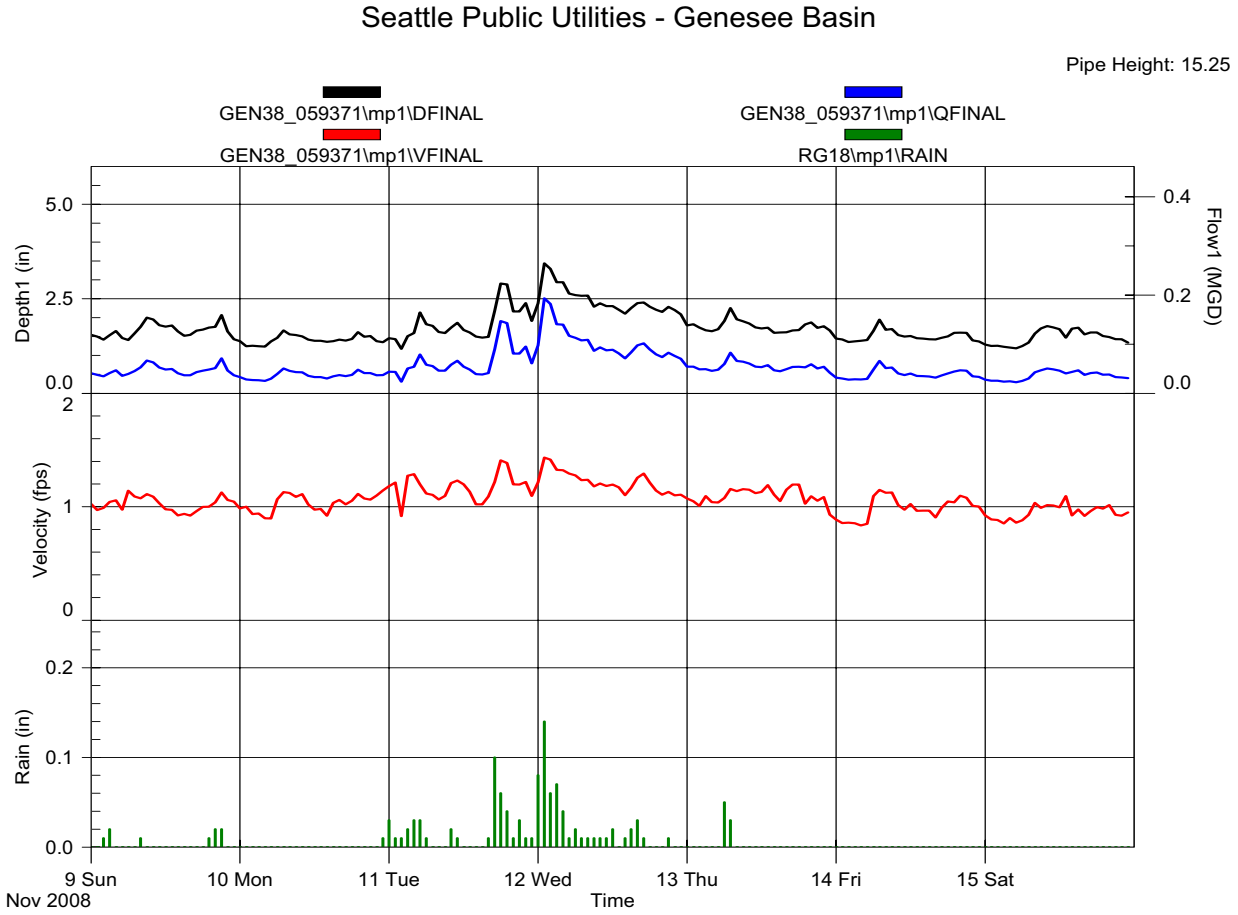
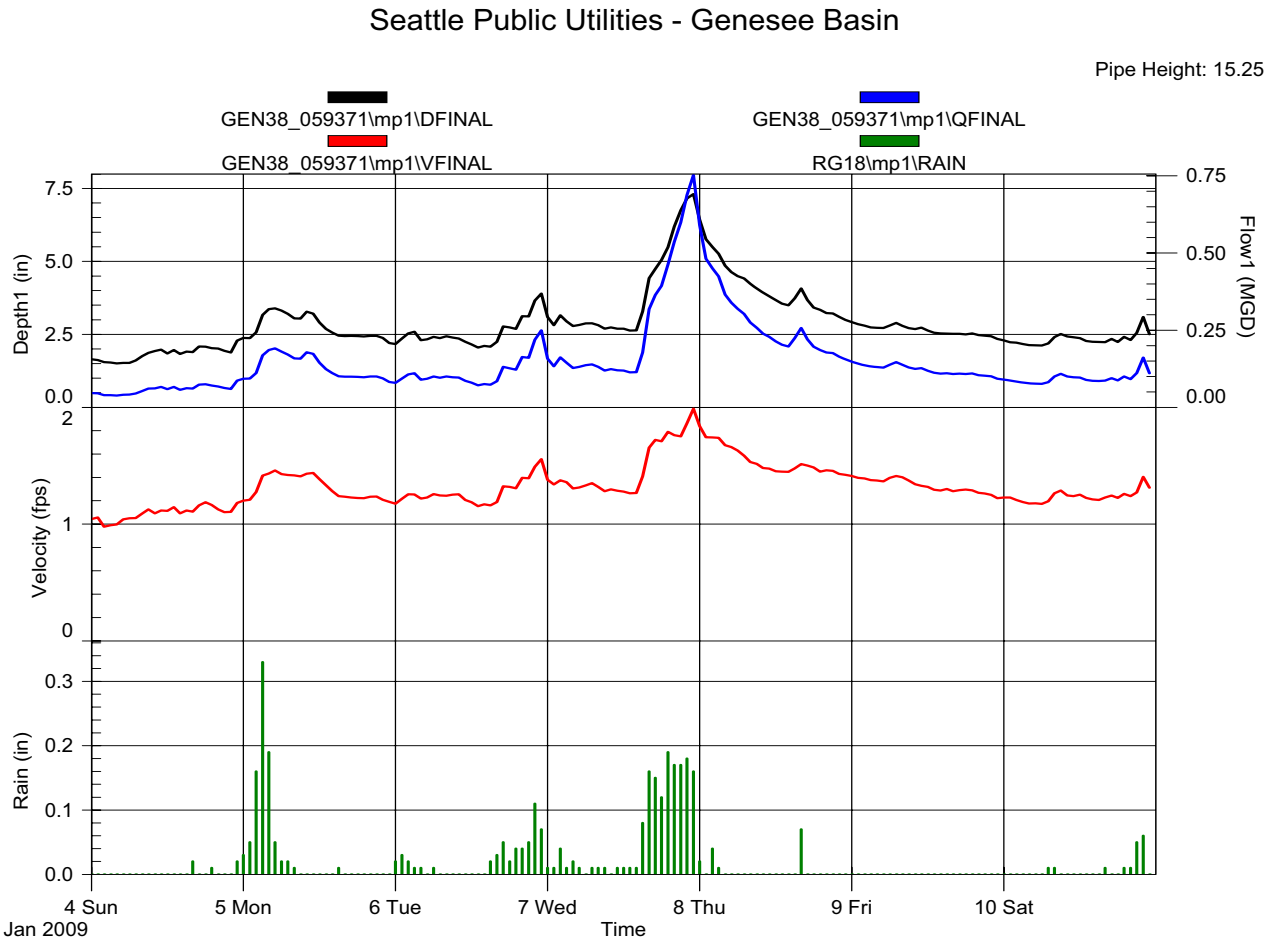
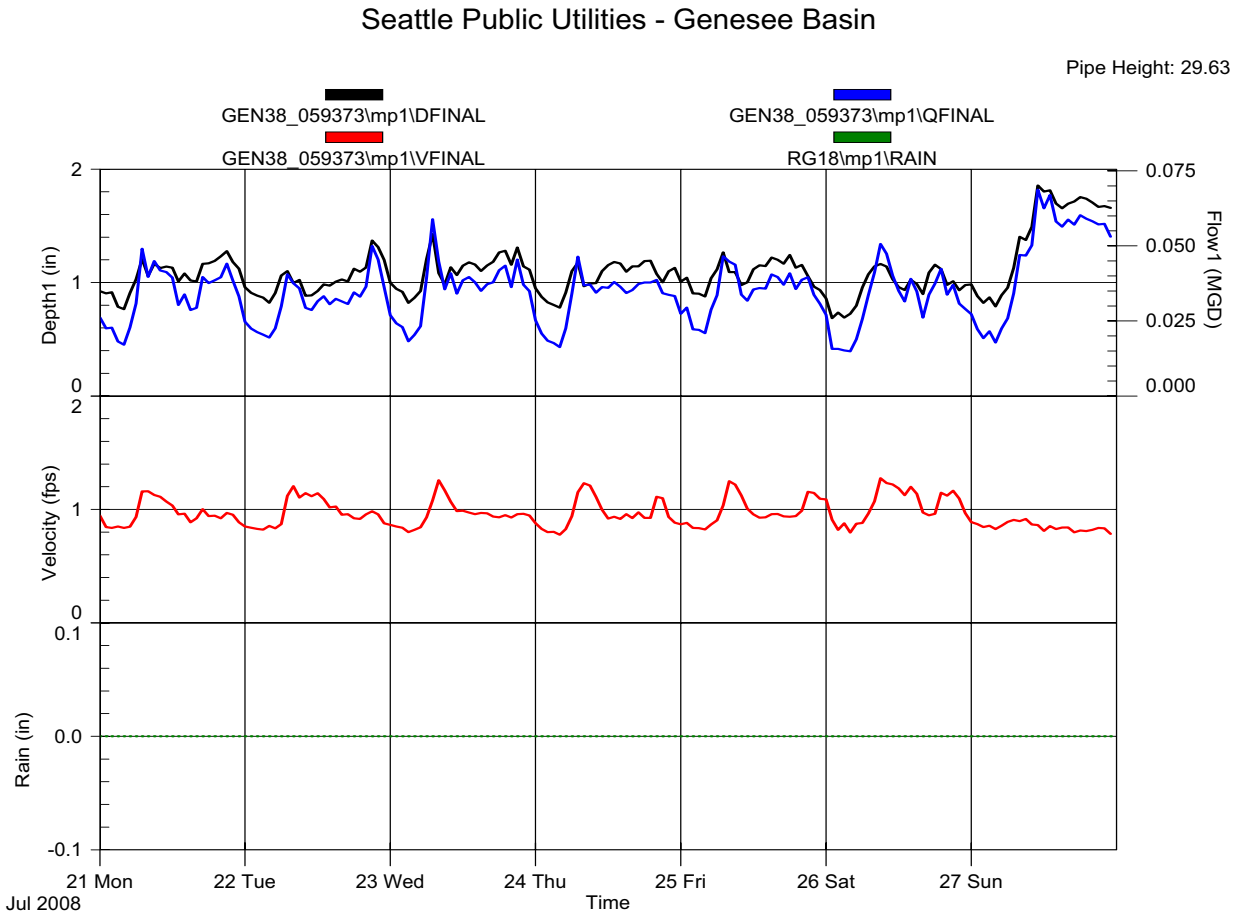
GEN38_059371\mp1\QFINAL
GEN38_059371\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
2 Sun
Nov 2008
3 Mon
4 Tue
5 Wed
6 Thu
7 Fri
8 Sat
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 15.25
GEN38_059371\mp1\DFINAL
GEN38_059371\mp1\QFINAL
GEN38_059371\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
9 Sun
Nov 2008
10 Mon
11 Tue
12 Wed
13 Thu
14 Fri
15 Sat
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 15.25
GEN38_059371\mp1\DFINAL
GEN38_059371\mp1\QFINAL
GEN38_059371\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
7.5
5.0
2.5
0.0
Flow1 (MGD)
0.75
0.50
0.25
0.00
Velocity (fps)
2
1
0
Rain (in)
0.3
0.2
0.1
0.0
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time


Seattle Public Utilities - Genesee Basin
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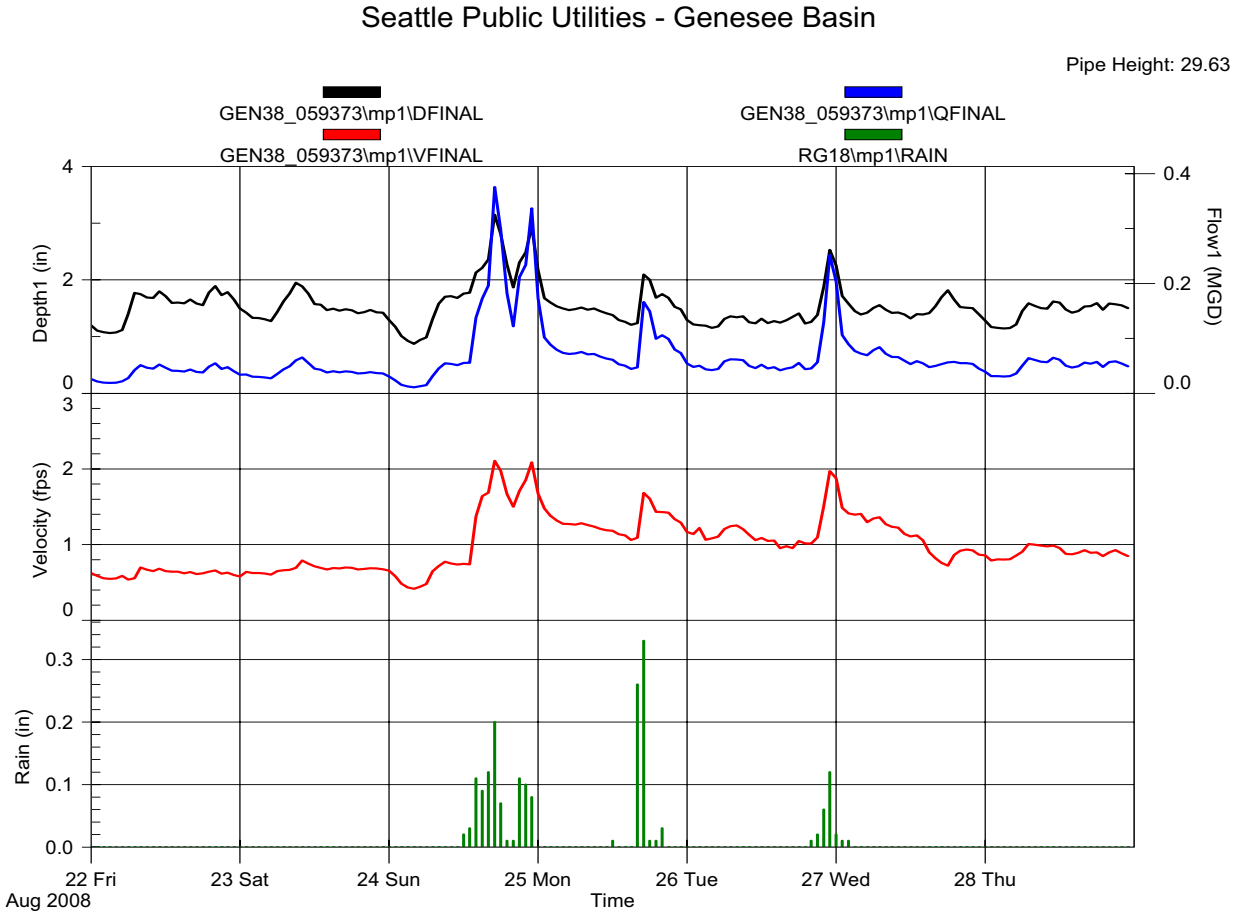
GEN38_059373\mp1\QFINAL
GEN38_059373\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
21 Mon
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Jul 2008
Time


Seattle Public Utilities - Genesee Basin
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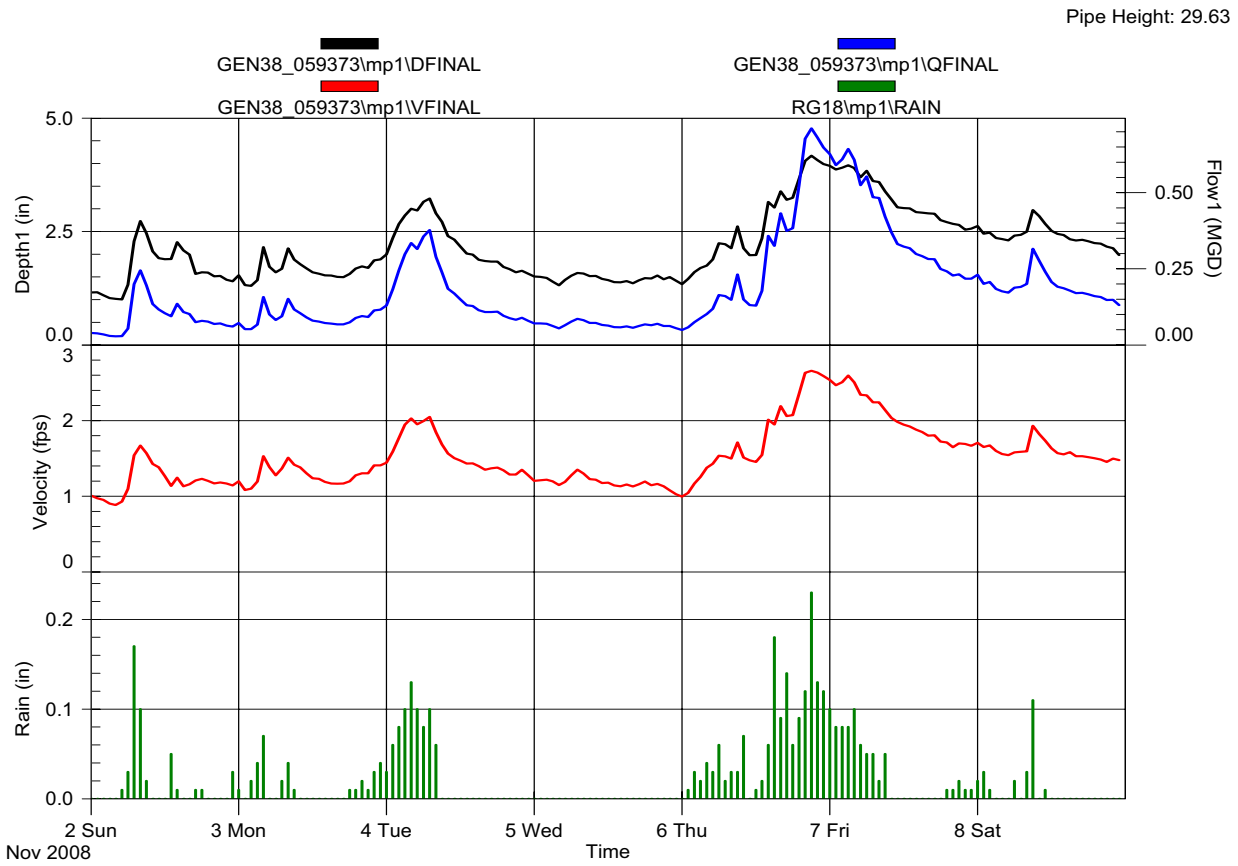
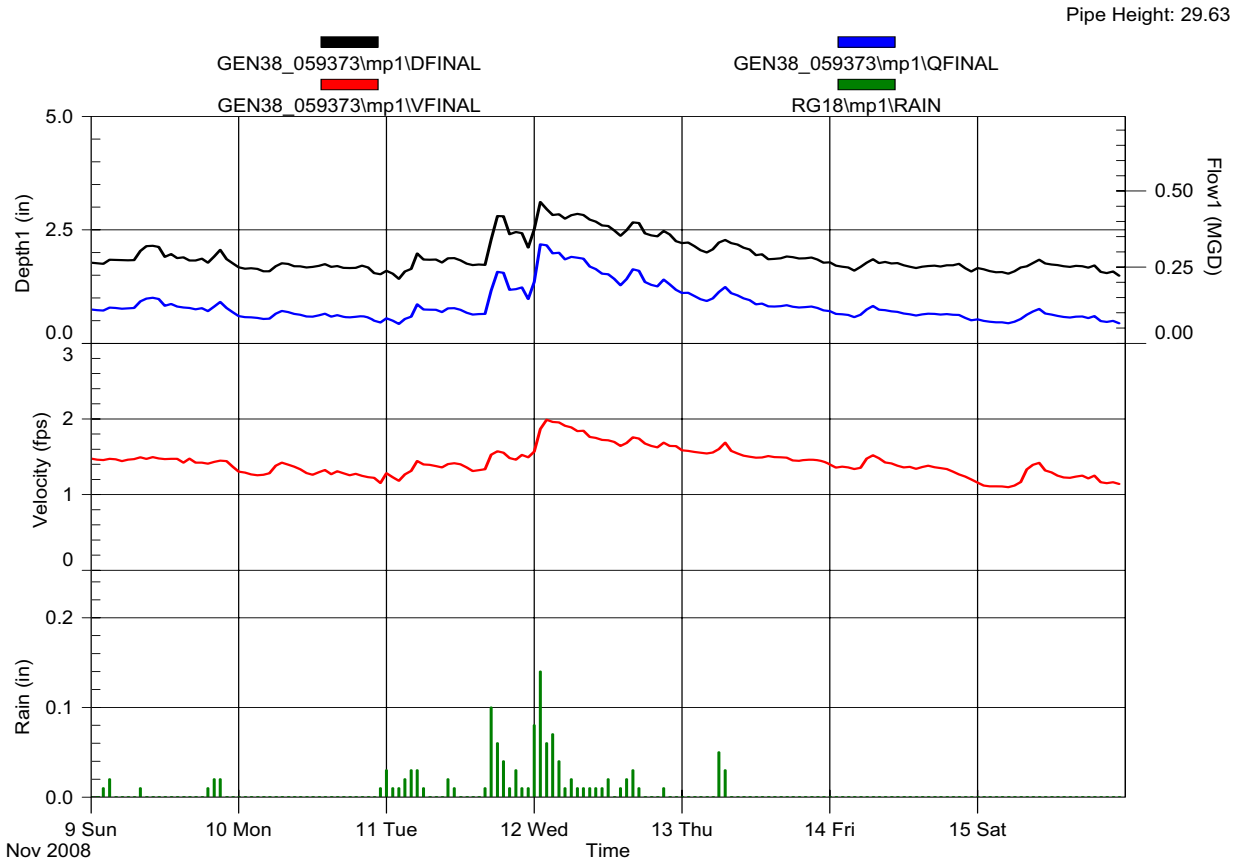
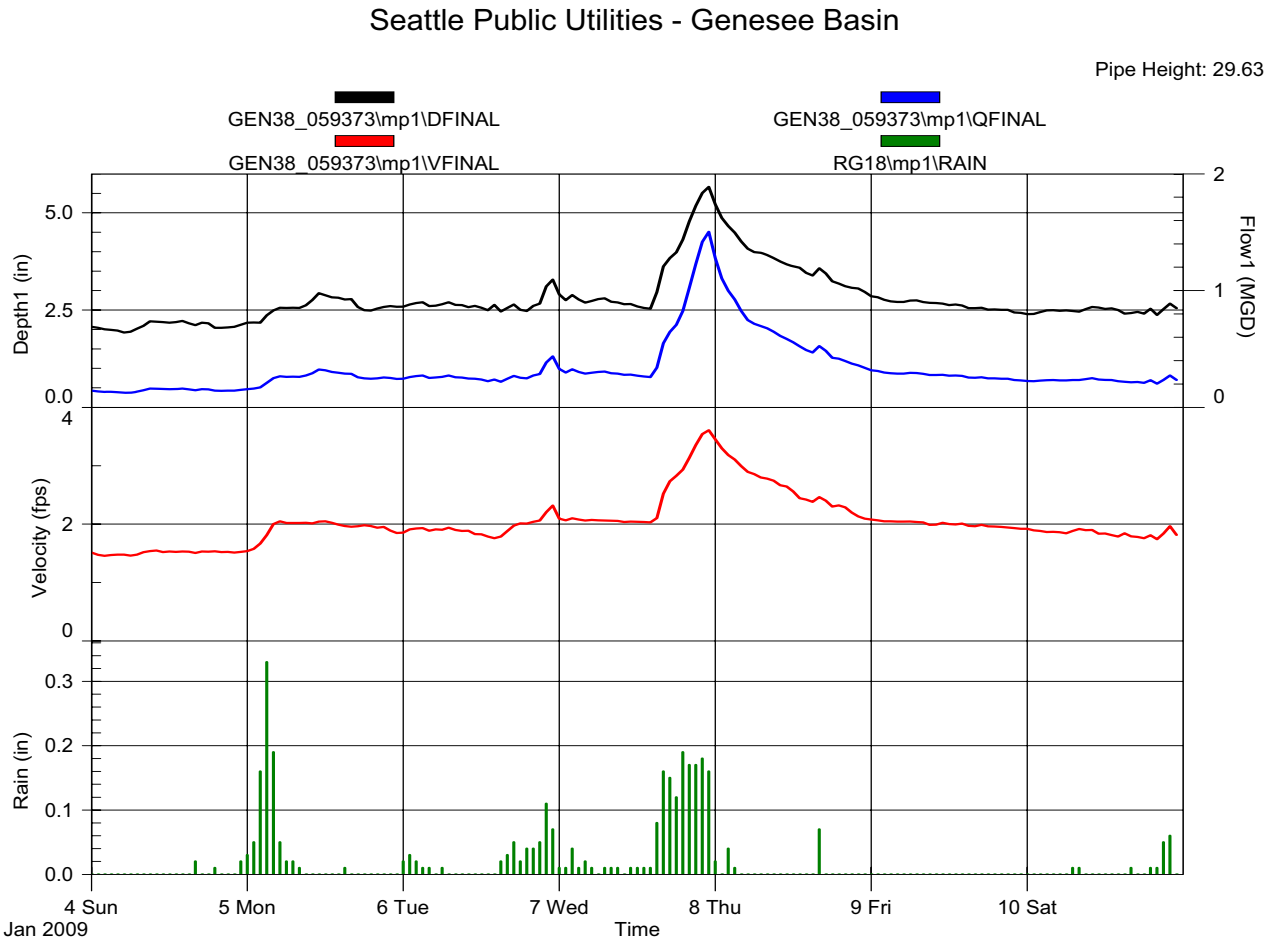
GEN38_059373\mp1\QFINAL
GEN38_059373\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
22 Fri
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Aug 2008
Time

Seattle Public Utilities - Genesee Basin



Seattle Public Utilities - Genesee Basin




Seattle Public Utilities - Genesee Basin
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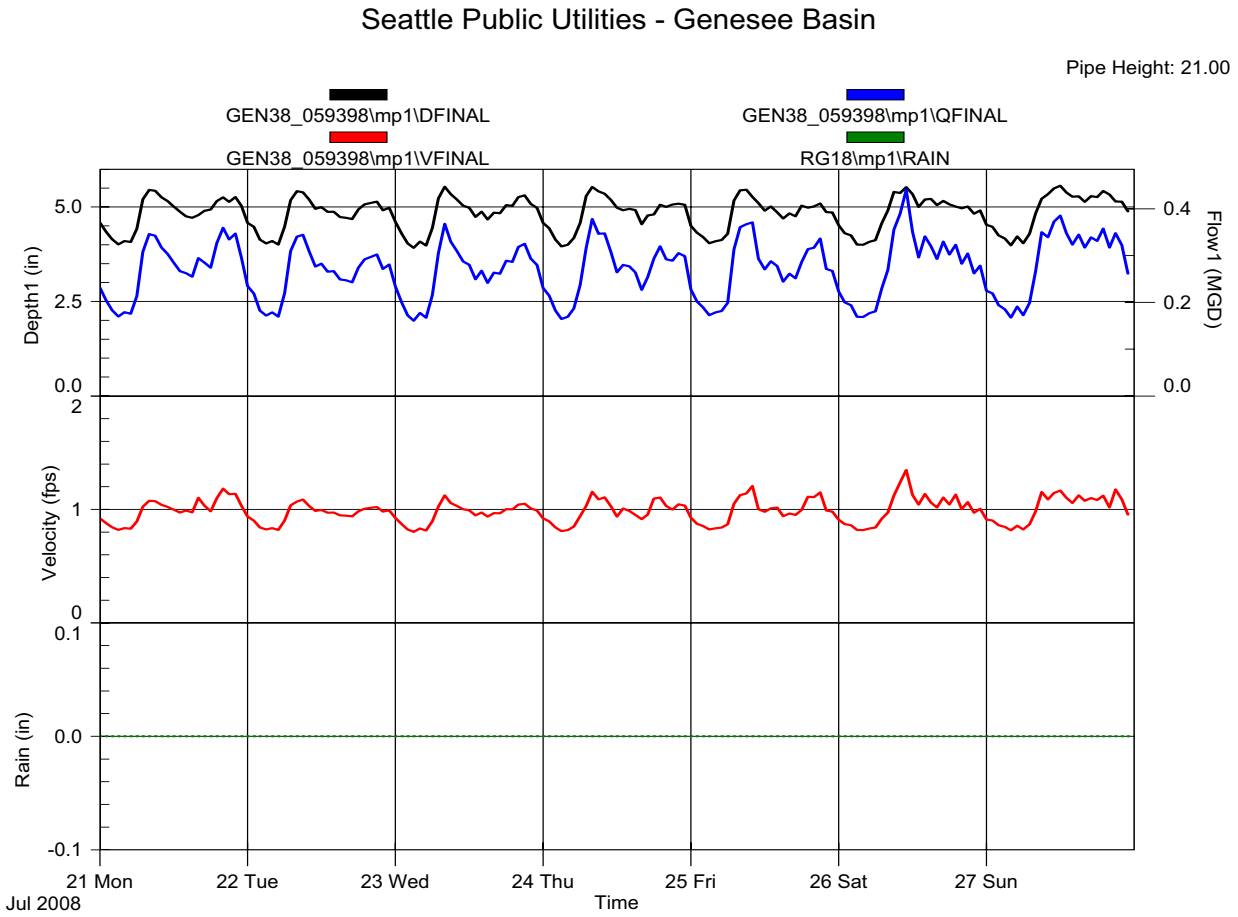
GEN38_059373\mp1\QFINAL
GEN38_059373\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
5.0
2.5
0.0
Flow1 (MGD)
2
1
0
Velocity (fps)
4
2
0
Rain (in)
0.3
0.2
0.1
0.0
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time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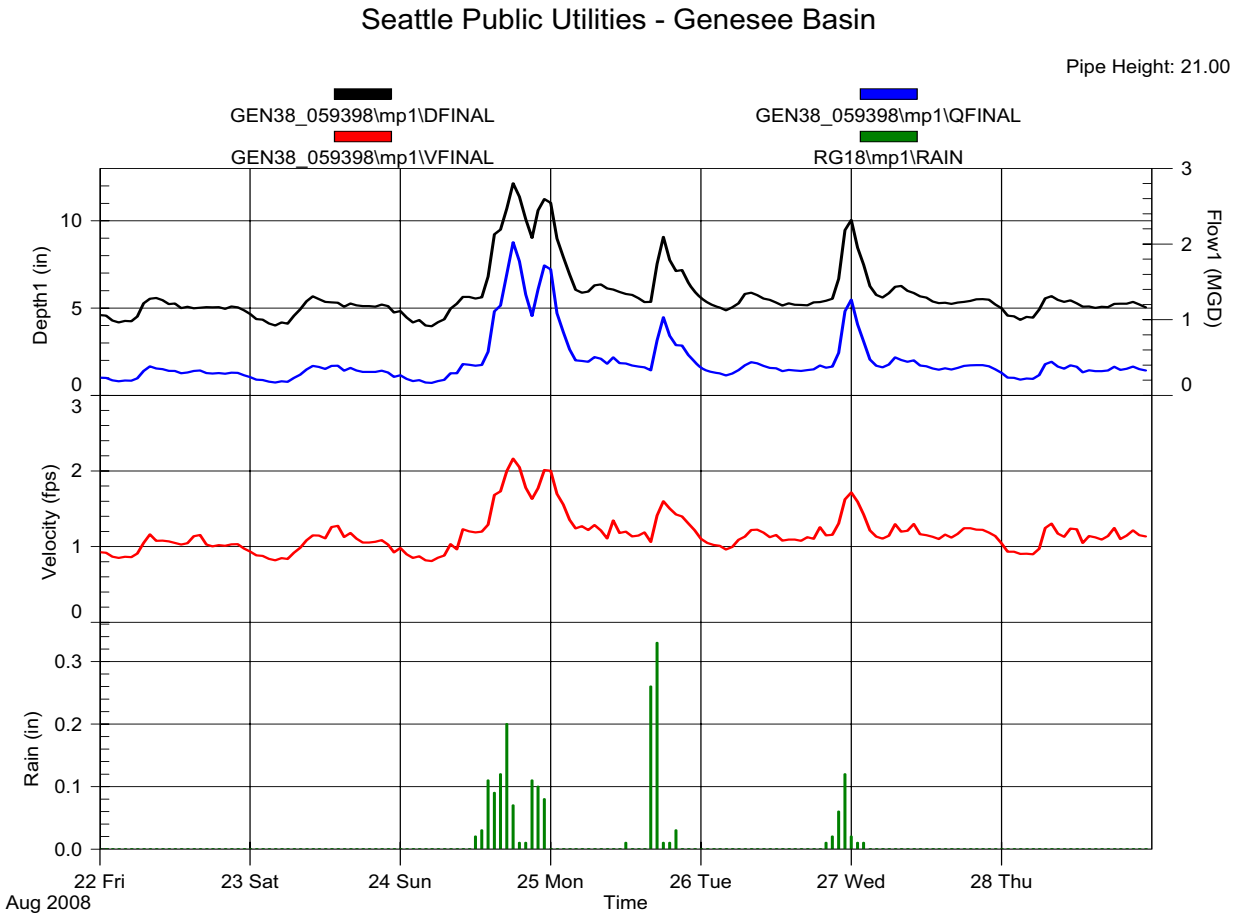
GEN38_059398\mp1\QFINAL
GEN38_059398\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
21 Mon
Jul 2008
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Time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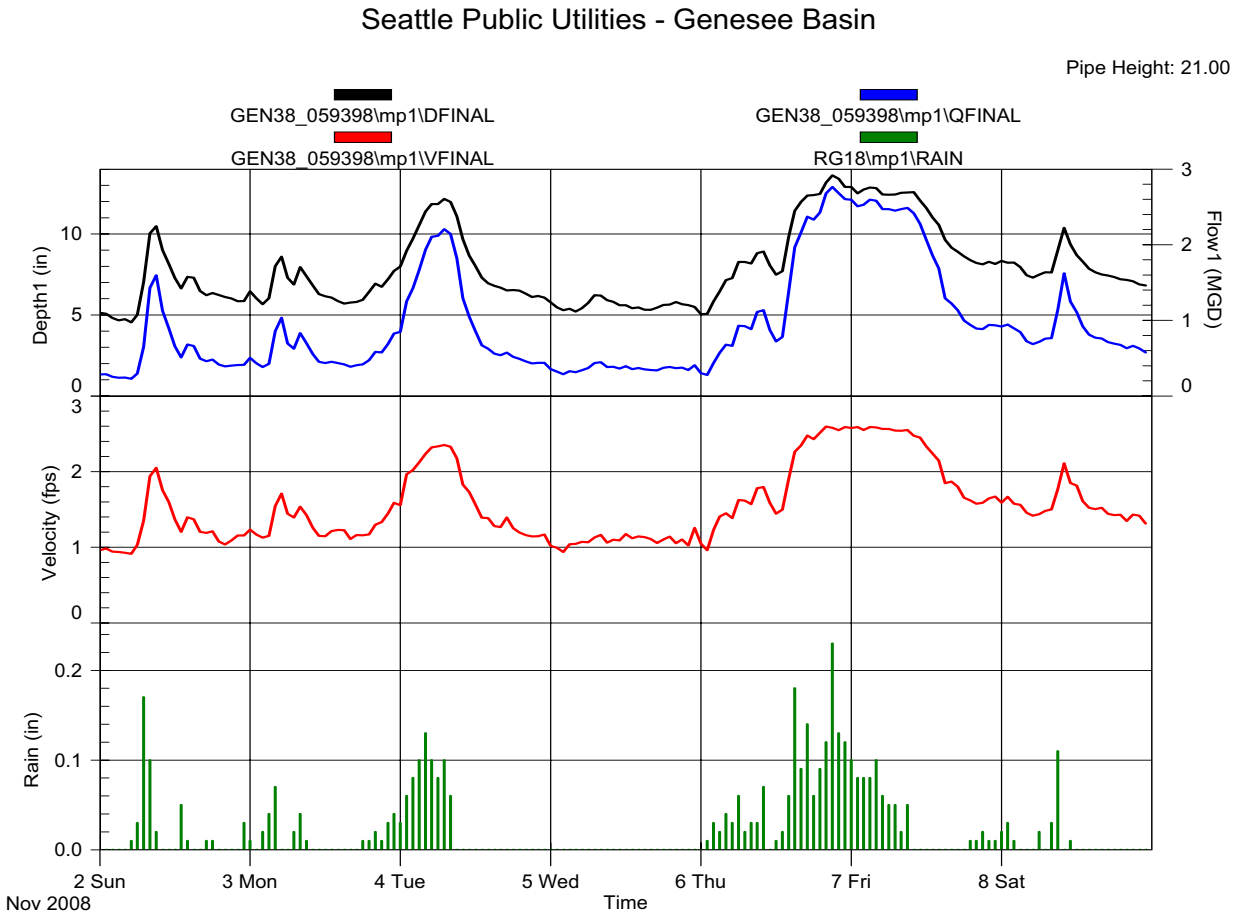
GEN38_059398\mp1\QFINAL
GEN38_059398\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
22 Fri
Aug 2008
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Time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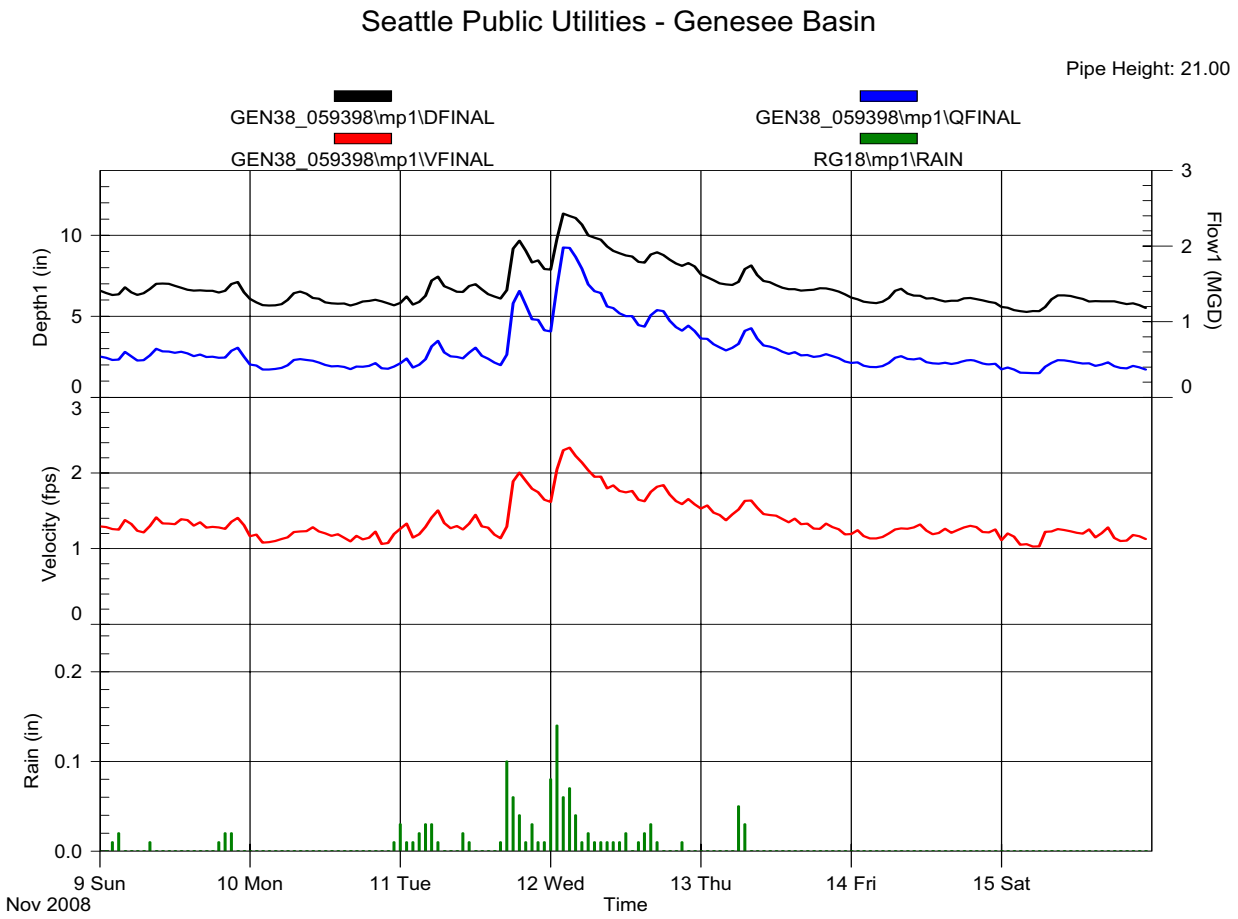
GEN38_059398\mp1\QFINAL
GEN38_059398\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
2 Sun
Nov 2008
3 Mon
4 Tue
5 Wed
6 Thu
7 Fri
8 Sat
Time


Seattle Public Utilities - Genesee Basin
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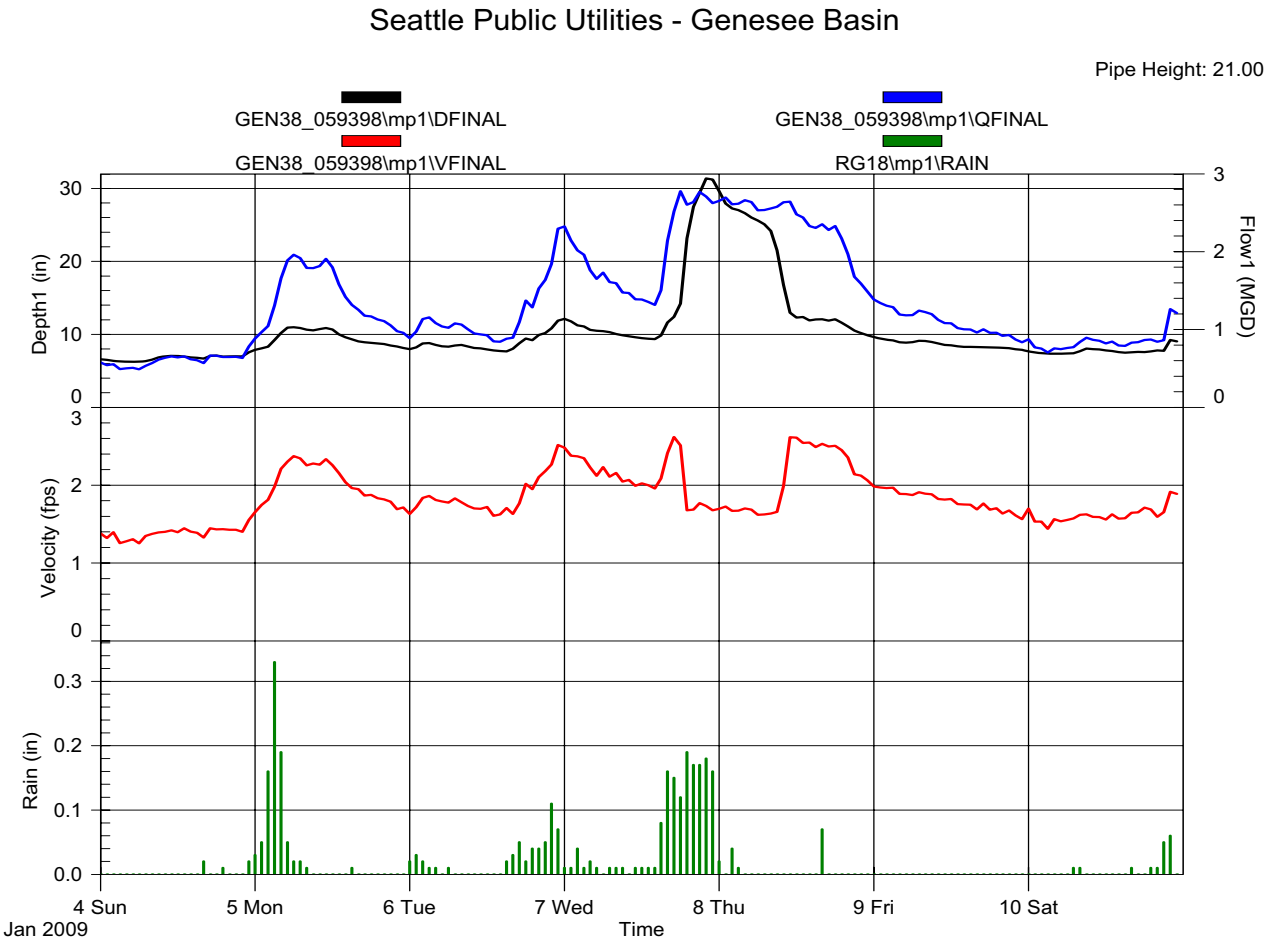
GEN38_059398\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
9 Sun
Nov 2008
10 Mon
11 Tue
12 Wed
13 Thu
14 Fri
15 Sat
Time


Seattle Public Utilities - Genesee Basin
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GEN38_059398\mp1\QFINAL
GEN38_059398\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
4 Sun
Jan 2009
5 Mon
6 Tue
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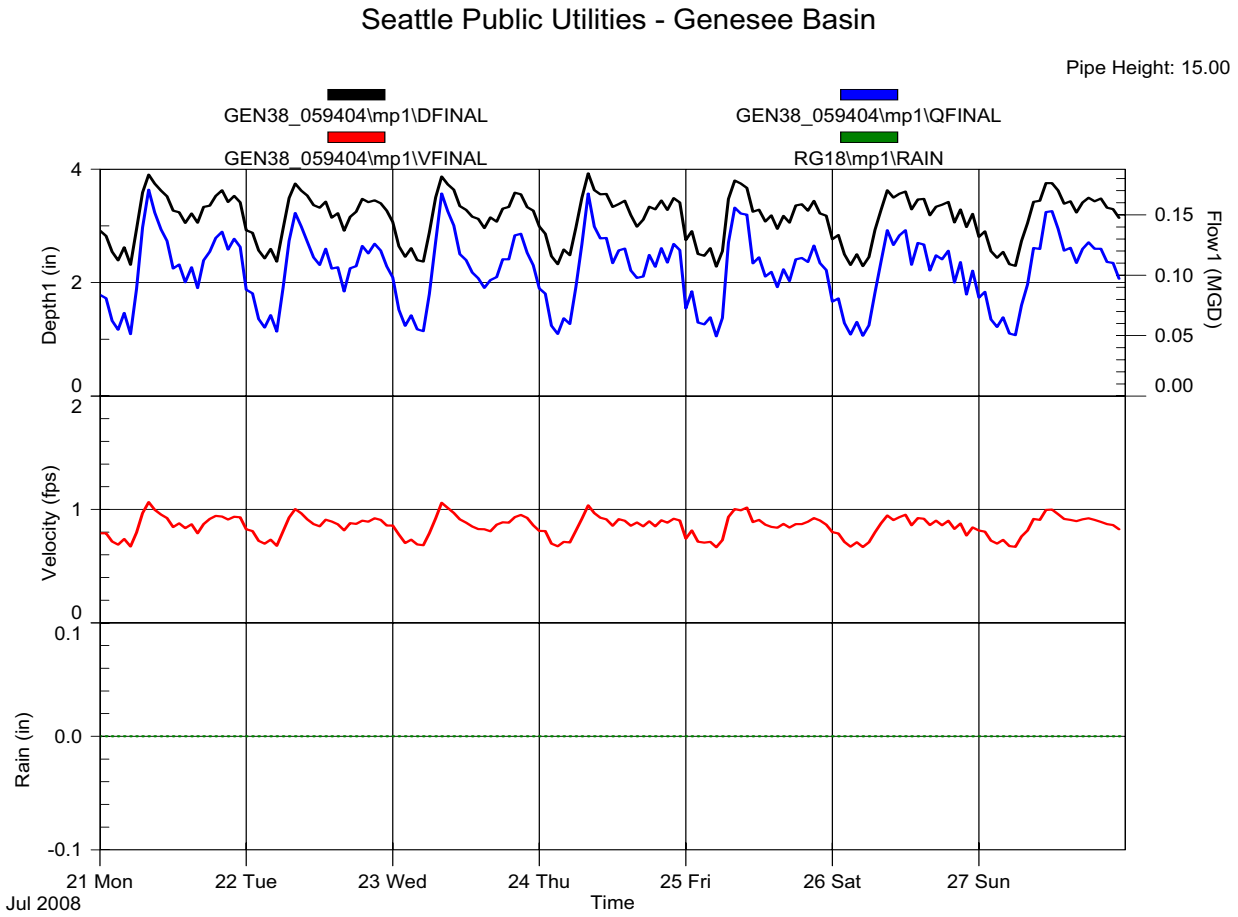
8 Thu
9 Fri
10 Sat
Time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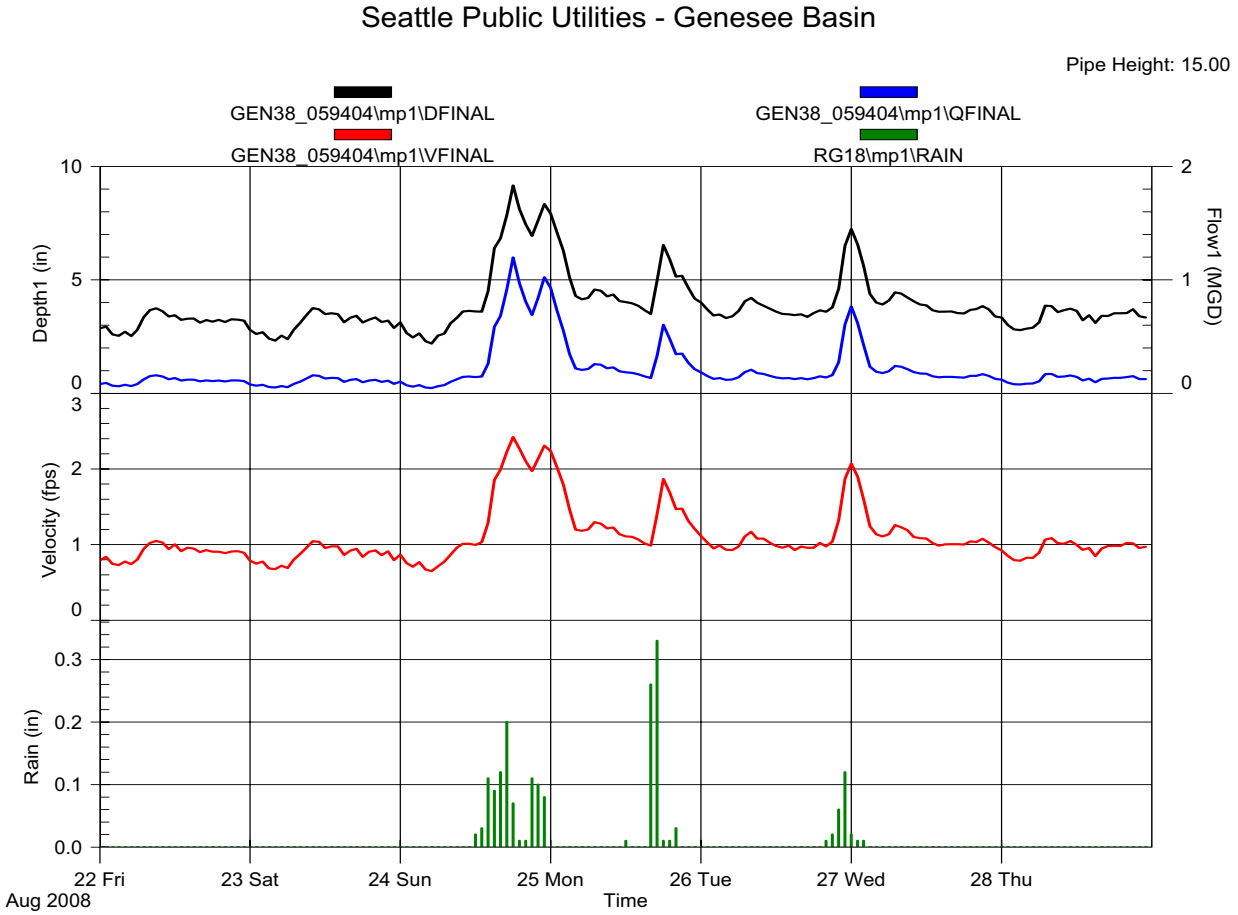
GEN38_059404\mp1\QFINAL
GEN38_059404\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
21 Mon
Jul 2008
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 15.00
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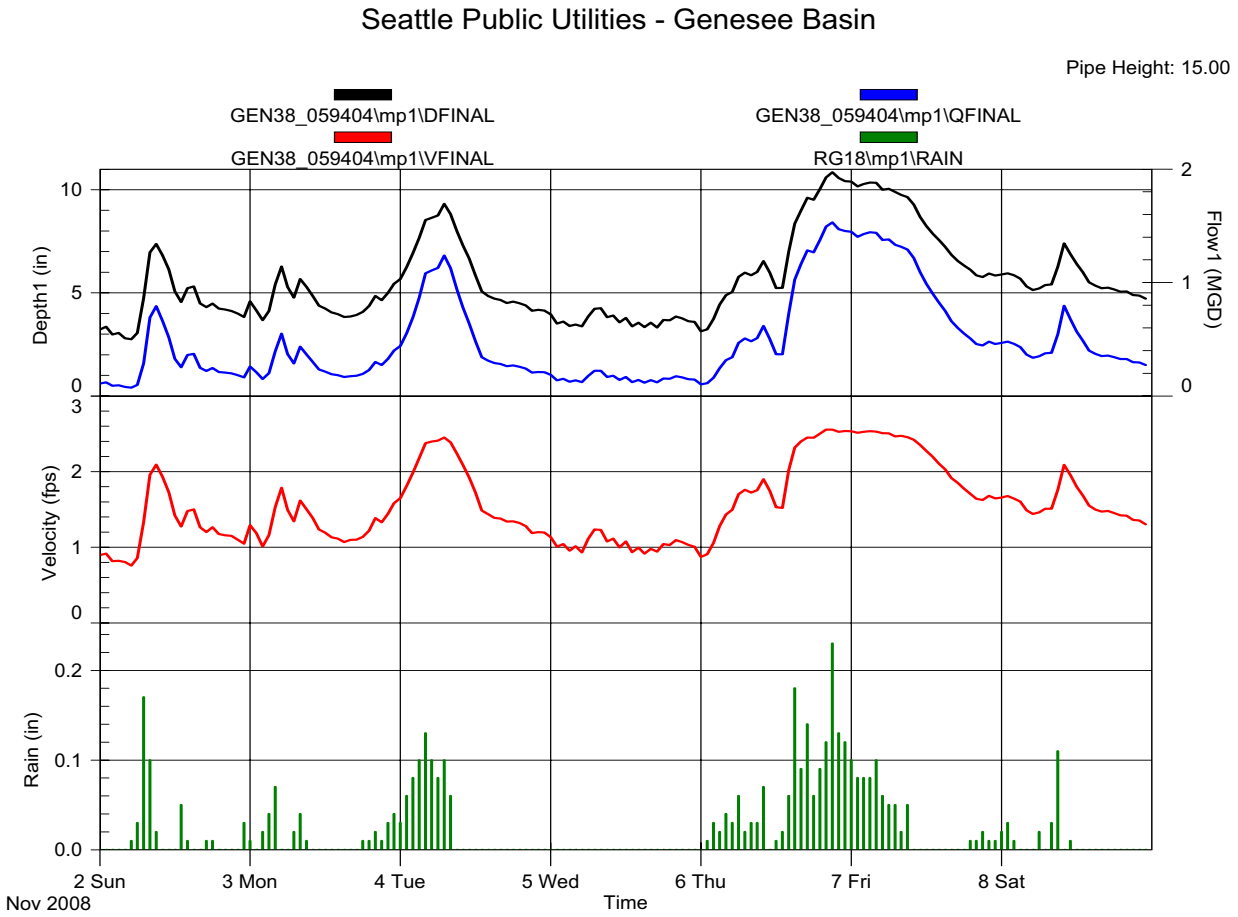
GEN38_059404\mp1\QFINAL
GEN38_059404\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
22 Fri
Aug 2008
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 15.00
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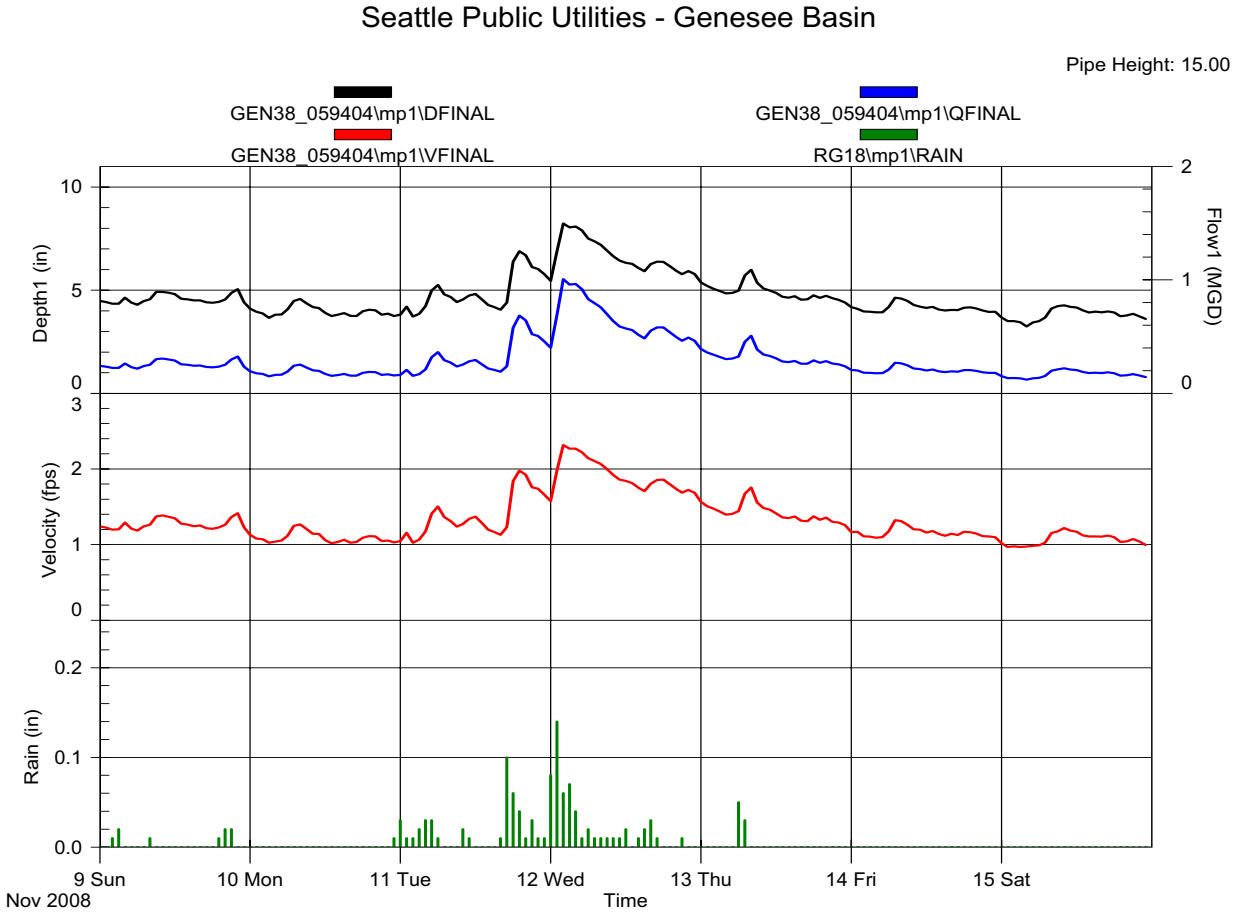
GEN38_059404\mp1\QFINAL
GEN38_059404\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
2 Sun
Nov 2008
3 Mon
4 Tue
5 Wed
6 Thu
7 Fri
8 Sat
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 15.00
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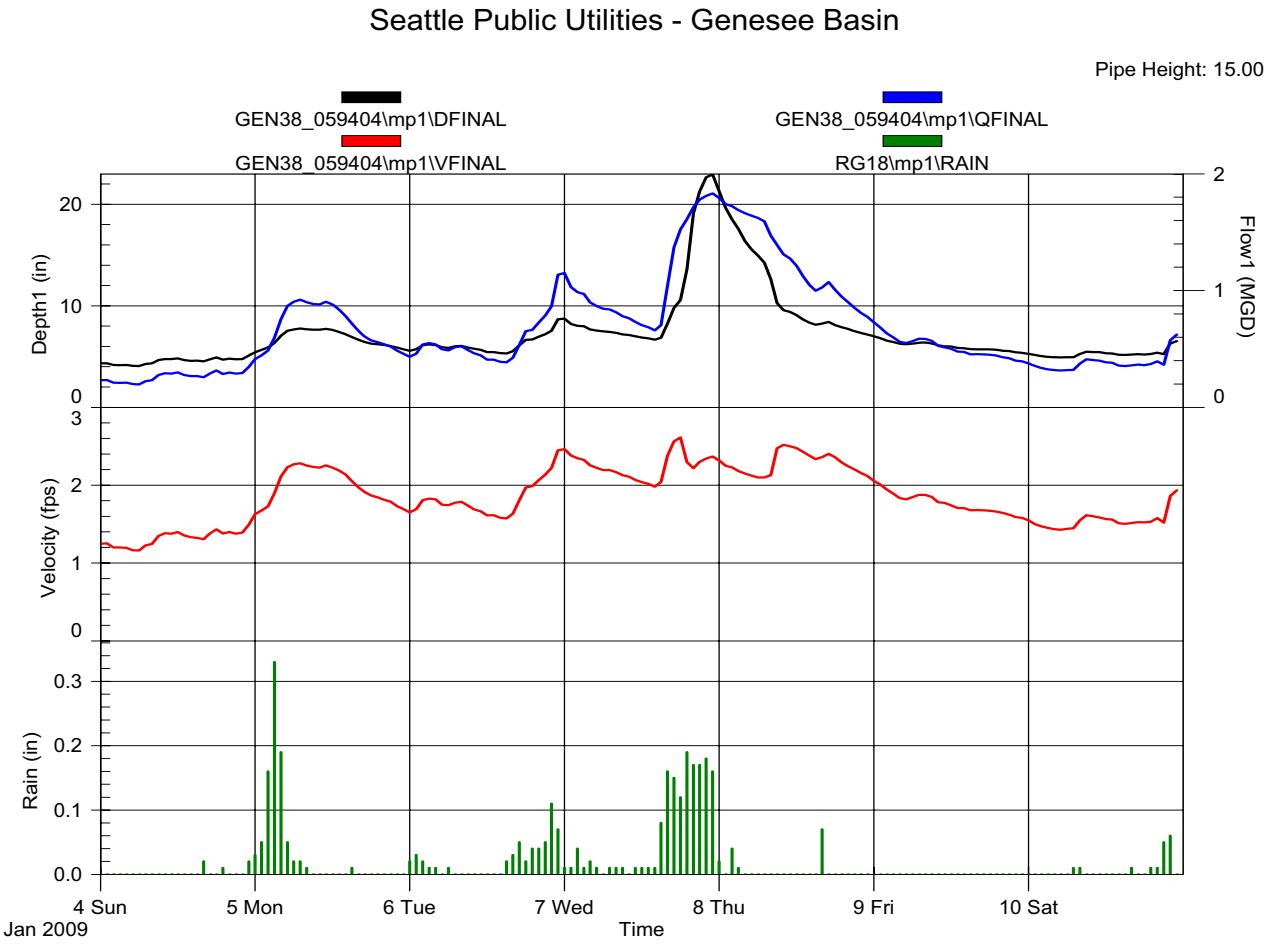
GEN38_059404\mp1\QFINAL
GEN38_059404\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
9 Sun
Nov 2008
10 Mon
11 Tue
12 Wed
13 Thu
14 Fri
15 Sat
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 15.00
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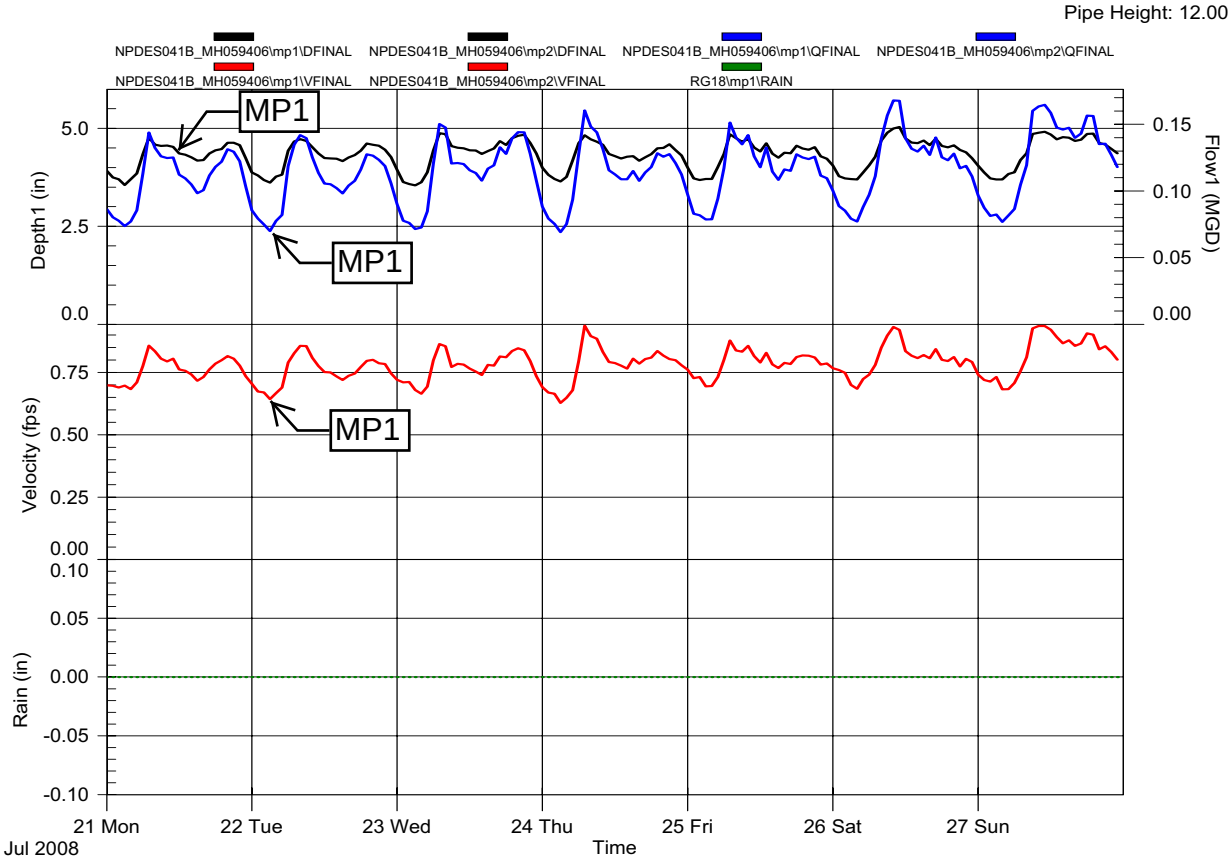
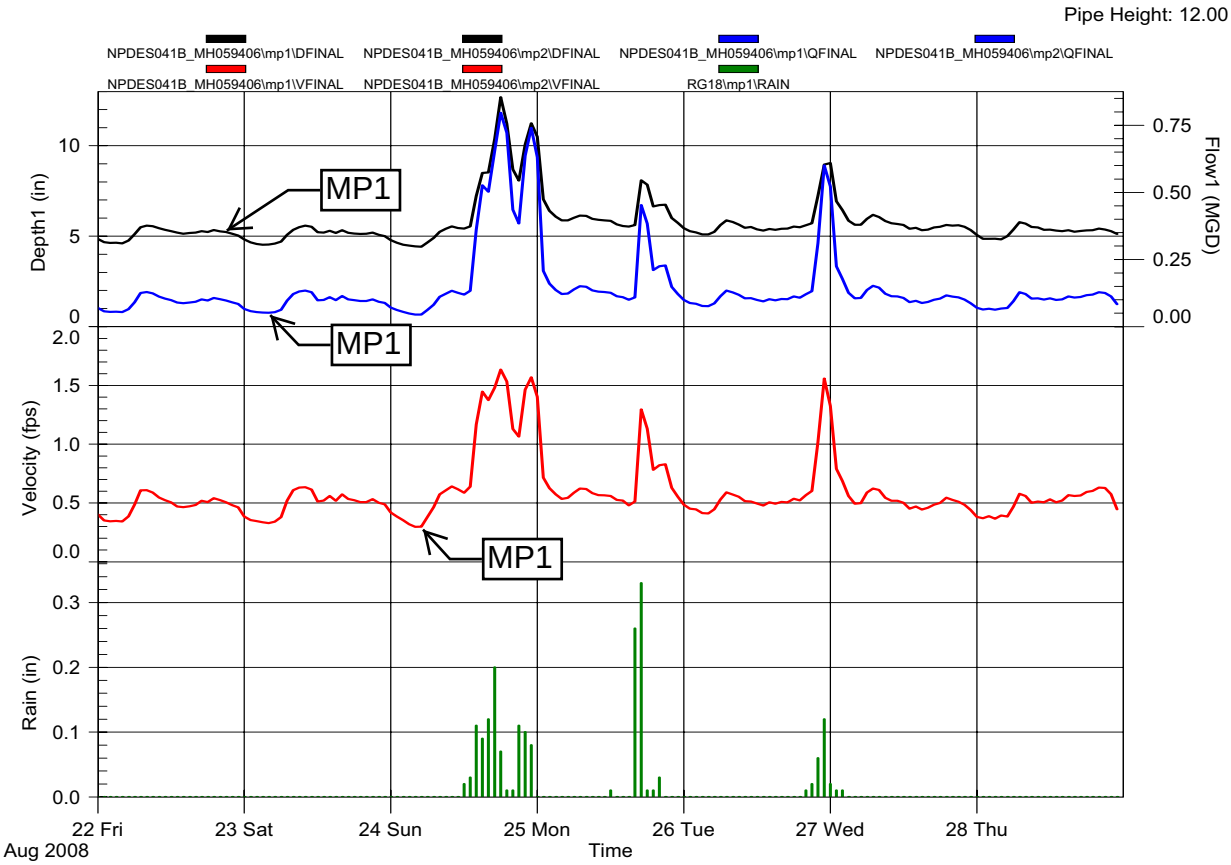
GEN38_059404\mp1\QFINAL
GEN38_059404\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time

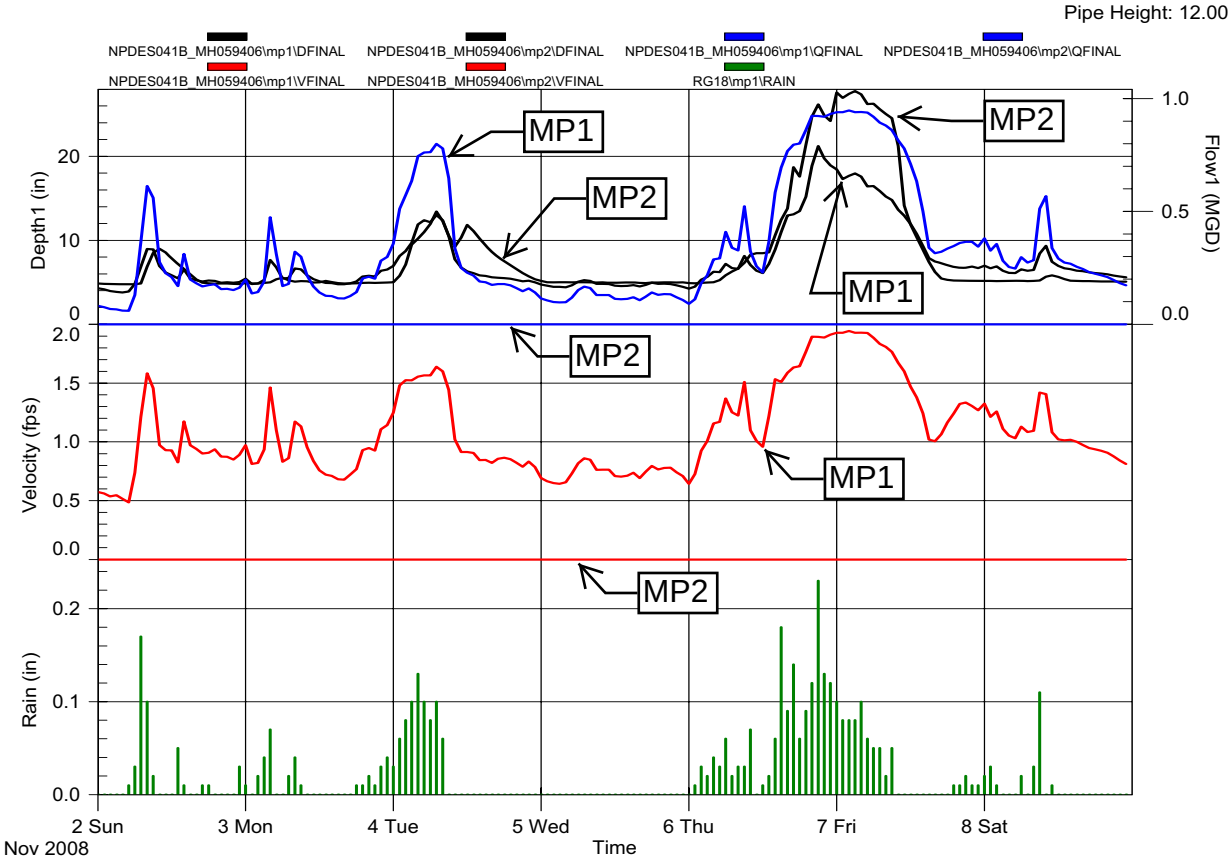
Seattle Public Utilities - Genesee Basin



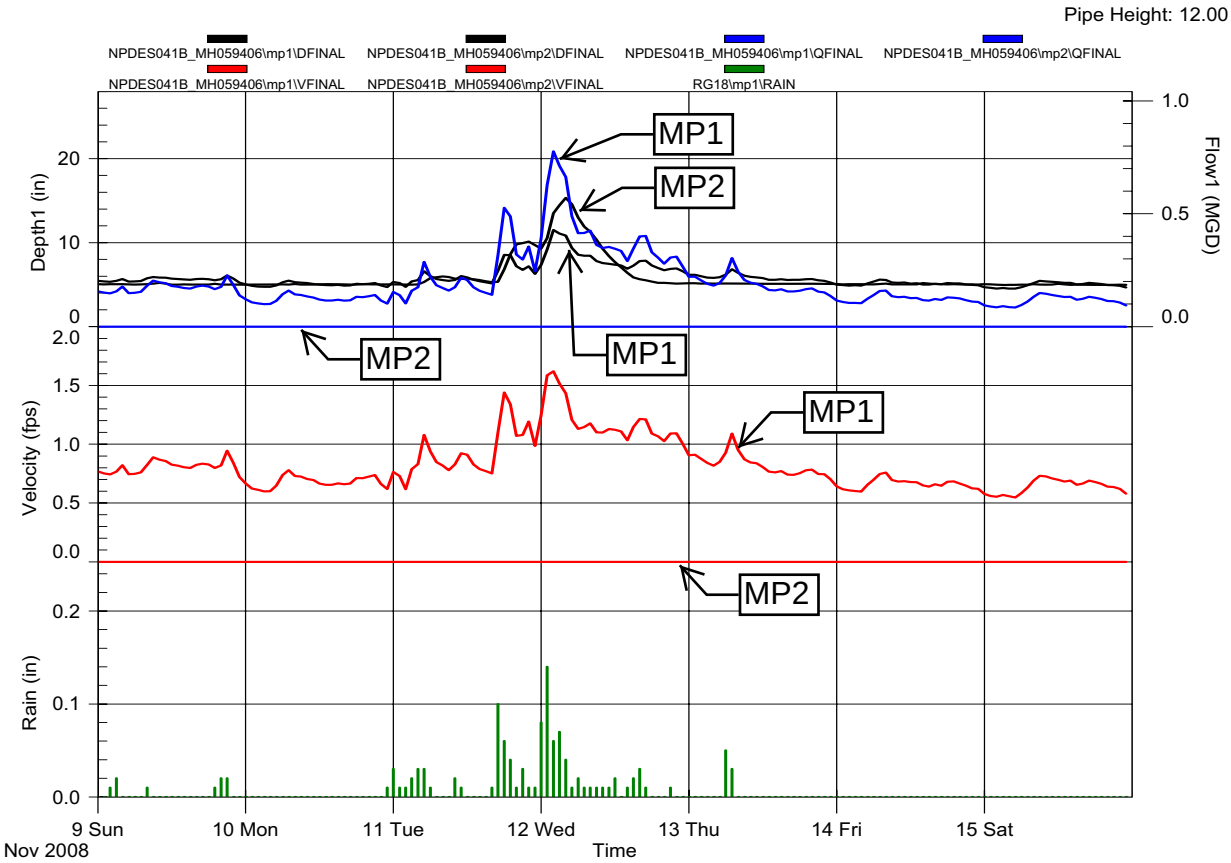
Seattle Public Utilities - Genesee Basin

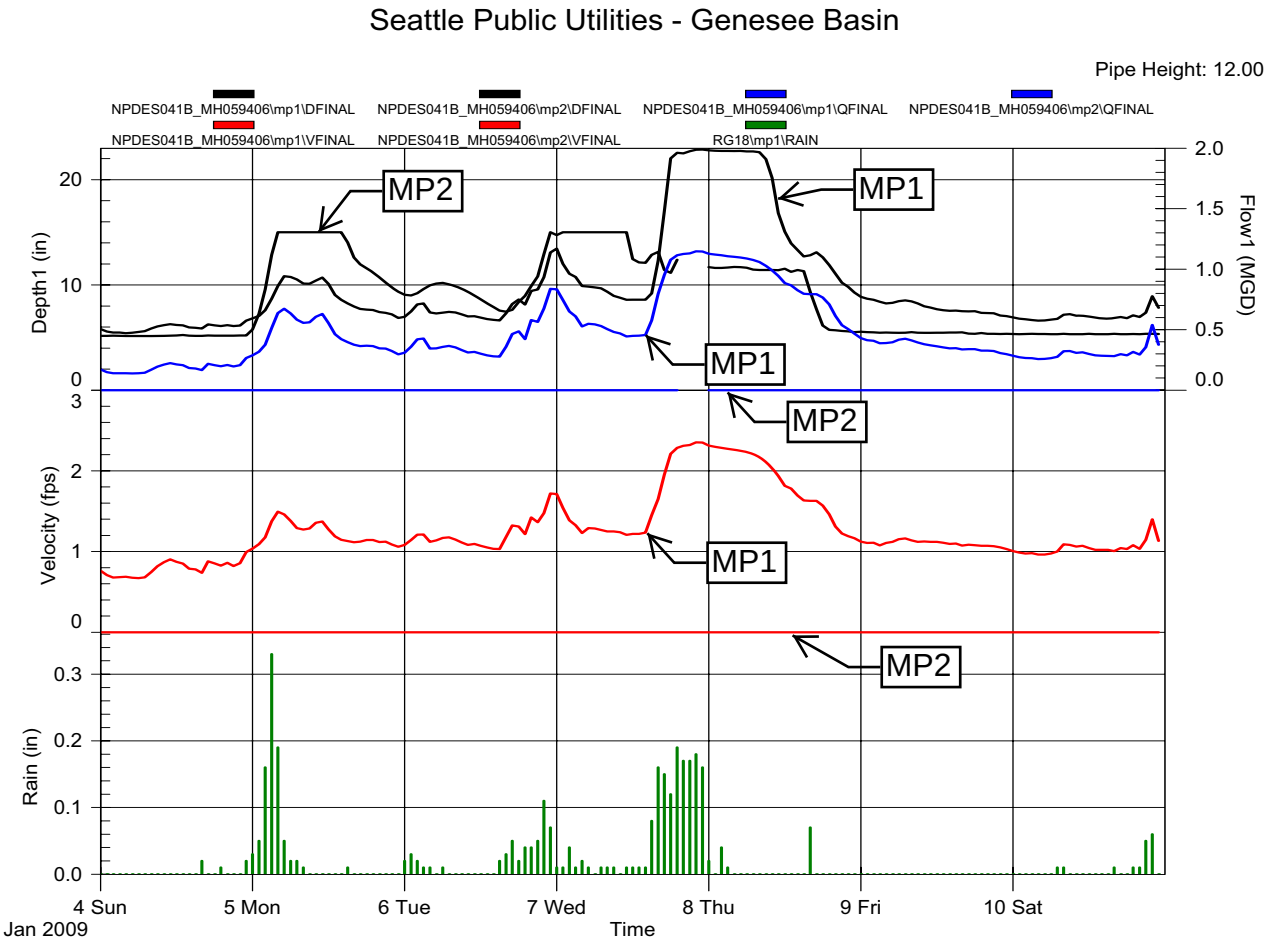


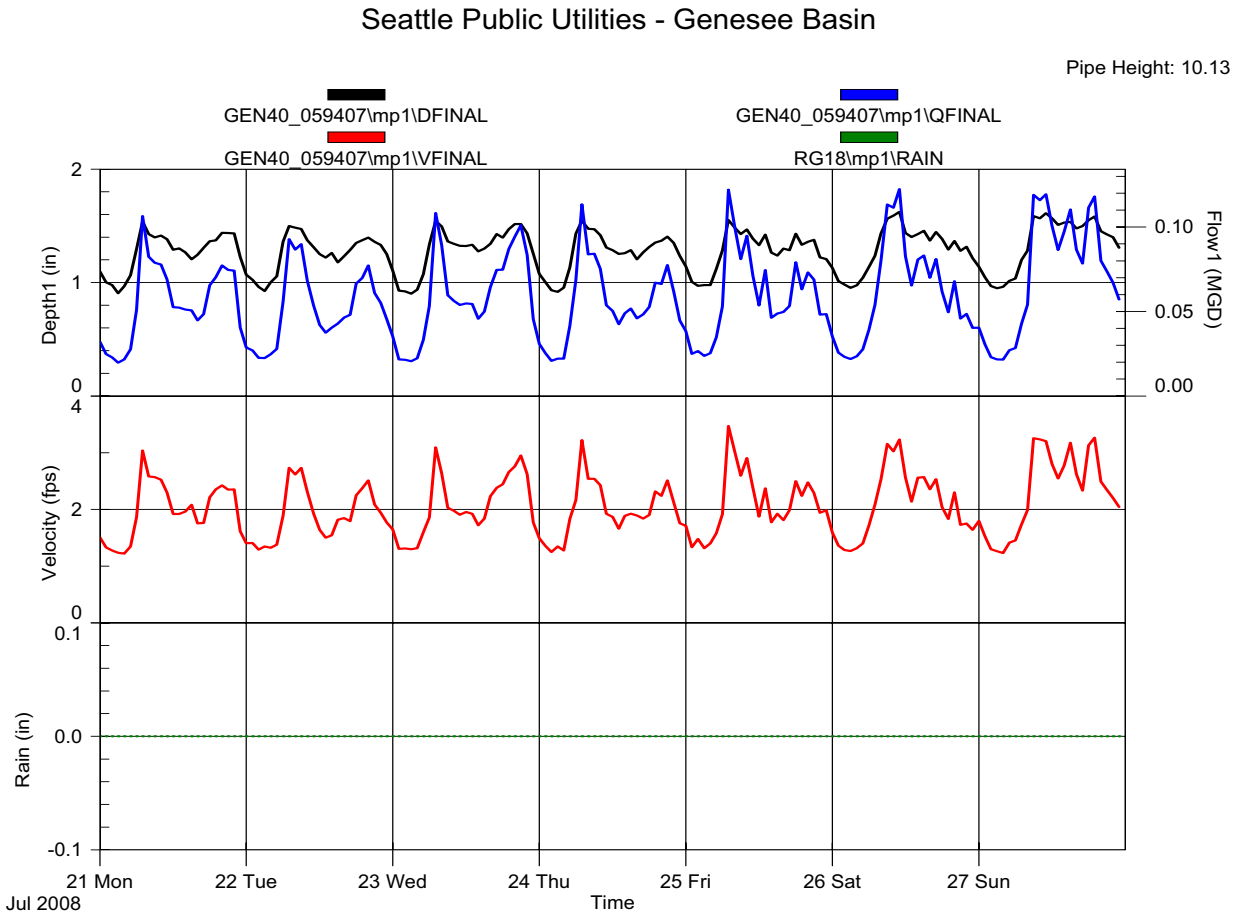
Seattle Public Utilities - Genesee Basin

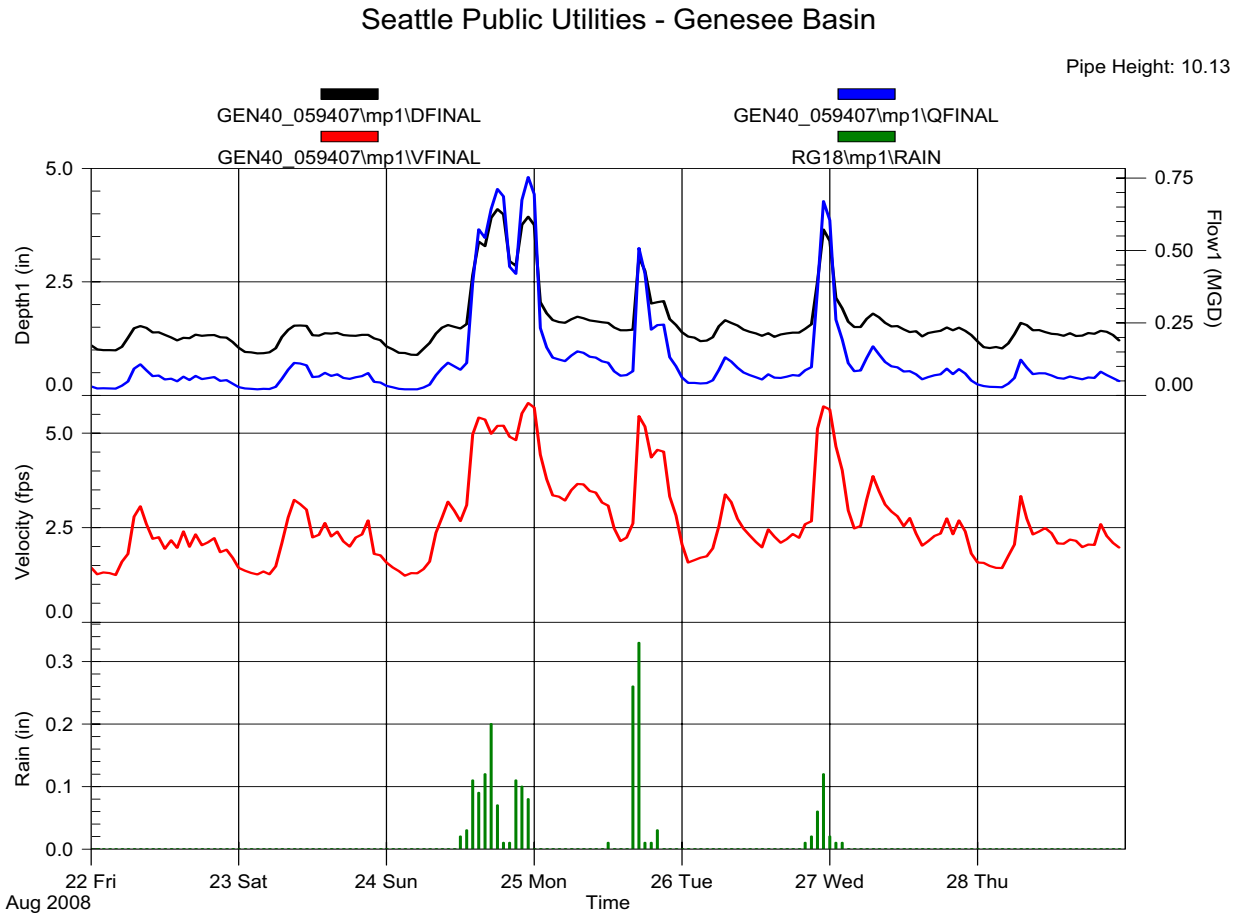


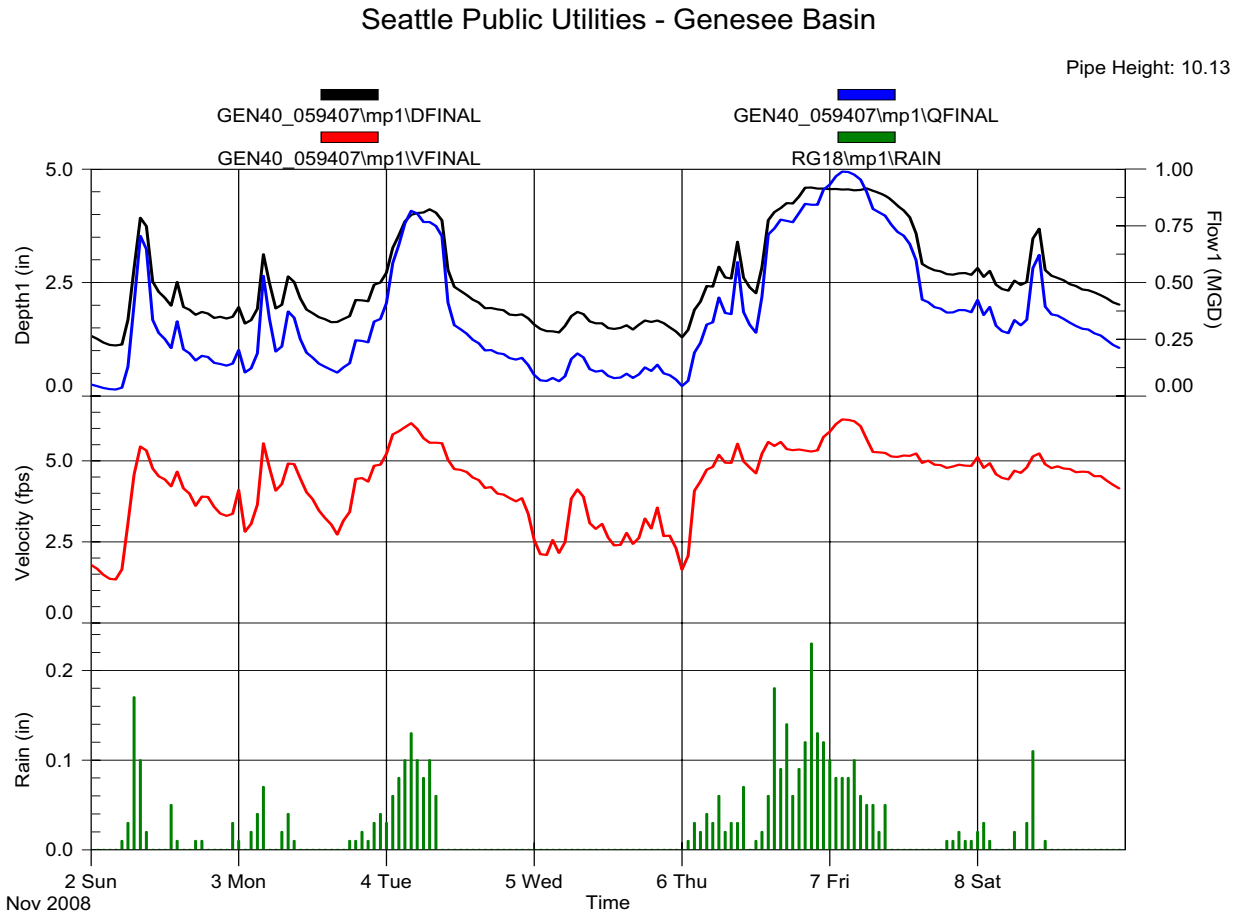
Seattle Public Utilities - Genesee Basin

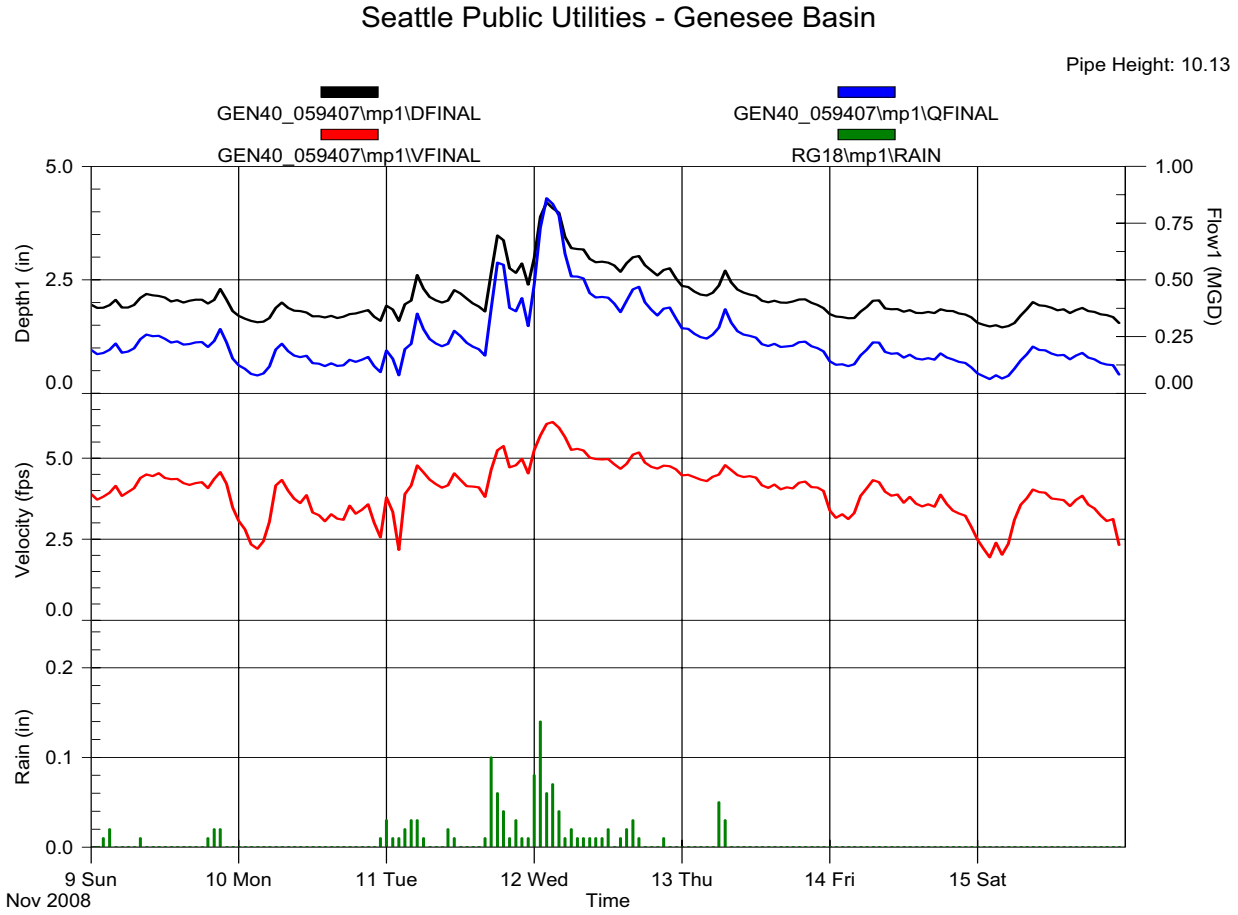


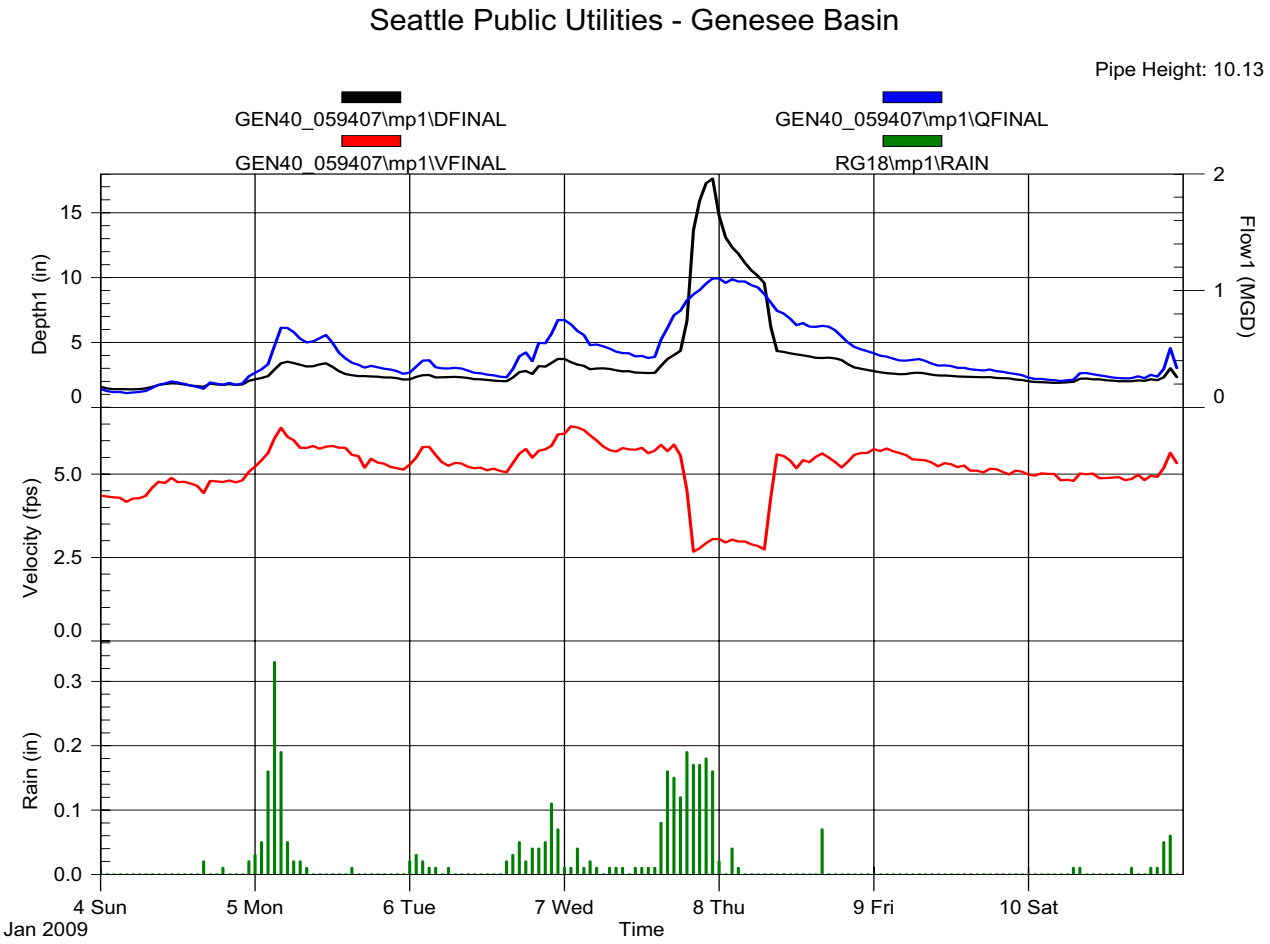

Seattle Public Utilities - Genesee Basin
Pipe Height: 12.00
NPDES041B_MH059406\mp1\DFINAL
NPDES041B_MH059406\mp2\DFINAL
NPDES041B_MH059406\mp1\QFINAL
NPDES041B_MH059406\mp2\QFINAL
NPDES041B_MH059406\mp1\VFINAL
NPDES041B_MH059406\mp2\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
MP1
MP2
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time

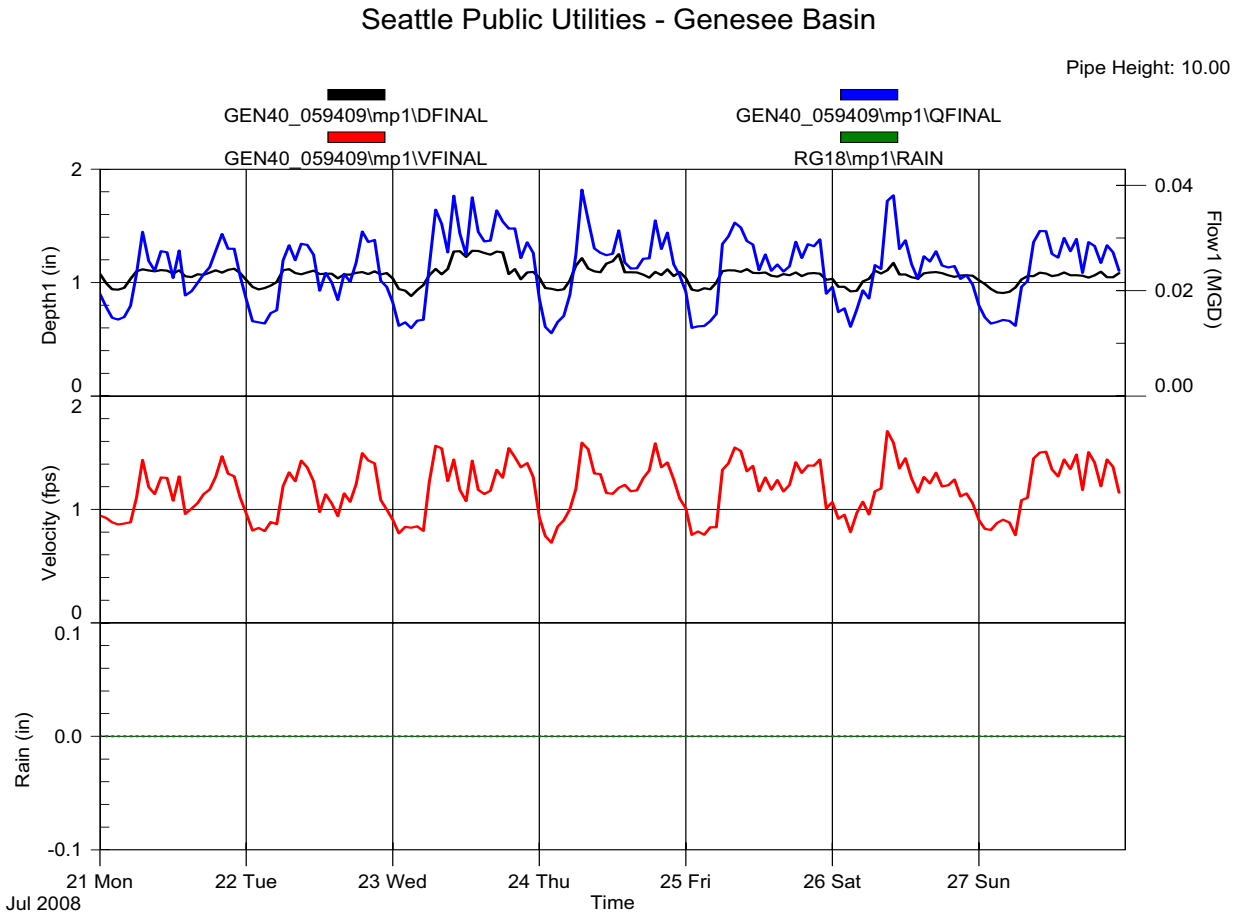

Seattle Public Utilities - Genesee Basin
Pipe Height: 10.13
GEN40_059407\mp1\DFINAL
GEN40_059407\mp1\QFINAL
GEN40_059407\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
21 Mon
Jul 2008
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Time

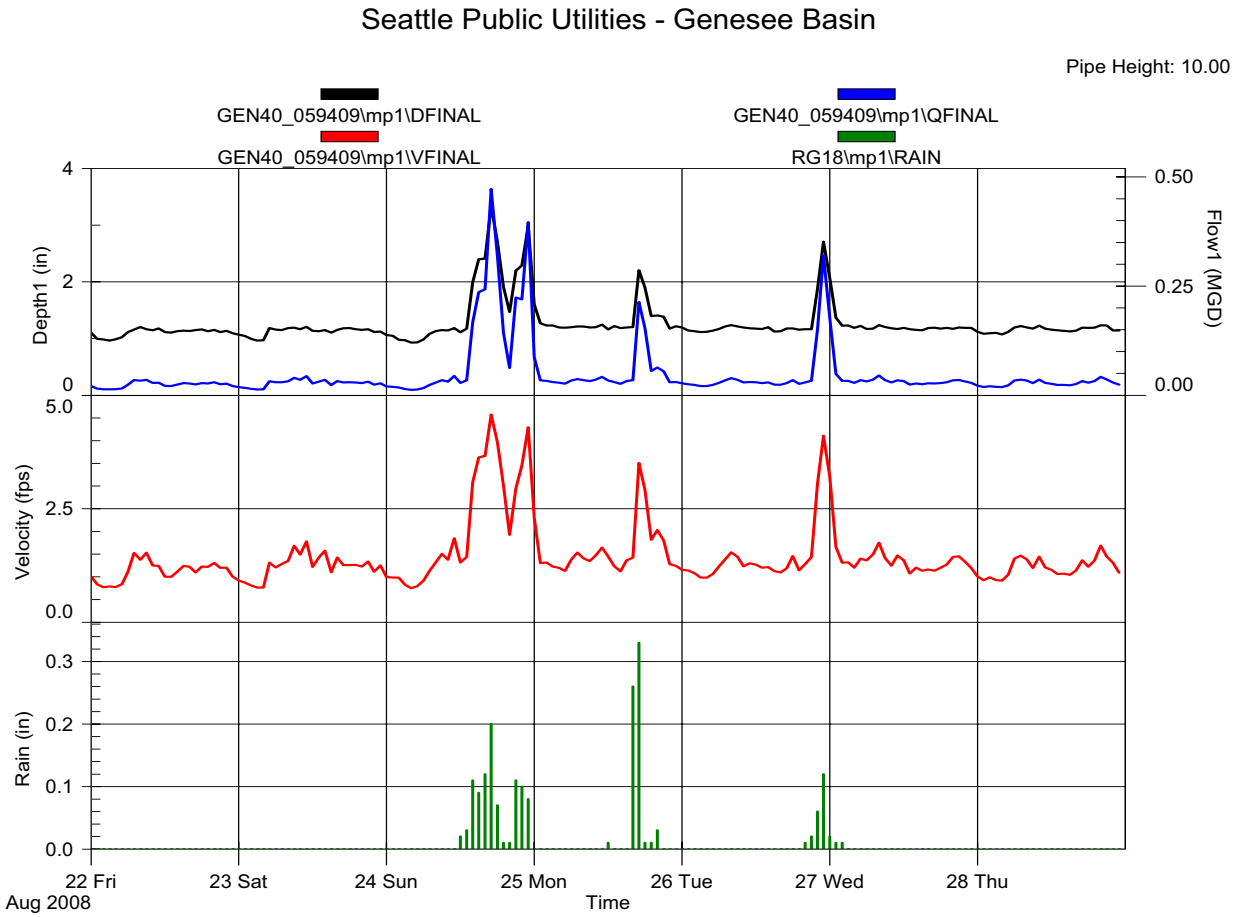

Seattle Public Utilities - Genesee Basin
Pipe Height: 10.13
GEN40_059407\mp1\DFINAL
GEN40_059407\mp1\QFINAL
GEN40_059407\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
22 Fri
Aug 2008
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Time

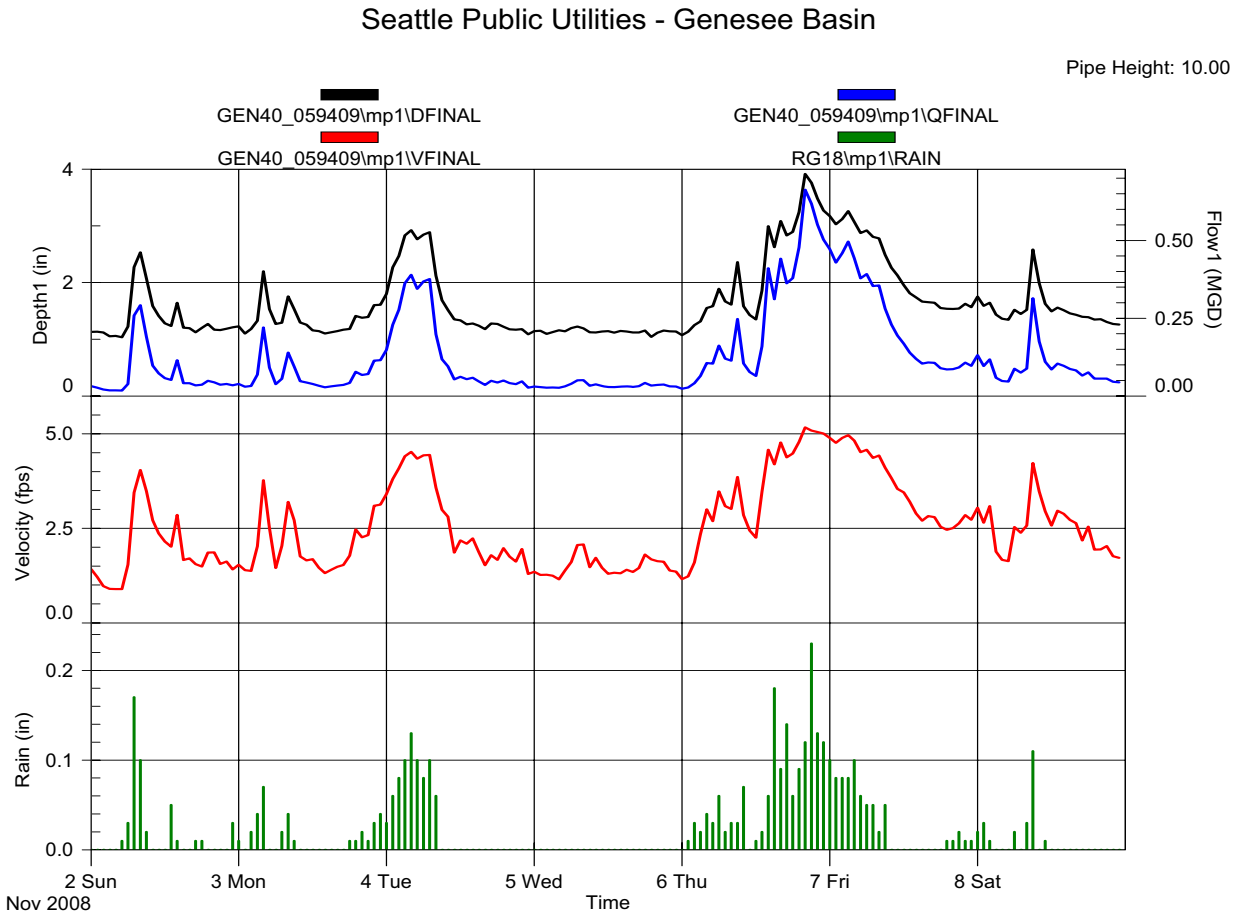

Seattle Public Utilities - Genesee Basin
Pipe Height: 10.13
GEN40_059407\mp1\DFINAL
GEN40_059407\mp1\QFINAL
GEN40_059407\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
2 Sun
Nov 2008
3 Mon
4 Tue
5 Wed
6 Thu
7 Fri
8 Sat
Time

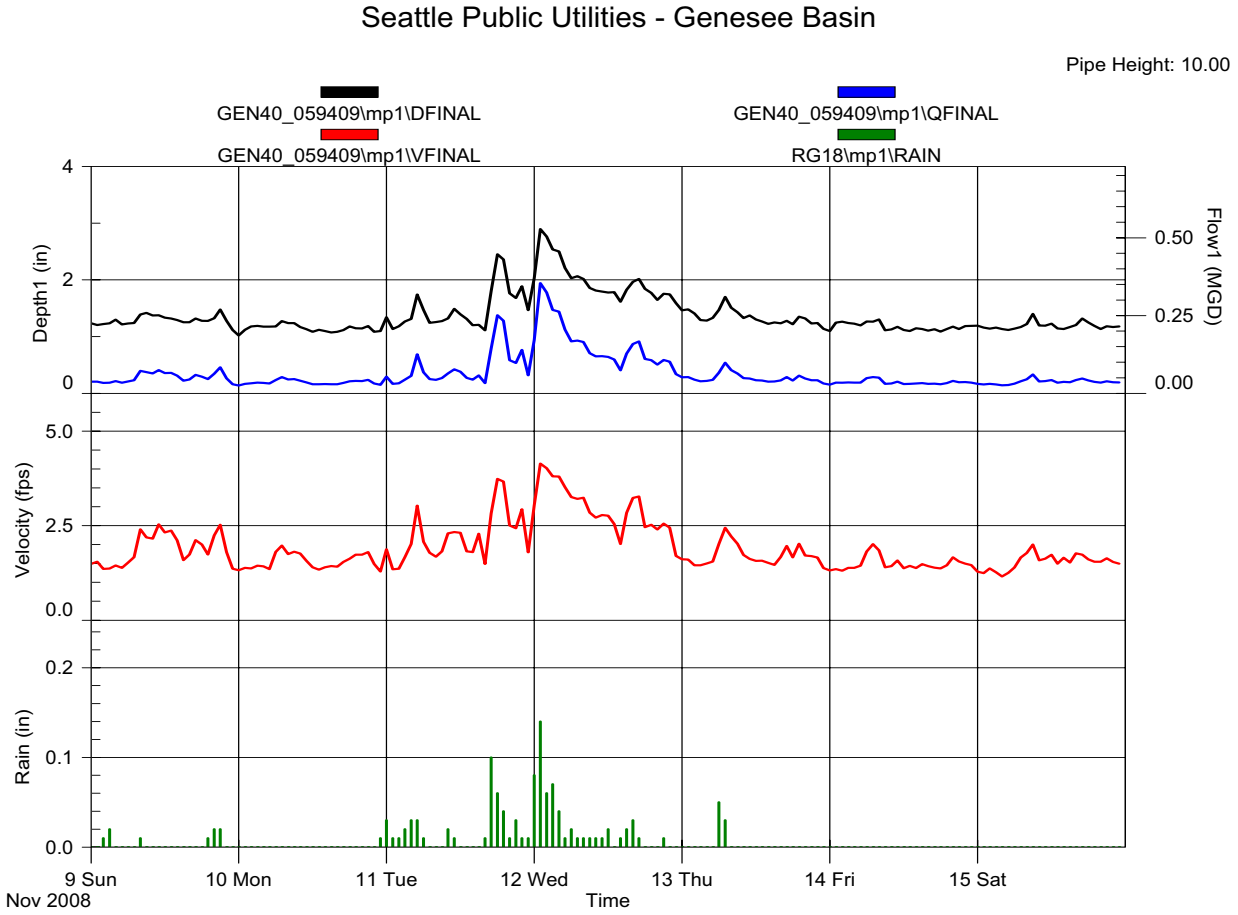

Seattle Public Utilities - Genesee Basin
Pipe Height: 10.13
GEN40_059407\mp1\DFINAL
GEN40_059407\mp1\QFINAL
GEN40_059407\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
9 Sun
Nov 2008
10 Mon
11 Tue
12 Wed
13 Thu
14 Fri
15 Sat
Time

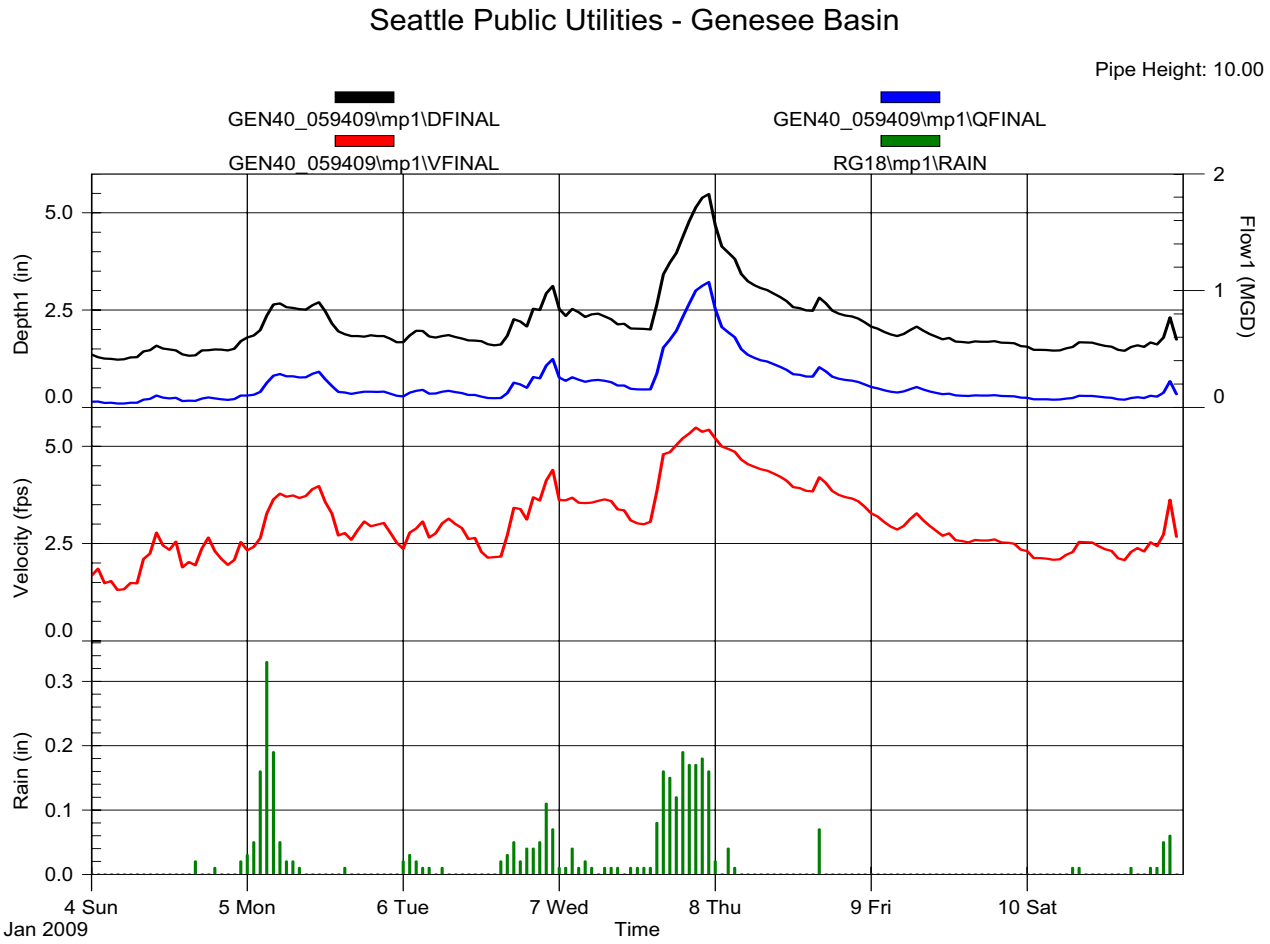

Seattle Public Utilities - Genesee Basin
Pipe Height: 10.13
GEN40_059407\mp1\DFINAL
GEN40_059407\mp1\QFINAL
GEN40_059407\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 10.00
GEN40_059409\mp1\DFINAL
GEN40_059409\mp1\QFINAL
GEN40_059409\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
21 Mon
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Jul 2008
Time

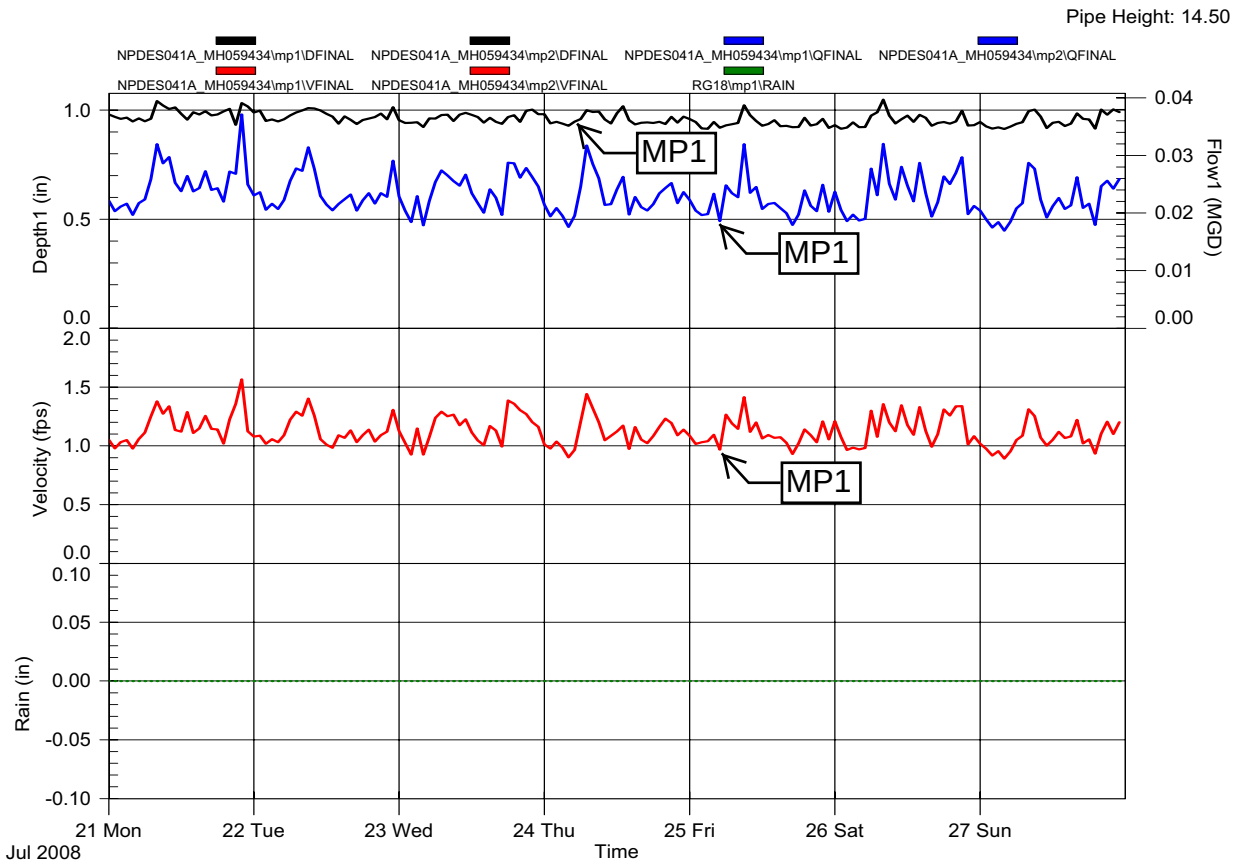

Seattle Public Utilities - Genesee Basin
Pipe Height: 10.00
GEN40_059409\mp1\DFINAL
GEN40_059409\mp1\QFINAL
GEN40_059409\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
22 Fri
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Aug 2008
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 10.00
GEN40_059409\mp1\DFINAL
GEN40_059409\mp1\QFINAL
GEN40_059409\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
2 Sun
Nov 2008
3 Mon
4 Tue
5 Wed
6 Thu
7 Fri
8 Sat
Time

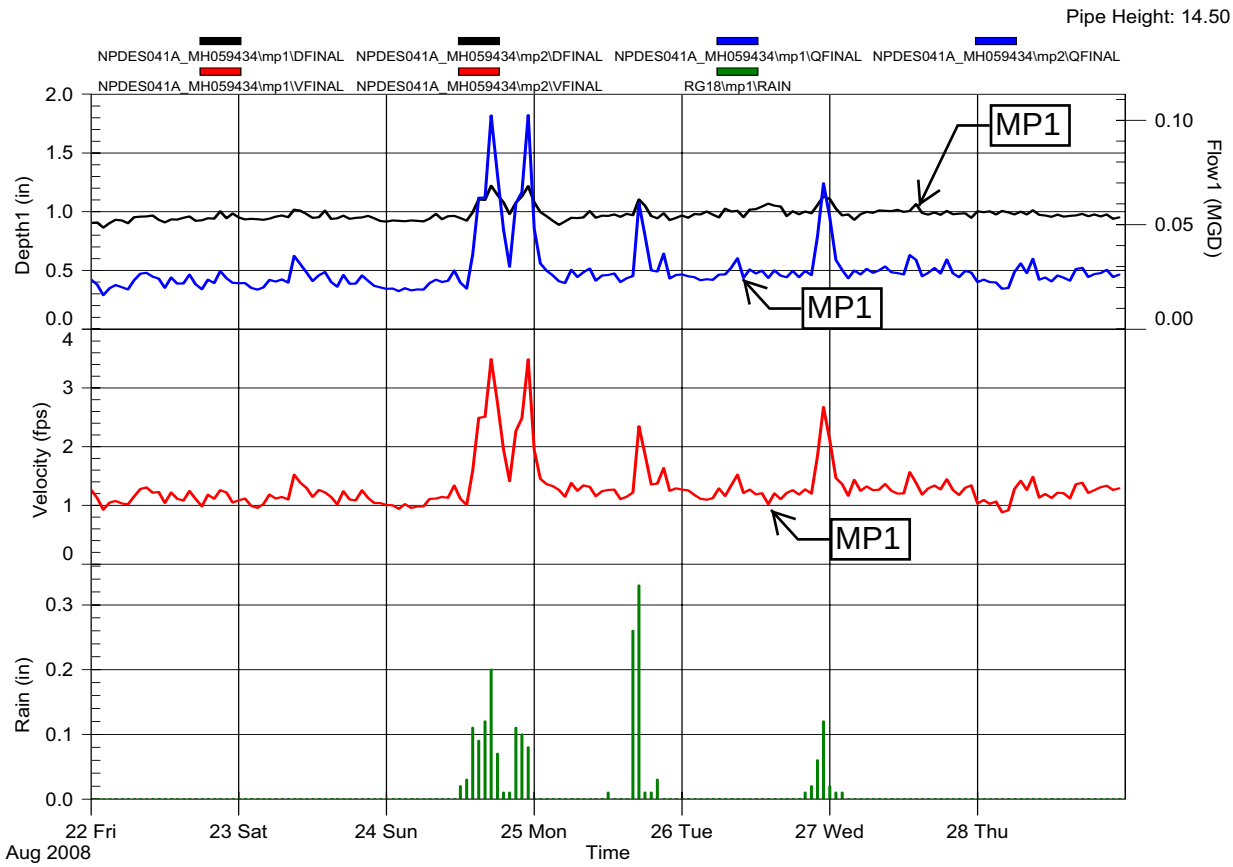

Seattle Public Utilities - Genesee Basin
Pipe Height: 10.00
GEN40_059409\mp1\DFINAL
GEN40_059409\mp1\QFINAL
GEN40_059409\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
9 Sun
Nov 2008
10 Mon
11 Tue
12 Wed
13 Thu
14 Fri
15 Sat
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 10.00
GEN40_059409\mp1\DFINAL
GEN40_059409\mp1\QFINAL
GEN40_059409\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
5.0
2.5
0.0
Flow1 (MGD)
2
1
0
Velocity (fps)
5.0
2.5
0.0
Rain (in)
0.3
0.2
0.1
0.0
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time

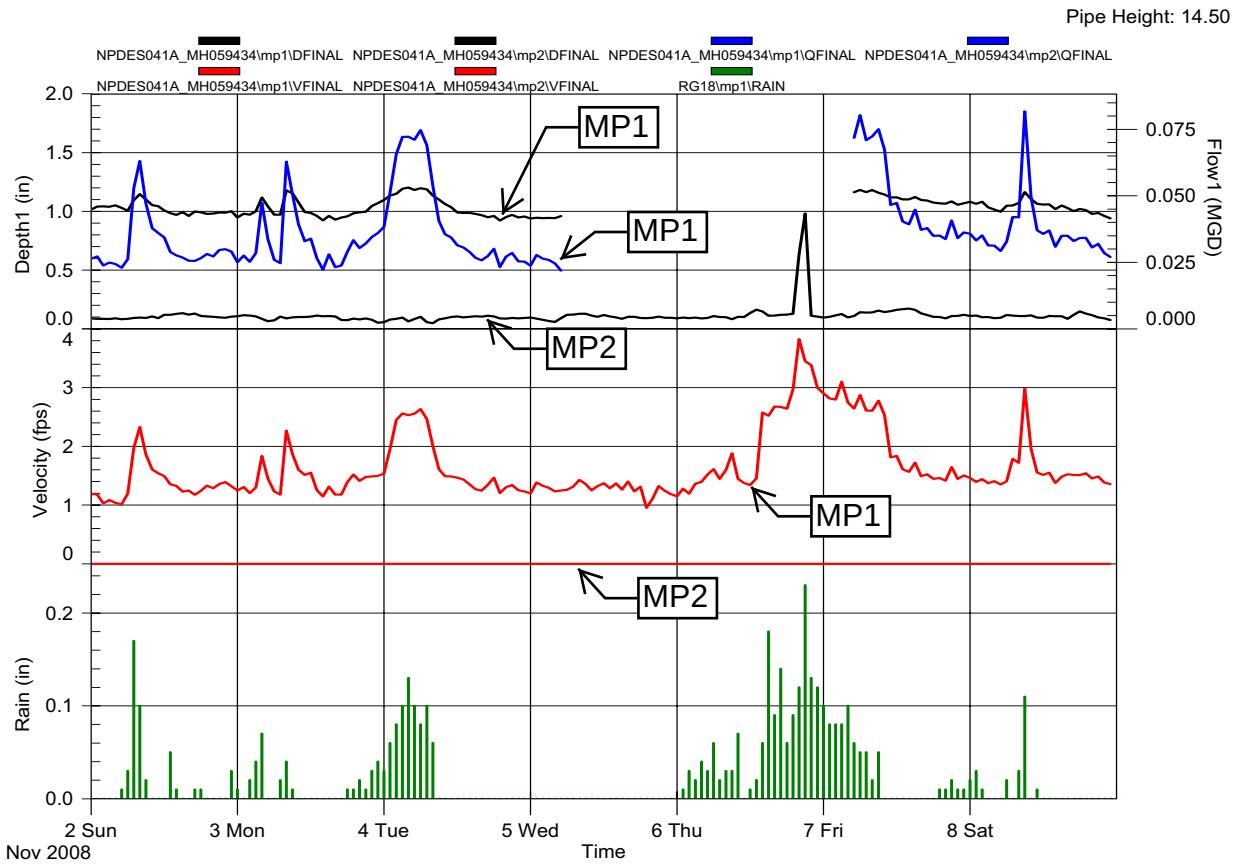
Seattle Public Utilities - Genesee Basin



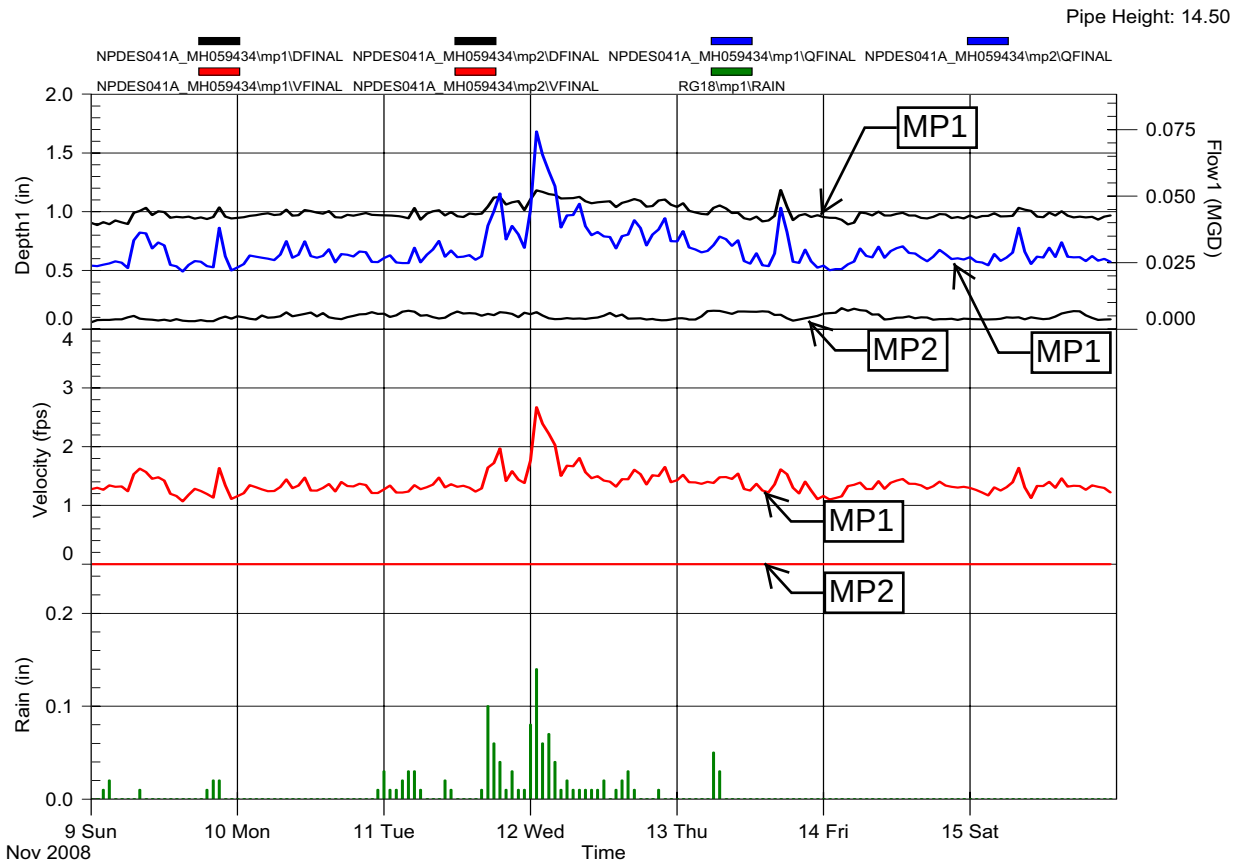
Seattle Public Utilities - Genesee Basin

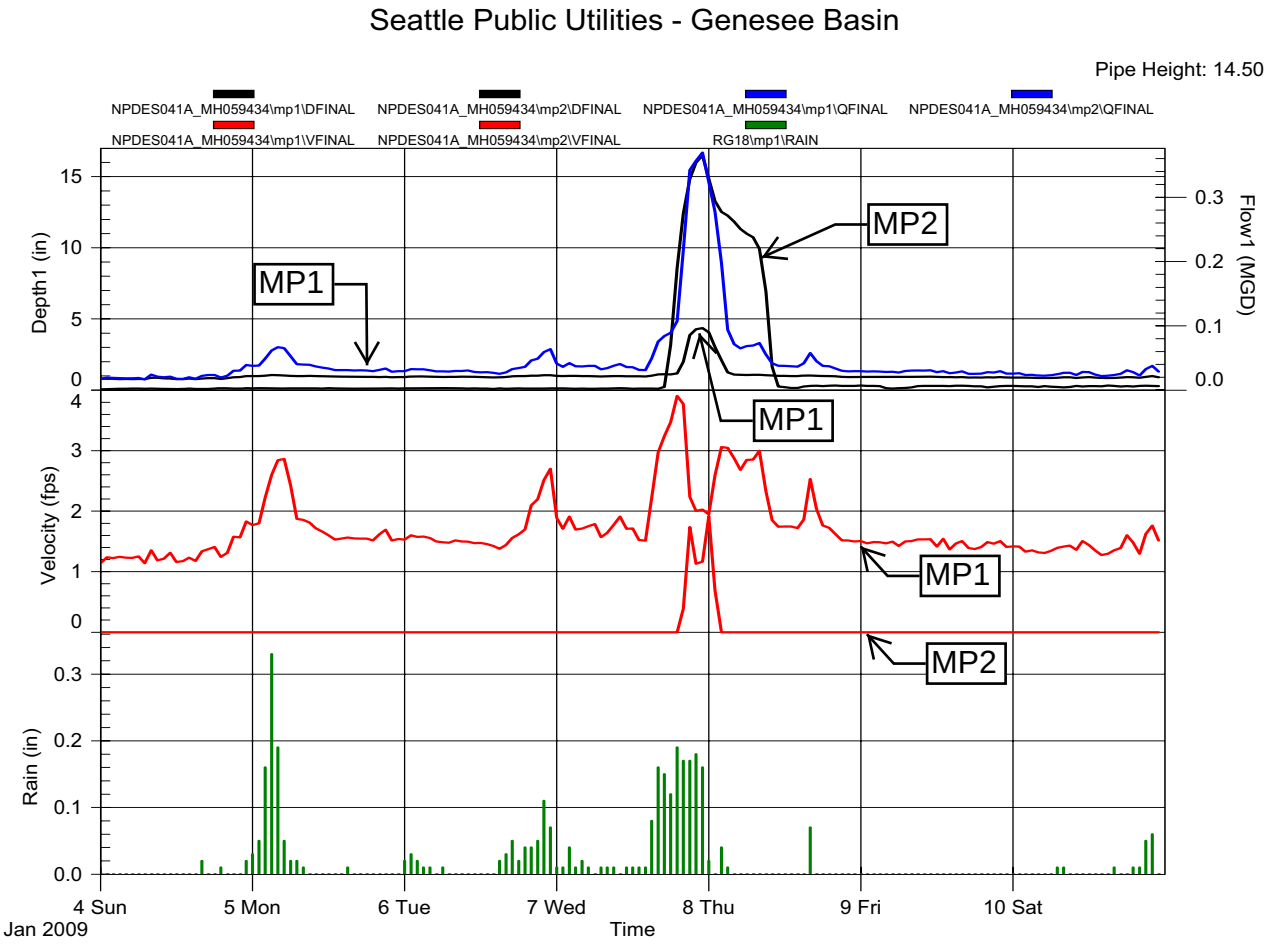


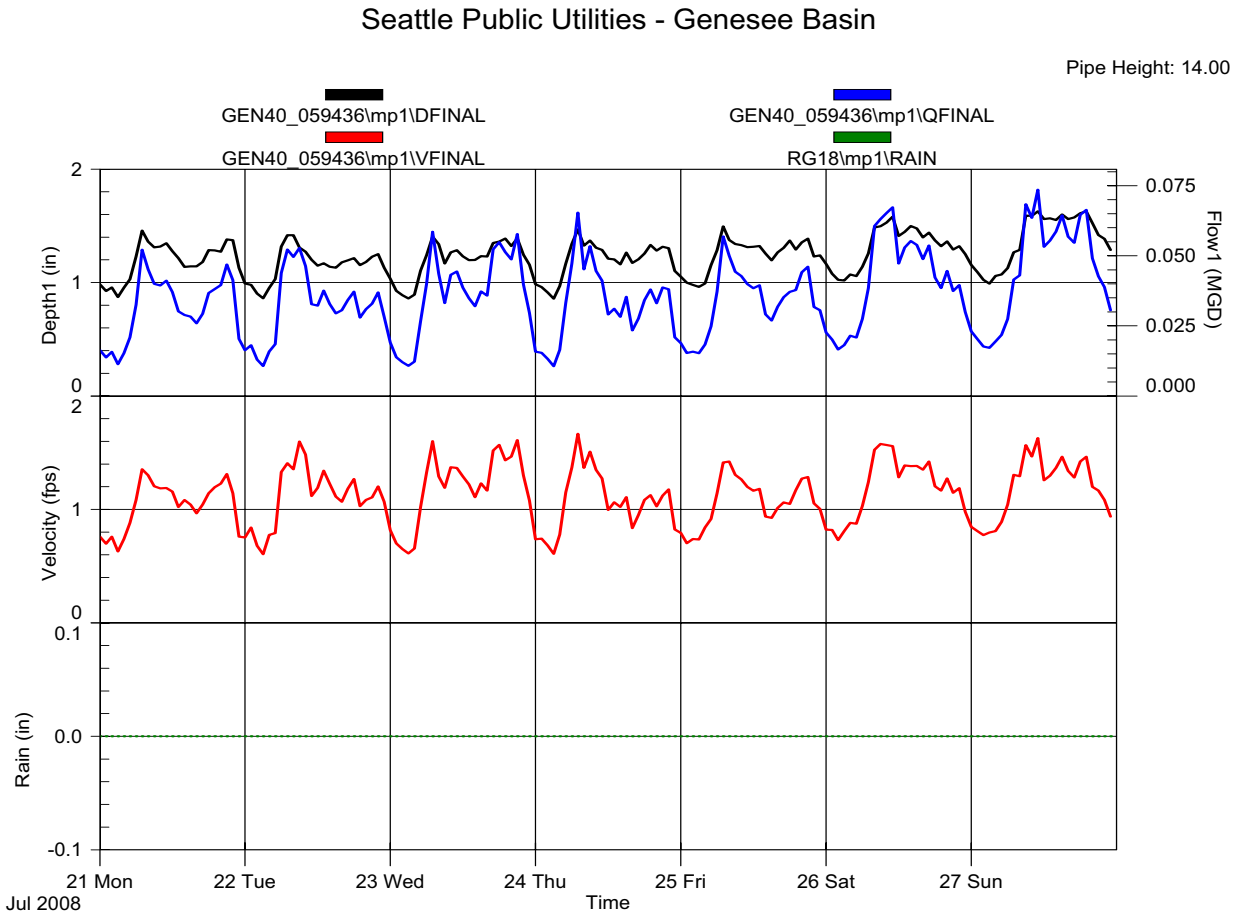
Seattle Public Utilities - Genesee Basin

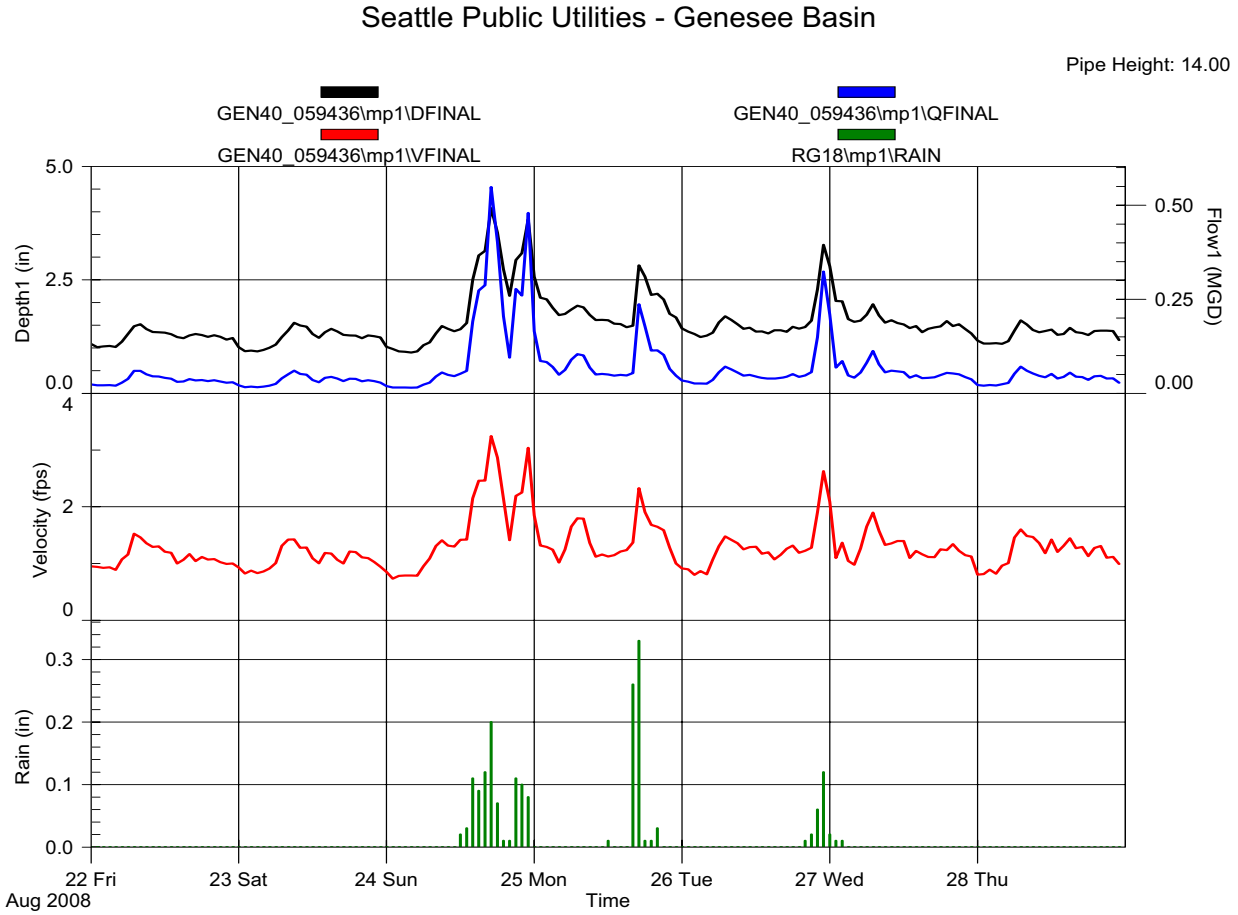


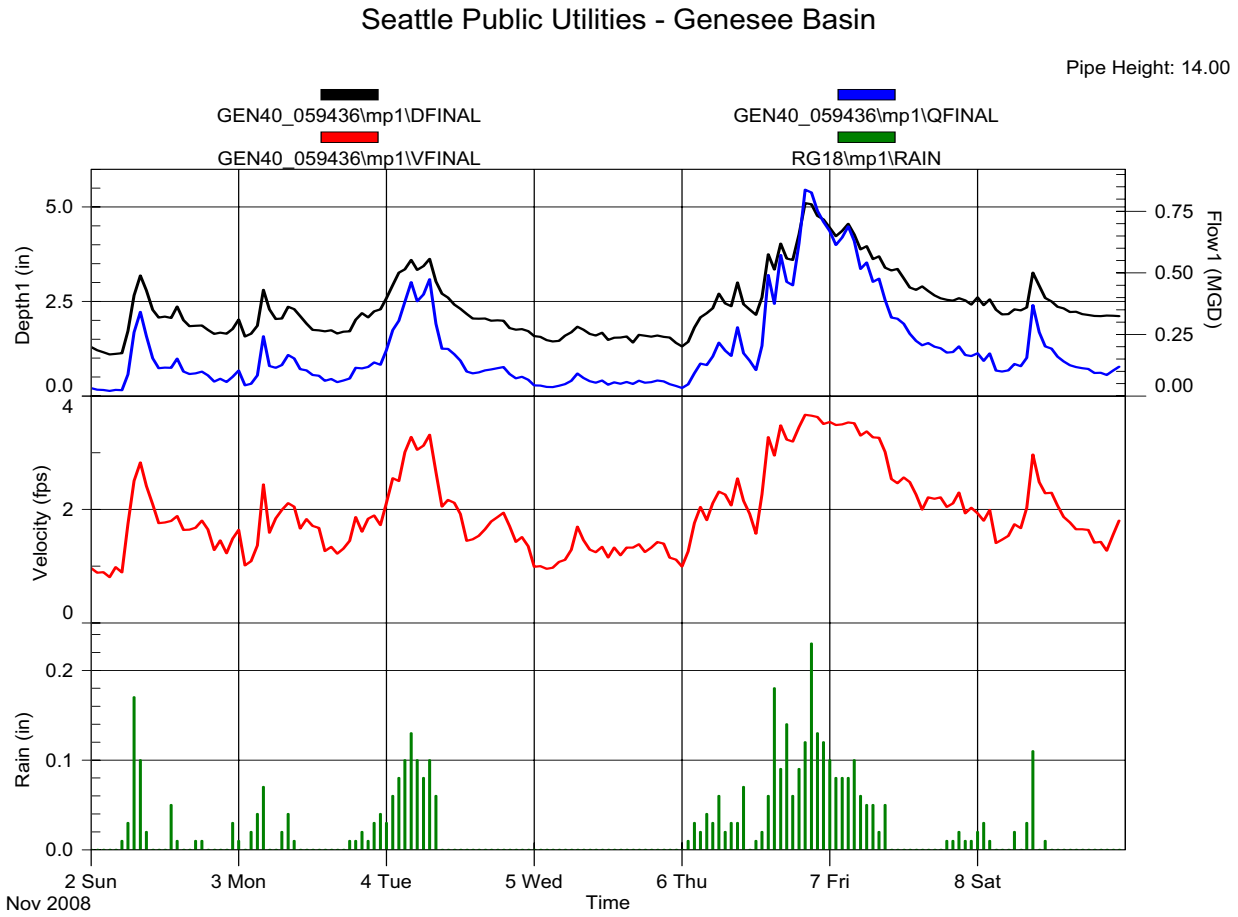
Seattle Public Utilities - Genesee Basin

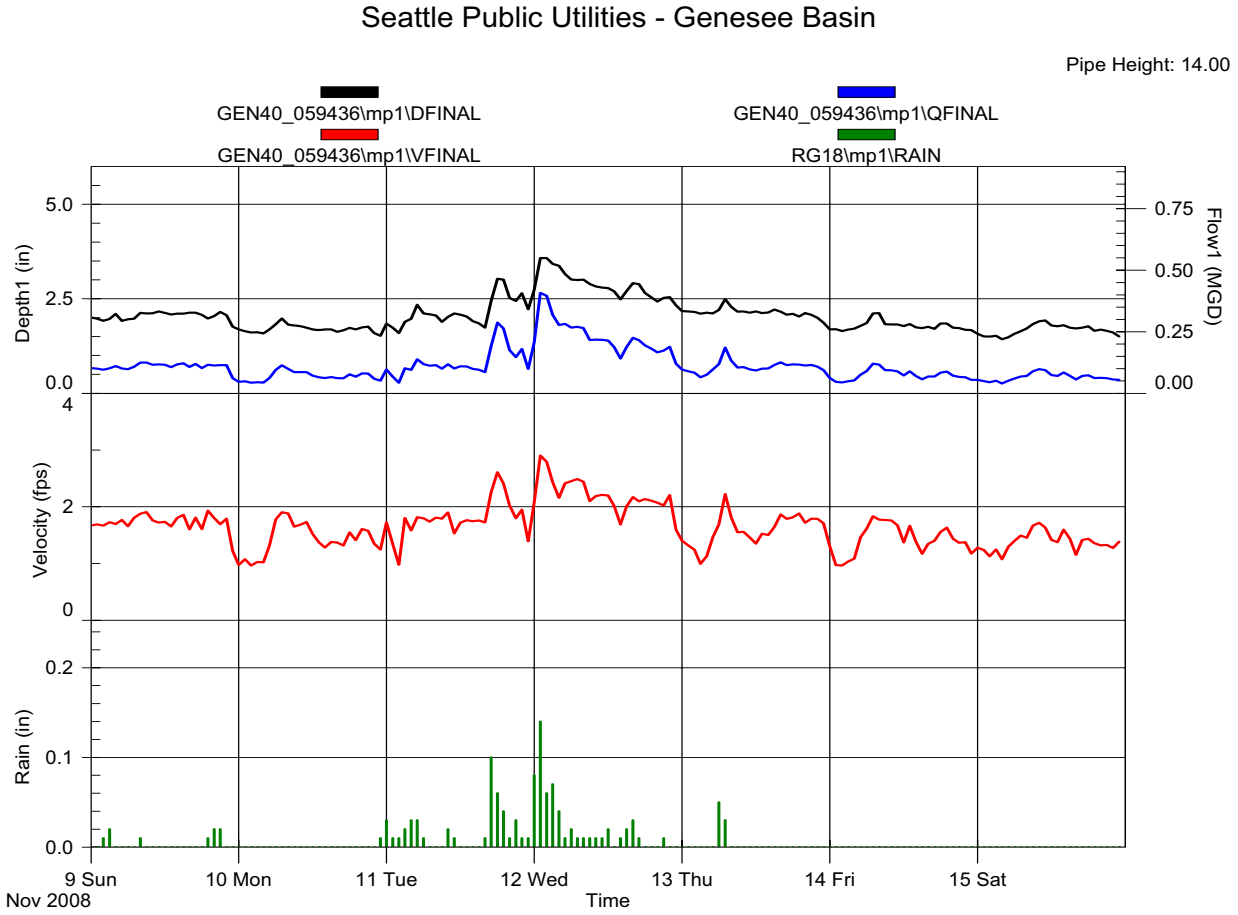


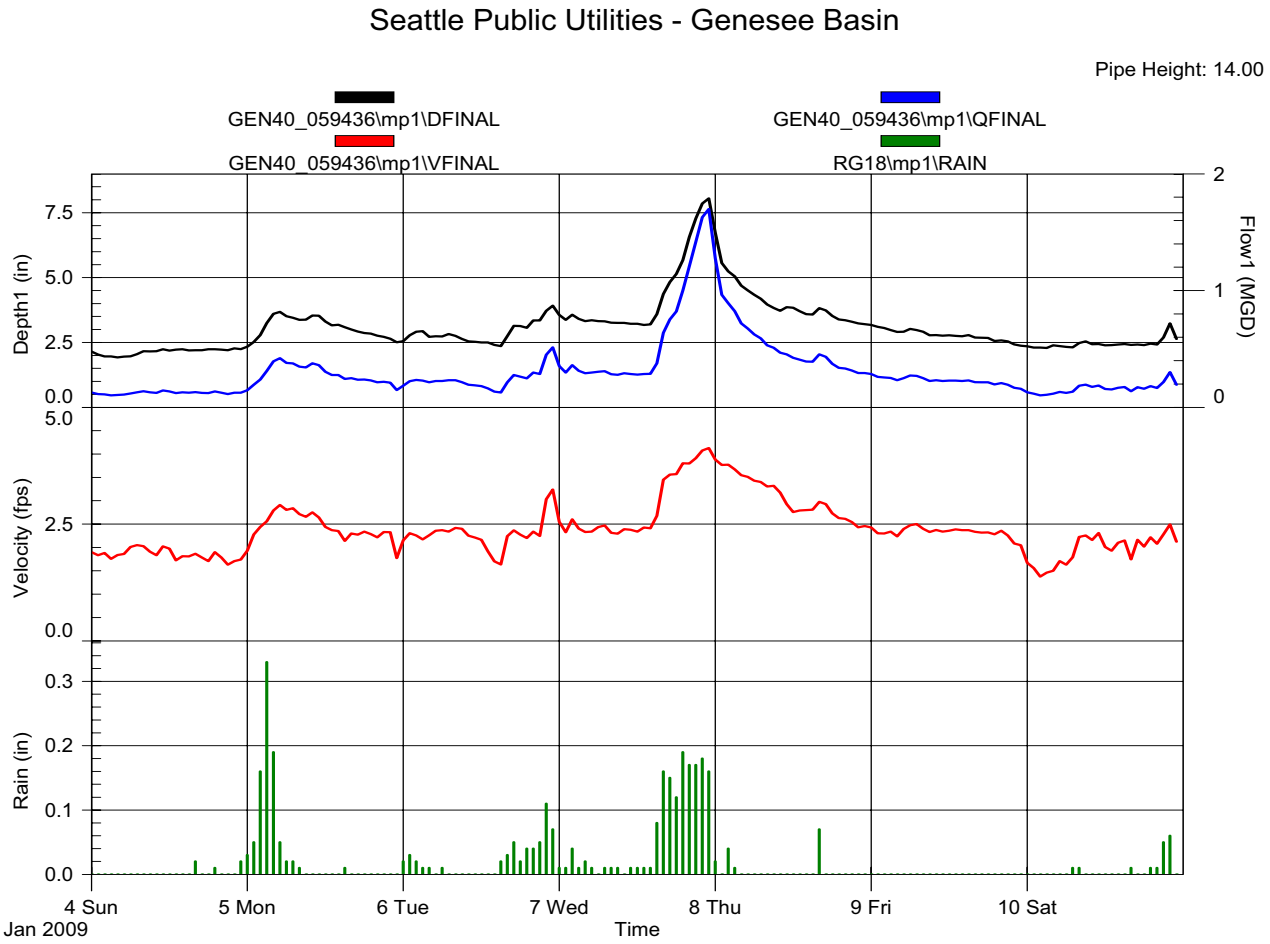

Seattle Public Utilities - Genesee Basin
Pipe Height: 14.50
NPDES041A_MH059434\mp1\DFINAL
NPDES041A_MH059434\mp2\DFINAL
NPDES041A_MH059434\mp1\QFINAL
NPDES041A_MH059434\mp2\QFINAL
NPDES041A_MH059434\mp1\VFINAL
NPDES041A_MH059434\mp2\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
MP1
MP2
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time

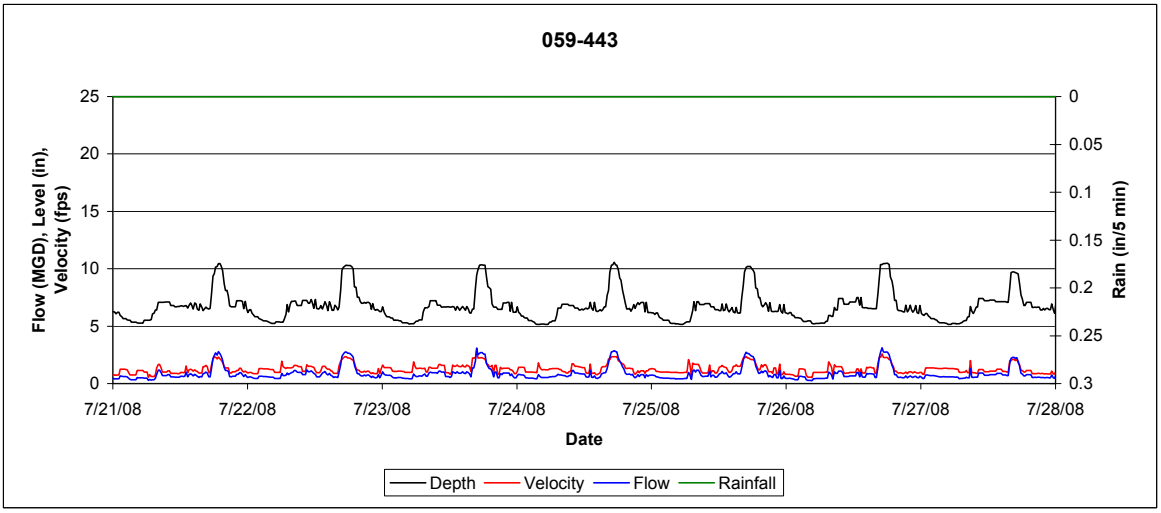

Seattle Public Utilities - Genesee Basin
Pipe Height: 14.00
GEN40_059436\mp1\DFINAL
GEN40_059436\mp1\QFINAL
GEN40_059436\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
21 Mon
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Jul 2008
Time

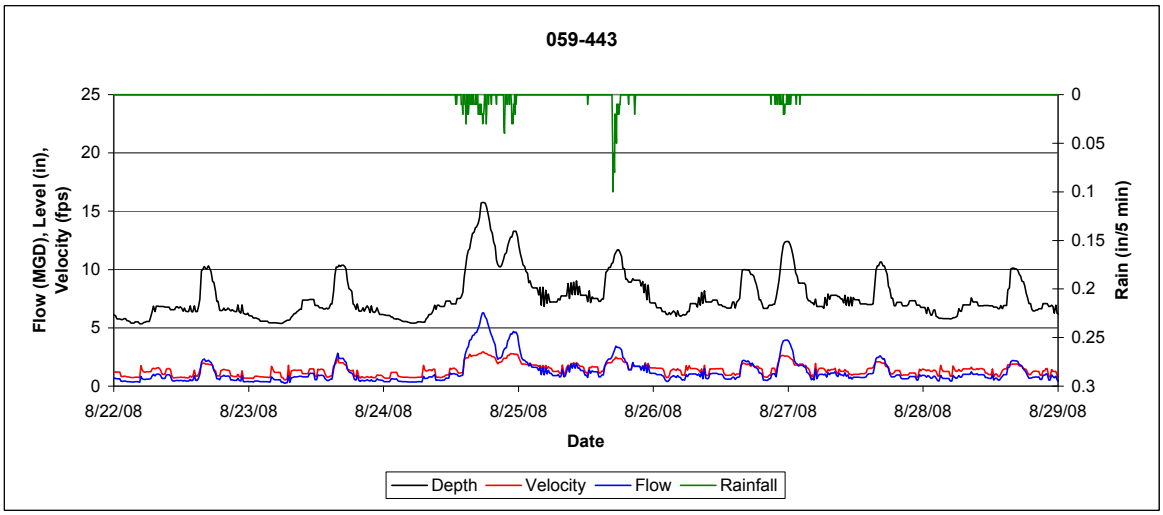

Seattle Public Utilities - Genesee Basin
Pipe Height: 14.00
GEN40_059436\mp1\DFINAL
GEN40_059436\mp1\QFINAL
GEN40_059436\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
22 Fri
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Aug 2008
Time

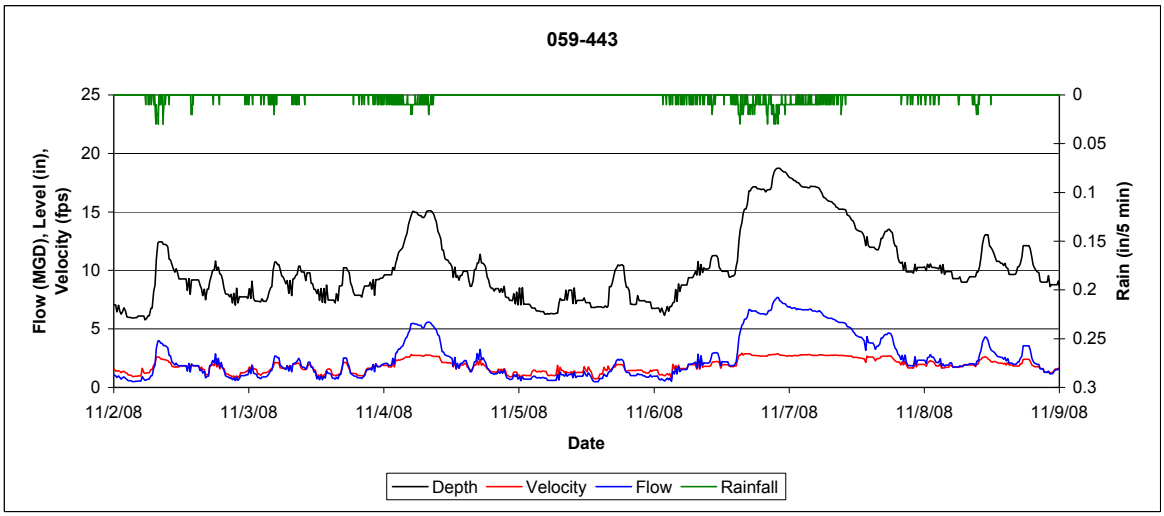

Seattle Public Utilities - Genesee Basin
Pipe Height: 14.00
GEN40_059436\mp1\DFINAL
GEN40_059436\mp1\QFINAL
GEN40_059436\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
2 Sun
Nov 2008
3 Mon
4 Tue
5 Wed
6 Thu
7 Fri
8 Sat
Time

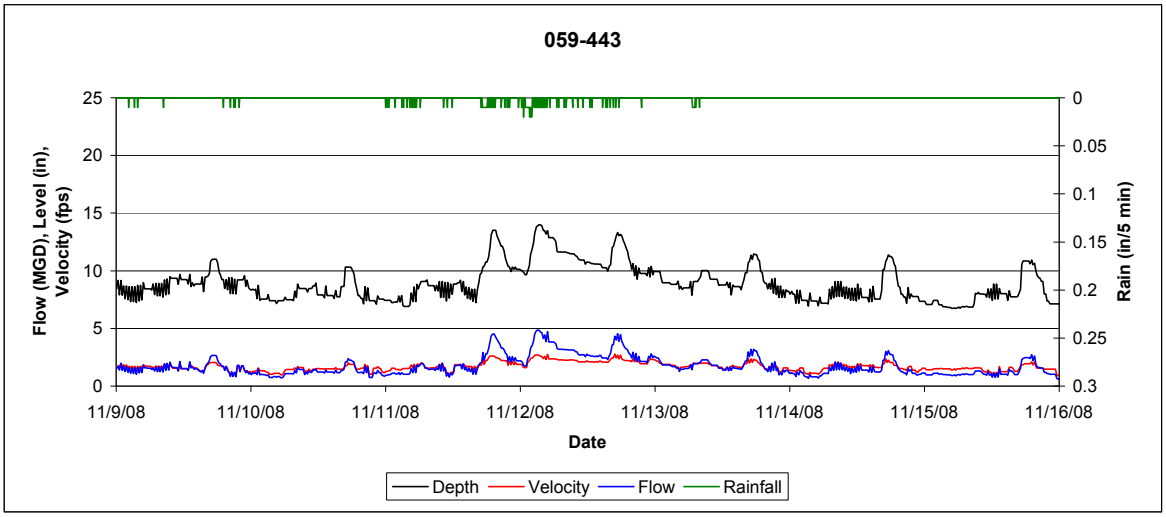

Seattle Public Utilities - Genesee Basin
Pipe Height: 14.00
GEN40_059436\mp1\DFINAL
GEN40_059436\mp1\QFINAL
GEN40_059436\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
9 Sun
Nov 2008
10 Mon
11 Tue
12 Wed
13 Thu
14 Fri
15 Sat
Time

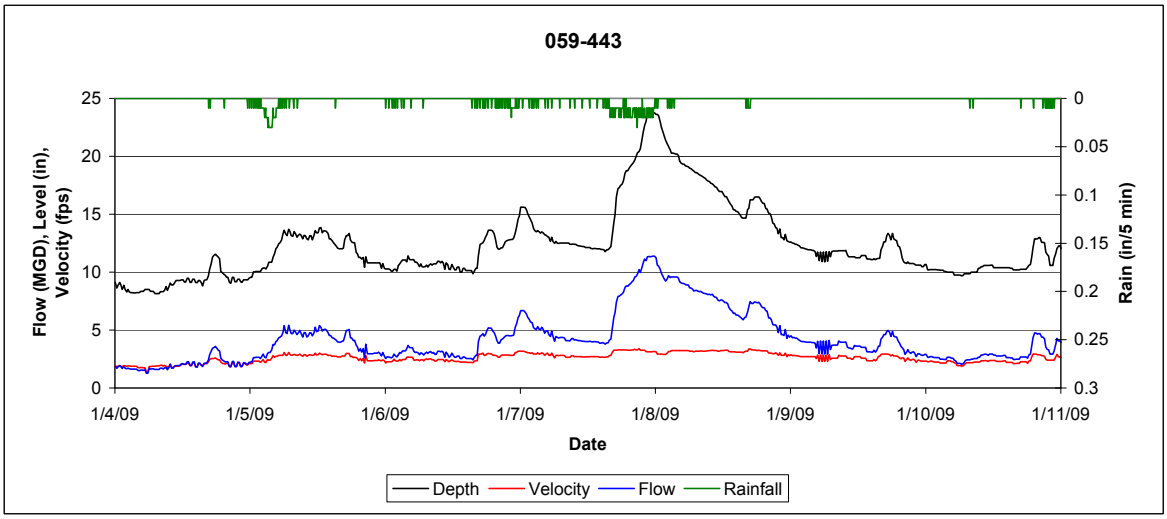

Seattle Public Utilities - Genesee Basin
Pipe Height: 14.00
GEN40_059436\mp1\DFINAL
GEN40_059436\mp1\QFINAL
GEN40_059436\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
7.5
5.0
2.5
0.0
Flow1 (MGD)
2
1
0
Velocity (fps)
5.0
2.5
0.0
Rain (in)
0.3
0.2
0.1
0.0
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time

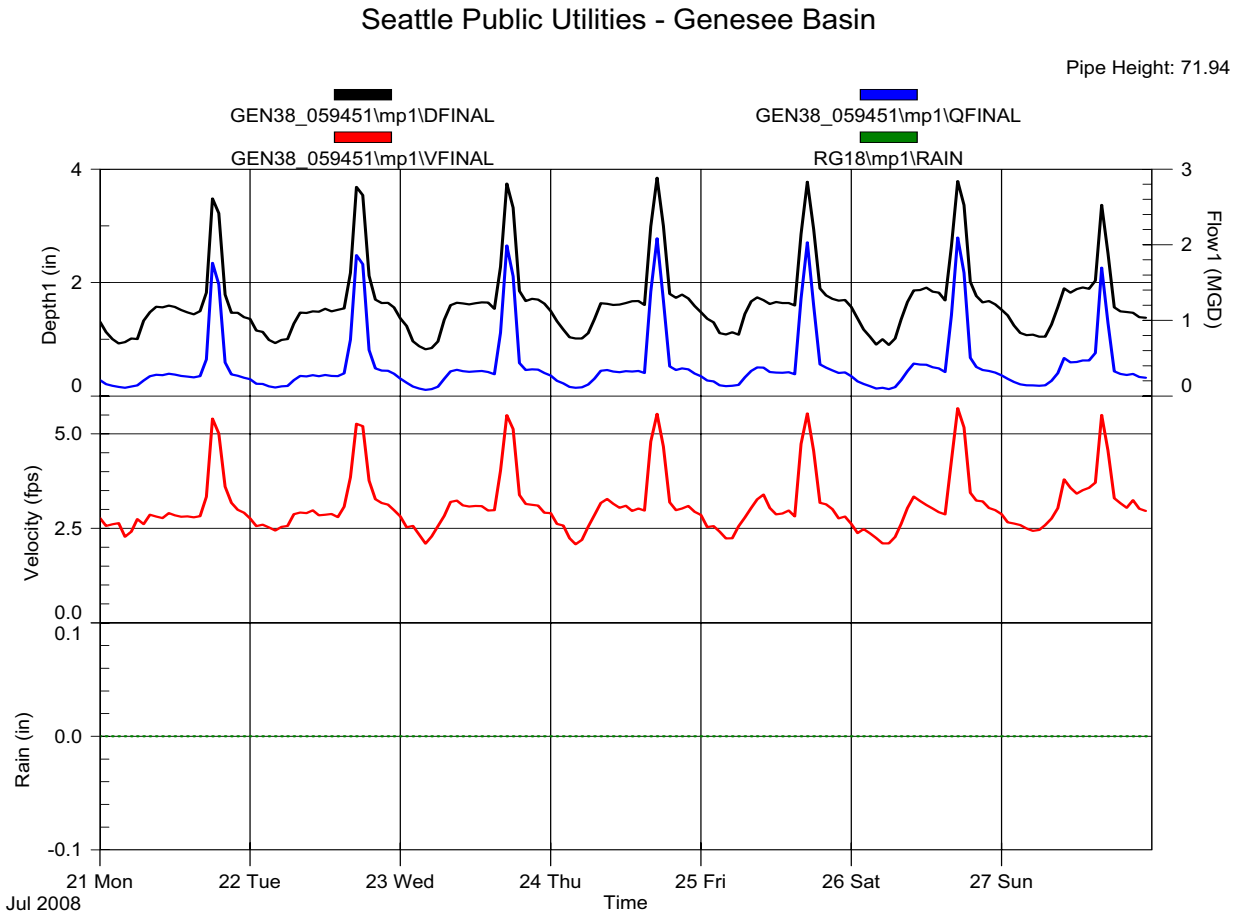

059-443
Flow (MGD), Level (in), Velocity (fps)
Rain (in/5 min)
25
20
15
10
5
0
0
0.05
0.1
0.15
0.2
0.25
0.3
7/21/08
7/22/08
7/23/08
7/24/08
7/25/08
7/26/08
7/27/08
7/28/08
Date
Depth
Velocity
Flow
Rainfall

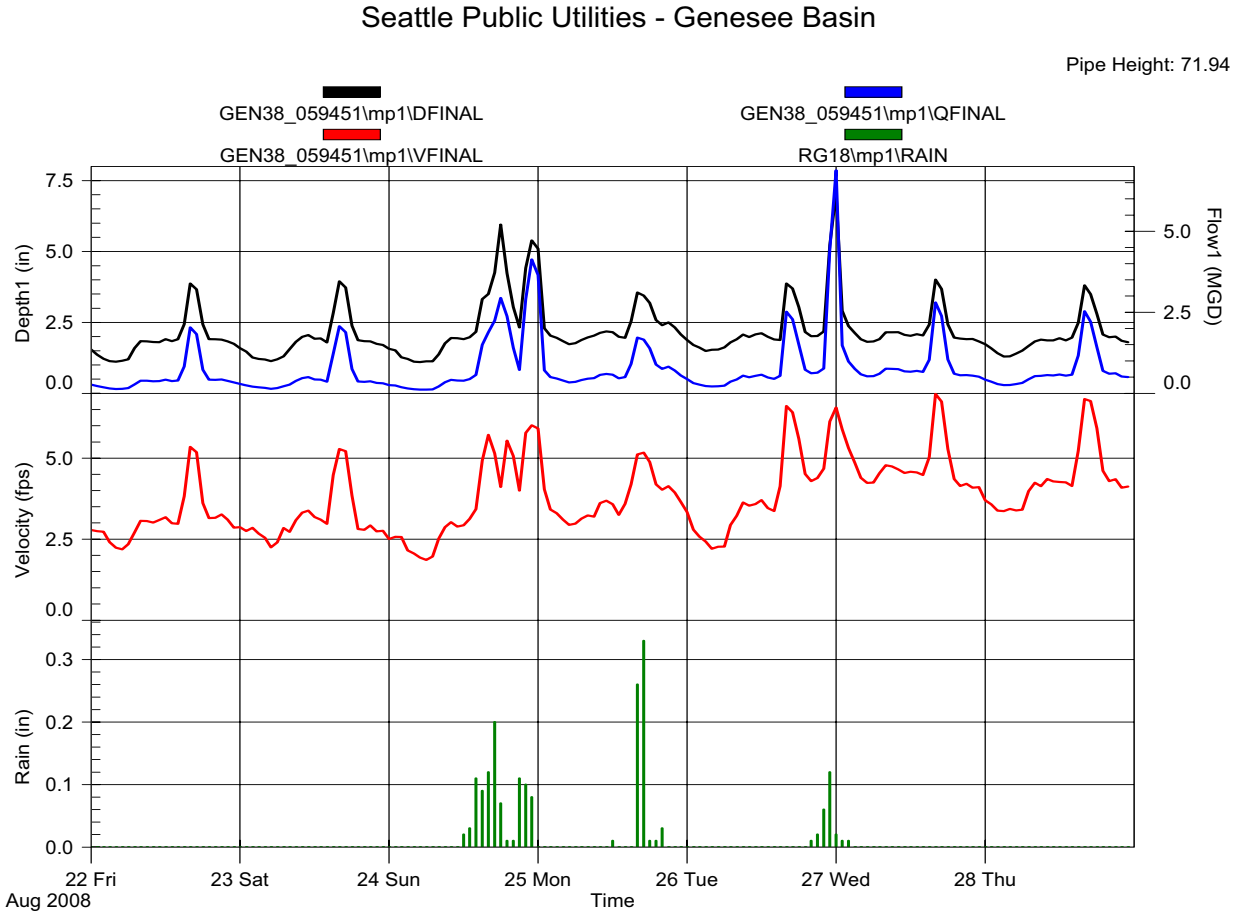

059-443
Flow (MGD), Level (in), Velocity (fps)
Rain (in/5 min)
25
20
15
10
5
0
0
0.05
0.1
0.15
0.2
0.25
0.3
8/22/08
8/23/08
8/24/08
8/25/08
8/26/08
8/27/08
8/28/08
8/29/08
Date
Depth
Velocity
Flow
Rainfall

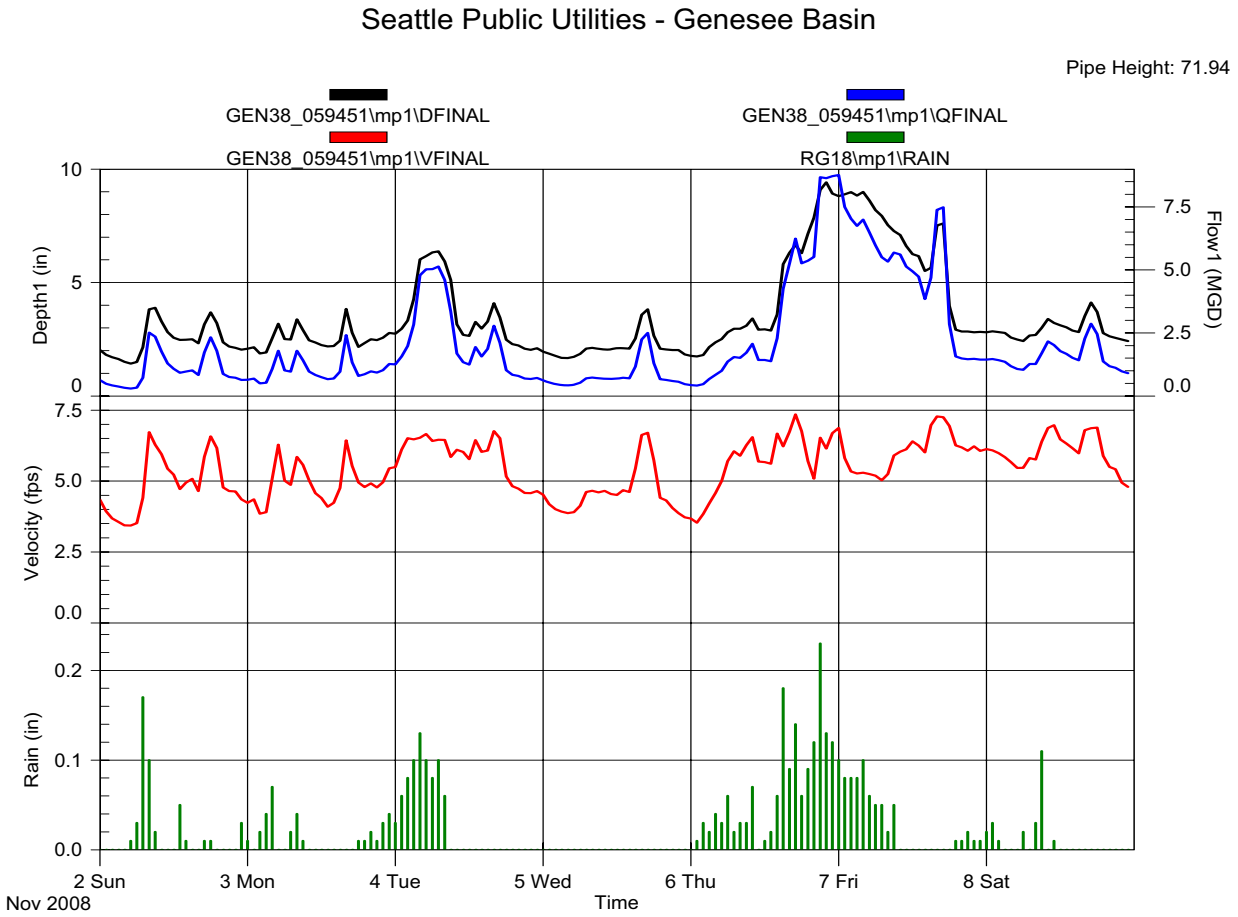

059-443
Flow (MGD), Level (in), Velocity (fps)
Rain (in/5 min)
25
20
15
10
5
0
0
0.05
0.1
0.15
0.2
0.25
0.3
11/2/08
11/3/08
11/4/08
11/5/08
11/6/08
11/7/08
11/8/08
11/9/08
Date
Depth
Velocity
Flow
Rainfall

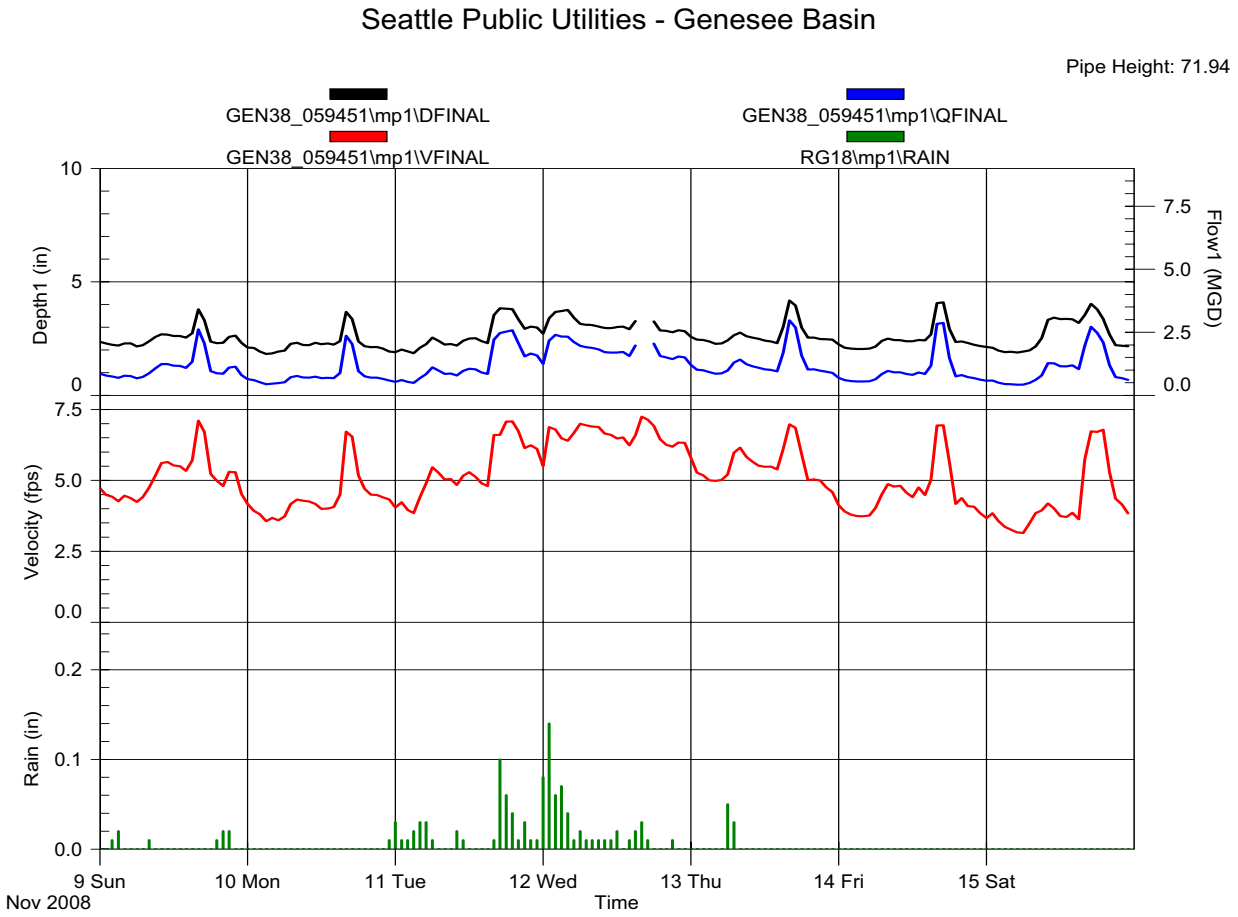

059-443
Flow (MGD), Level (in), Velocity (fps)
Rain (in/5 min)
25
20
15
10
5
0
0
0.05
0.1
0.15
0.2
0.25
0.3
11/9/08
11/10/08
11/11/08
11/12/08
11/13/08
11/14/08
11/15/08
11/16/08
Date
Depth
Velocity
Flow
Rainfall


059-443
Flow (MGD), Level (in), Velocity (fps)
Rain (in/5 min)
25
20
15
10
5
0
0
0.05
0.1
0.15
0.2
0.25
0.3
1/4/09
1/5/09
1/6/09
1/7/09
1/8/09
1/9/09
1/10/09
1/11/09
Date
Depth
Velocity
Flow
Rainfall


Seattle Public Utilities - Genesee Basin
Pipe Height: 71.94
GEN38_059451\mp1\DFINAL
GEN38_059451\mp1\QFINAL
GEN38_059451\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
21 Mon
Jul 2008
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 71.94
GEN38_059451\mp1\DFINAL
GEN38_059451\mp1\QFINAL
GEN38_059451\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
22 Fri
Aug 2008
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 71.94
GEN38_059451\mp1\DFINAL
GEN38_059451\mp1\QFINAL
GEN38_059451\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
2 Sun
Nov 2008
3 Mon
4 Tue
5 Wed
6 Thu
7 Fri
8 Sat
Time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Velocity (fps)
Rain (in)
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Nov 2008
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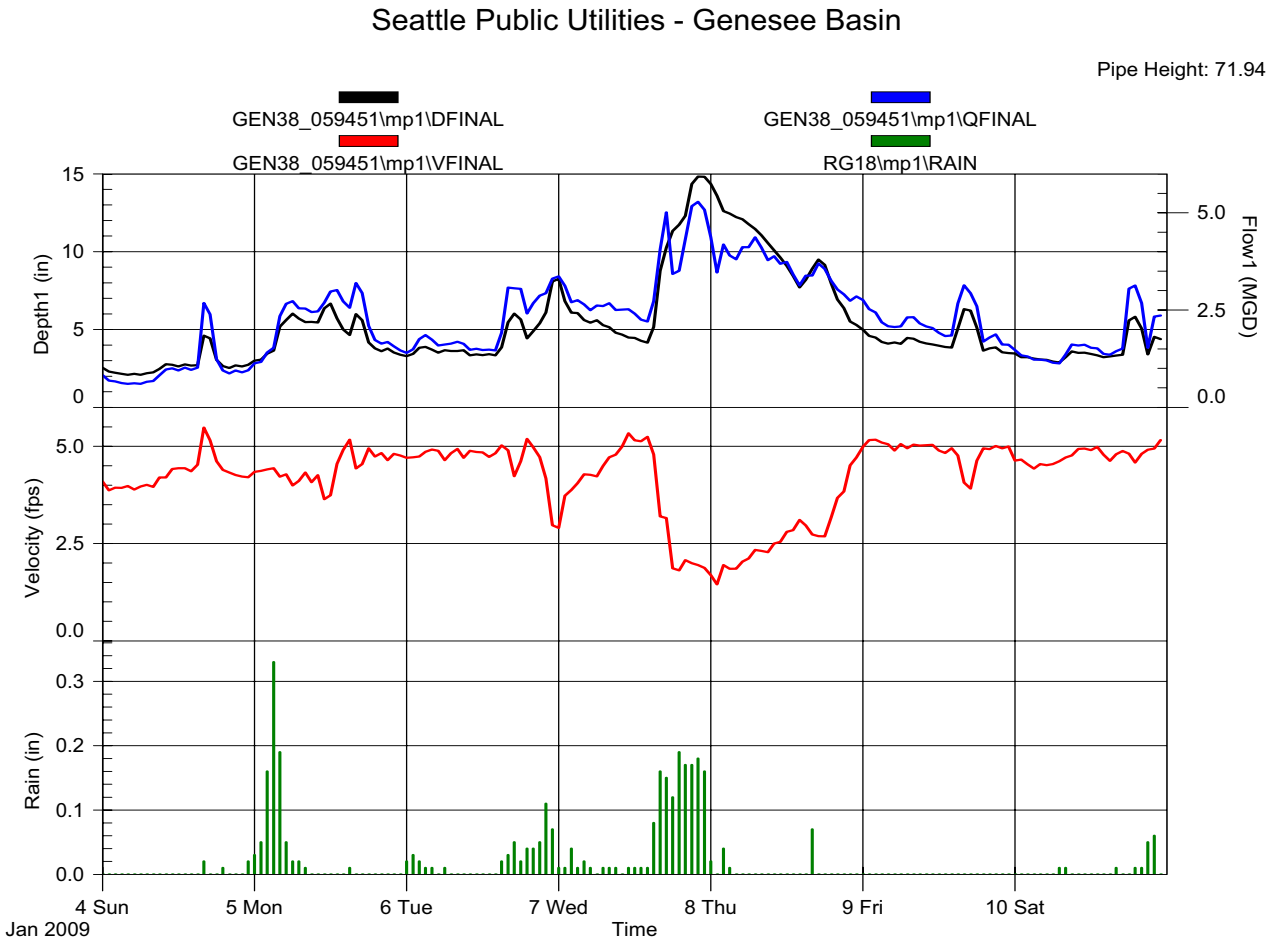
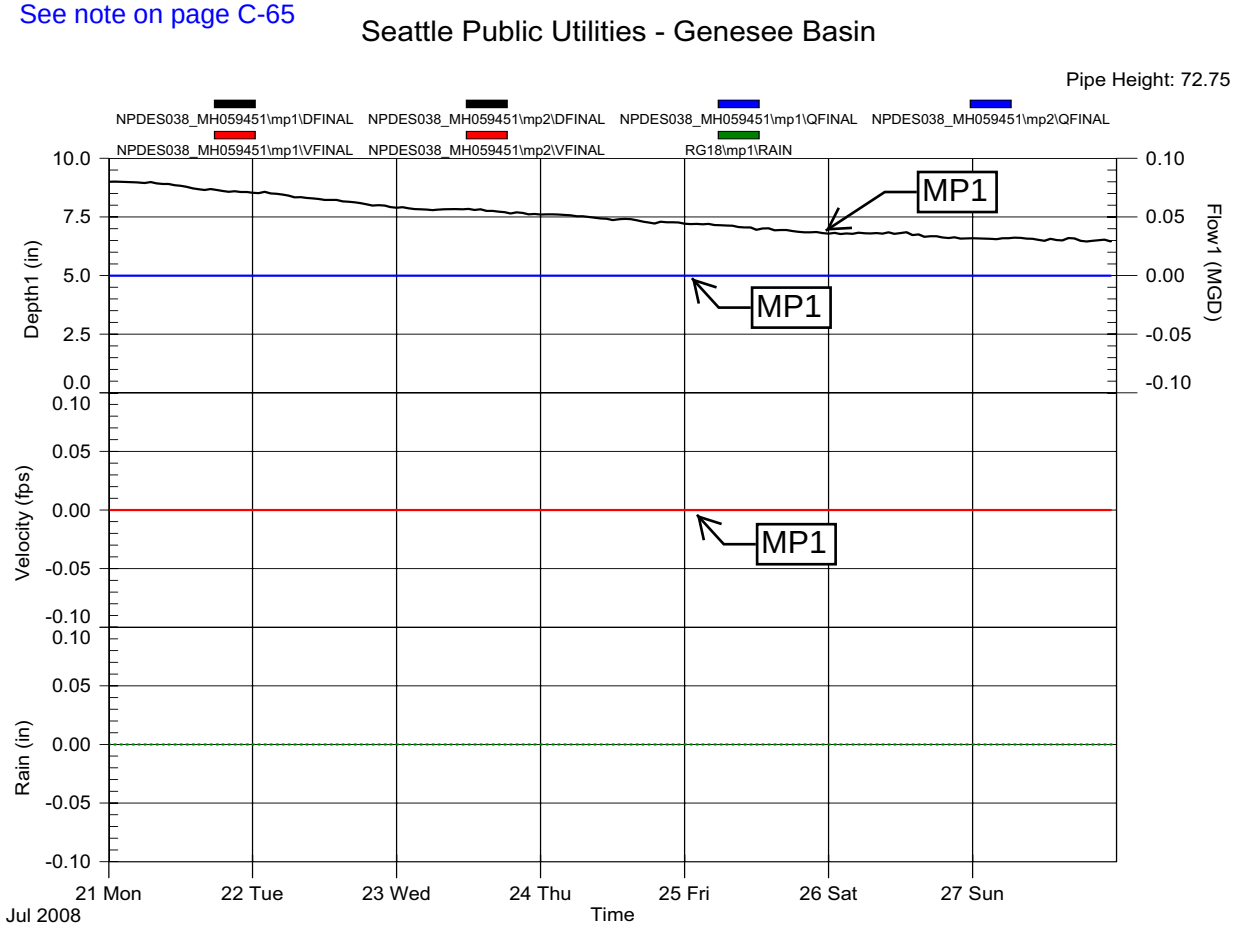
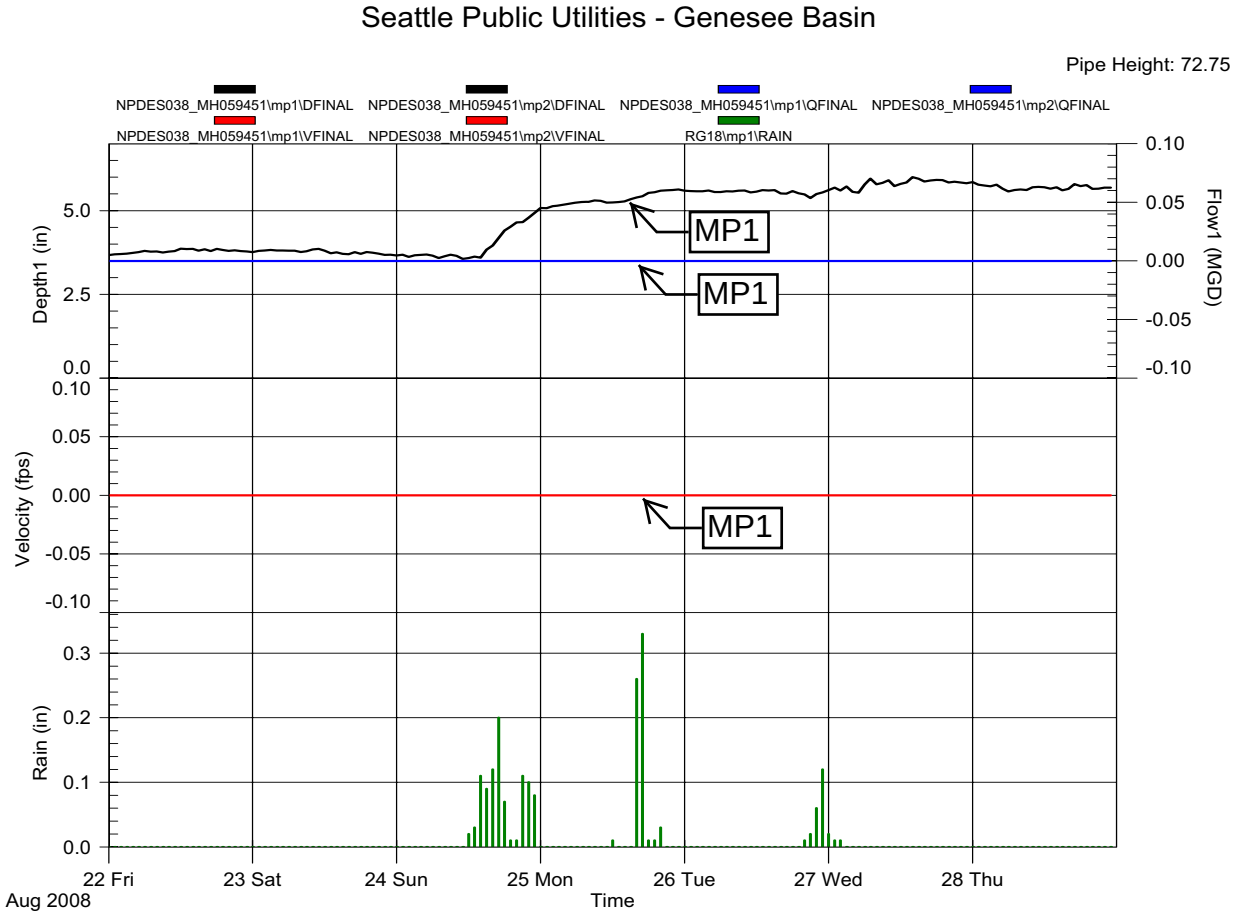


Flow records at 059-346, over the horseshoe weir from 059-451, do not show flow during the January 7, 2009 event. Depths at 059-451 indicate flows above the horseshoe weir, and thus contradict the hydrograph for 059-346 (Page C-19). This situation is described more fully in Section 4.6.1 in the Report.

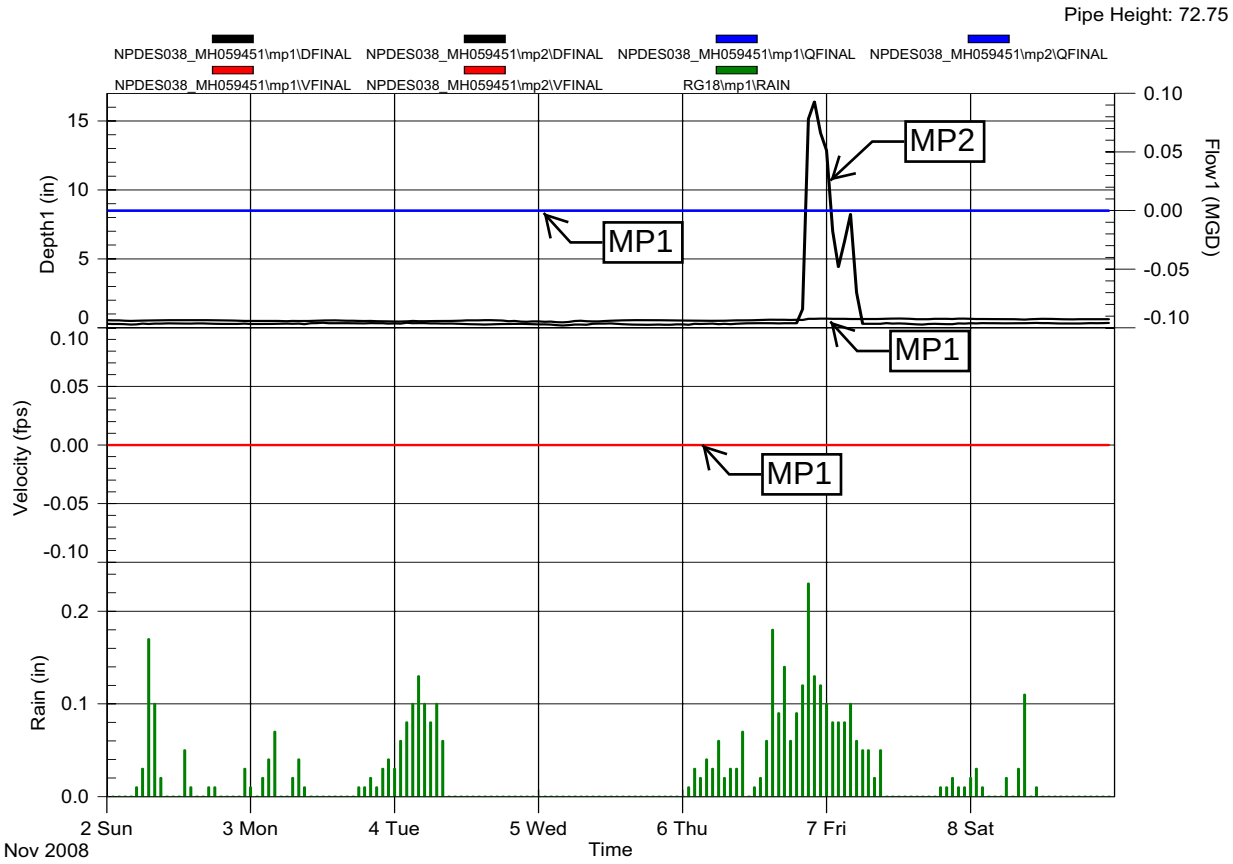
See note on page C-65



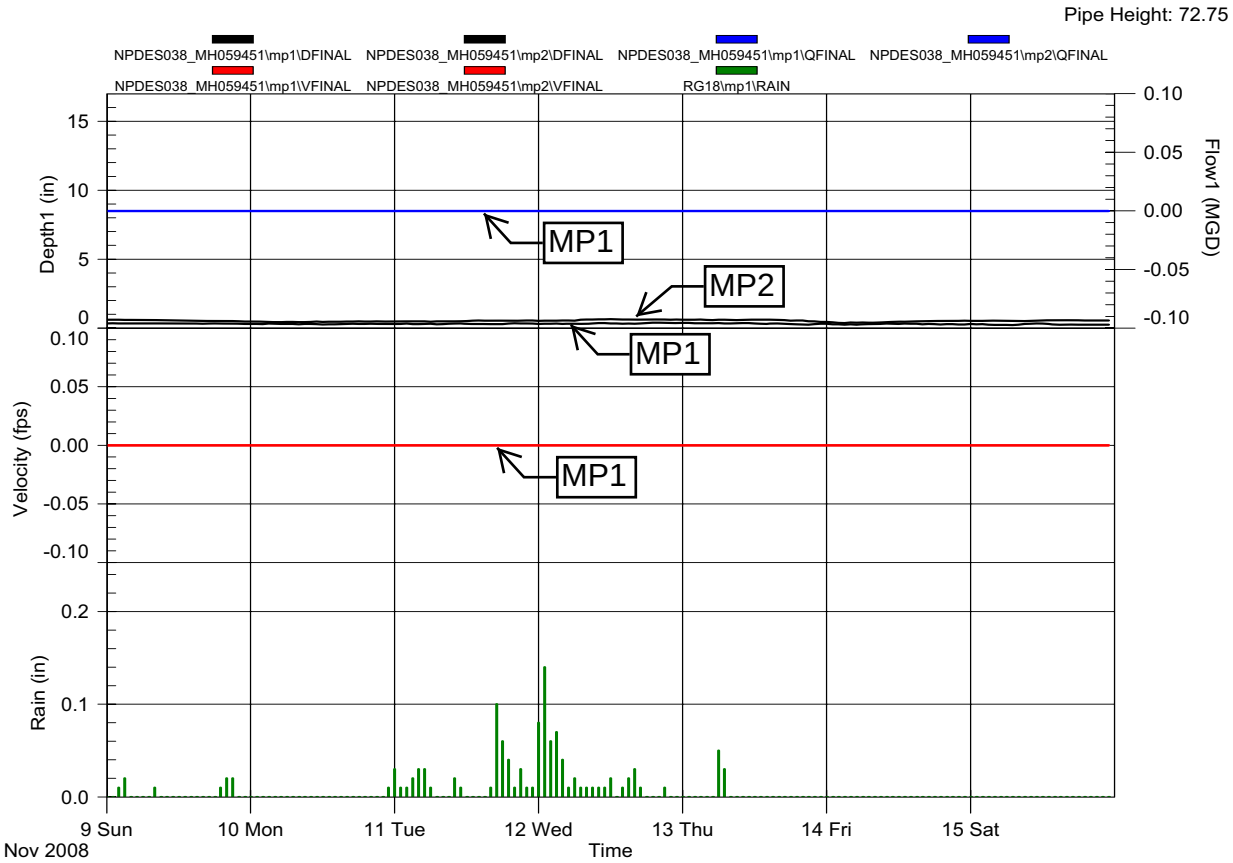


See note on page C-65

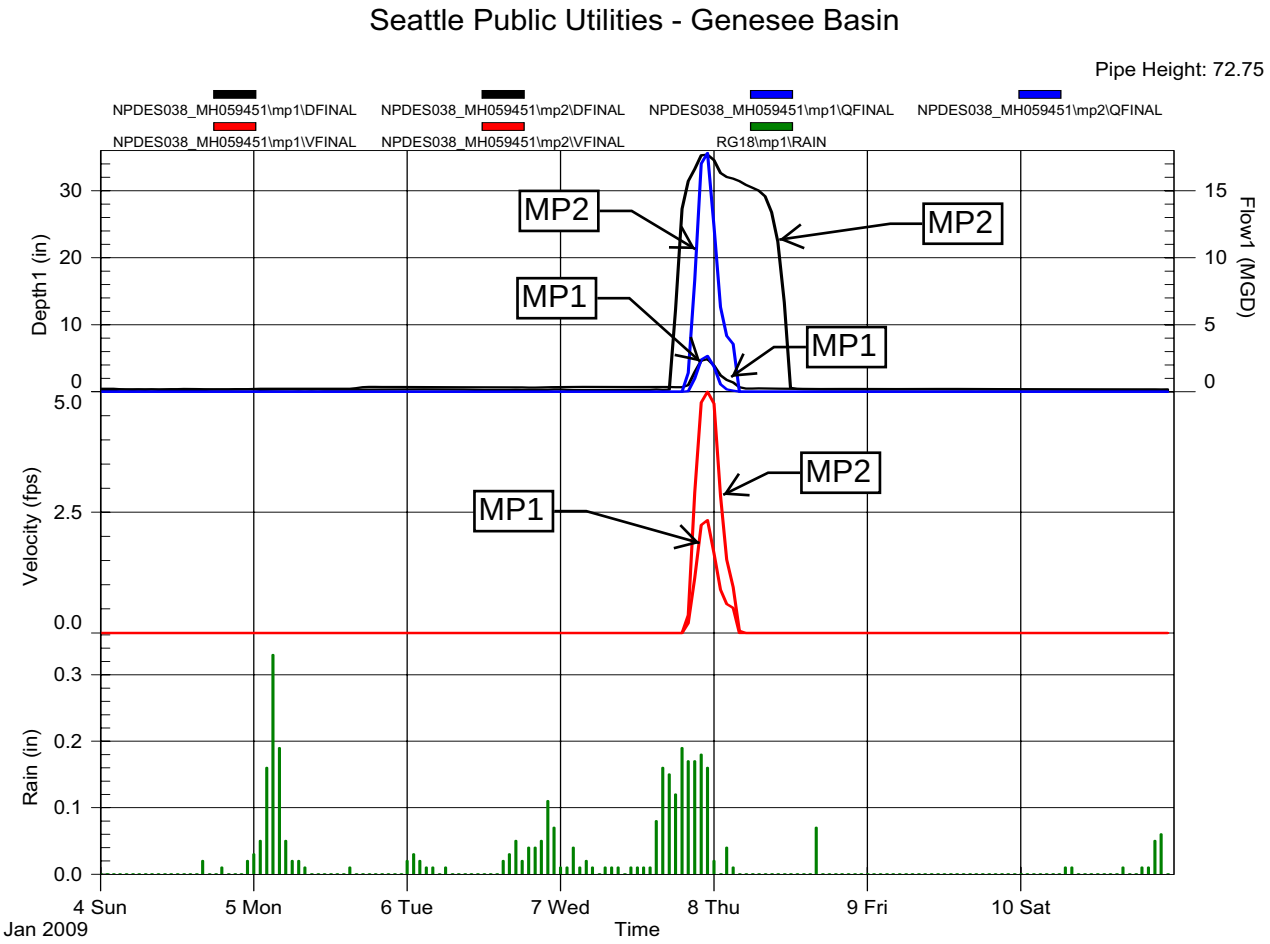
Seattle Public Utilities - Genesee Basin

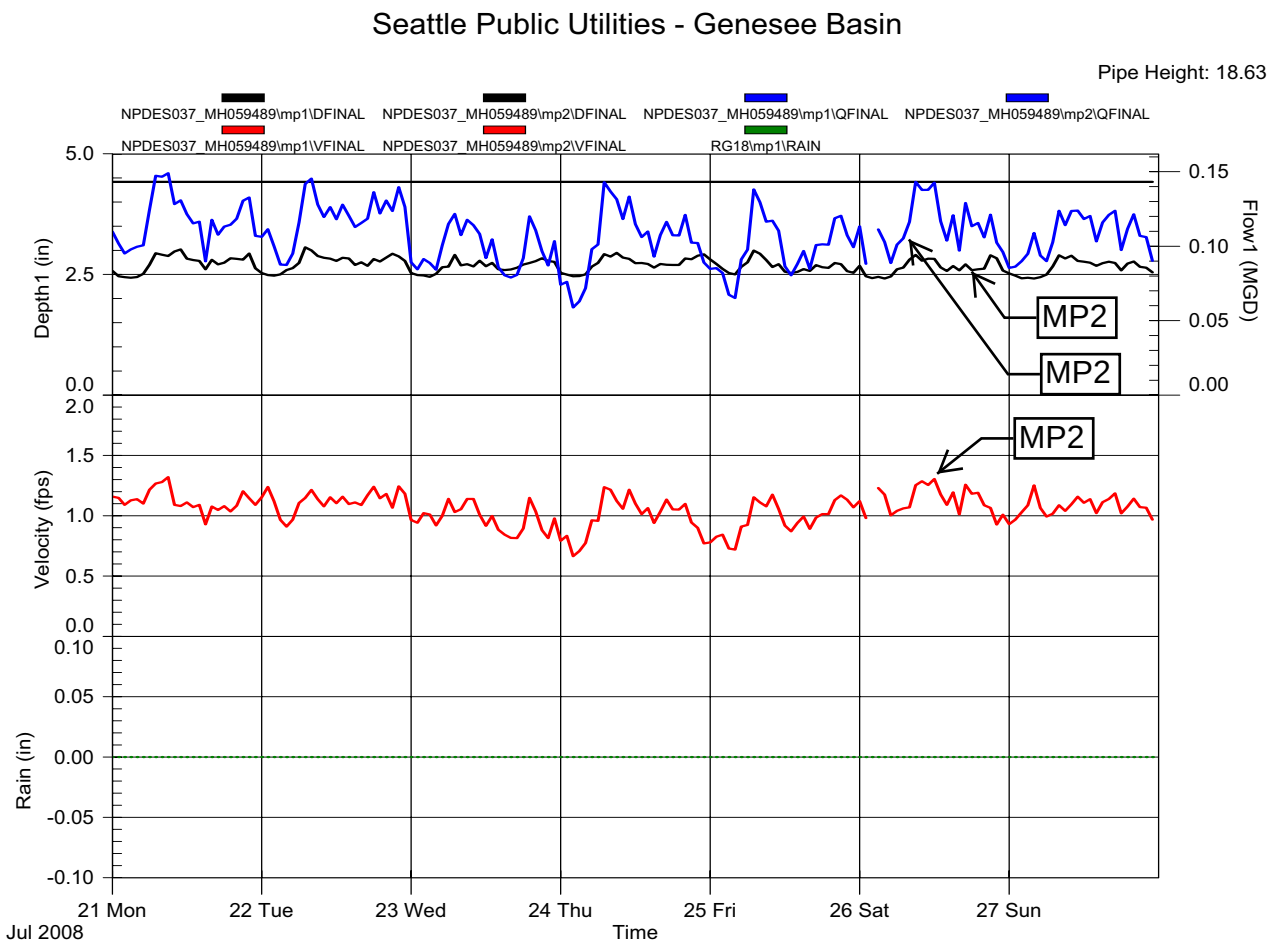


Seattle Public Utilities - Genesee Basin



Note: NPDES_38 MH059451 was incorrectly labeled. This site is at MH 059-574 and 059-346, not MH 059-451. Continued monitoring at this site can be found under the label "NPDES038_MH059574." This site is also known as "Structure A". Please see Section 3.2 *059-451 "A" (Monitoring ID NPDES38_059-451, Structure "A")* in the report for more details.

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NPDES037_MH059489\mp2\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
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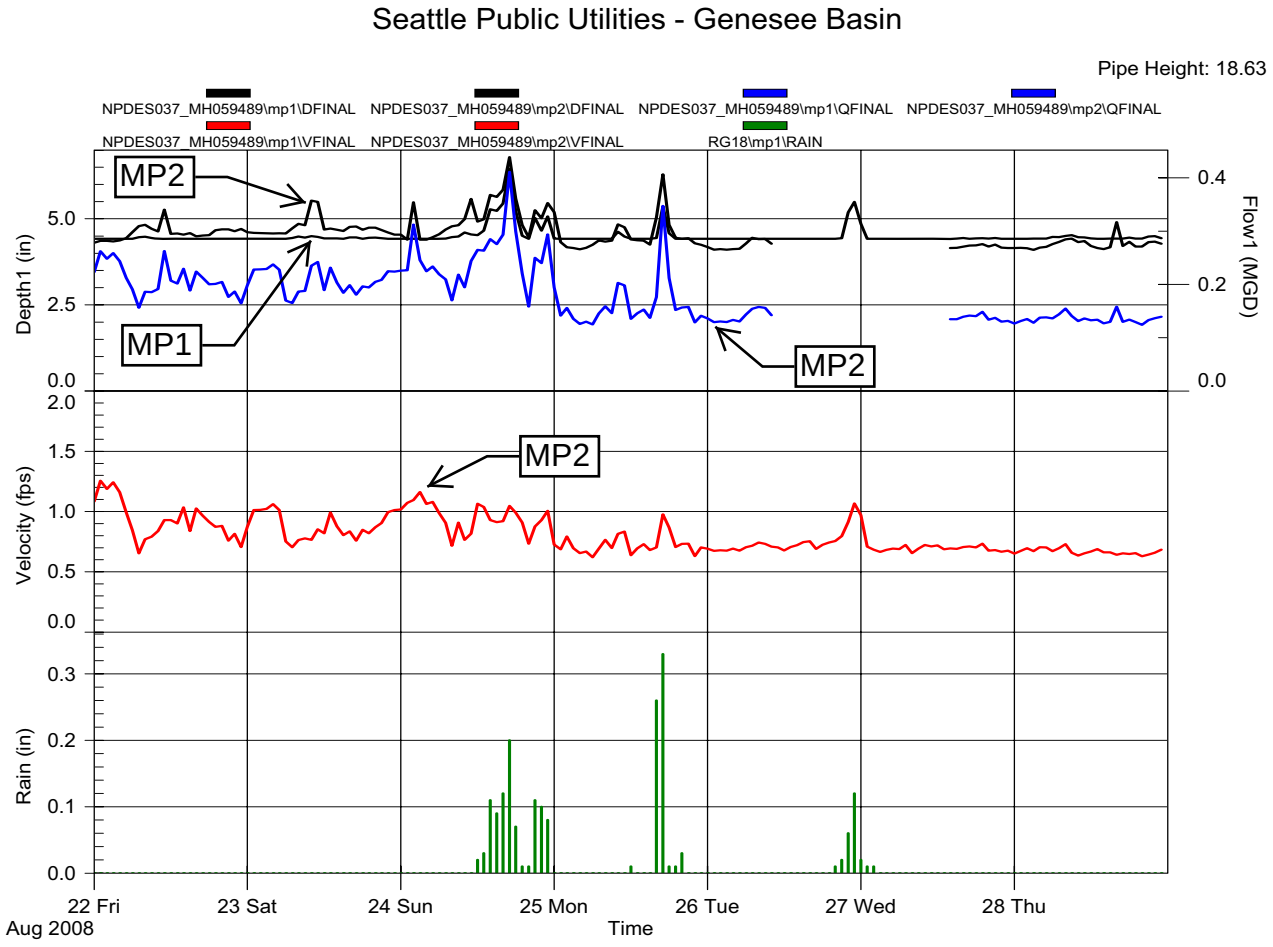
Time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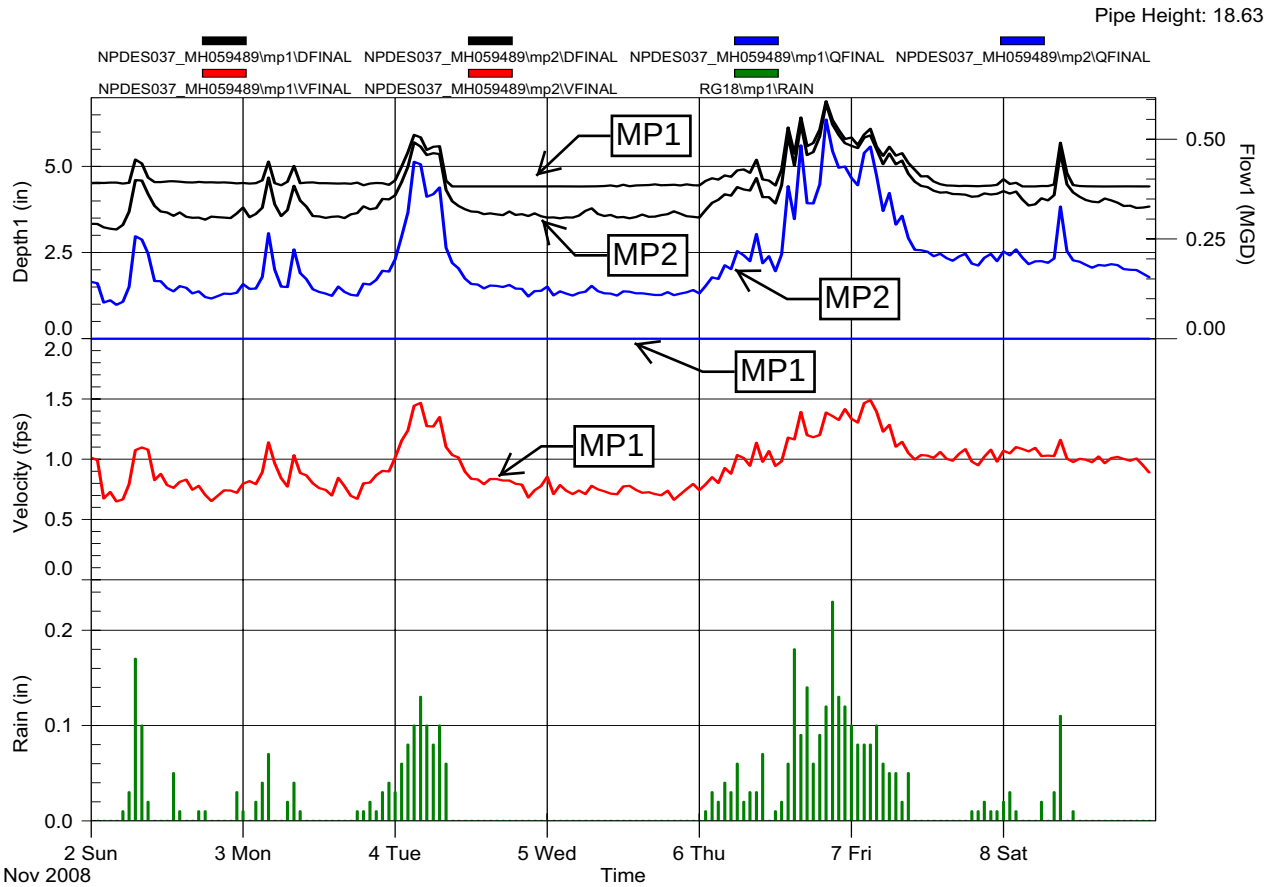
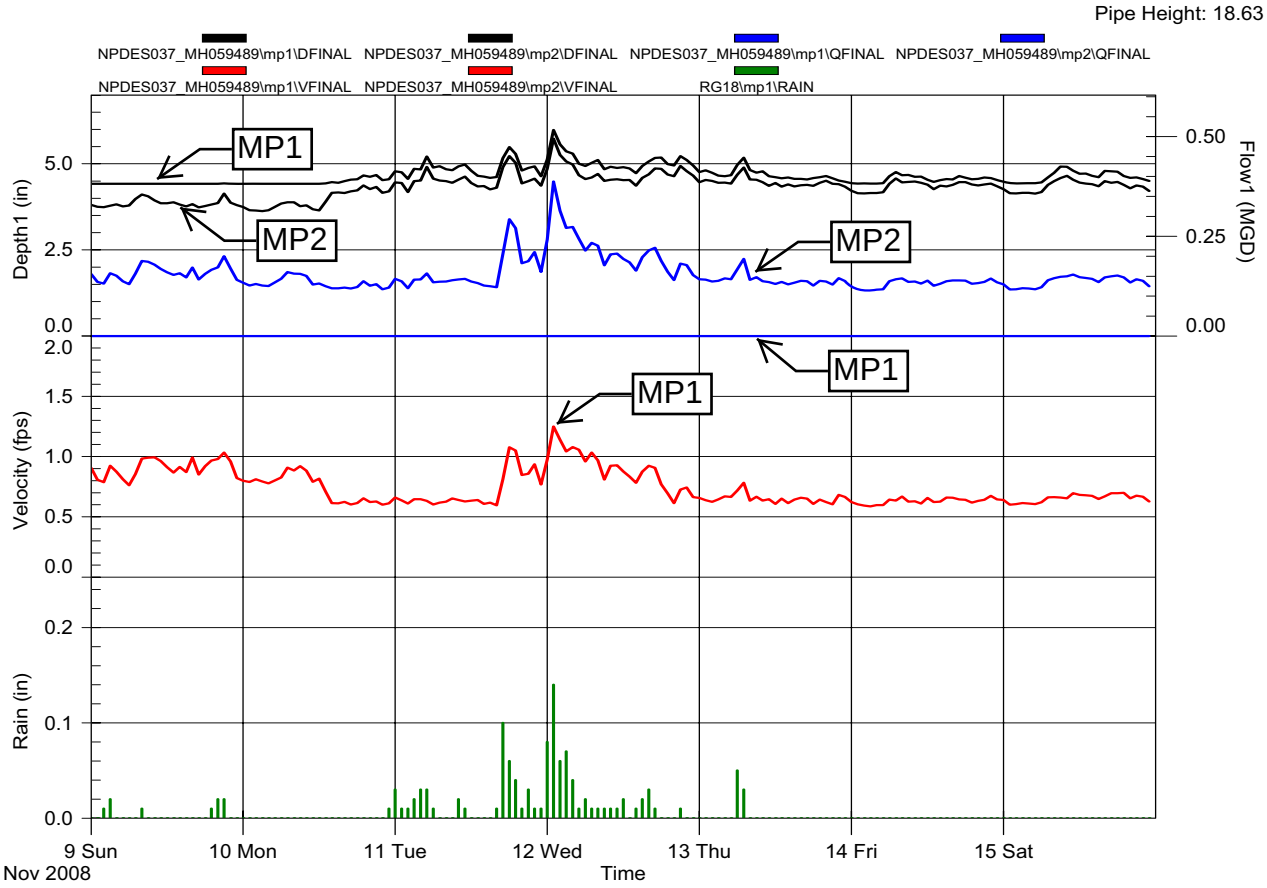
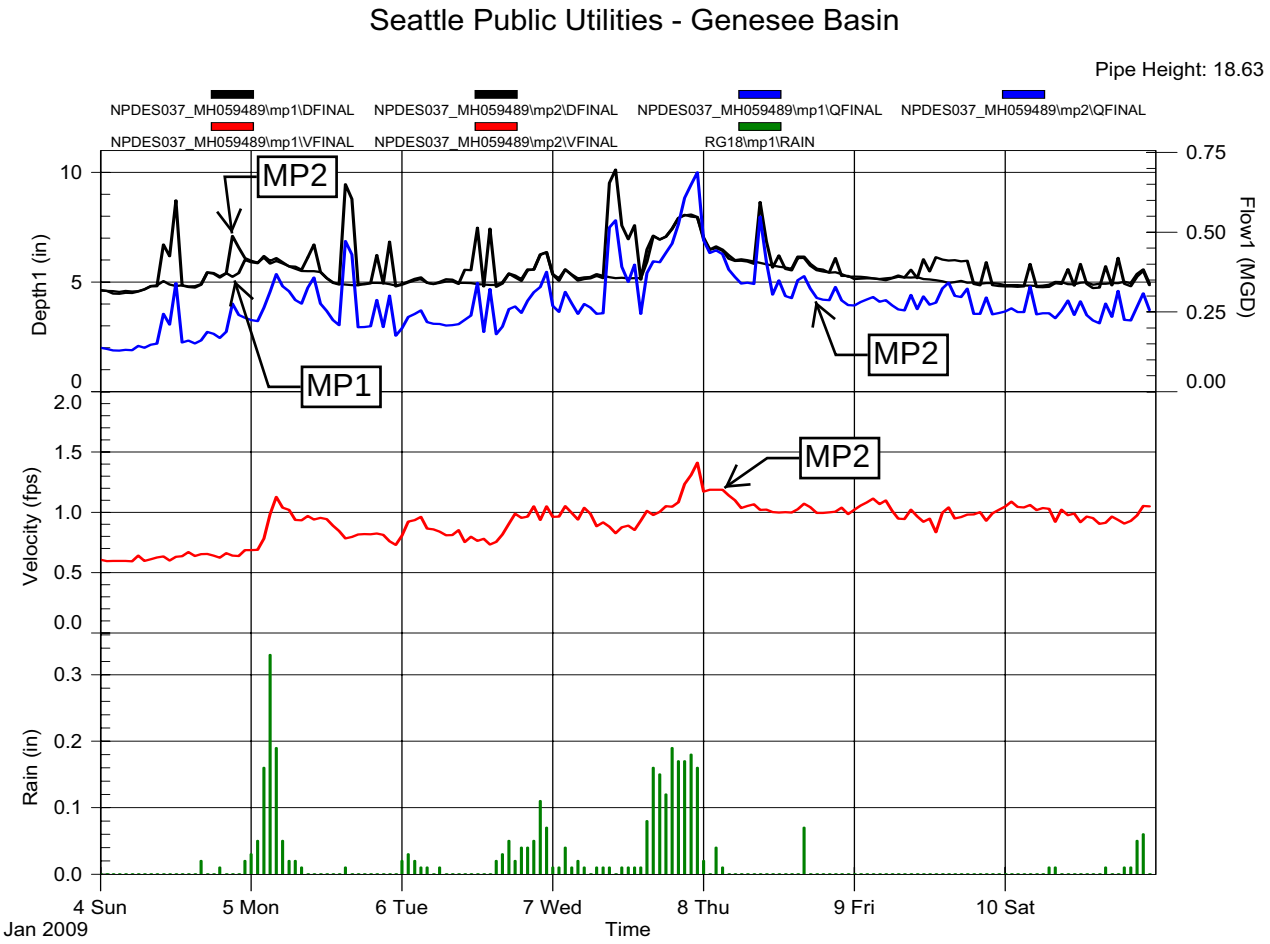
Seattle Public Utilities - Genesee Basin



Seattle Public Utilities - Genesee Basin

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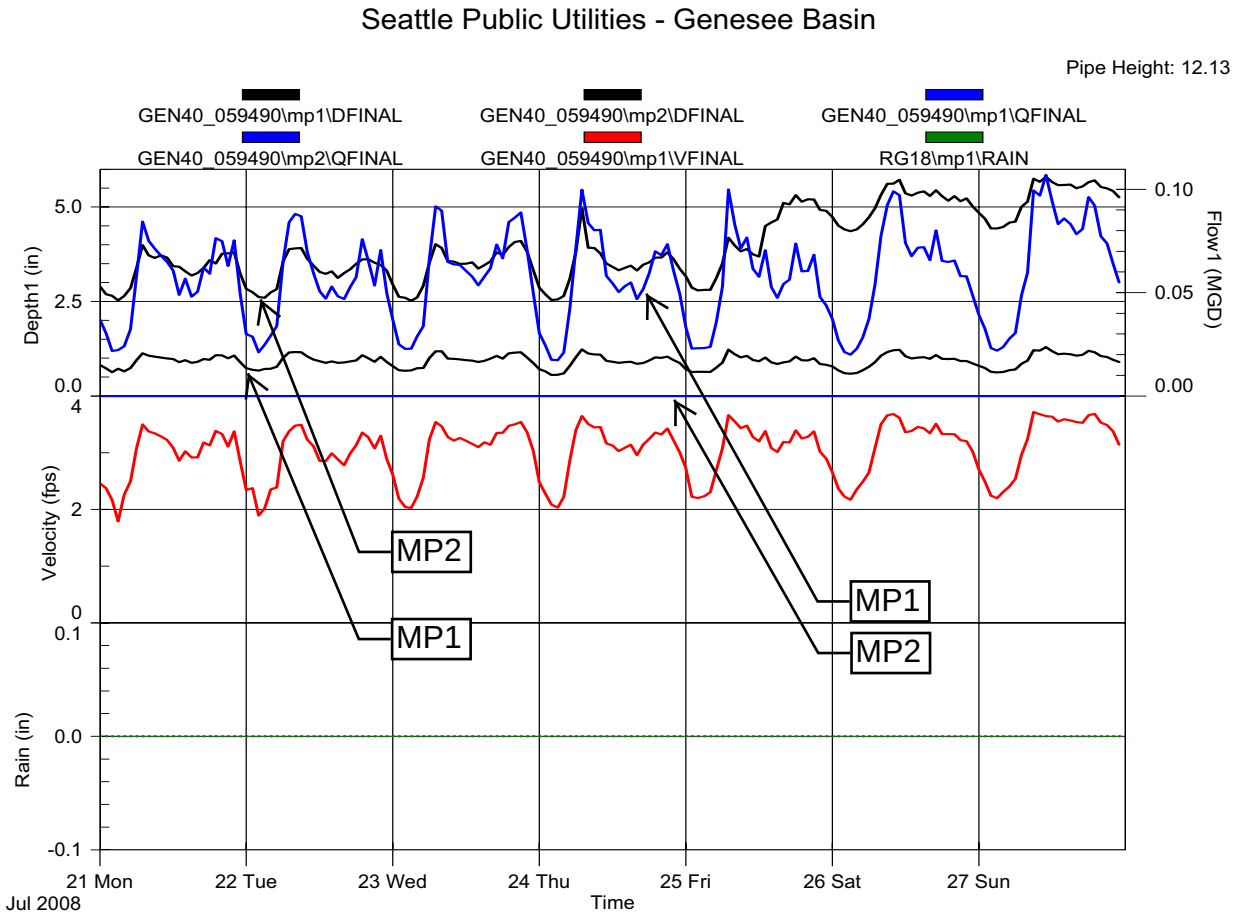
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Flow1 (MGD)
Velocity (fps)
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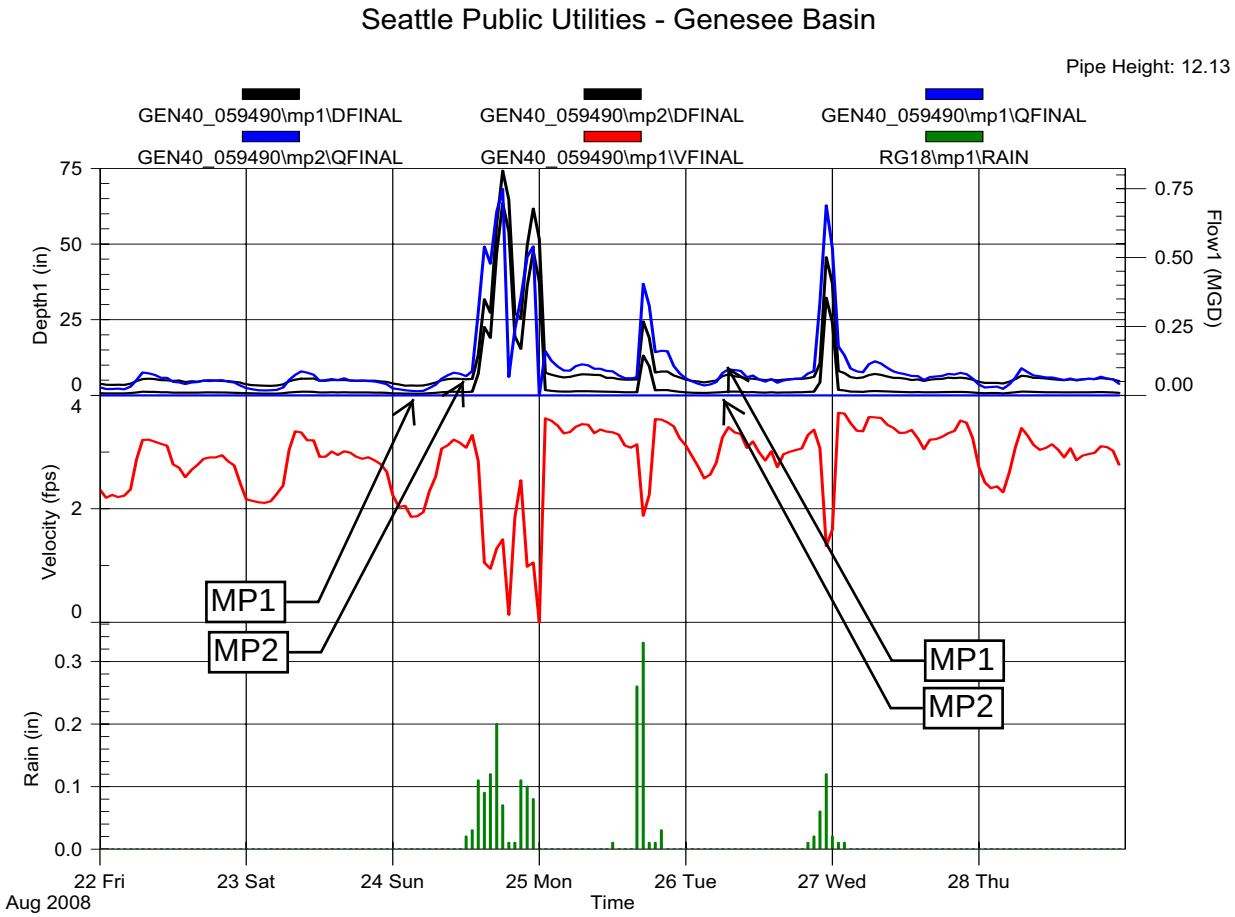
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Velocity (fps)
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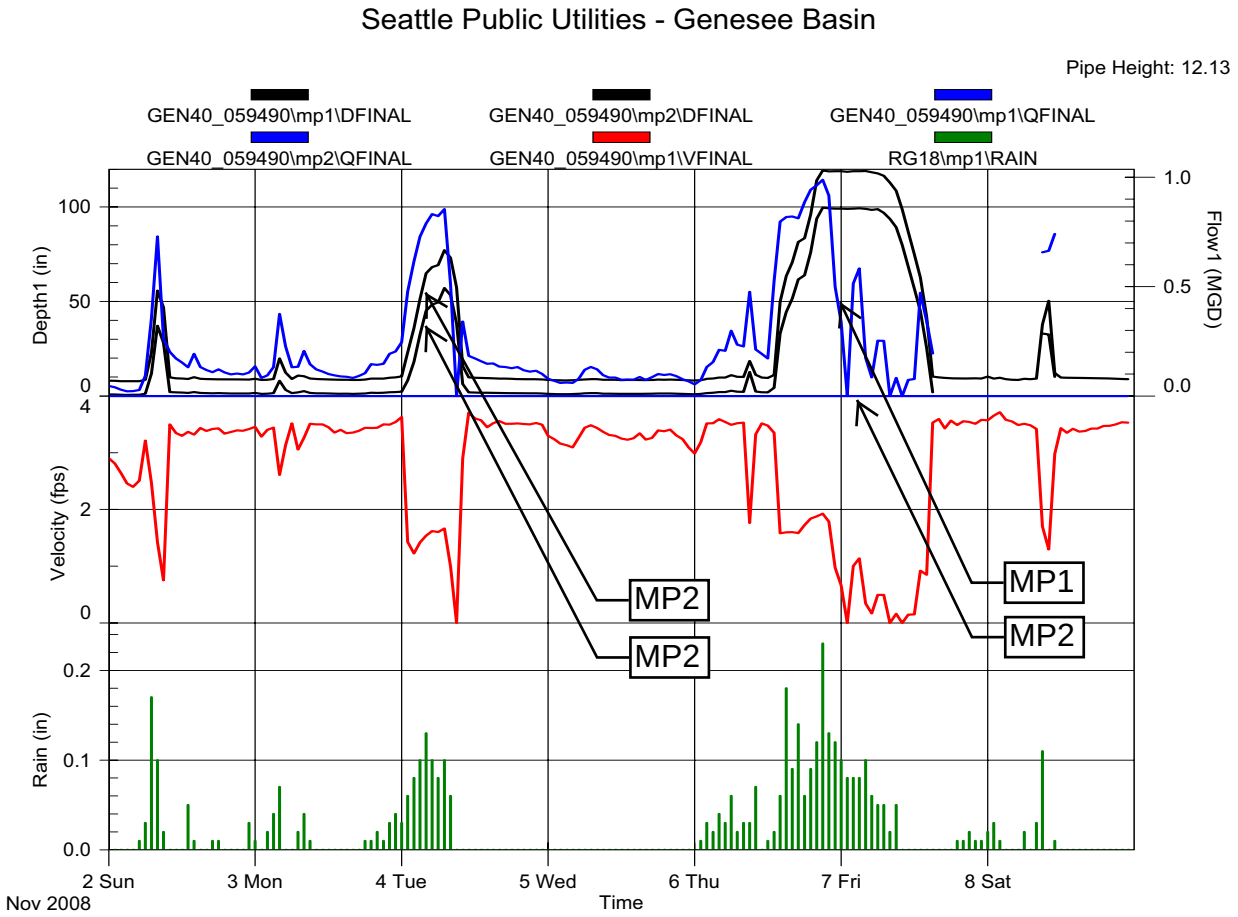
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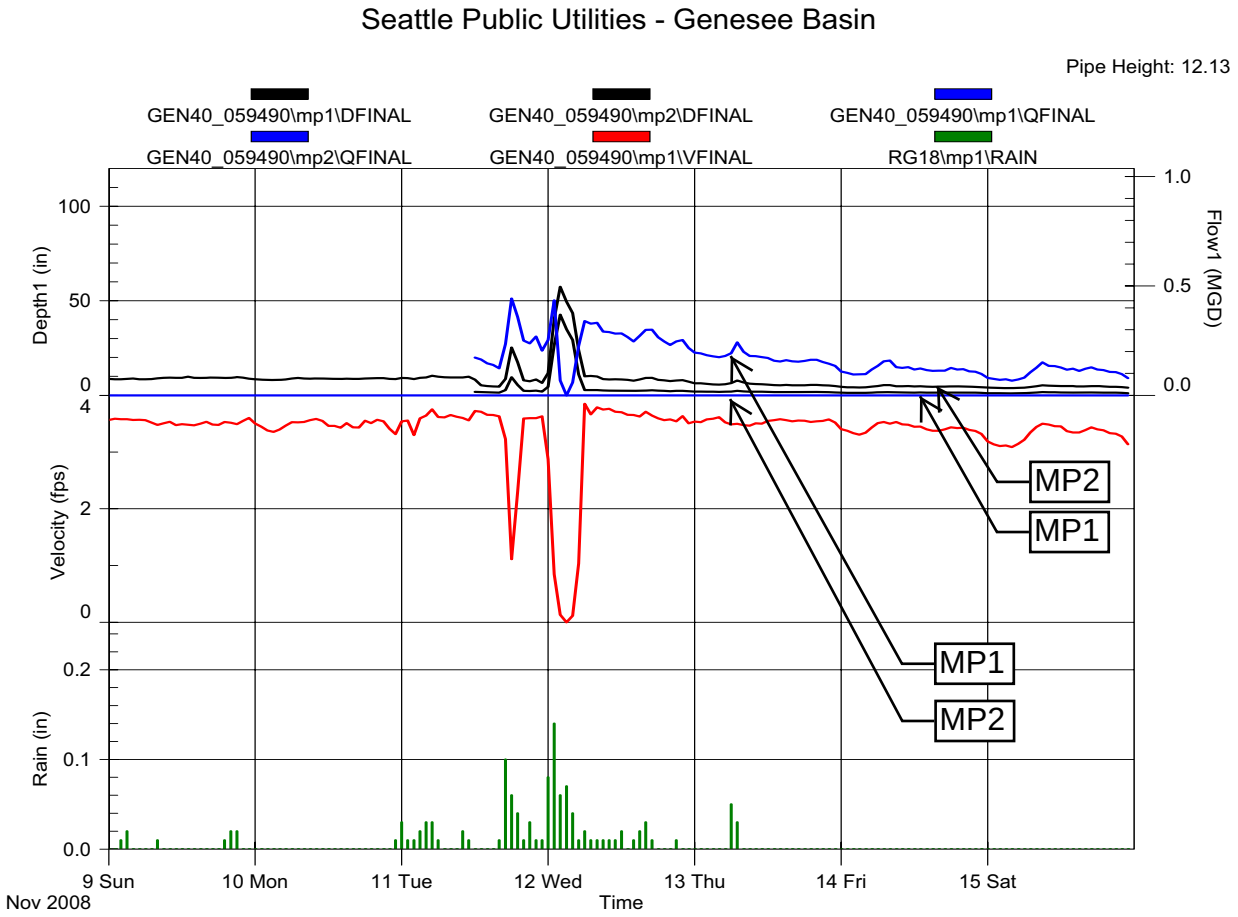
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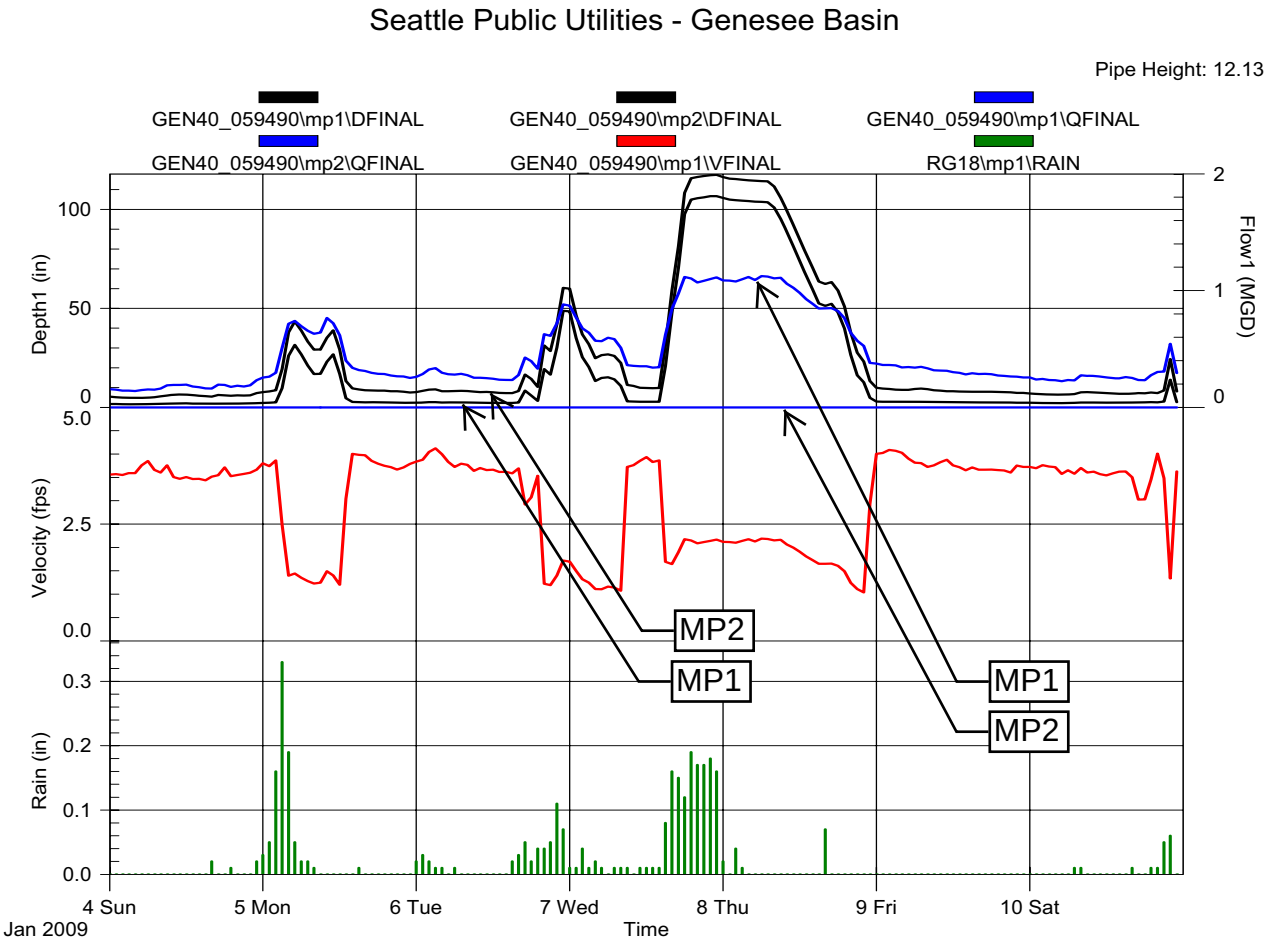
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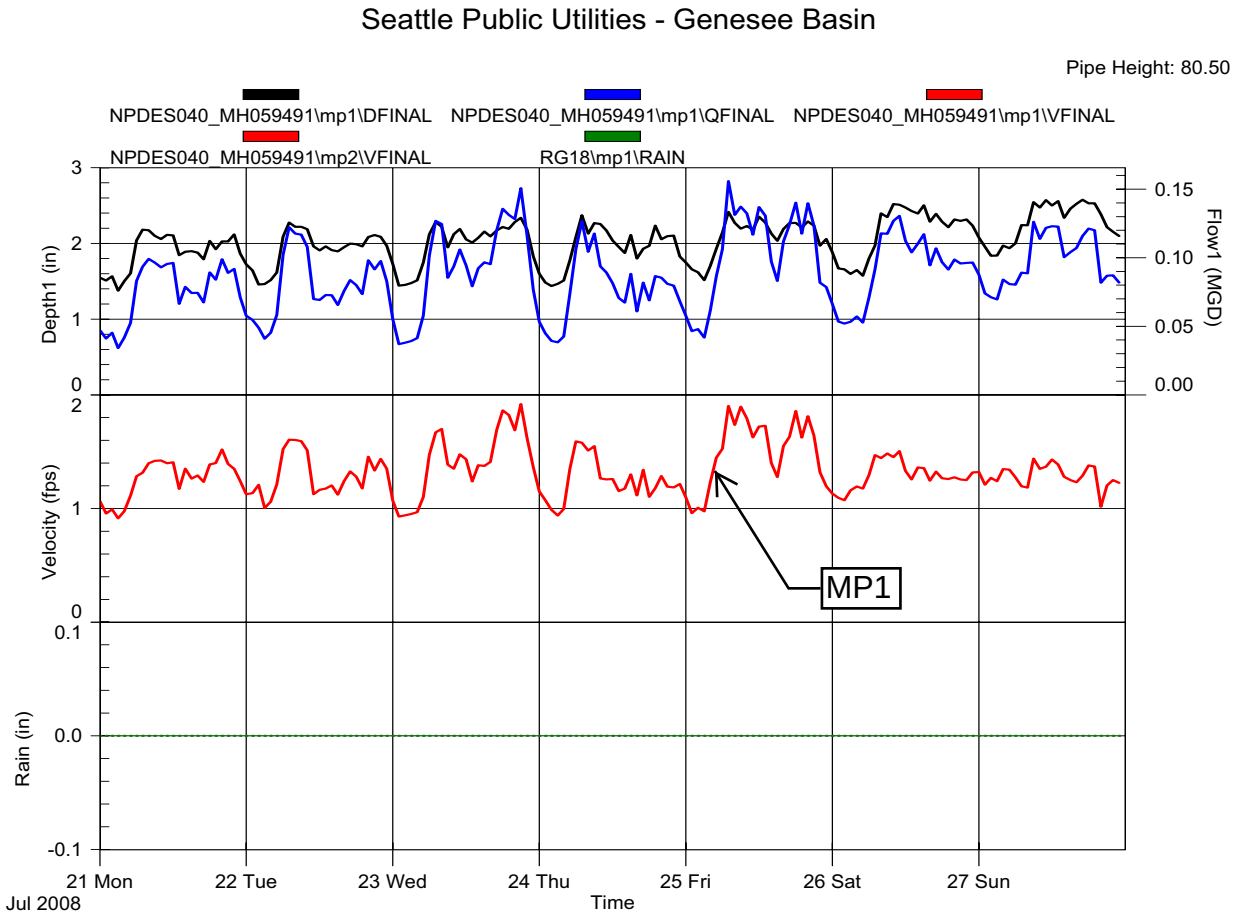
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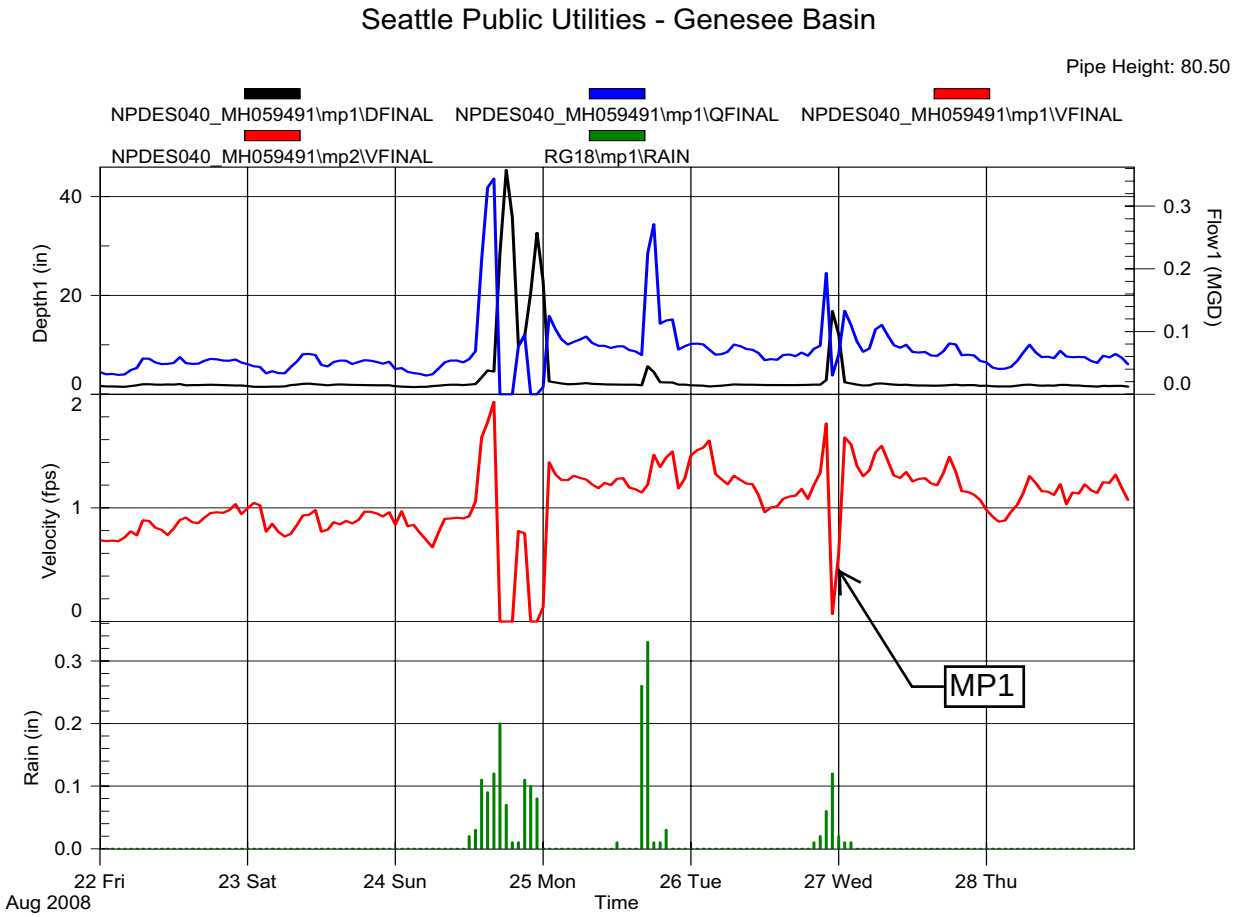
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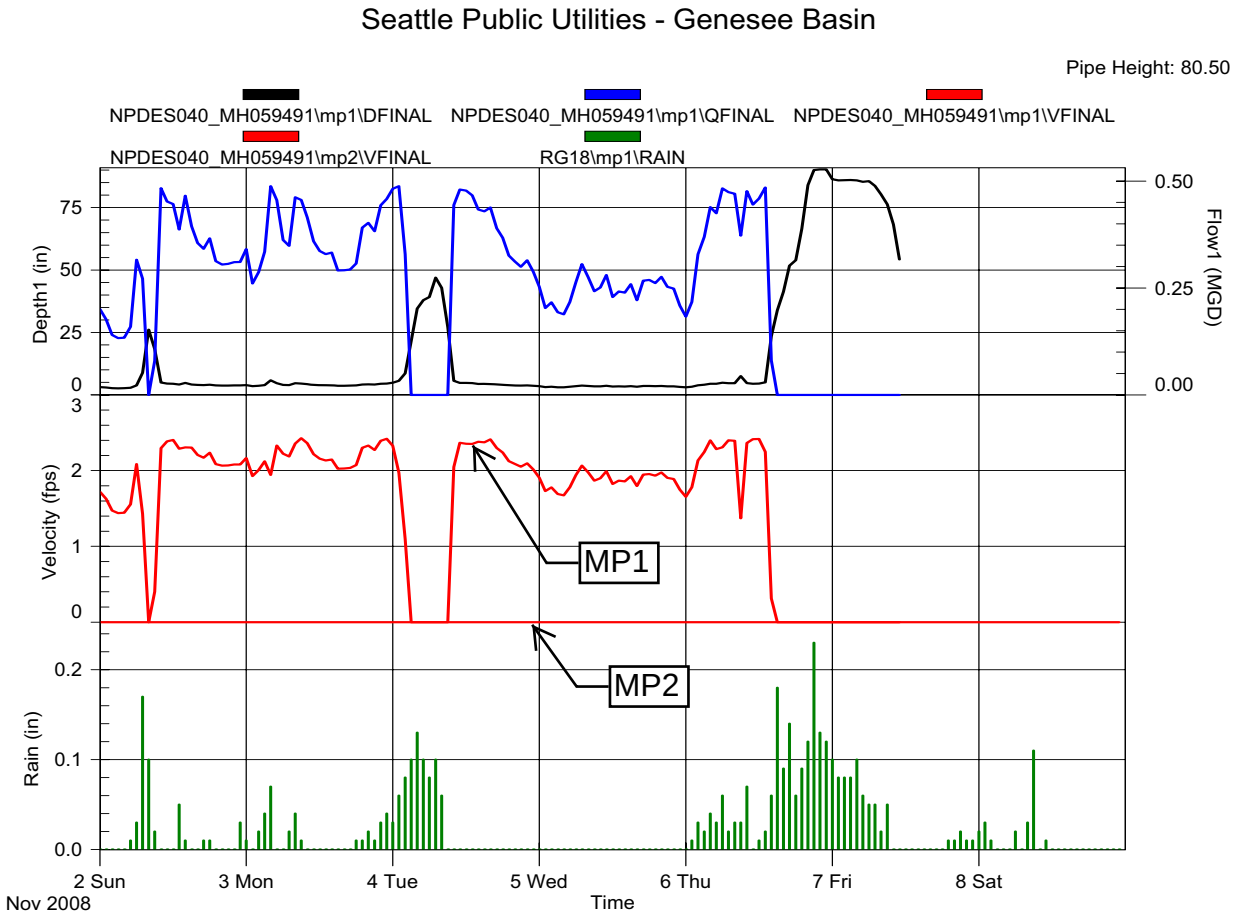
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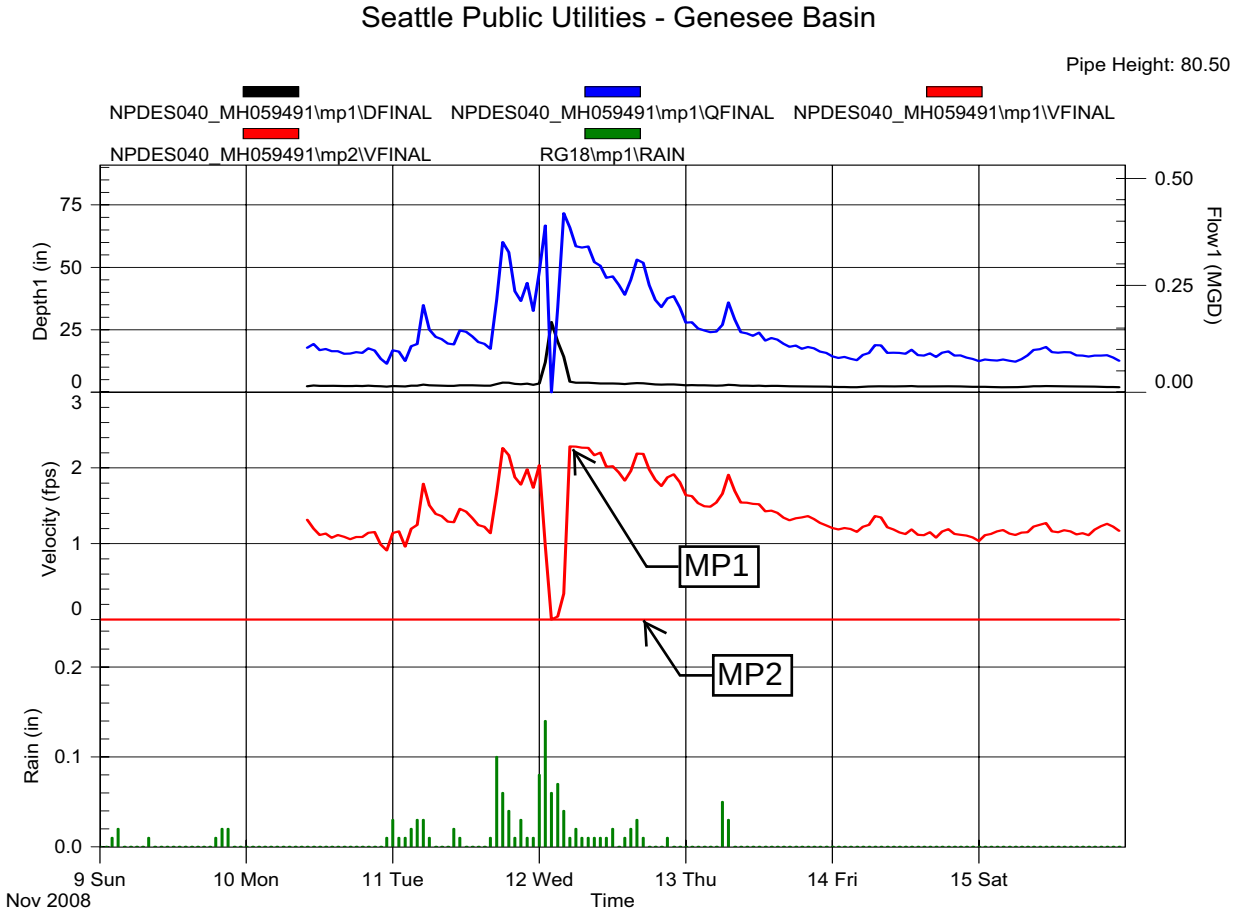
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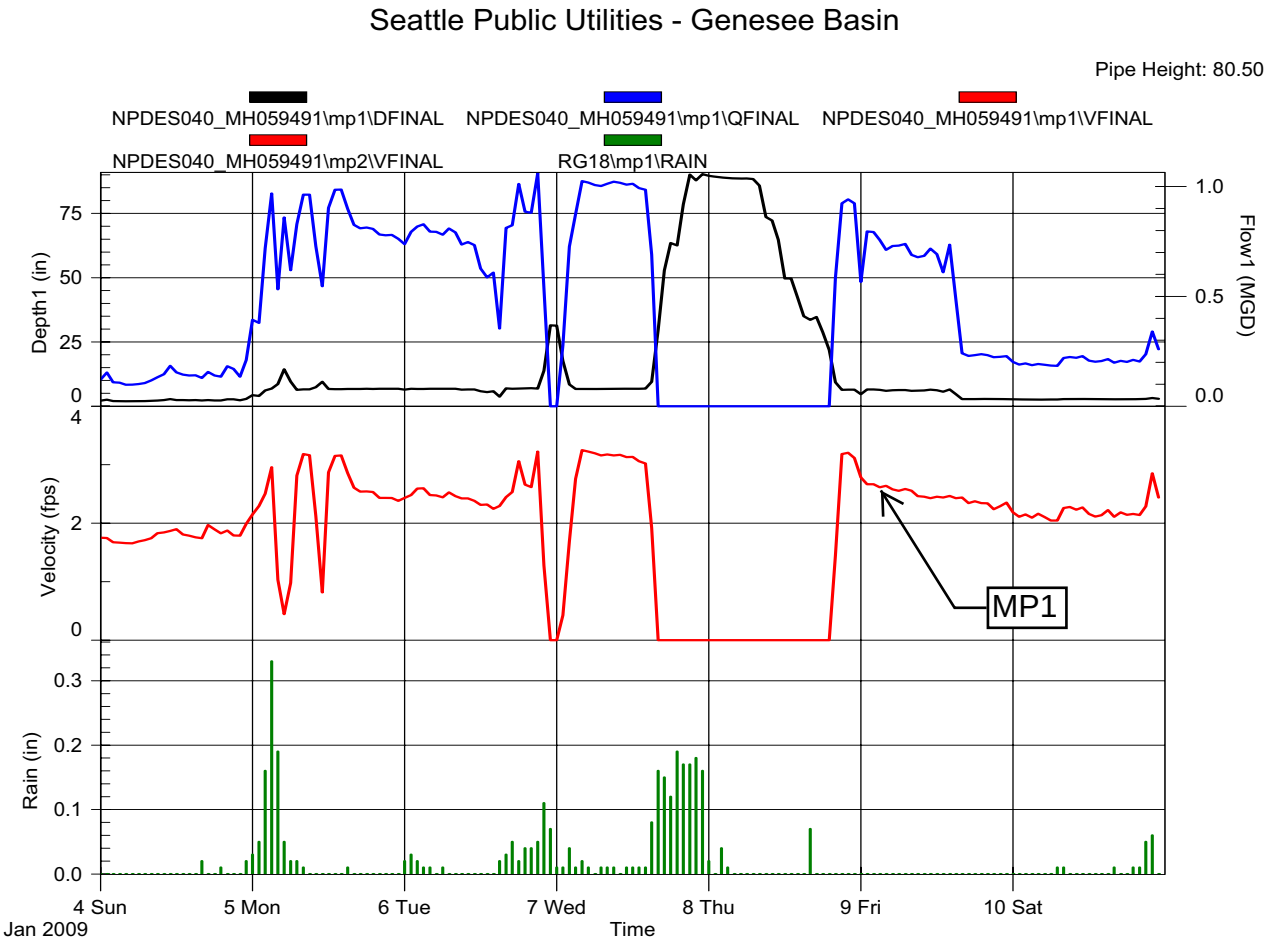
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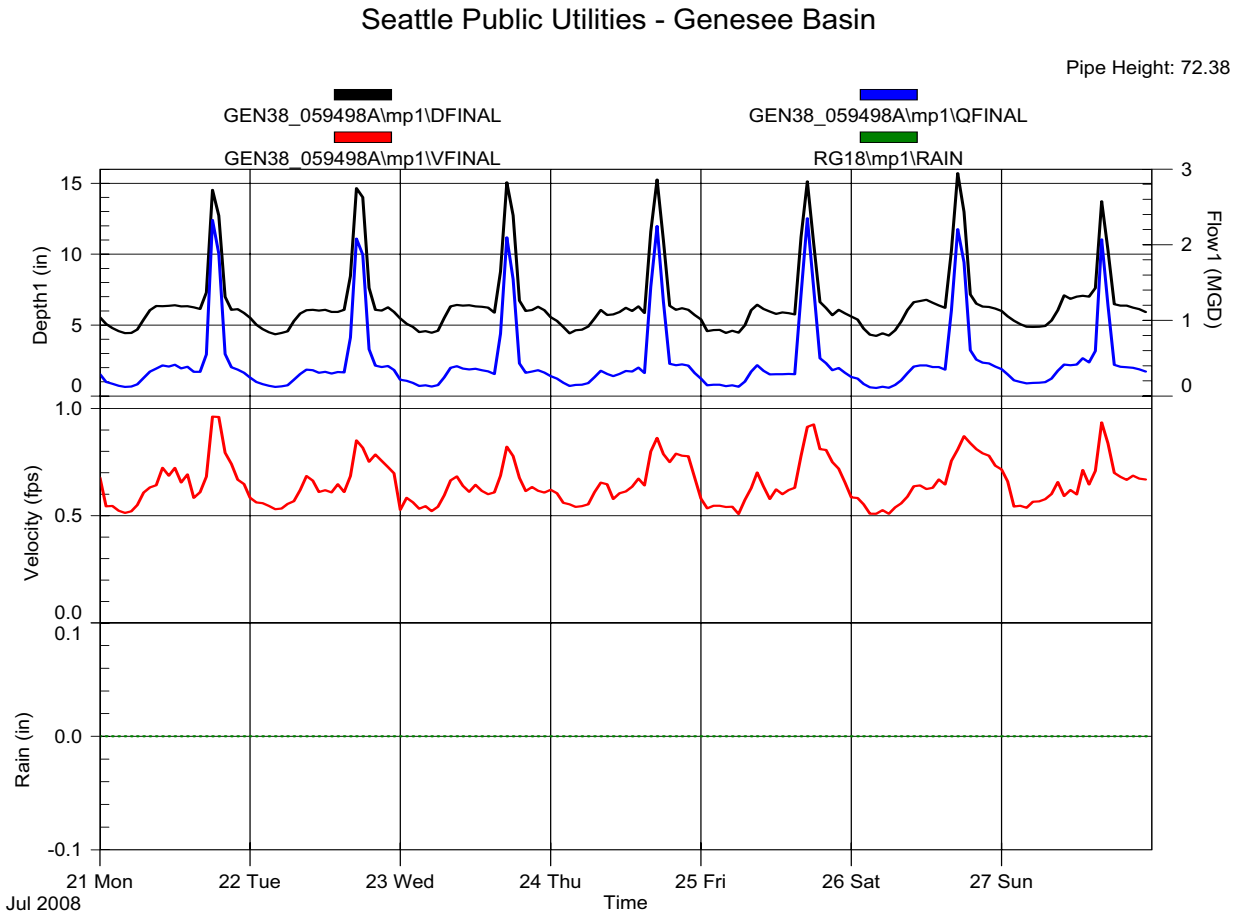
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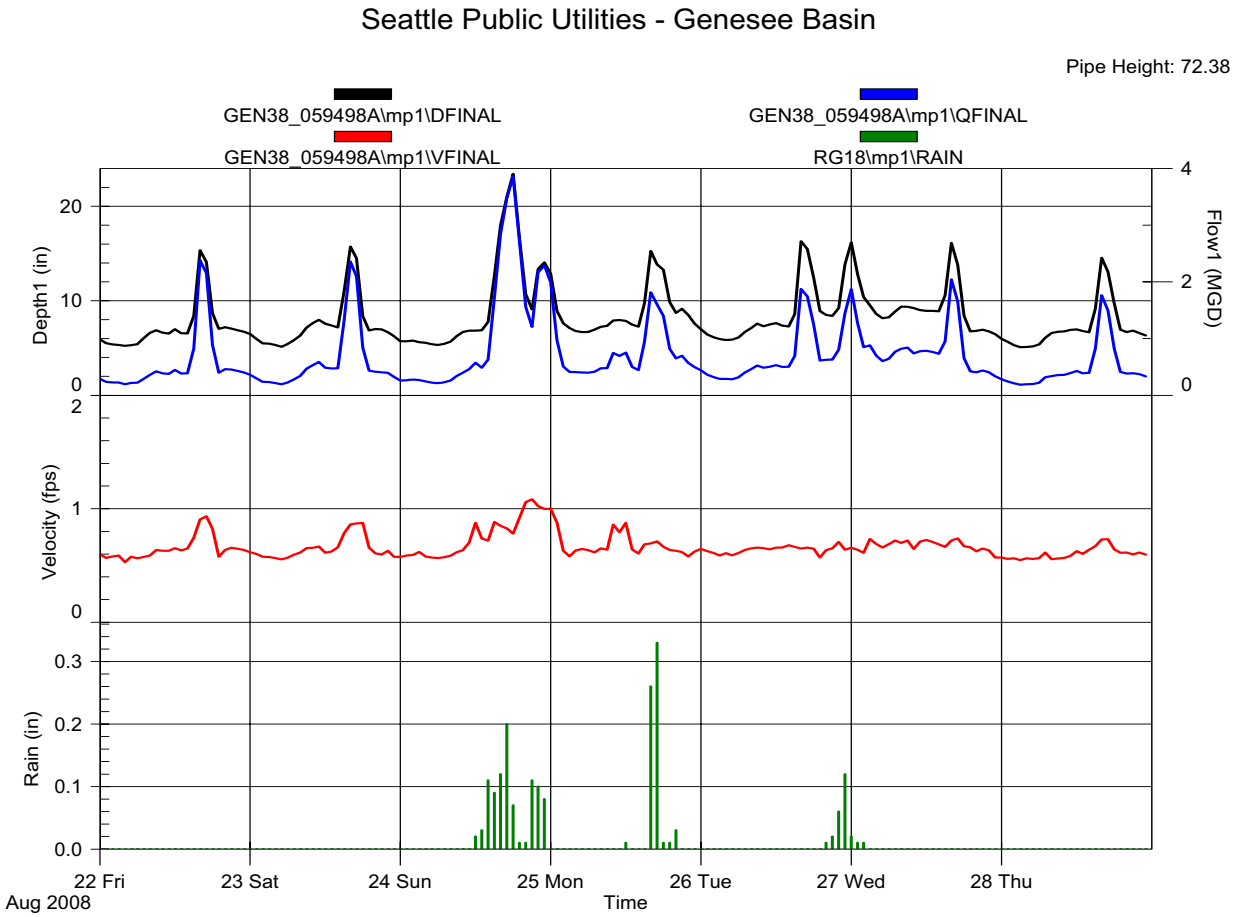
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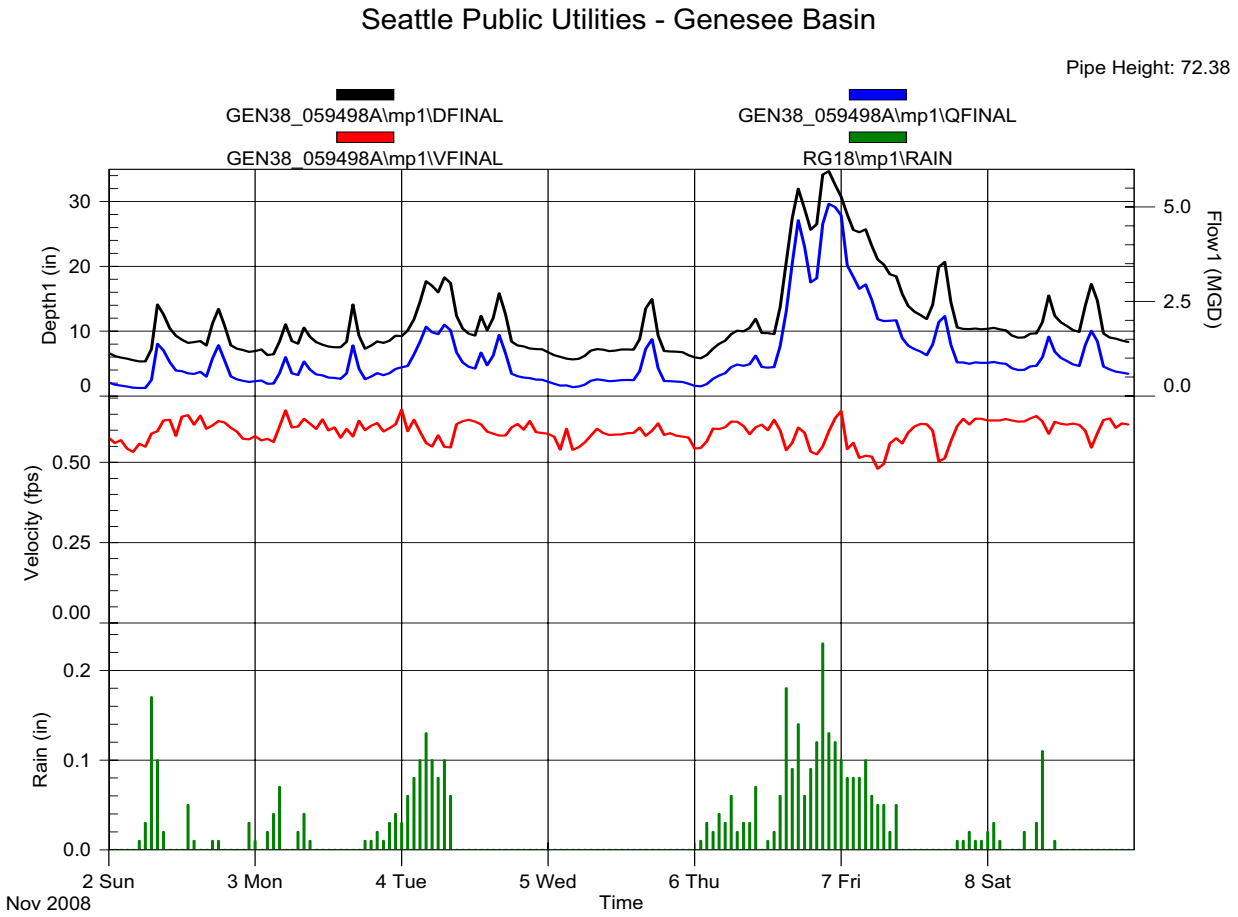
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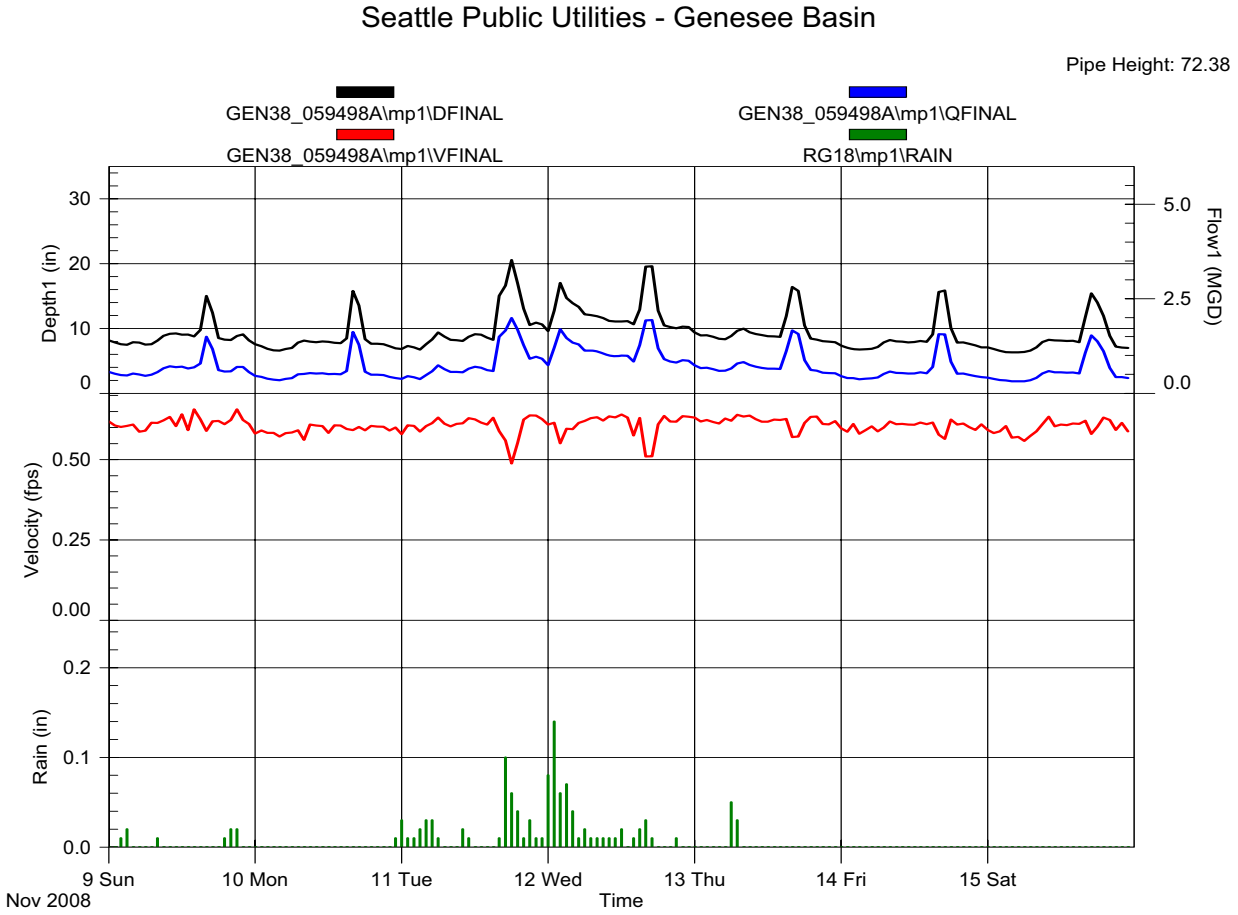
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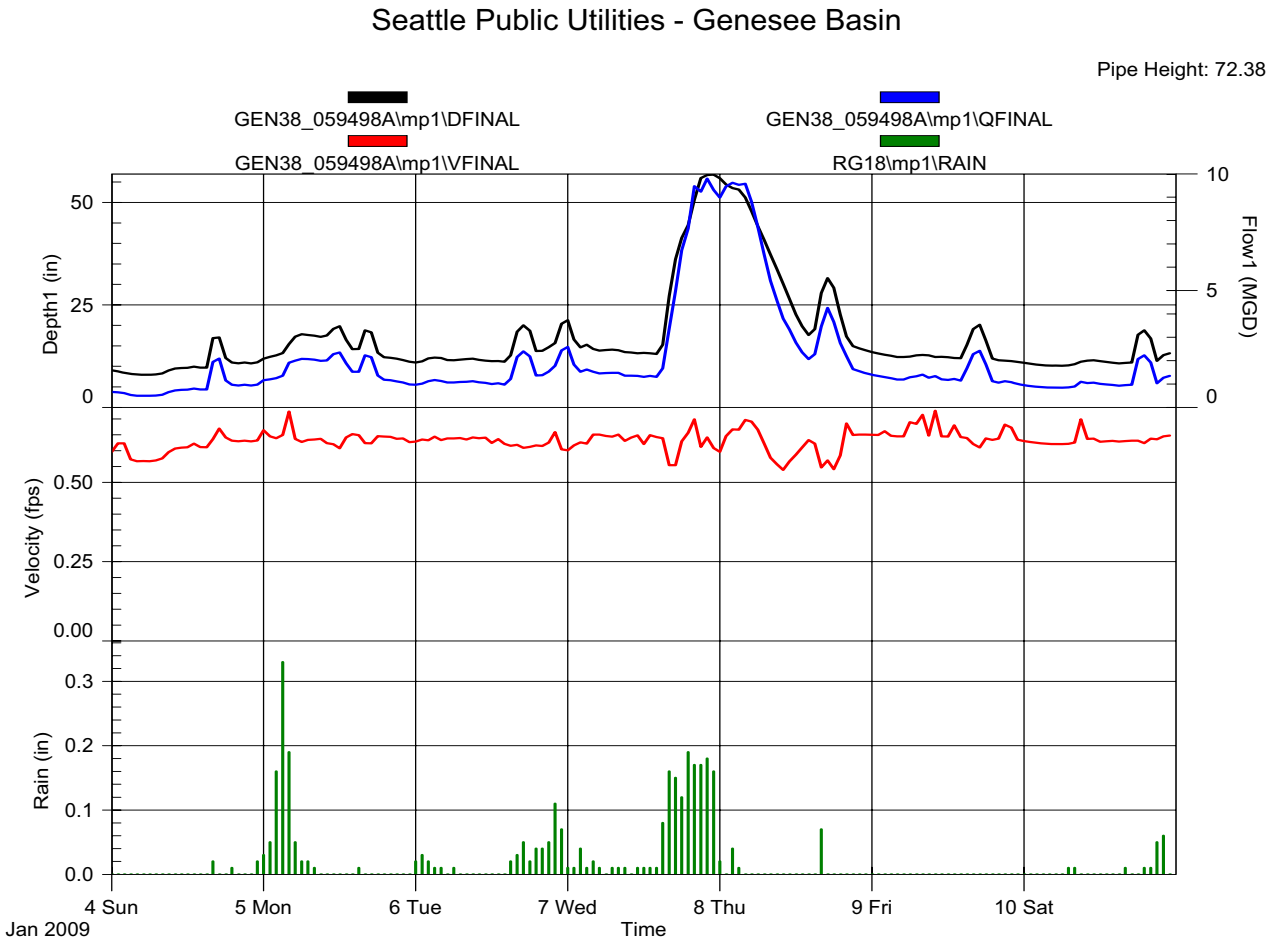
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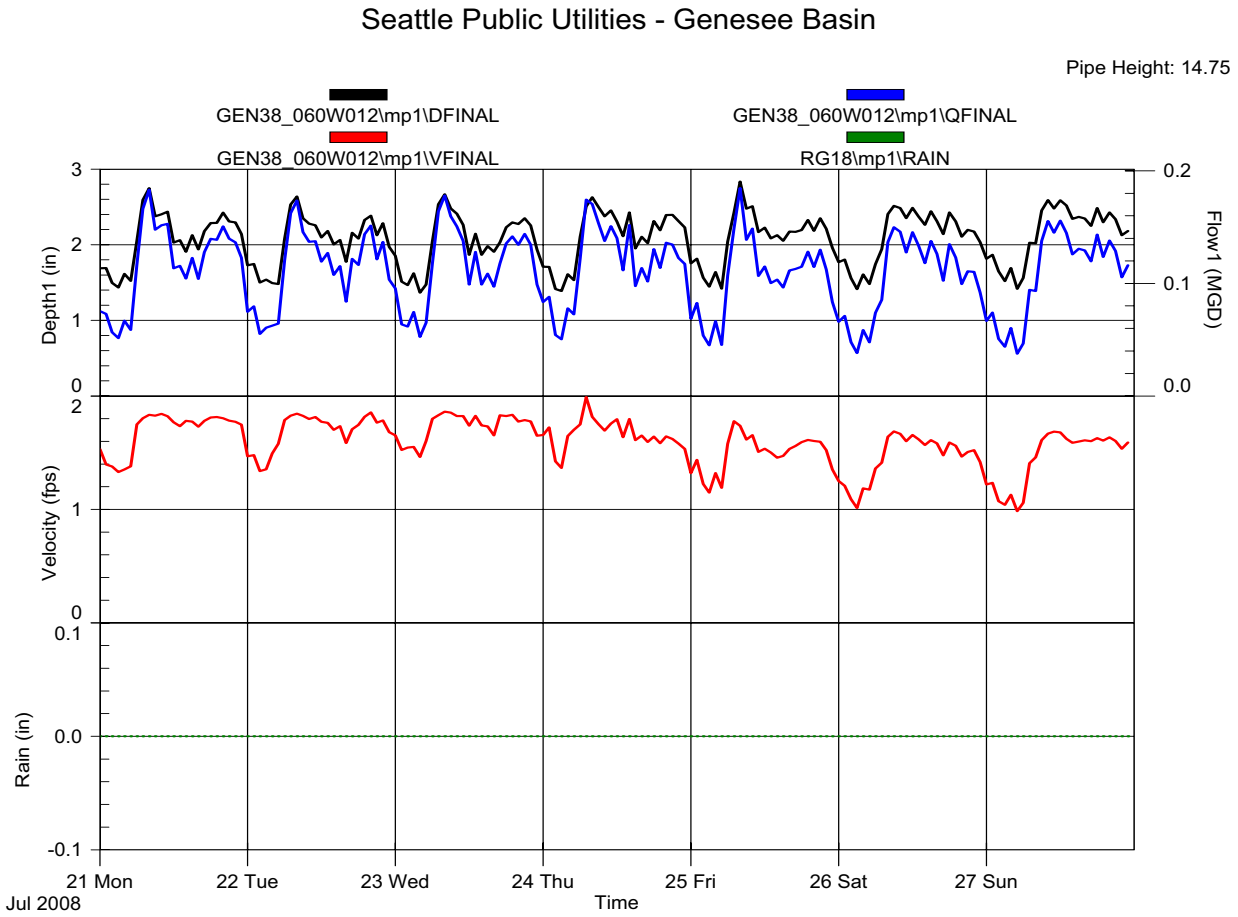
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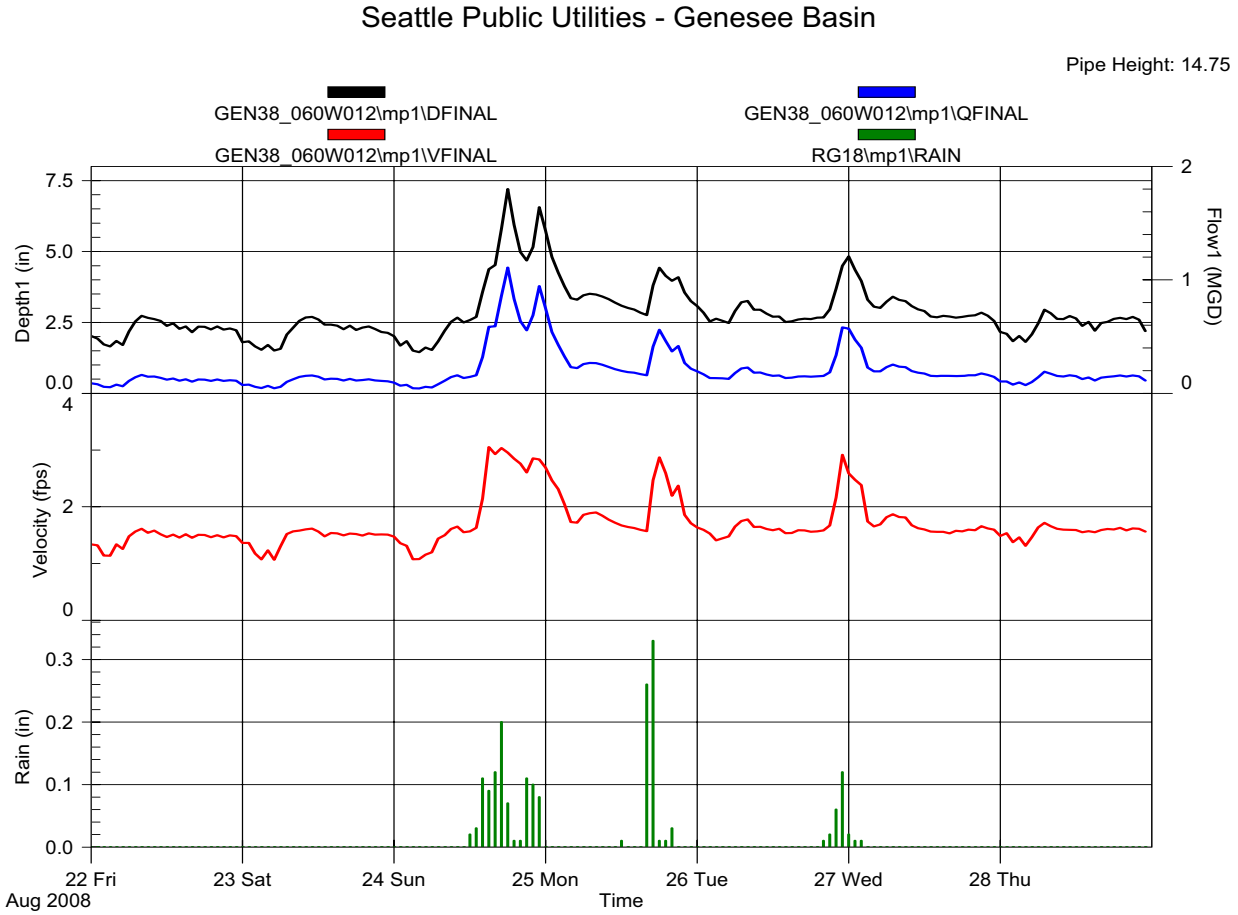
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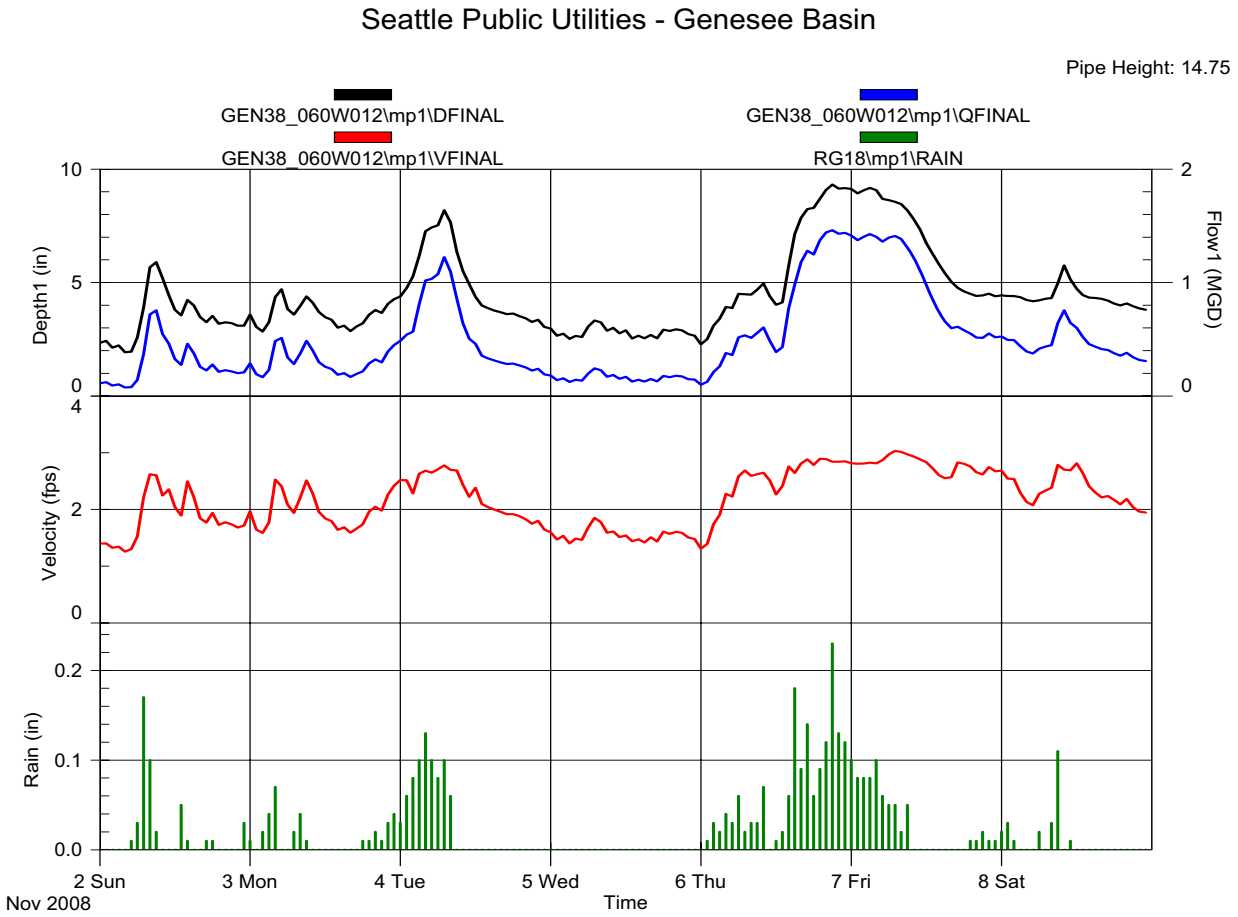
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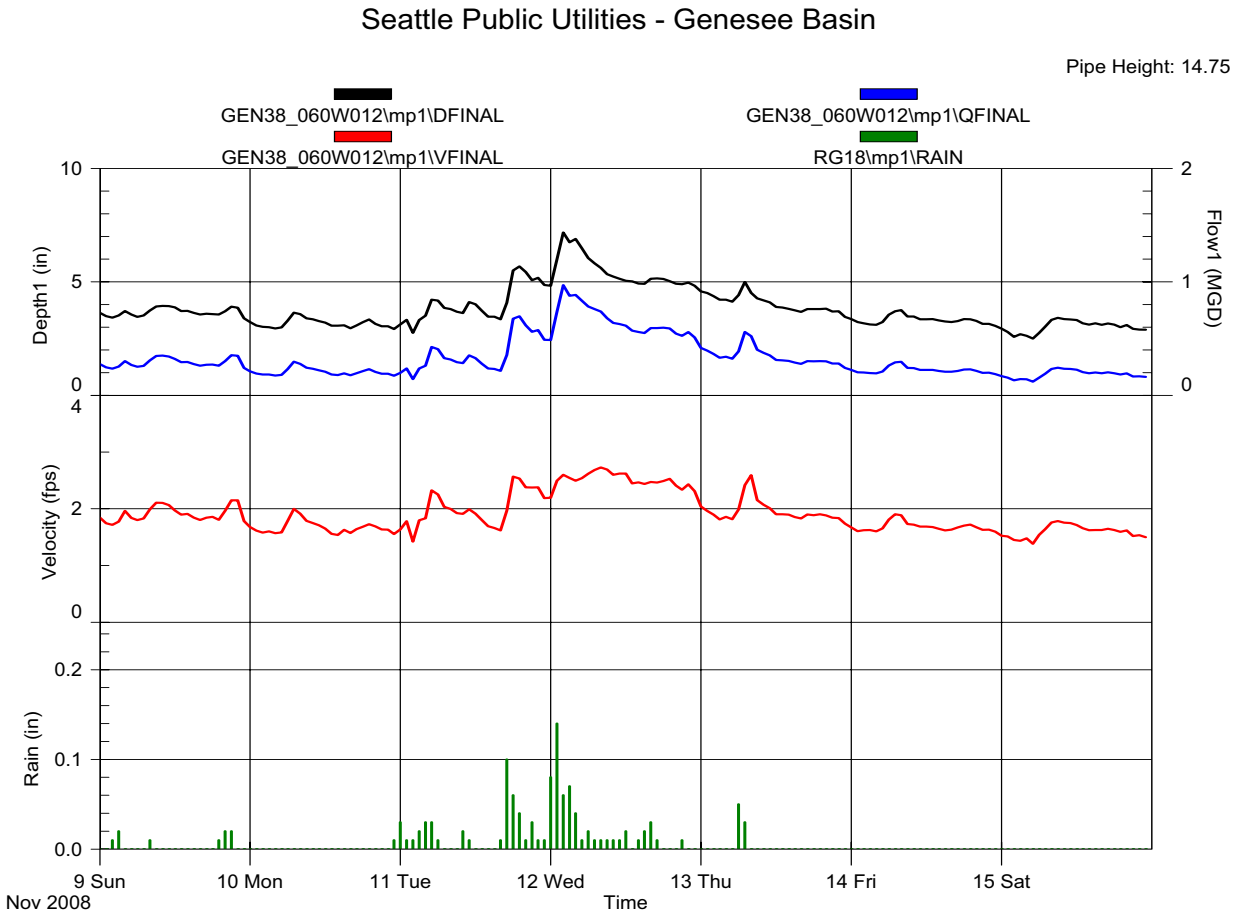
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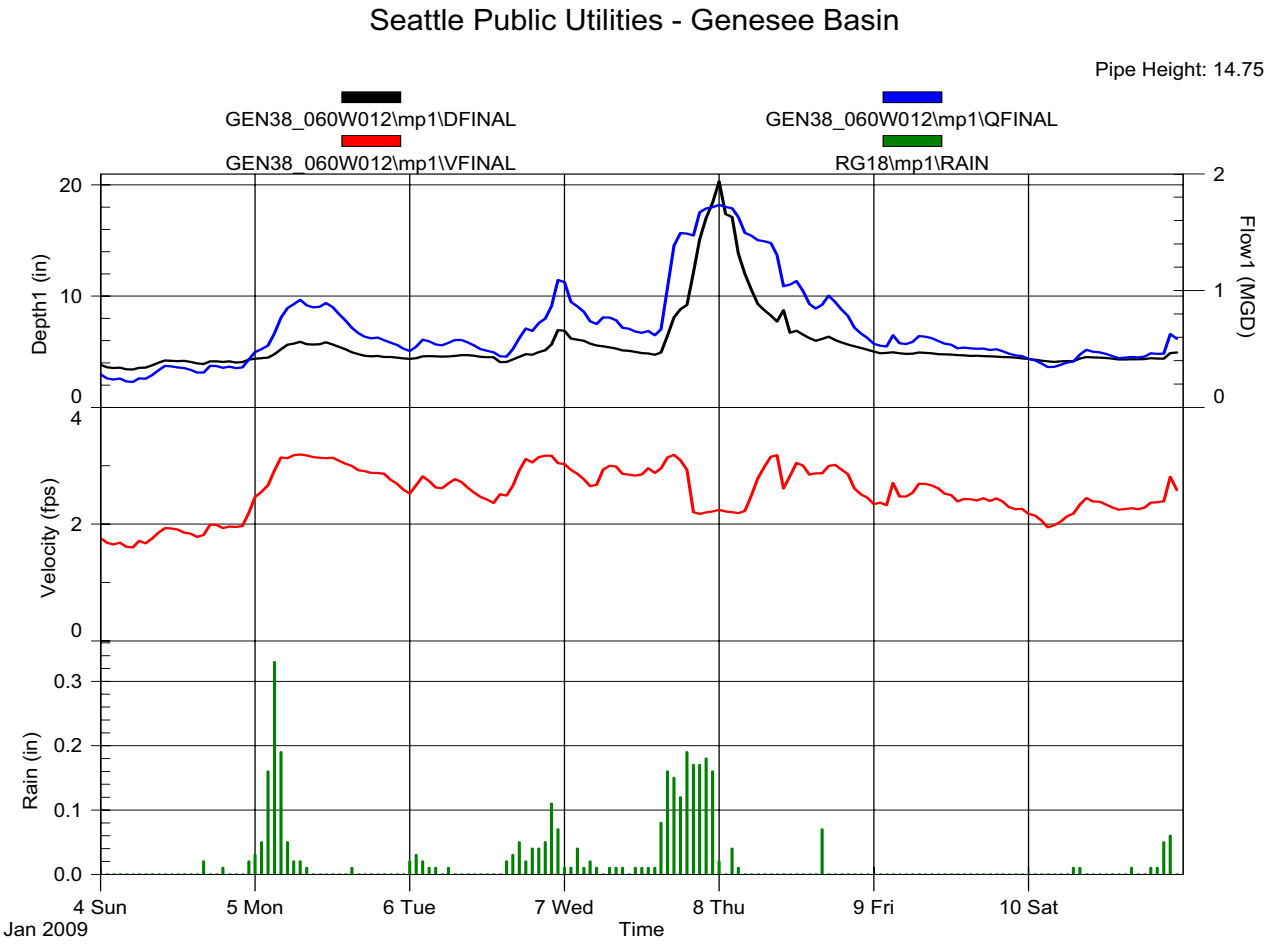
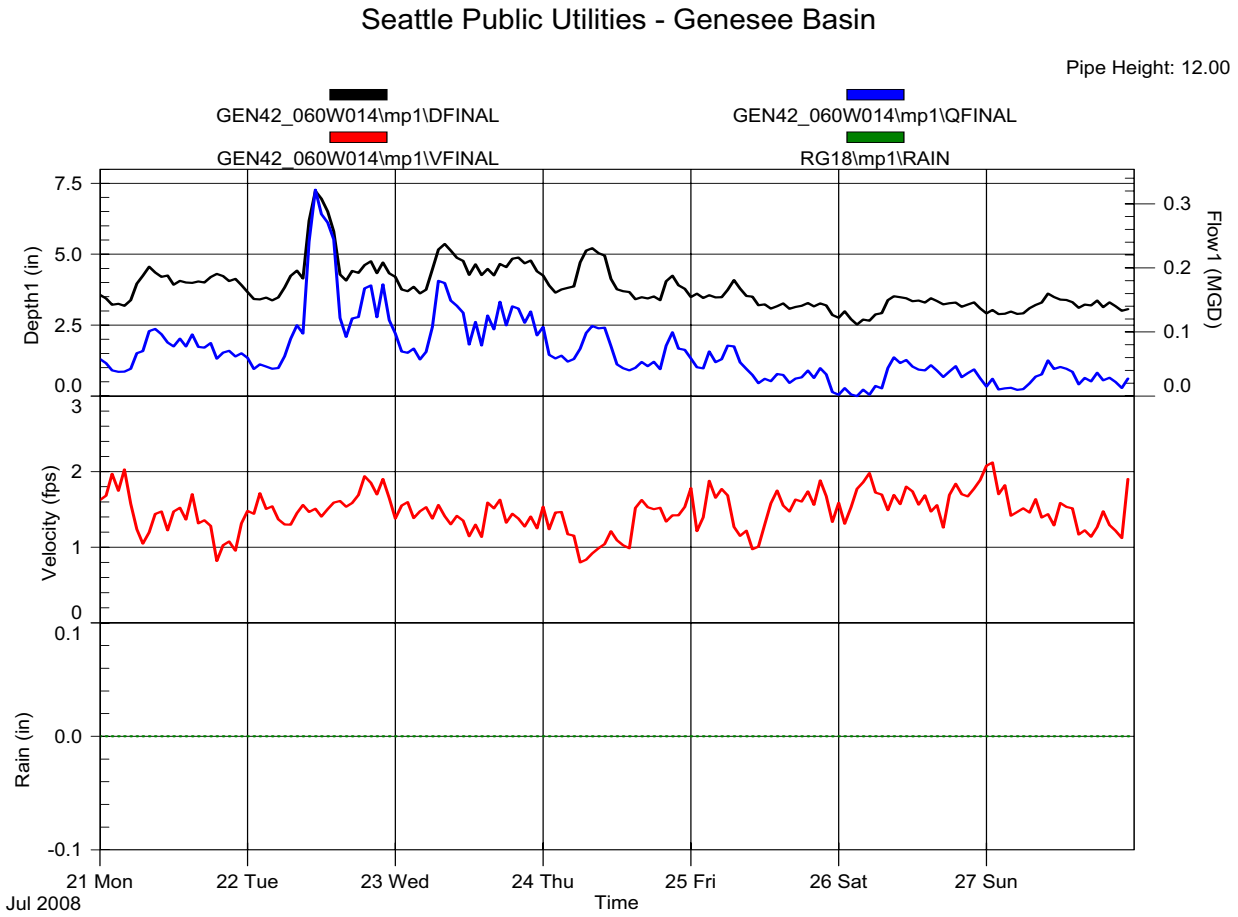
15 Sat
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 14.75
GEN38_060W012\mp1\DFINAL
GEN38_060W012\mp1\QFINAL
GEN38_060W012\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 12.00
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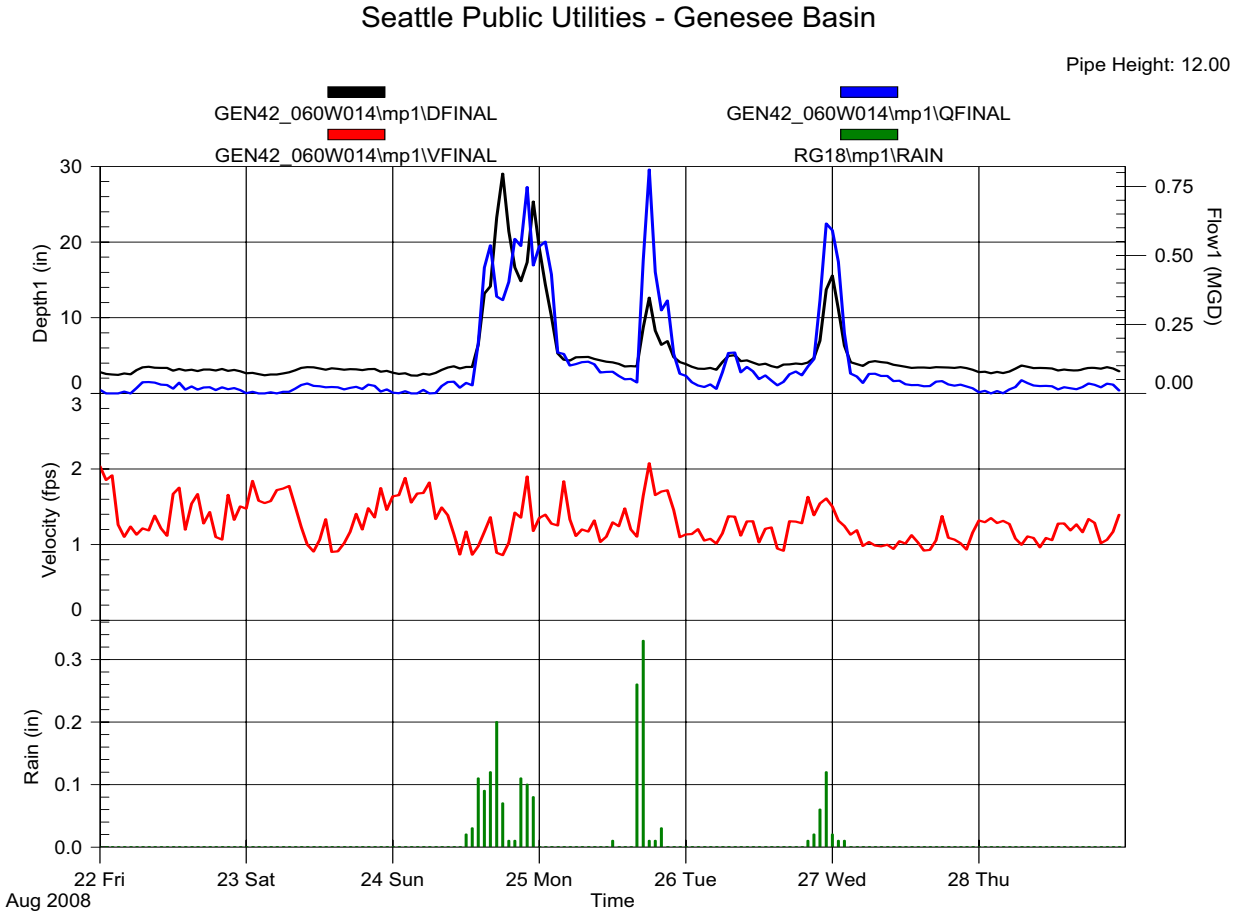
GEN42_060W014\mp1\QFINAL
GEN42_060W014\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
21 Mon
Jul 2008
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 12.00
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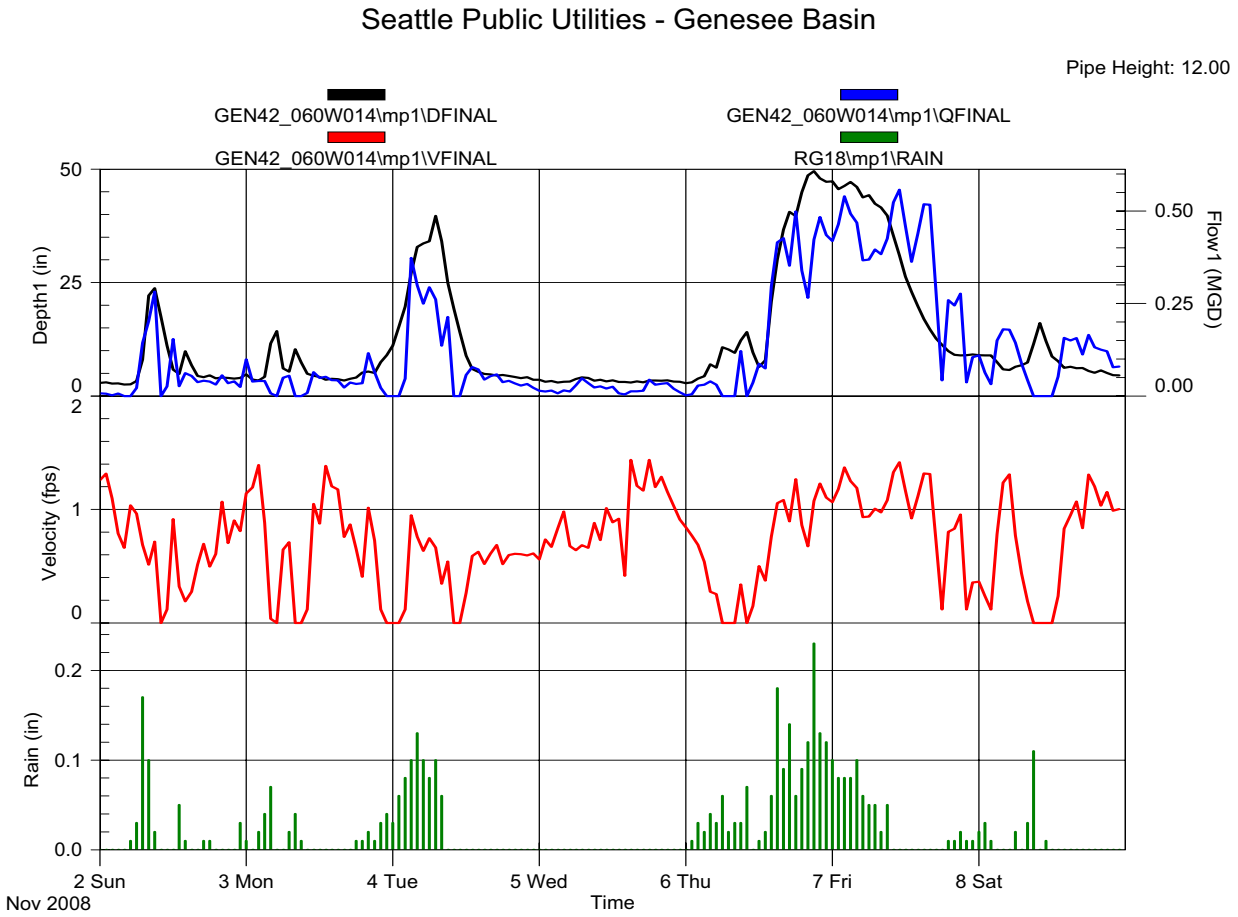
GEN42_060W014\mp1\QFINAL
GEN42_060W014\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
22 Fri
Aug 2008
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Time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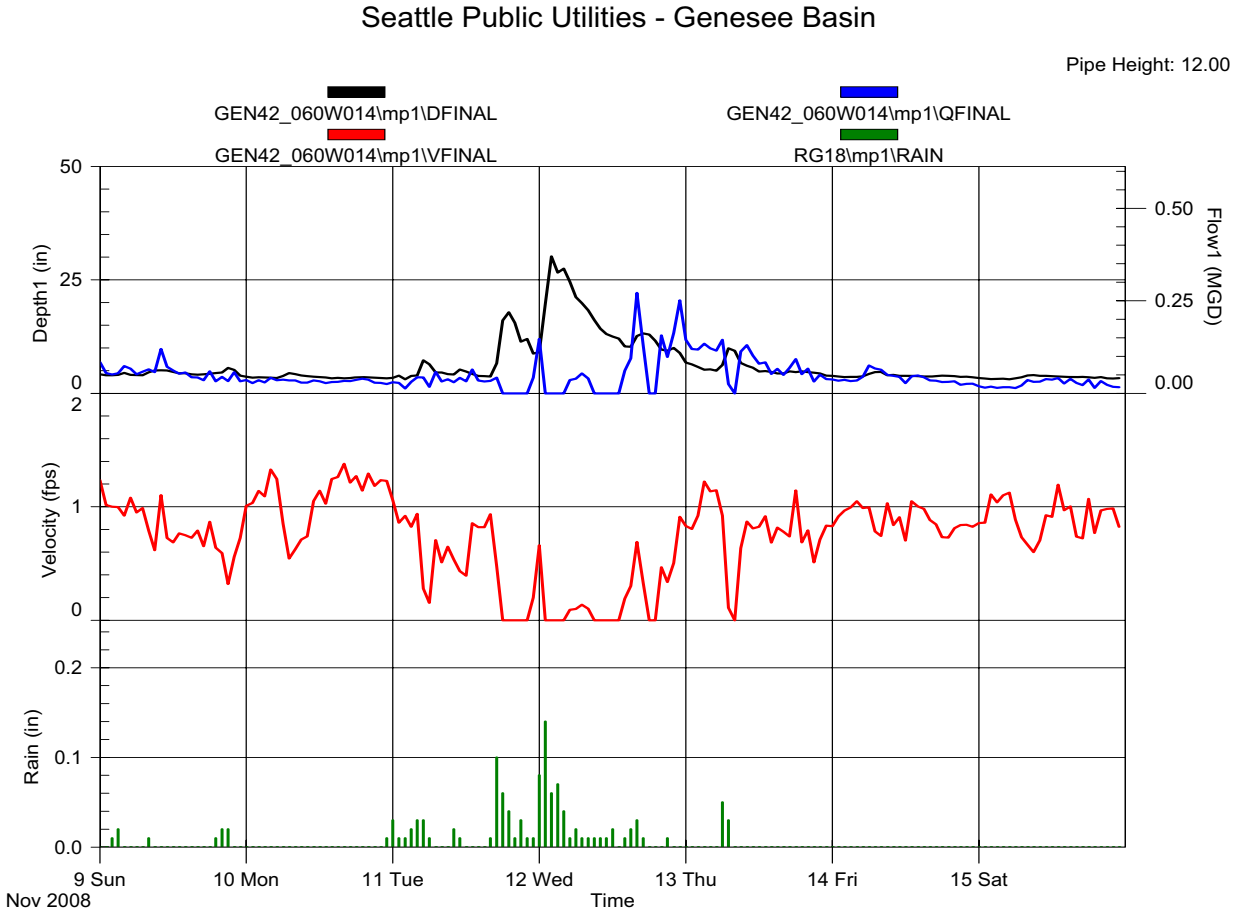
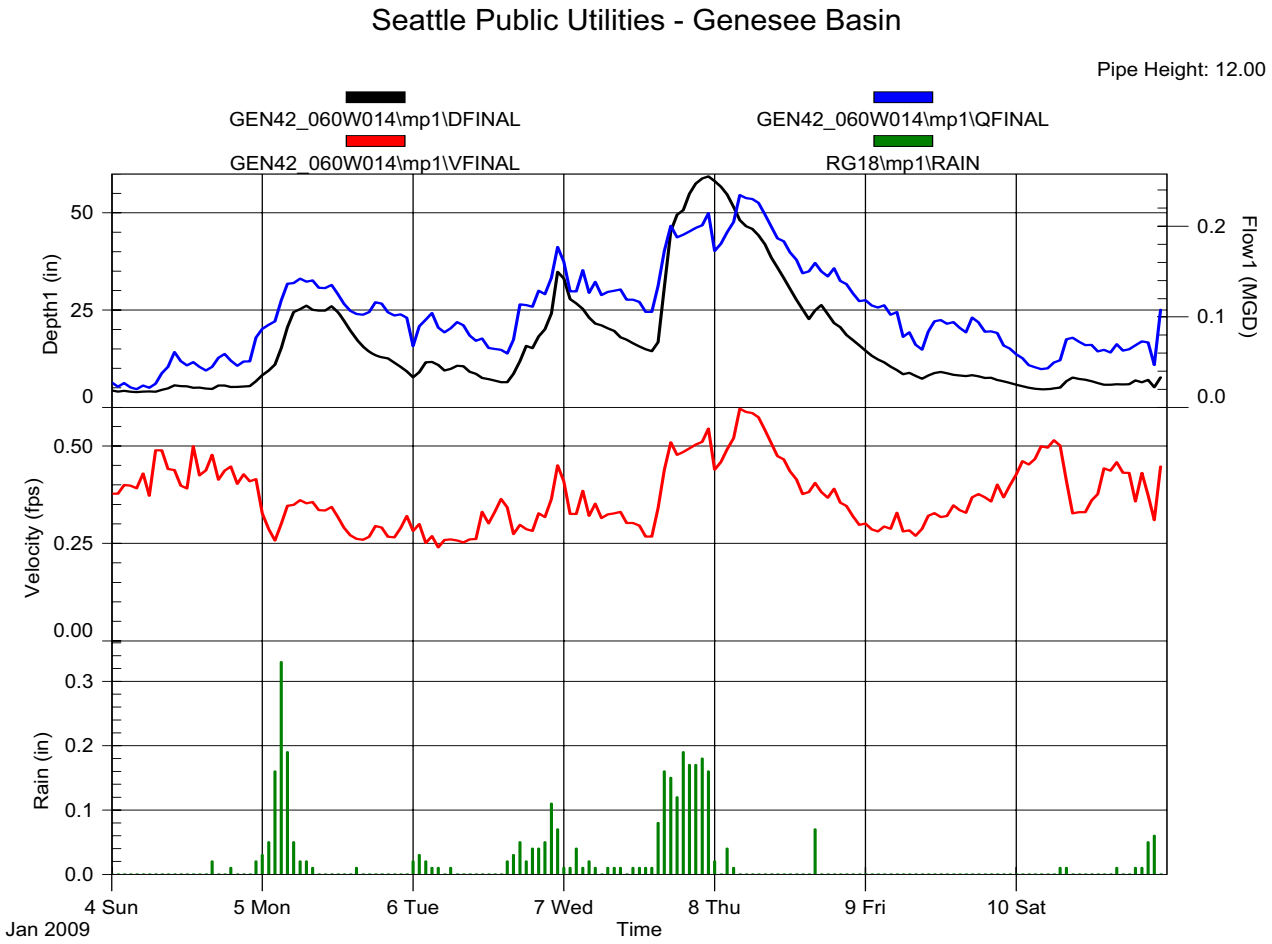
GEN42_060W014\mp1\QFINAL
GEN42_060W014\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
2 Sun
Nov 2008
3 Mon
4 Tue
5 Wed
6 Thu
7 Fri
8 Sat
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 12.00
GEN42_060W014\mp1\DFINAL
GEN42_060W014\mp1\QFINAL
GEN42_060W014\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
9 Sun
Nov 2008
10 Mon
11 Tue
12 Wed
13 Thu
14 Fri
15 Sat
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 12.00
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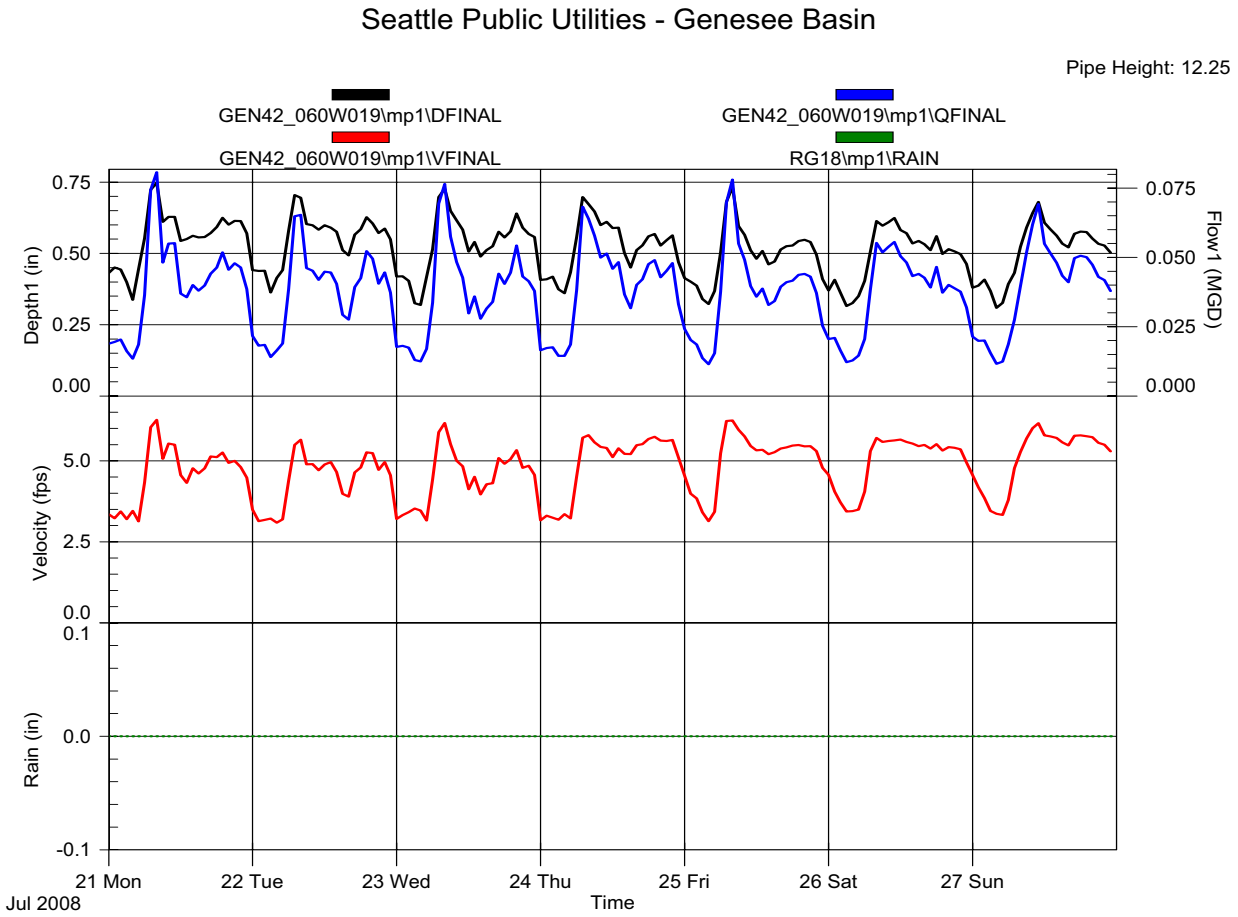
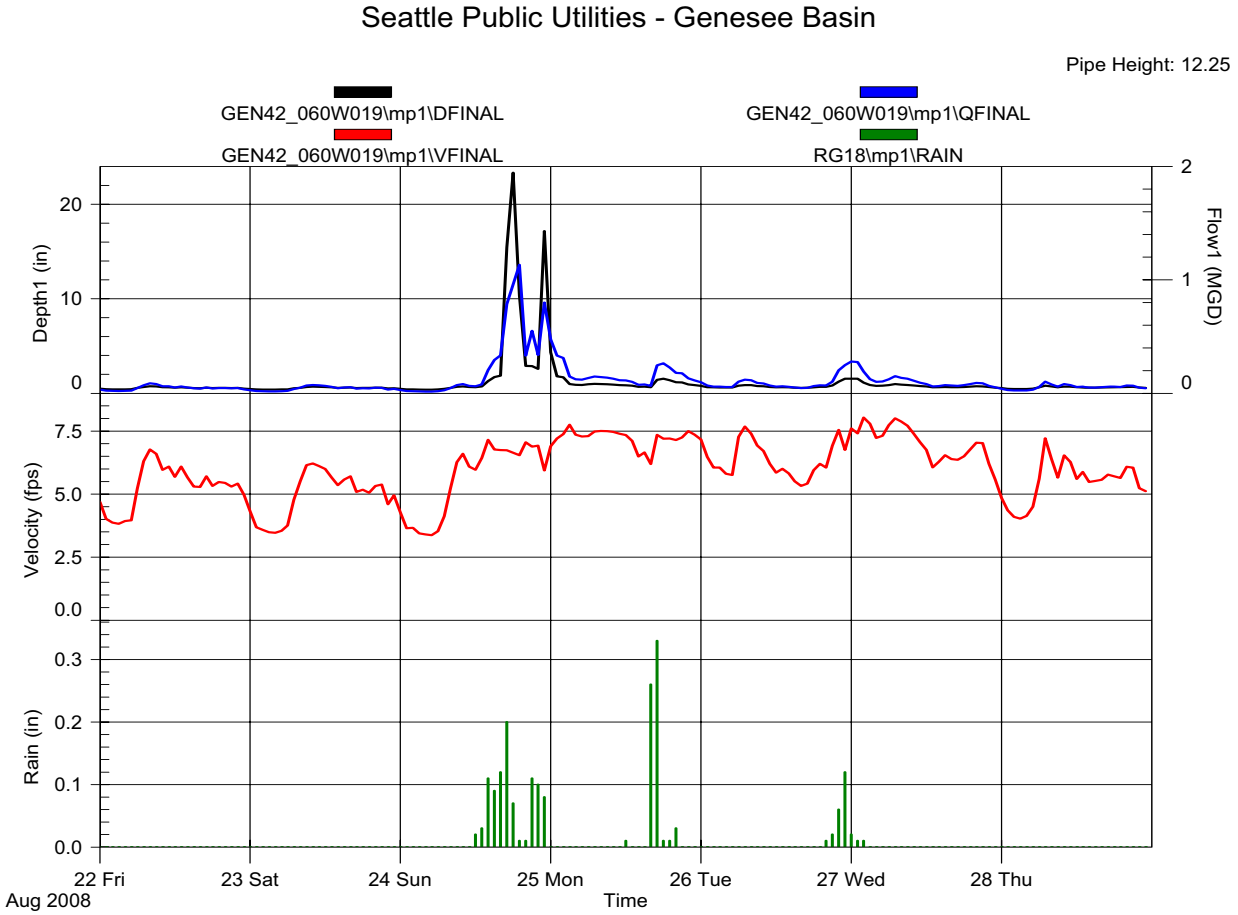
GEN42_060W014\mp1\QFINAL
GEN42_060W014\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
50
25
0
Flow1 (MGD)
0.2
0.1
0.0
Velocity (fps)
0.50
0.25
0.00
Rain (in)
0.3
0.2
0.1
0.0
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 12.25
GEN42_060W019\mp1\DFINAL
GEN42_060W019\mp1\QFINAL
GEN42_060W019\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
21 Mon
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Jul 2008
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 12.25
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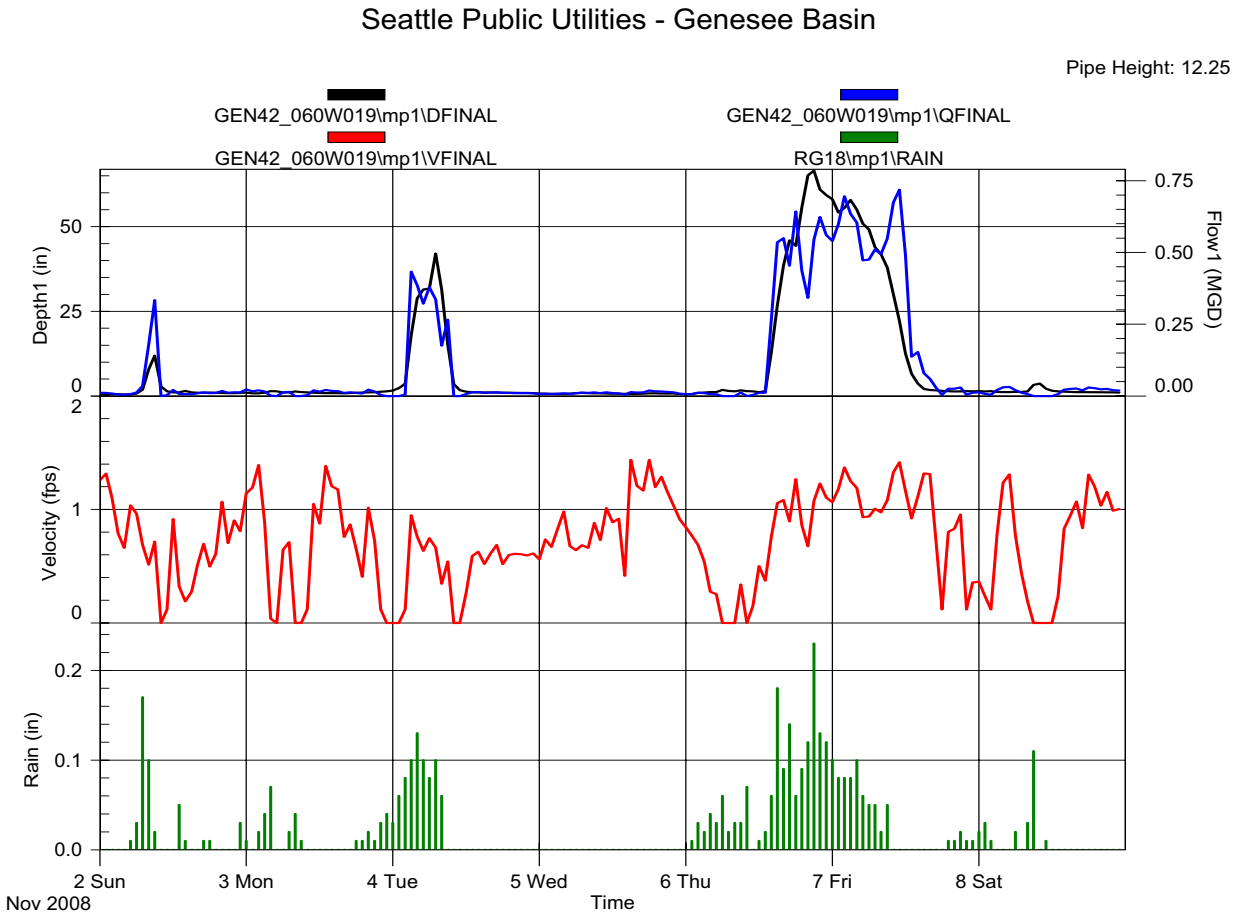
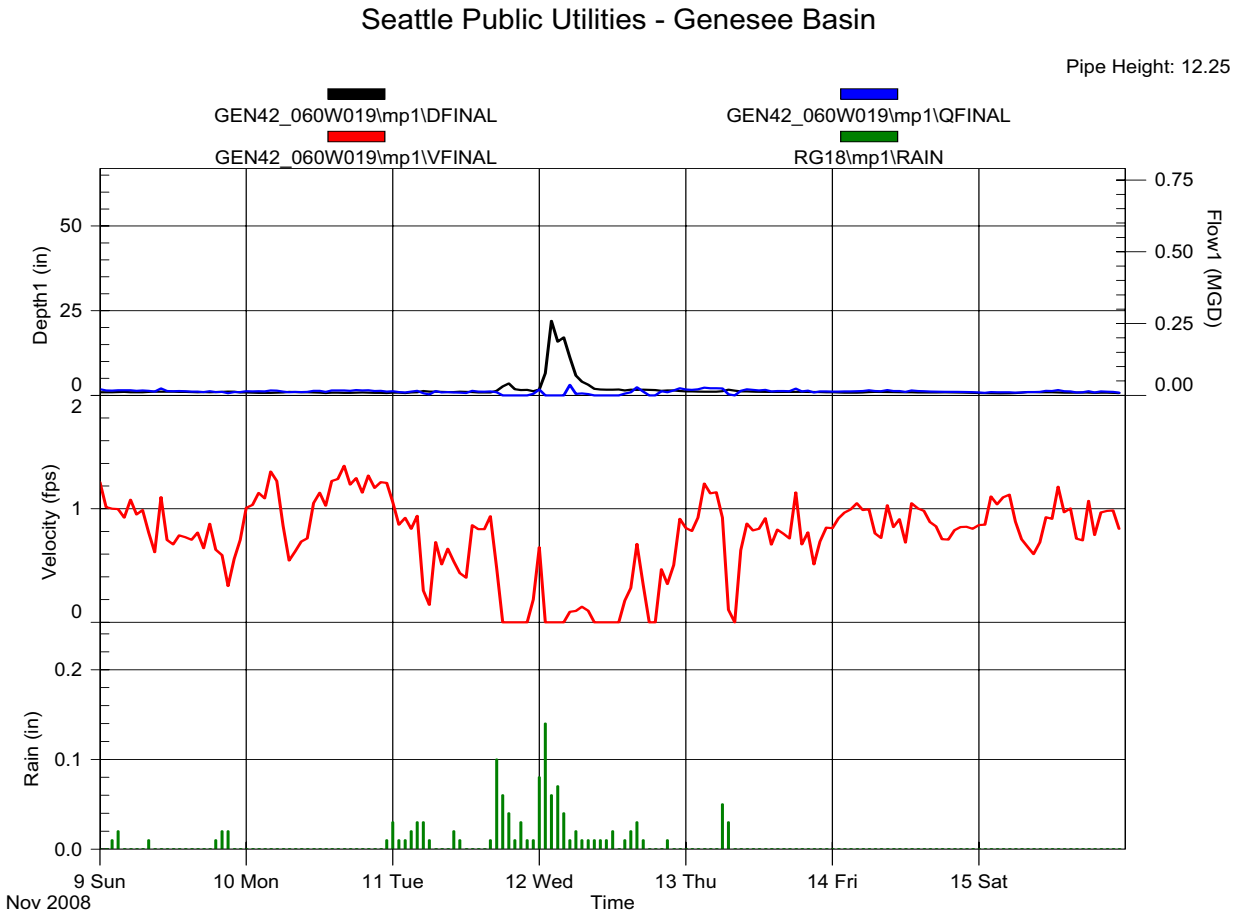
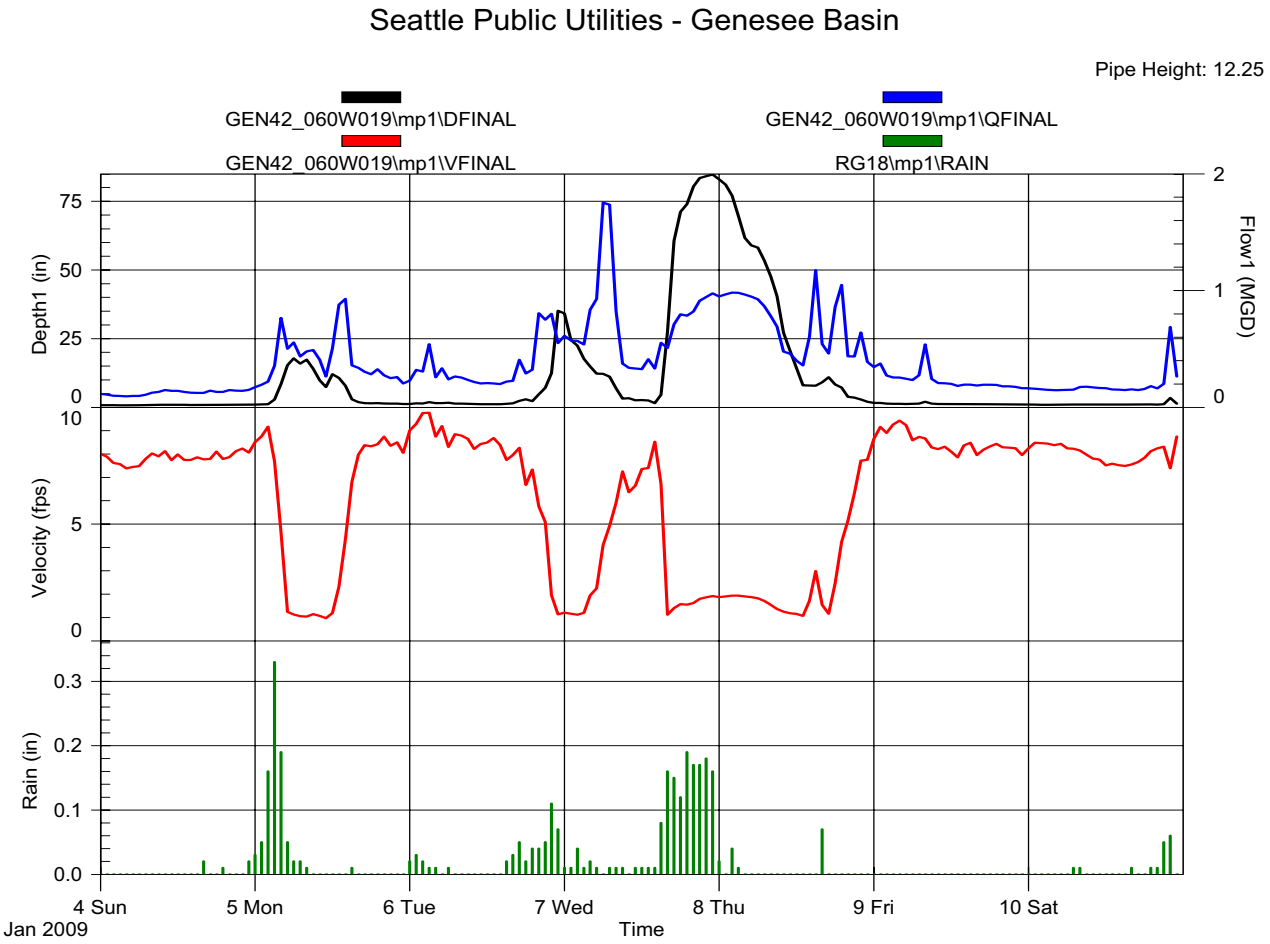
GEN42_060W019\mp1\QFINAL
GEN42_060W019\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
22 Fri
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Aug 2008
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 12.25
GEN42_060W019\mp1\DFINAL
GEN42_060W019\mp1\QFINAL
GEN42_060W019\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
2 Sun
Nov 2008
3 Mon
4 Tue
5 Wed
6 Thu
7 Fri
8 Sat
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 12.25
GEN42_060W019\mp1\DFINAL
GEN42_060W019\mp1\QFINAL
GEN42_060W019\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
9 Sun
Nov 2008
10 Mon
11 Tue
12 Wed
13 Thu
14 Fri
15 Sat
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 12.25
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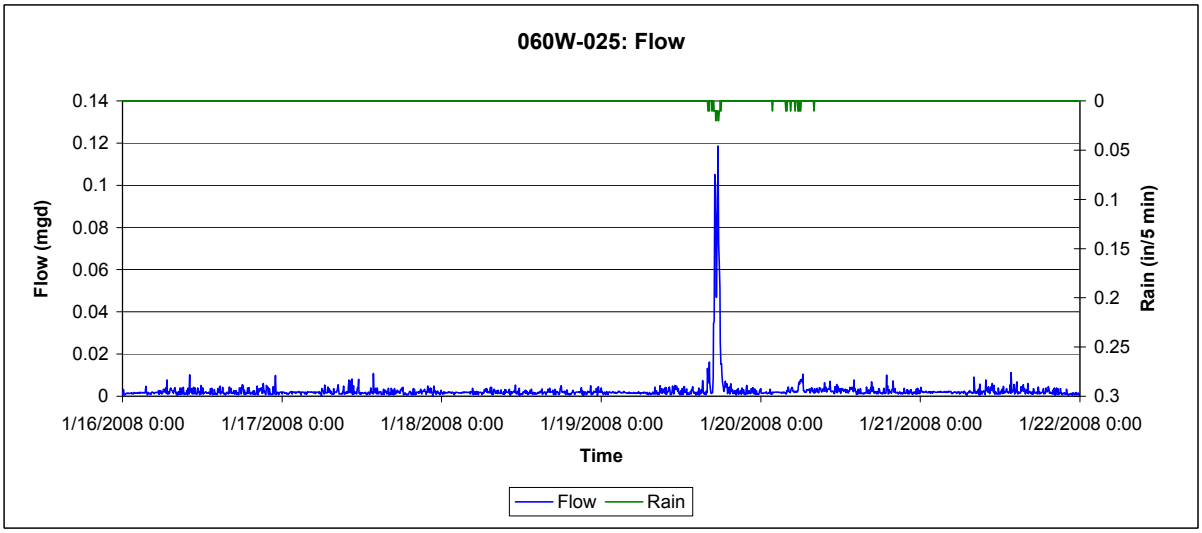
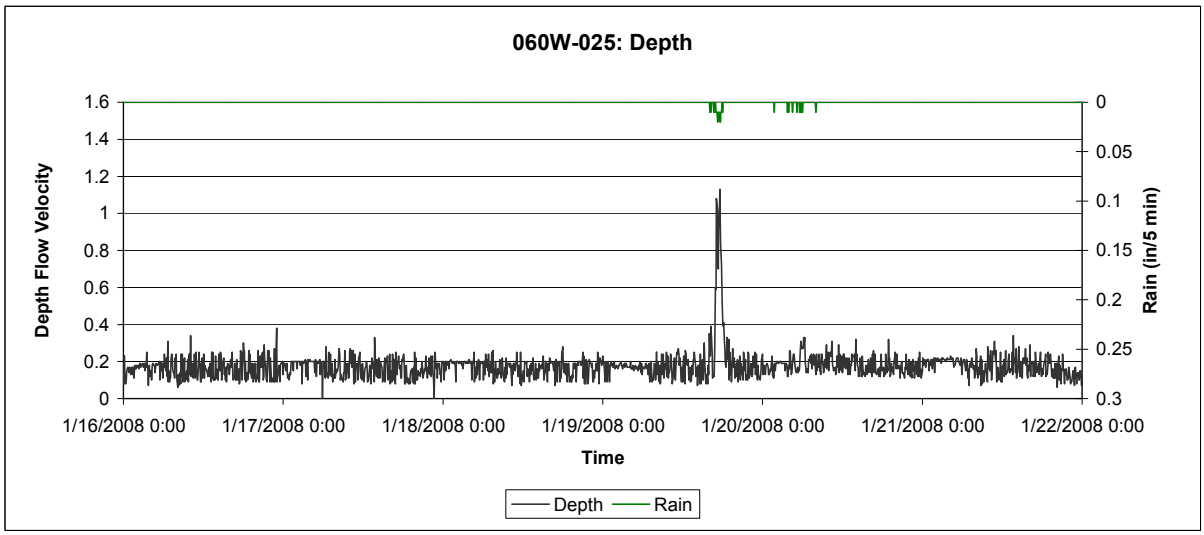
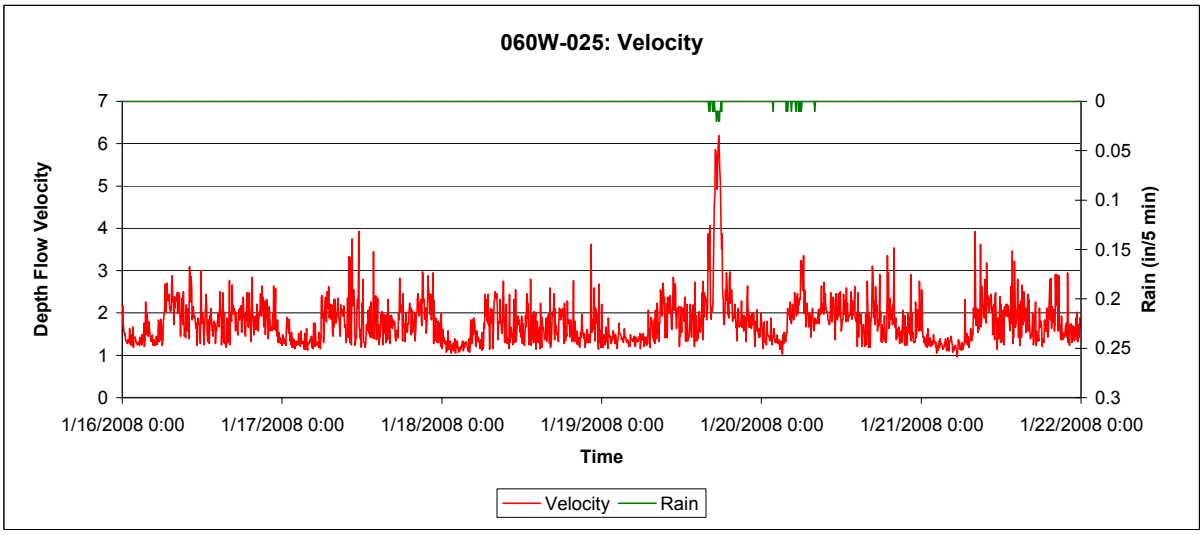
GEN42_060W019\mp1\QFINAL
GEN42_060W019\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time

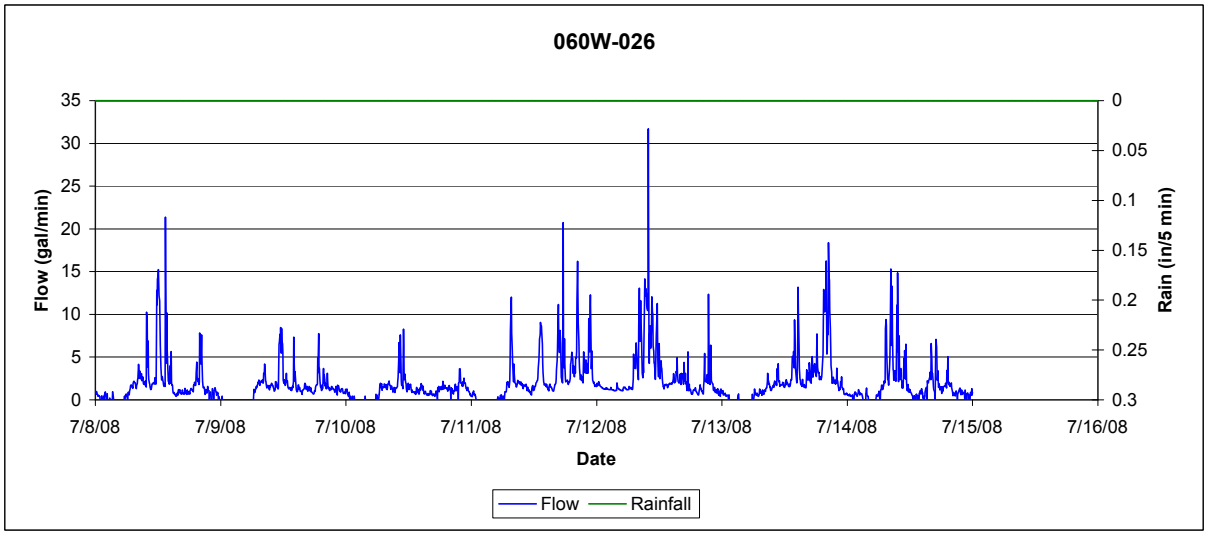
Note: 060W-025 was removed in February, 2008. Instead of hydrographs of the four example storms chosen for the other monitoring locations, hydrographs for the week from 1/16/08 to 1/22/08 are provided as an example of data from this location

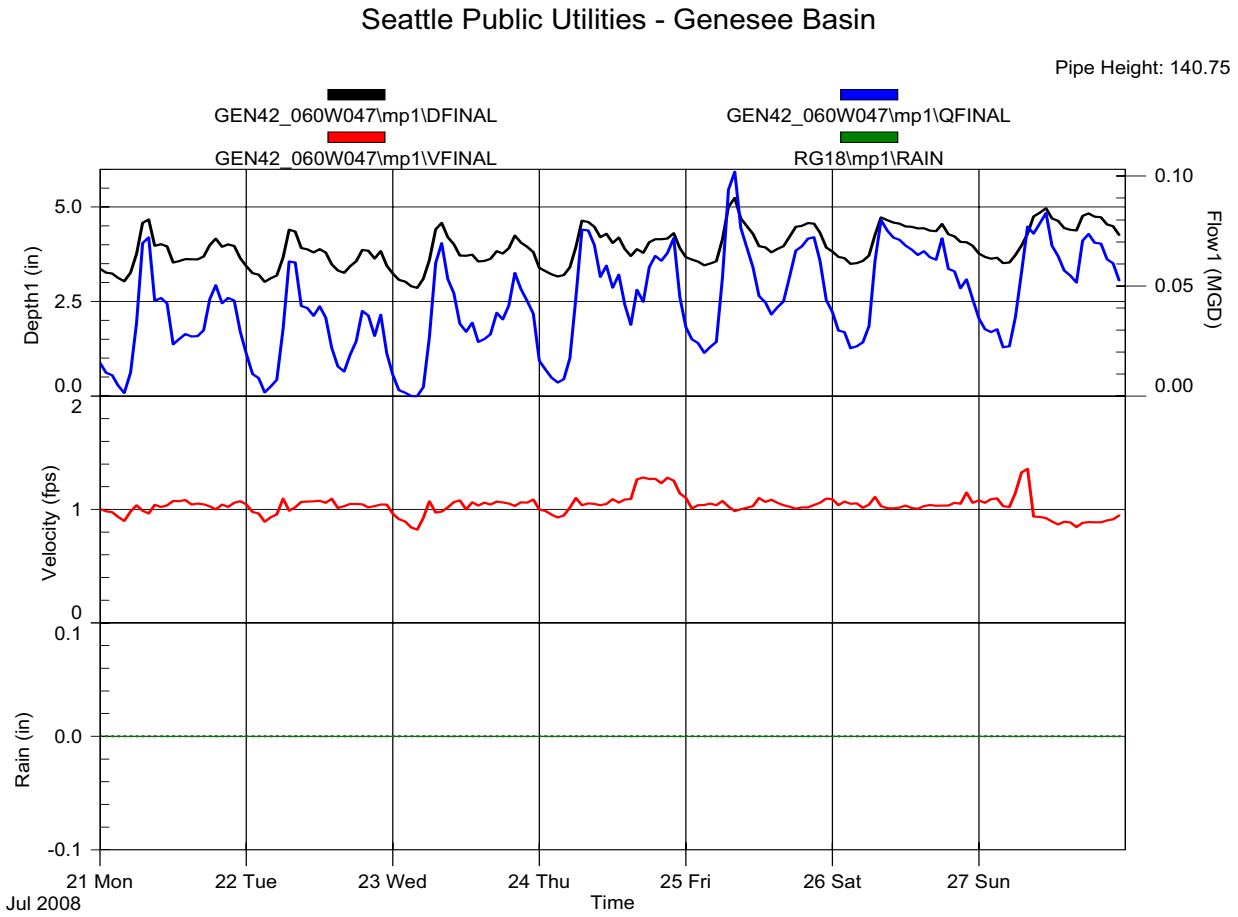


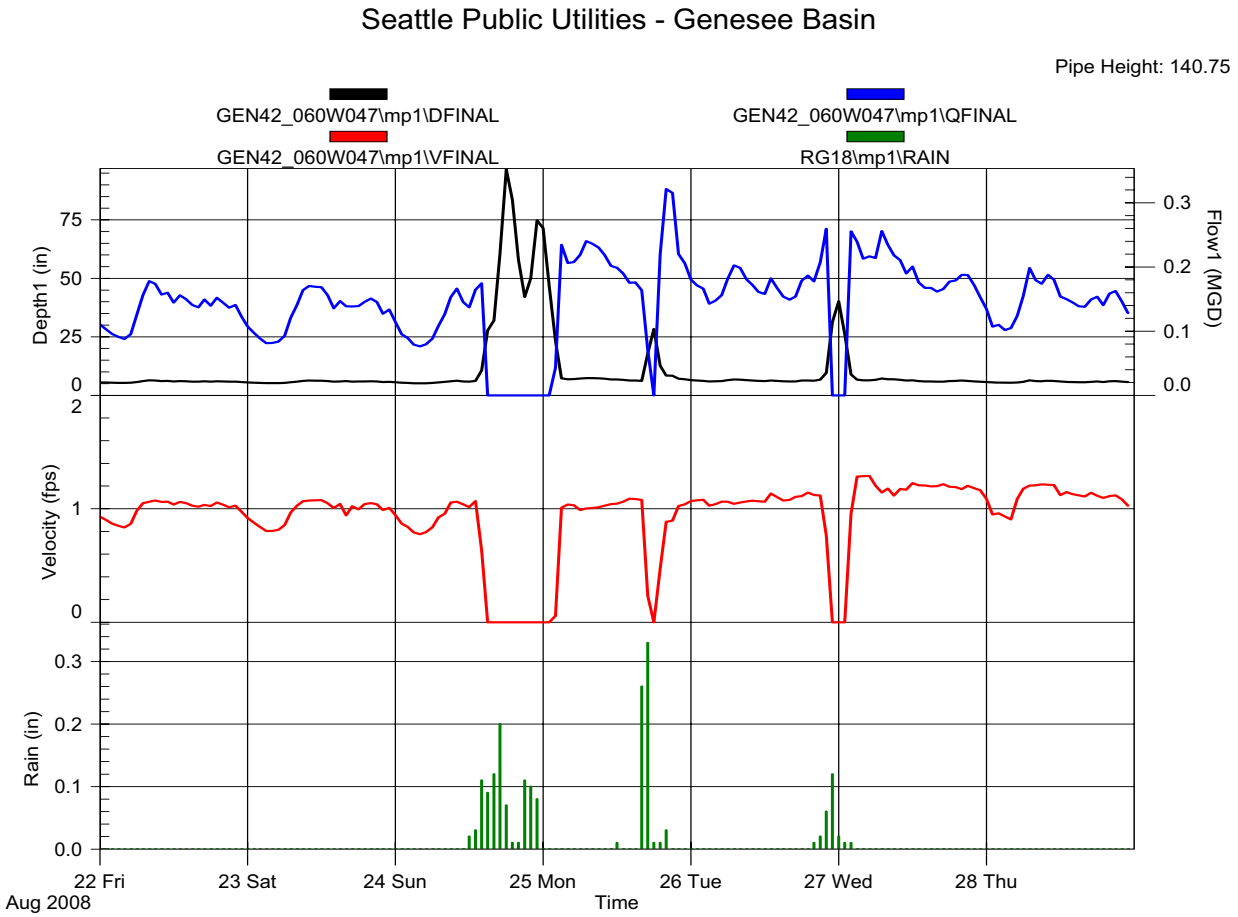




Note: 060W-026 was removed in July, 2008. Instead of hydrographs of the four example storms chosen for the other monitoring locations, hydrographs for the week from 7/8/08 to 7/16/08 are provided as an example of data from this location.




Seattle Public Utilities - Genesee Basin
Pipe Height: 140.75
GEN42_060W047\mp1\DFINAL
GEN42_060W047\mp1\QFINAL
GEN42_060W047\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
21 Mon
Jul 2008
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 140.75
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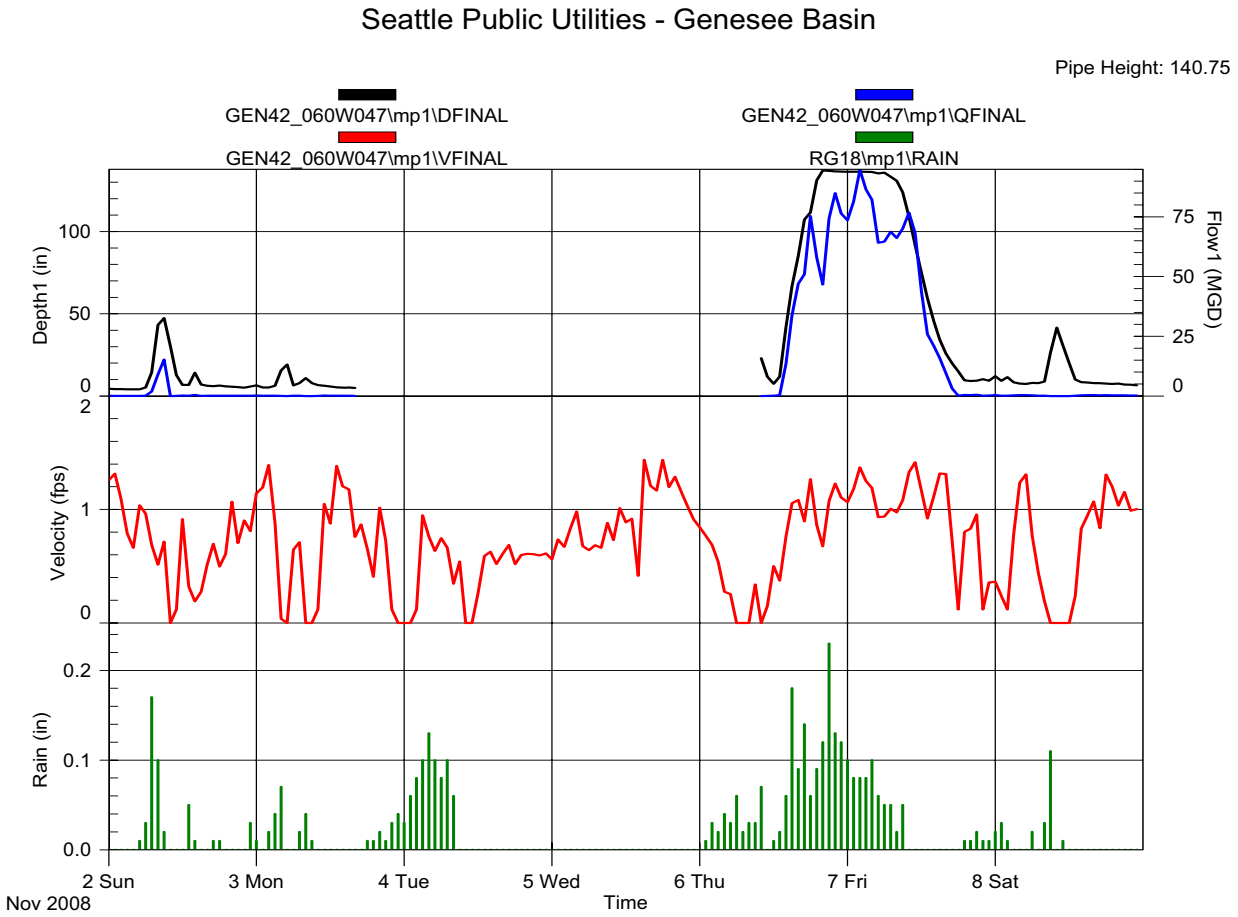
GEN42_060W047\mp1\QFINAL
GEN42_060W047\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
22 Fri
Aug 2008
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 140.75
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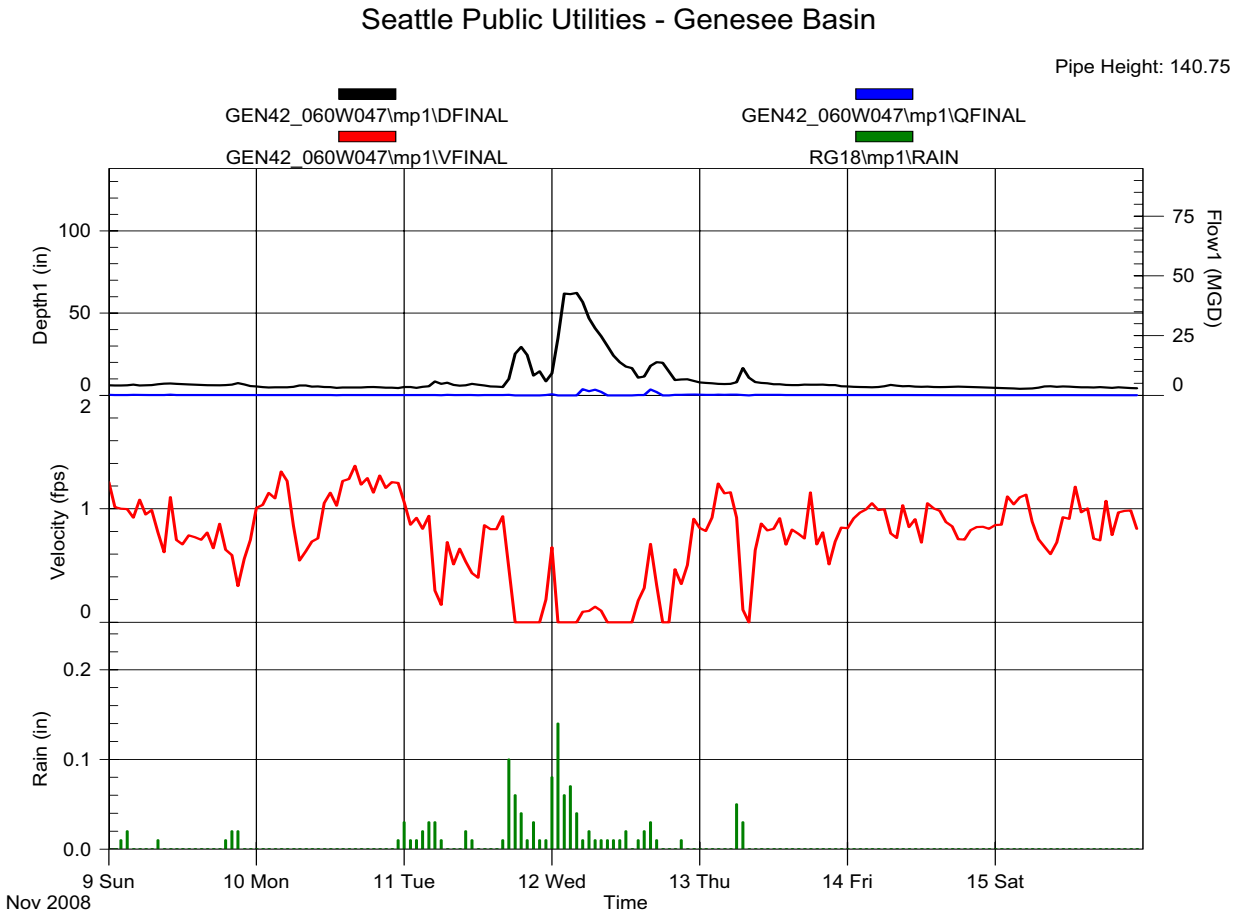
GEN42_060W047\mp1\QFINAL
GEN42_060W047\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
2 Sun
3 Mon
4 Tue
5 Wed
6 Thu
7 Fri
8 Sat
Nov 2008
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 140.75
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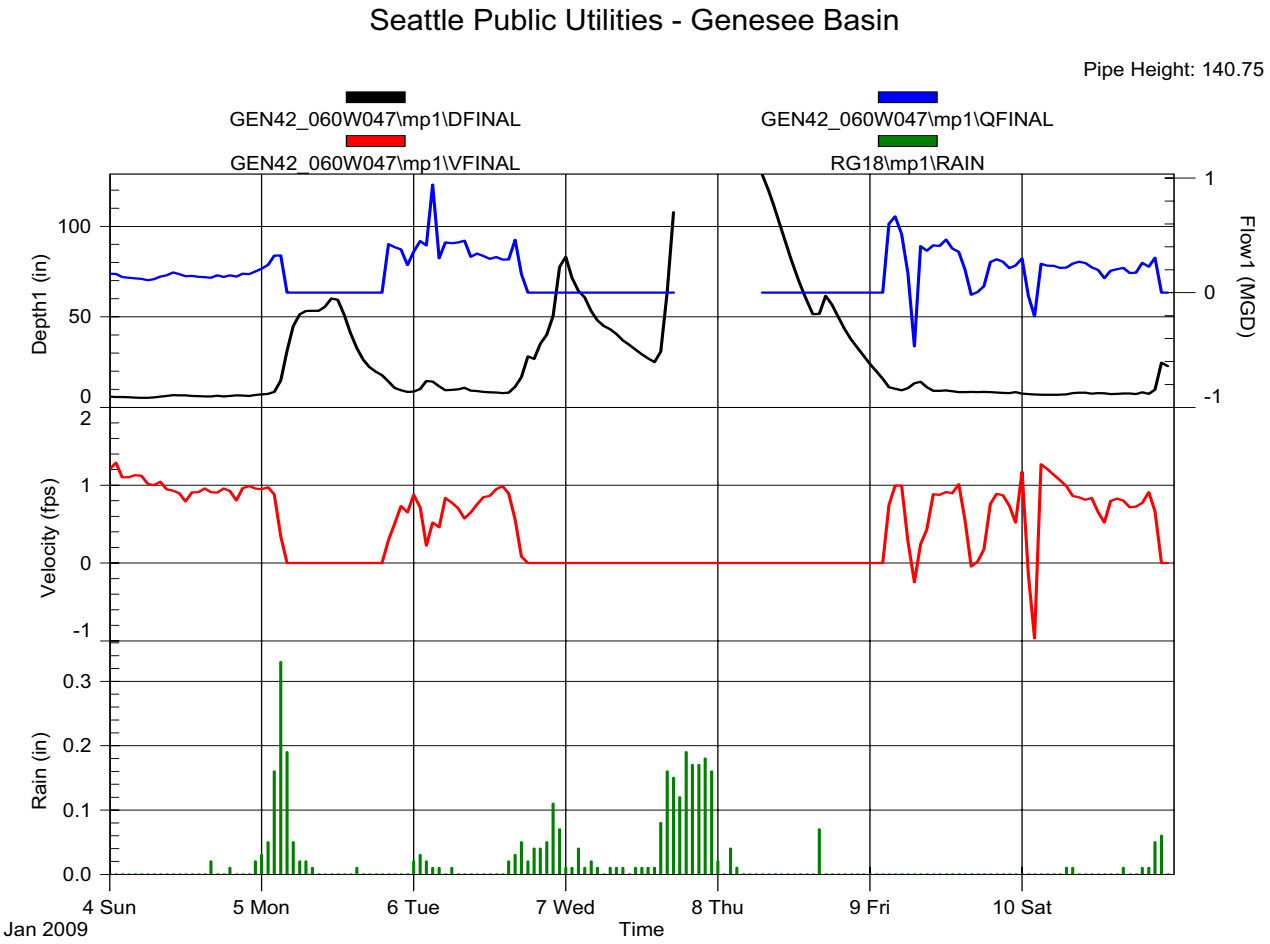
GEN42_060W047\mp1\QFINAL
GEN42_060W047\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
9 Sun
10 Mon
11 Tue
12 Wed
13 Thu
14 Fri
15 Sat
Nov 2008
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 140.75
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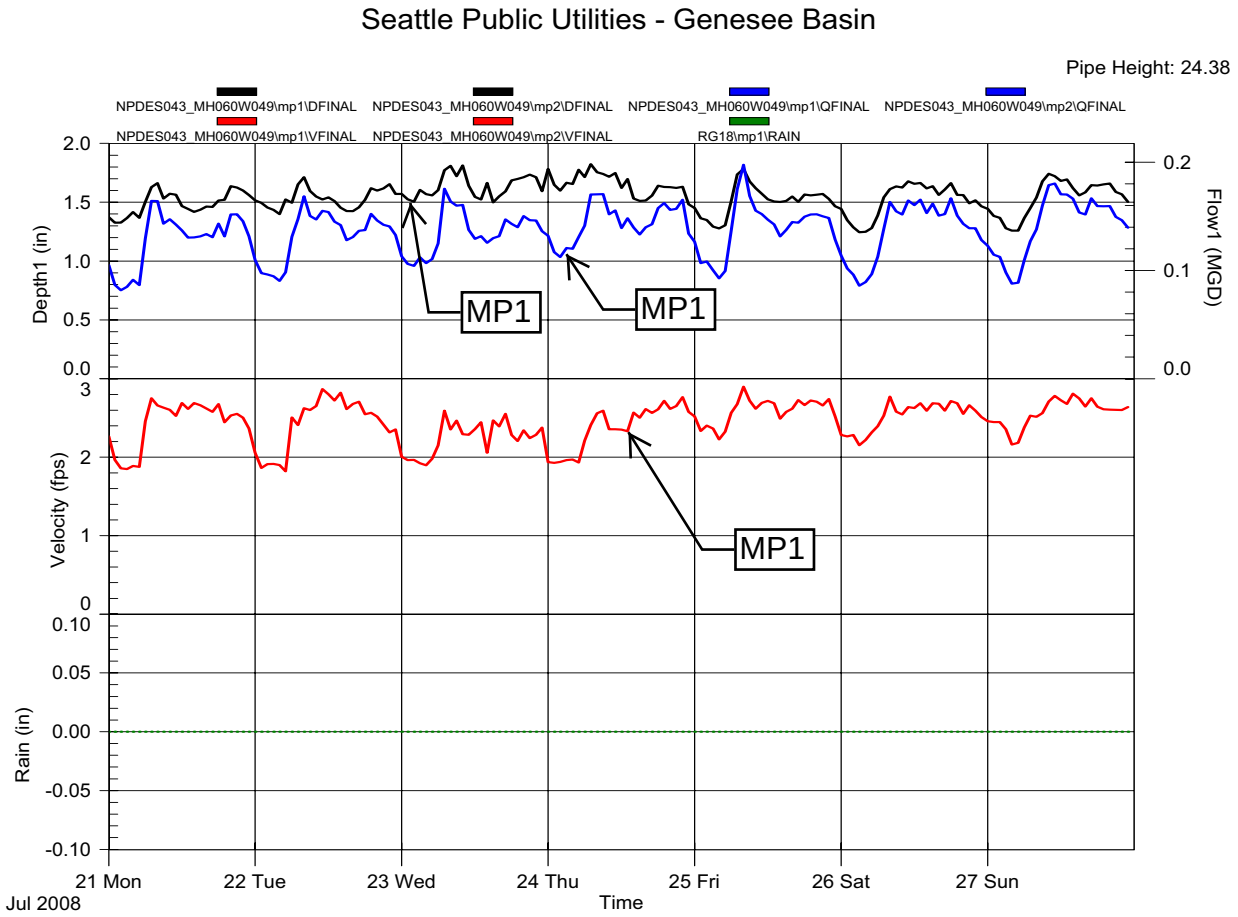
GEN42_060W047\mp1\QFINAL
GEN42_060W047\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time


Seattle Public Utilities - Genesee Basin
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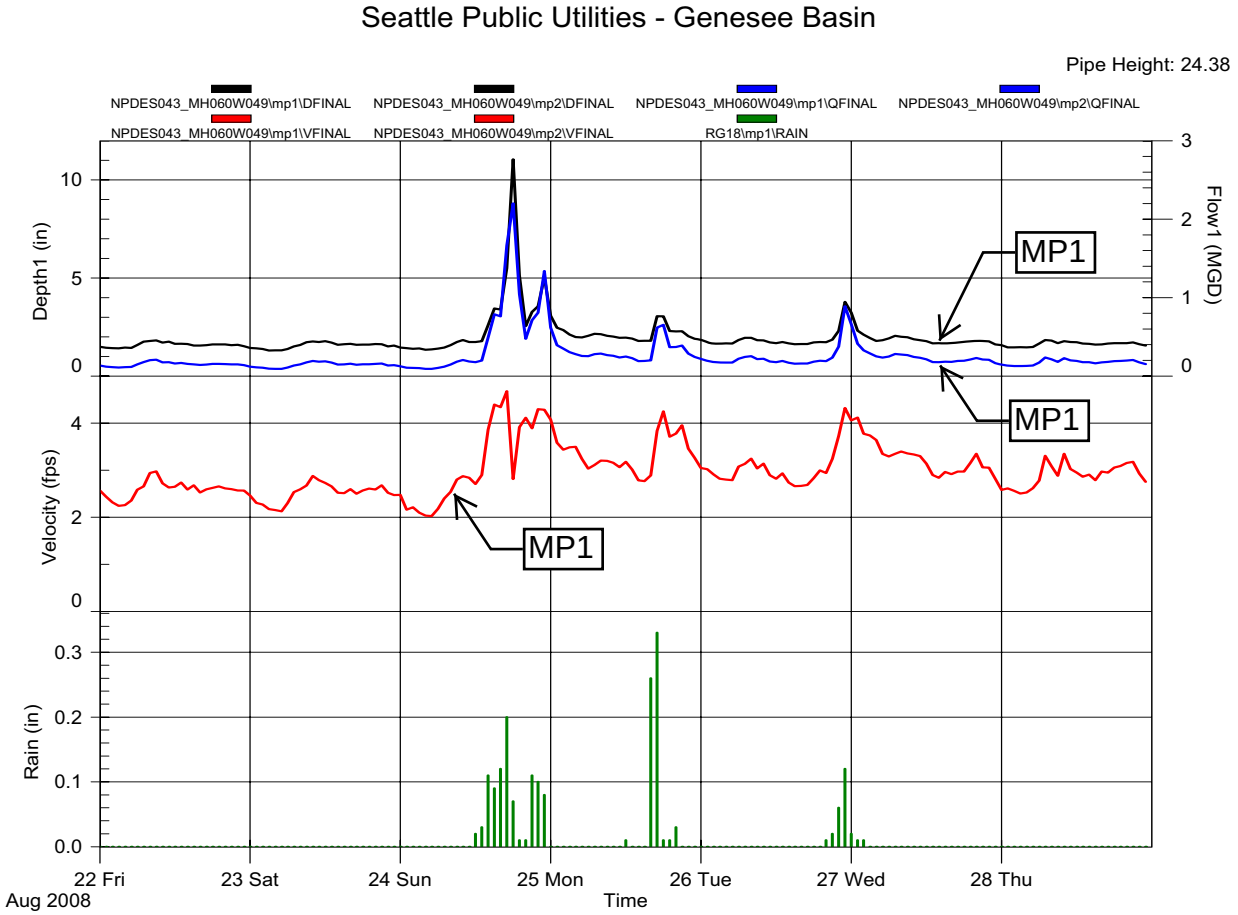
NPDES043_MH060W049\mp2\DFINAL
NPDES043_MH060W049\mp1\QFINAL
NPDES043_MH060W049\mp2\QFINAL
NPDES043_MH060W049\mp1\VFINAL
NPDES043_MH060W049\mp2\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
MP1
MP1
MP1
21 Mon
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Jul 2008
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 24.38
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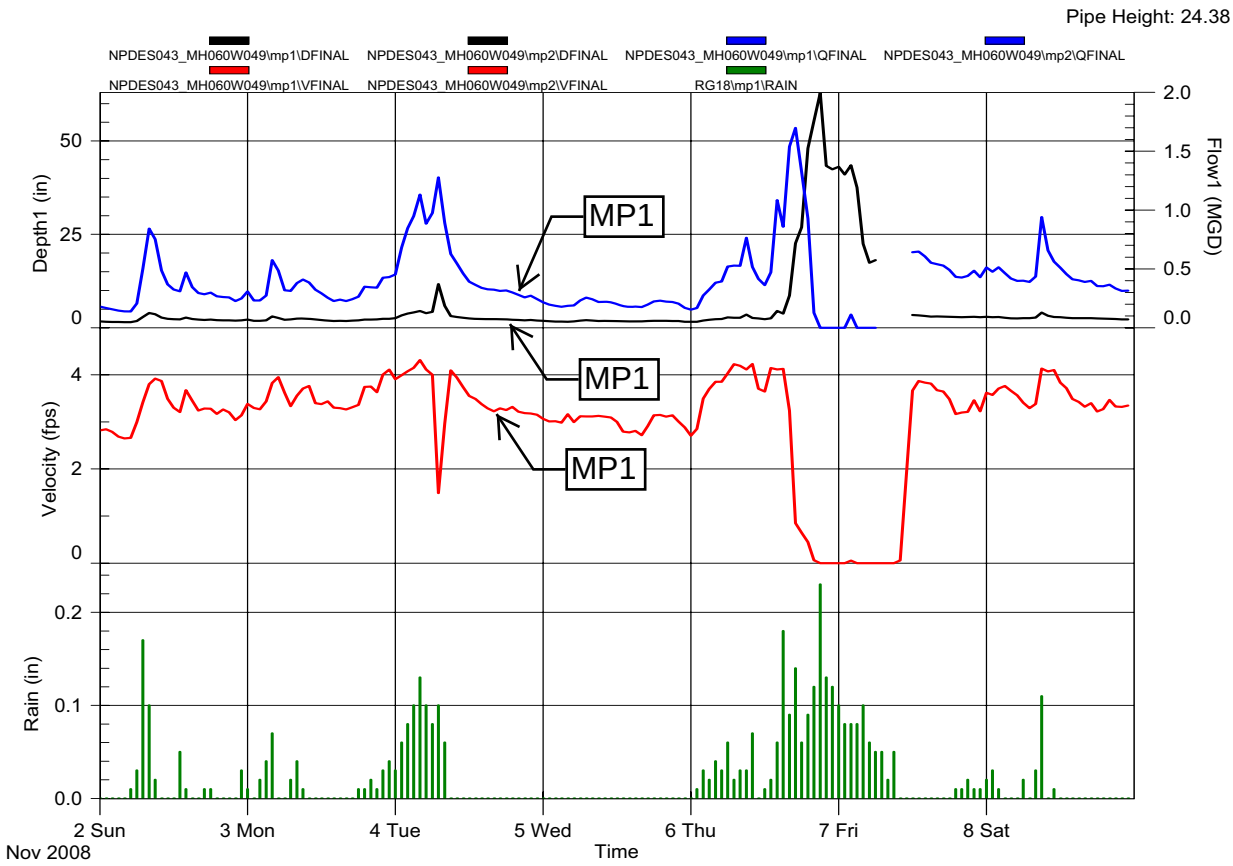
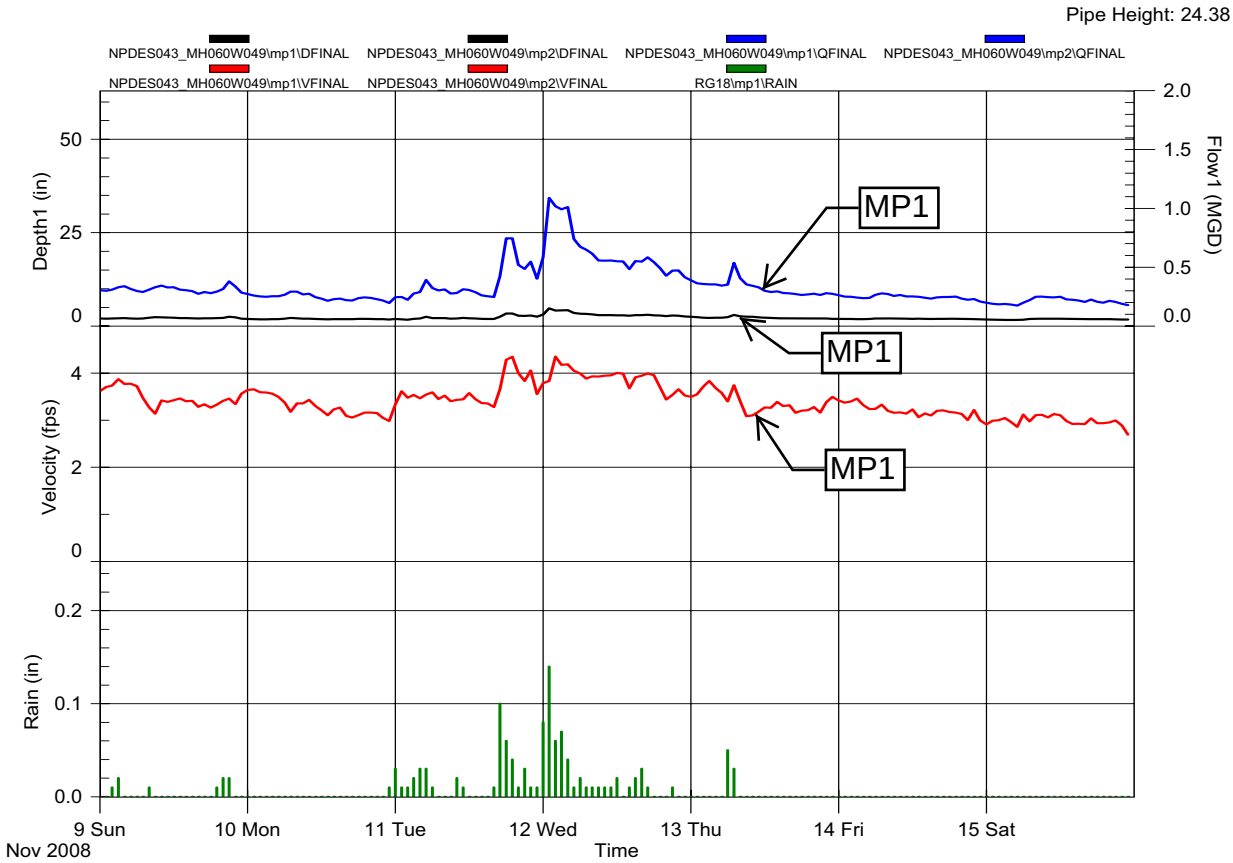
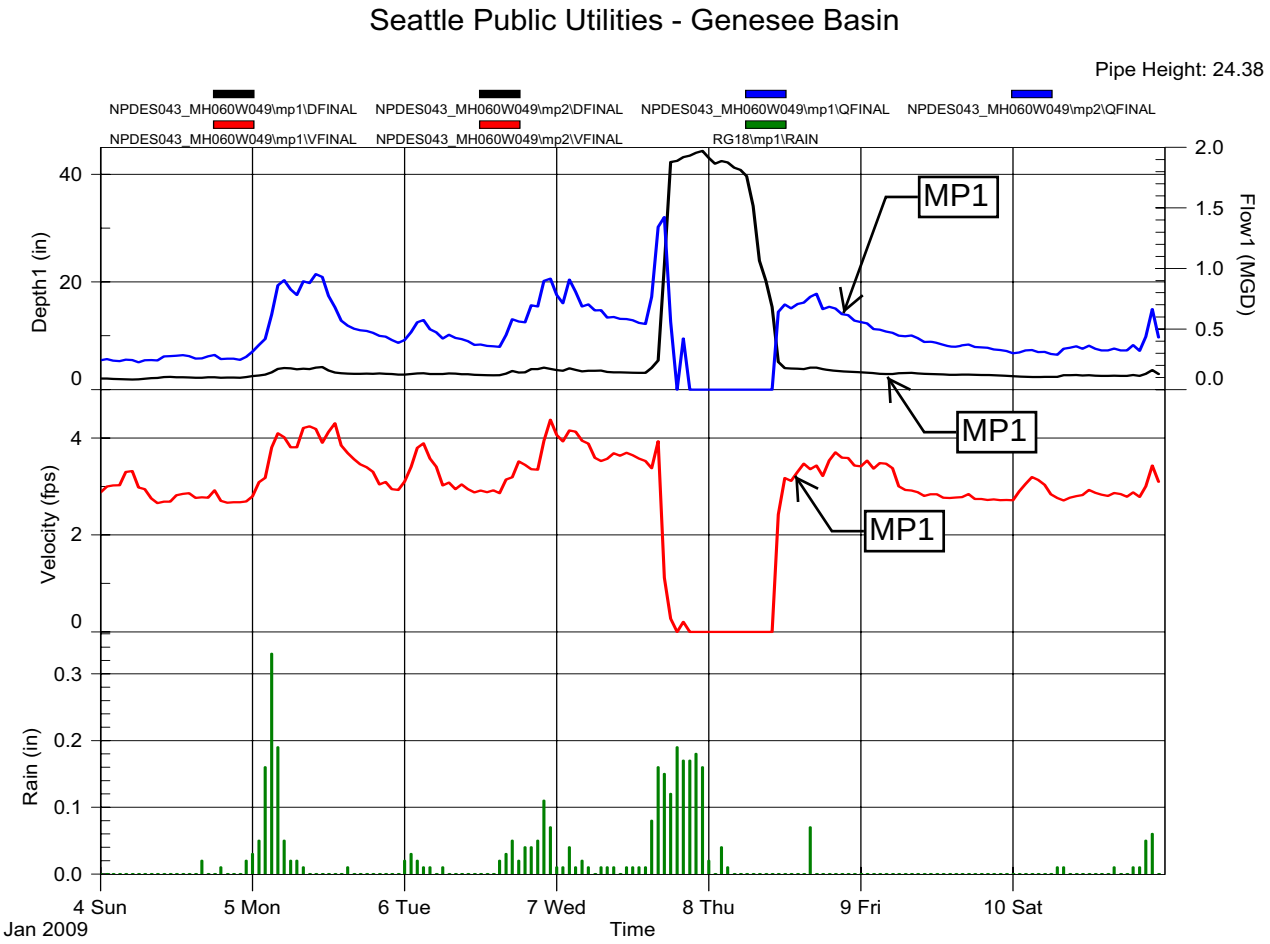
NPDES043_MH060W049\mp2\DFINAL
NPDES043_MH060W049\mp1\QFINAL
NPDES043_MH060W049\mp2\QFINAL
NPDES043_MH060W049\mp1\VFINAL
NPDES043_MH060W049\mp2\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
MP1
MP1
MP1
22 Fri
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Aug 2008
Time

Seattle Public Utilities - Genesee Basin



Seattle Public Utilities - Genesee Basin




Seattle Public Utilities - Genesee Basin
Pipe Height: 24.38
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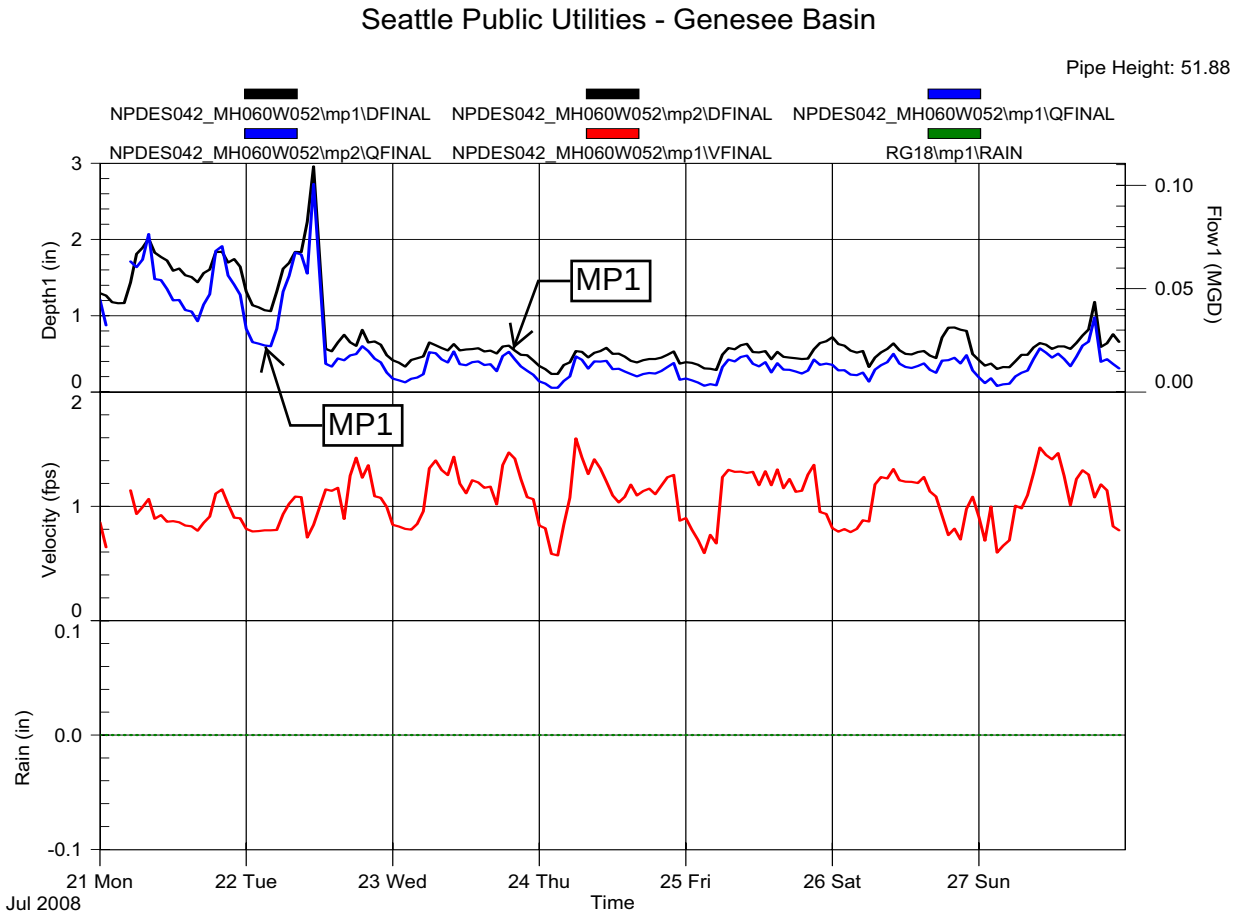
NPDES043_MH060W049\mp2\DFINAL
NPDES043_MH060W049\mp1\QFINAL
NPDES043_MH060W049\mp2\QFINAL
NPDES043_MH060W049\mp1\VFINAL
NPDES043_MH060W049\mp2\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
MP1
MP1
MP1
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 51.88
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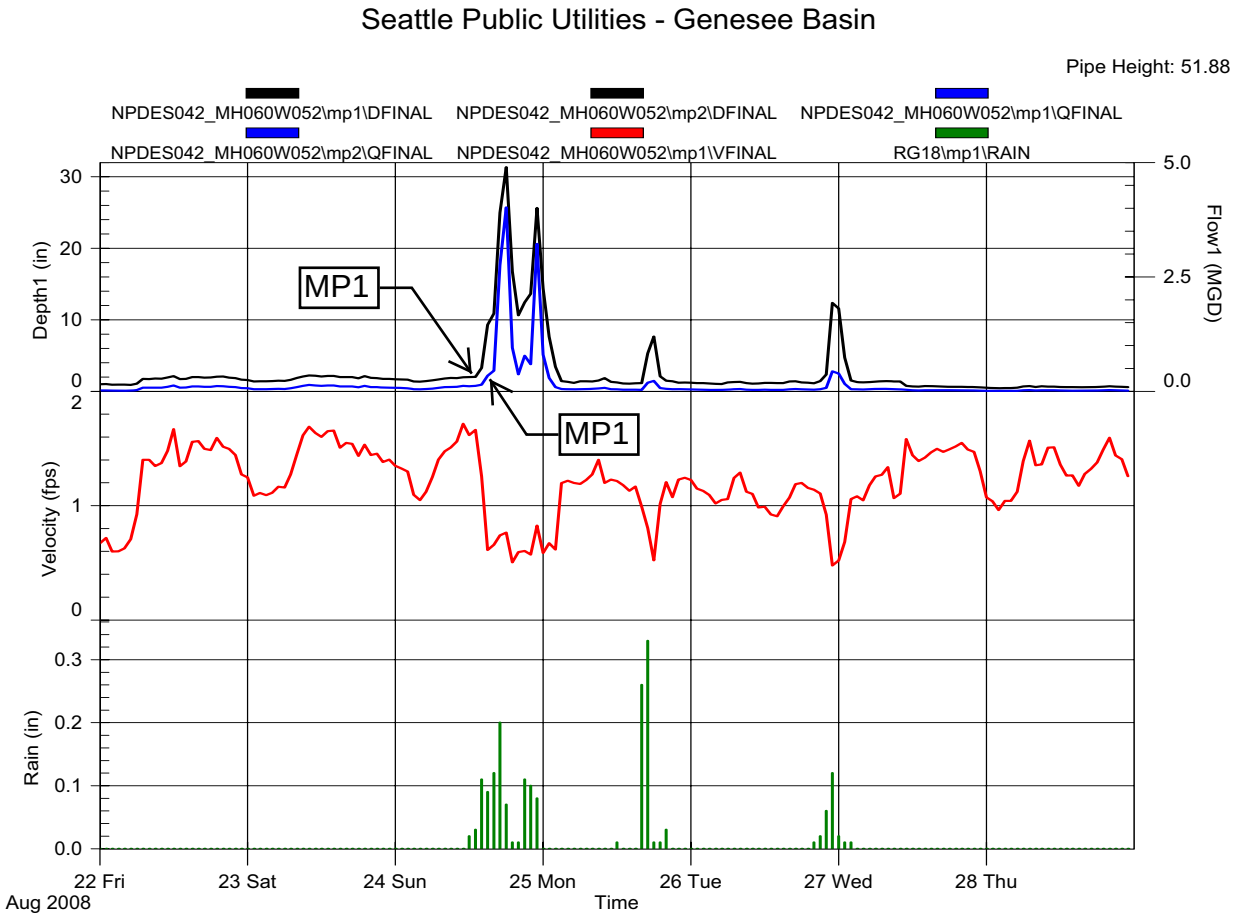
NPDES042_MH060W052\mp1\QFINAL
NPDES042_MH060W052\mp2\QFINAL
NPDES042_MH060W052\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
MP1
MP1
Velocity (fps)
Rain (in)
21 Mon
Jul 2008
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Time


Seattle Public Utilities - Genesee Basin
Pipe Height: 51.88
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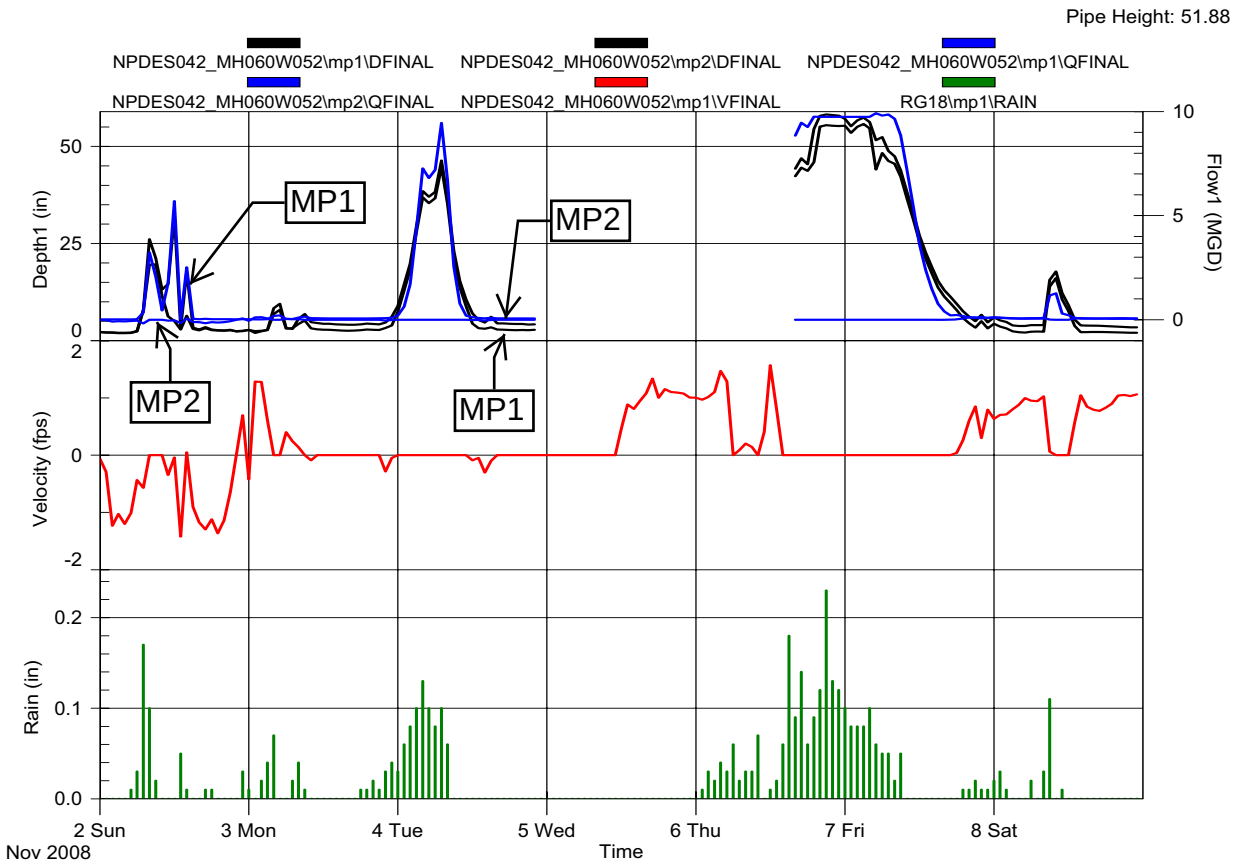
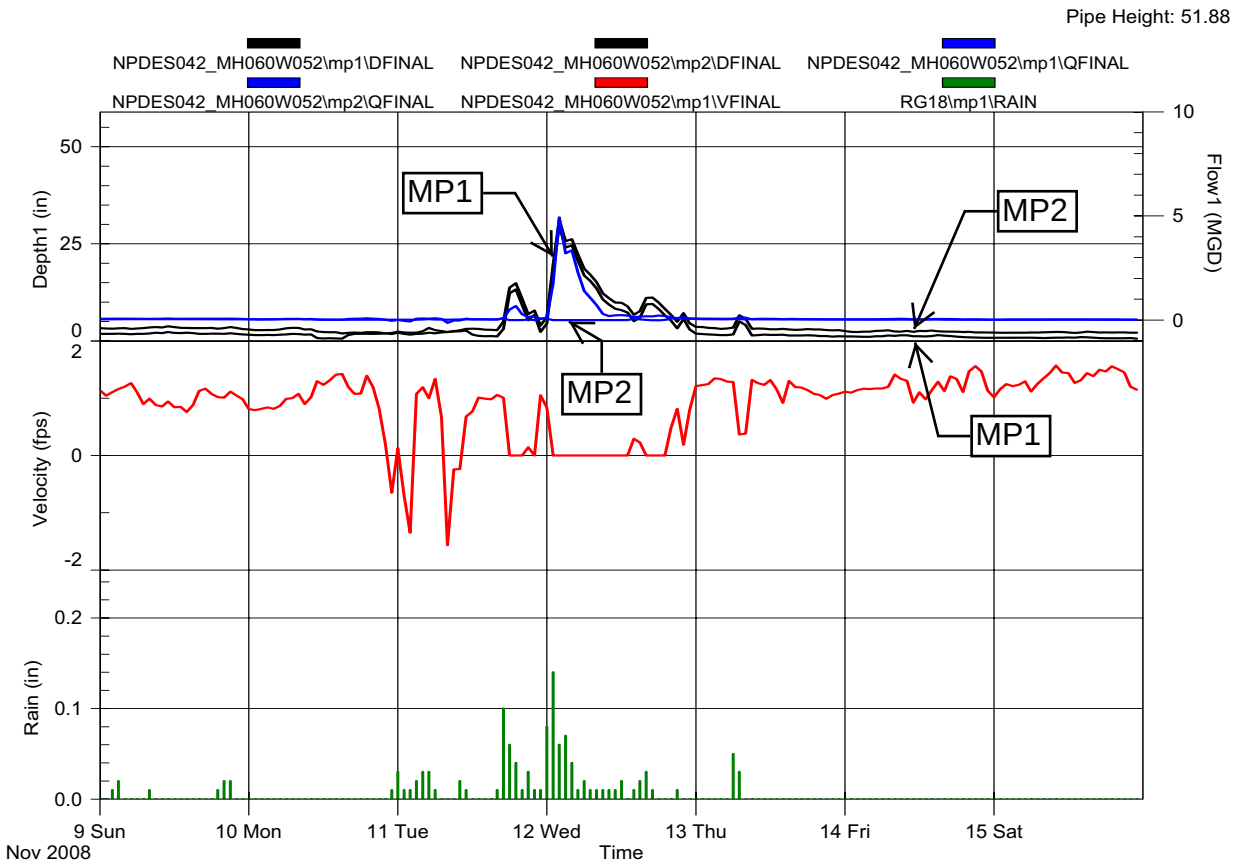
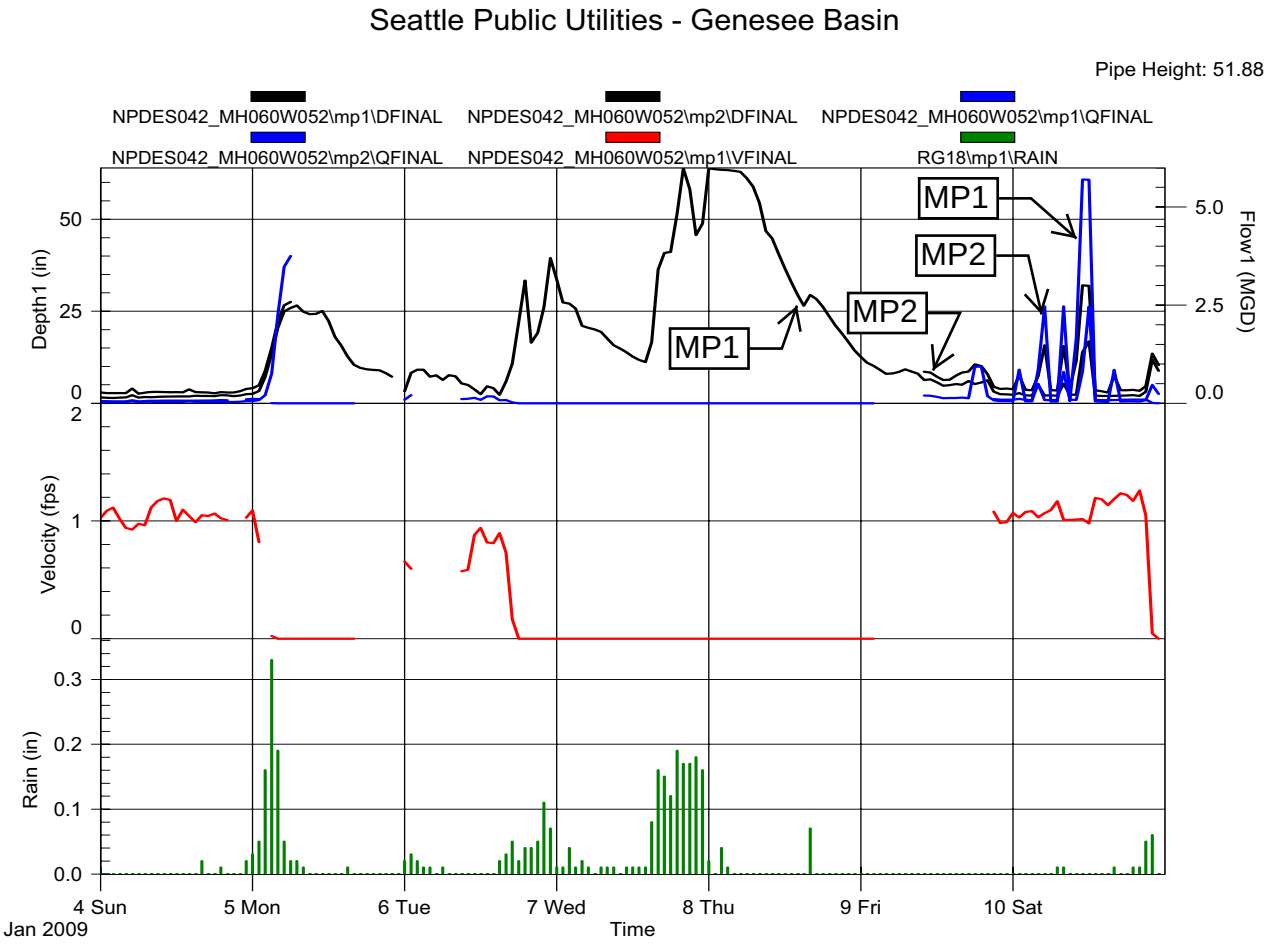
NPDES042_MH060W052\mp2\DFINAL
NPDES042_MH060W052\mp1\QFINAL
NPDES042_MH060W052\mp2\QFINAL
NPDES042_MH060W052\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
MP1
MP1
Velocity (fps)
Rain (in)
22 Fri
Aug 2008
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Time

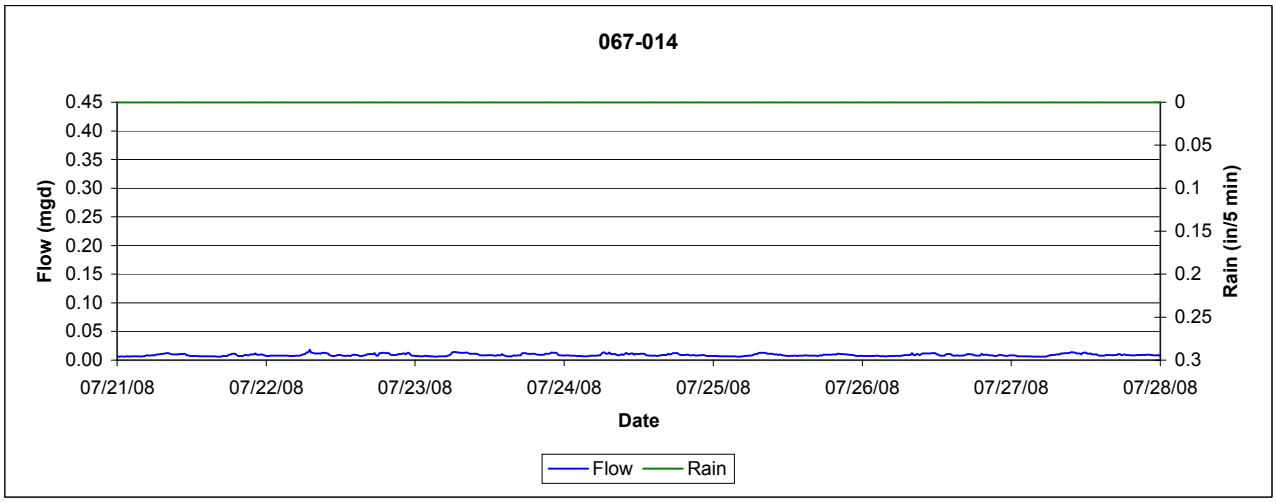
Seattle Public Utilities - Genesee Basin

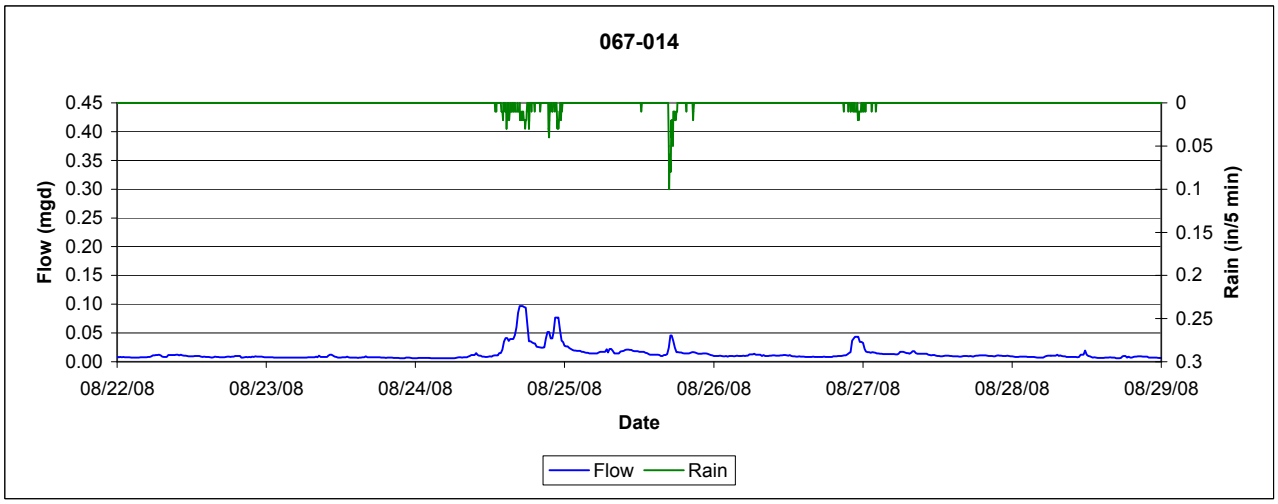


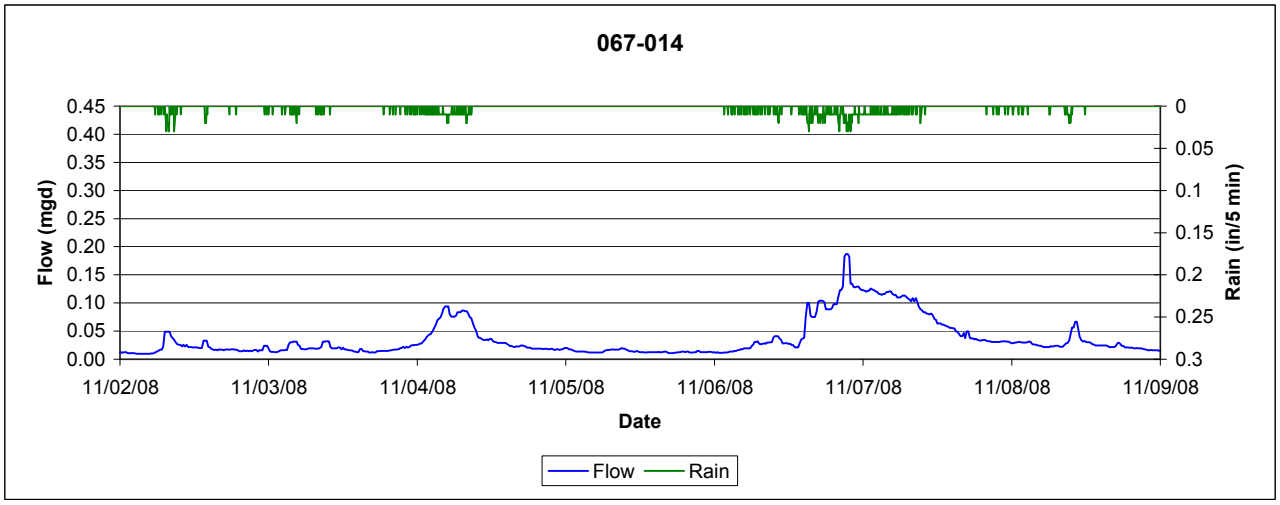
Seattle Public Utilities - Genesee Basin

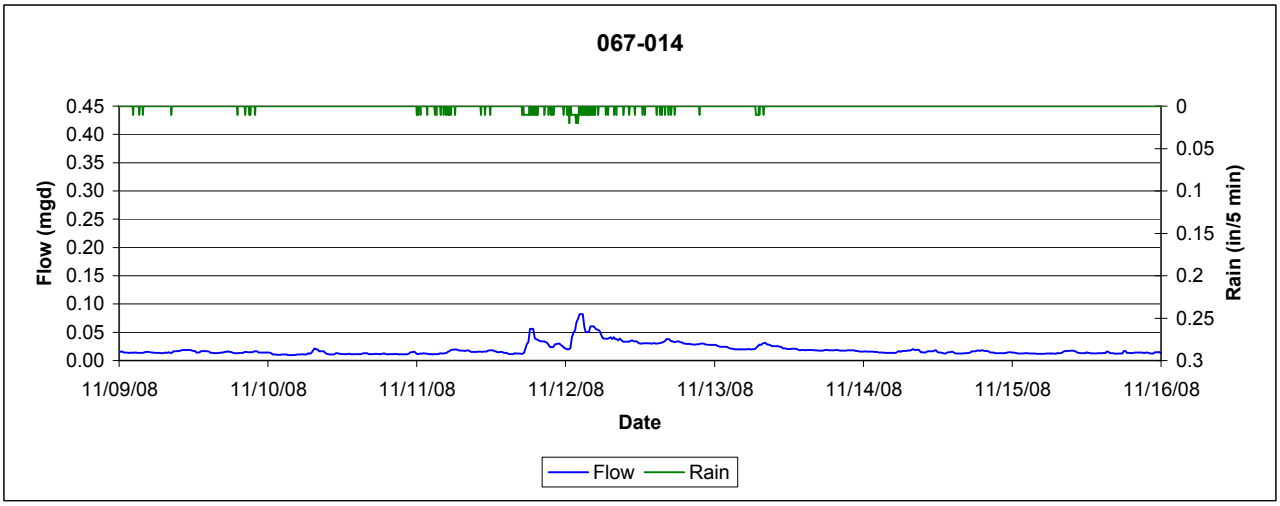


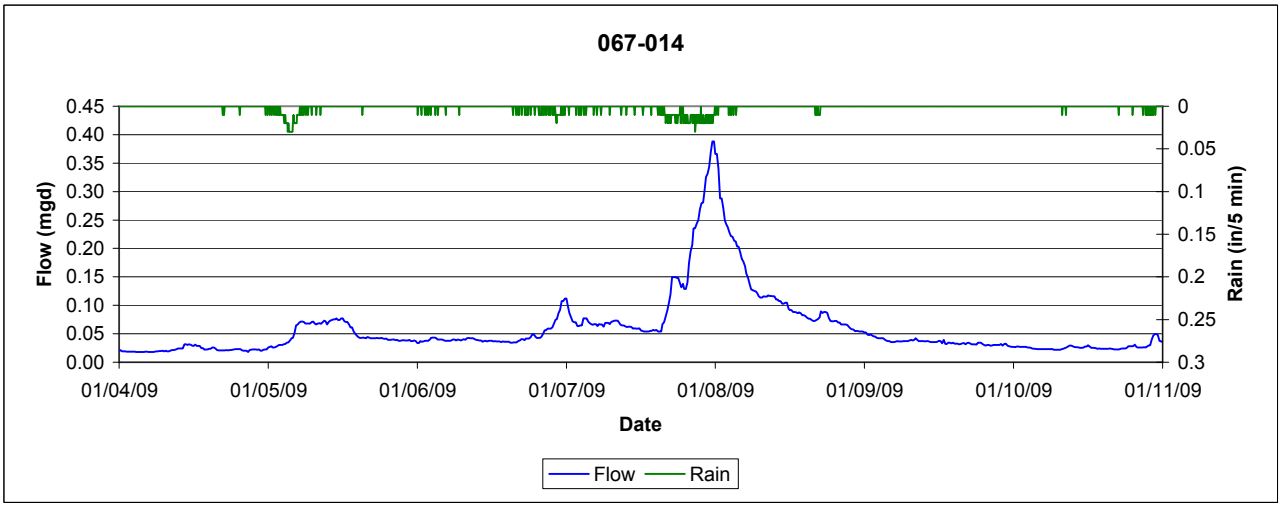

Seattle Public Utilities - Genesee Basin
Pipe Height: 51.88
NPDES042_MH060W052\mp1\DFINAL
NPDES042_MH060W052\mp2\DFINAL
NPDES042_MH060W052\mp1\QFINAL
NPDES042_MH060W052\mp2\QFINAL
NPDES042_MH060W052\mp1\VFINAL
RG18\mp1\RAIN
MP1
MP2
MP2
MP1
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time

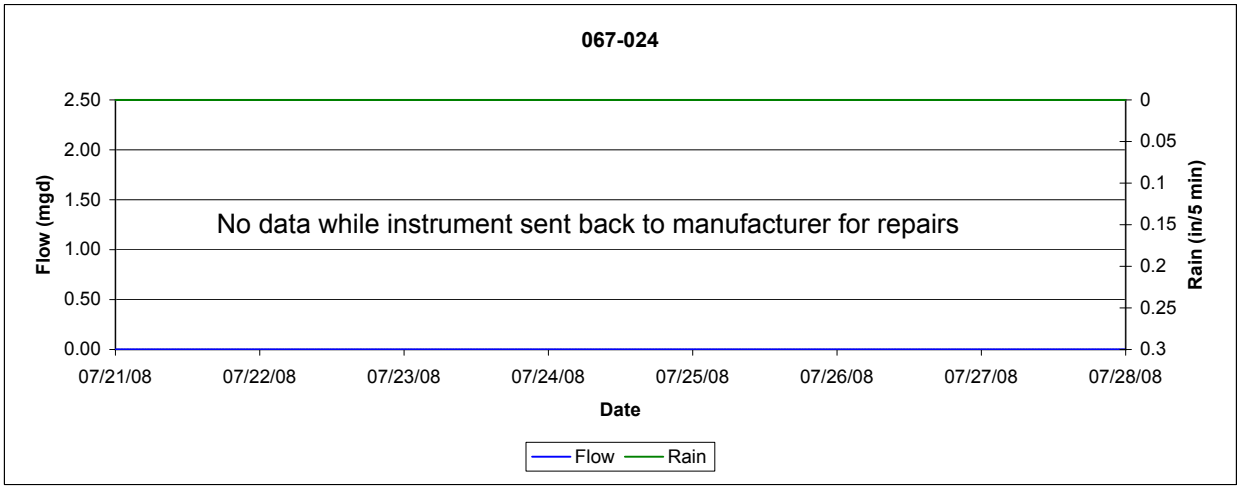

067-014
Flow (mgd)
Rain (in/5 min)
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
0.05
0.1
0.15
0.2
0.25
0.3
07/21/08
07/22/08
07/23/08
07/24/08
07/25/08
07/26/08
07/27/08
07/28/08
Date
Flow
Rain

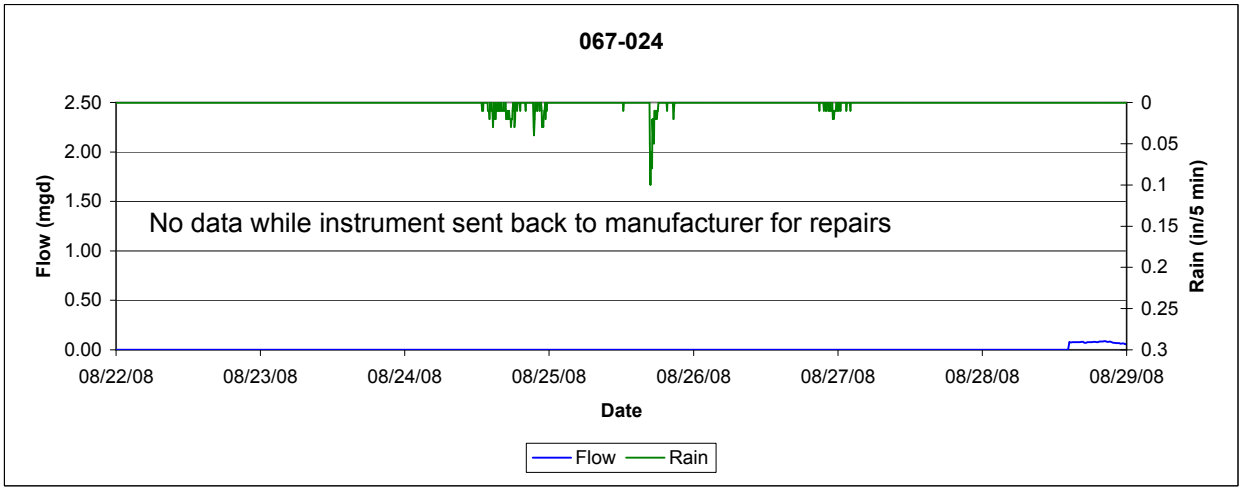

067-014
Flow (mgd)
Rain (in/5 min)
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
0.05
0.1
0.15
0.2
0.25
0.3
08/22/08
08/23/08
08/24/08
08/25/08
08/26/08
08/27/08
08/28/08
08/29/08
Date
Flow
Rain

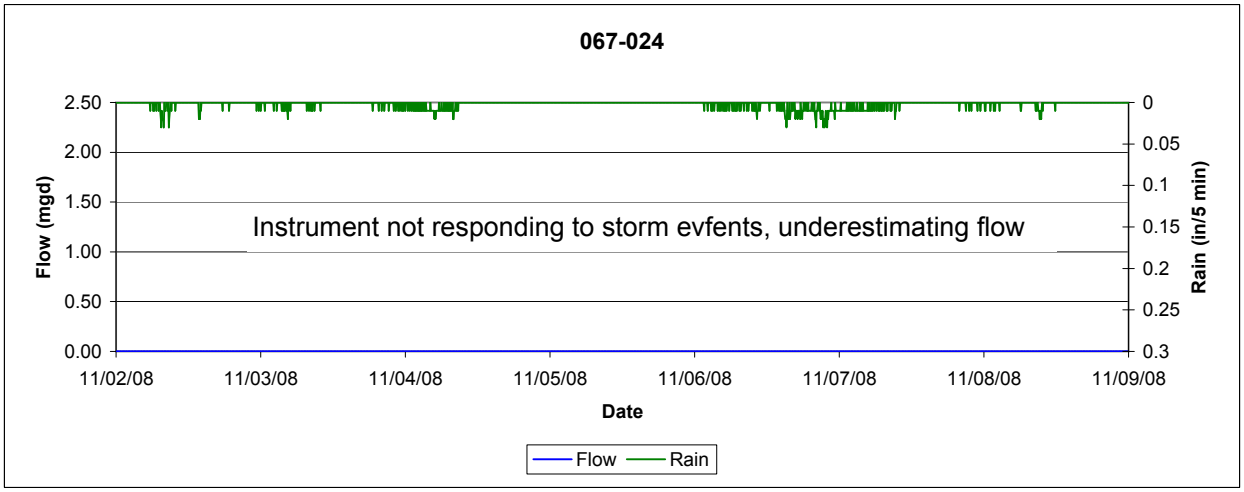

067-014
Flow (mgd)
Rain (in/5 min)
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
0.05
0.1
0.15
0.2
0.25
0.3
11/02/08
11/03/08
11/04/08
11/05/08
11/06/08
11/07/08
11/08/08
11/09/08
Date
Flow
Rain

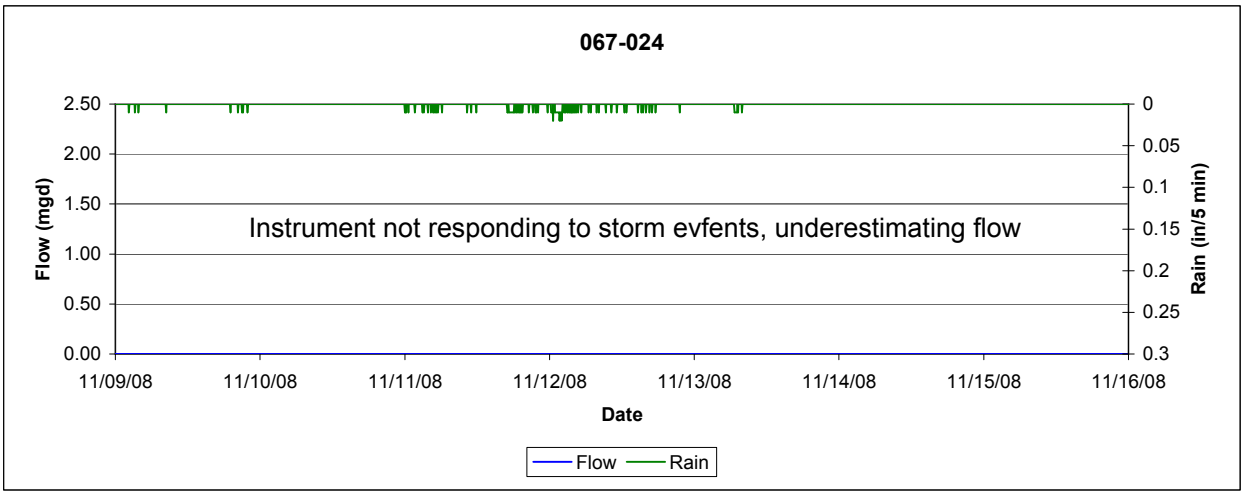

067-014
Flow (mgd)
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Rain (in/5 min)
0
0.05
0.1
0.15
0.2
0.25
0.3
11/09/08
11/10/08
11/11/08
11/12/08
11/13/08
11/14/08
11/15/08
11/16/08
Date
Flow
Rain

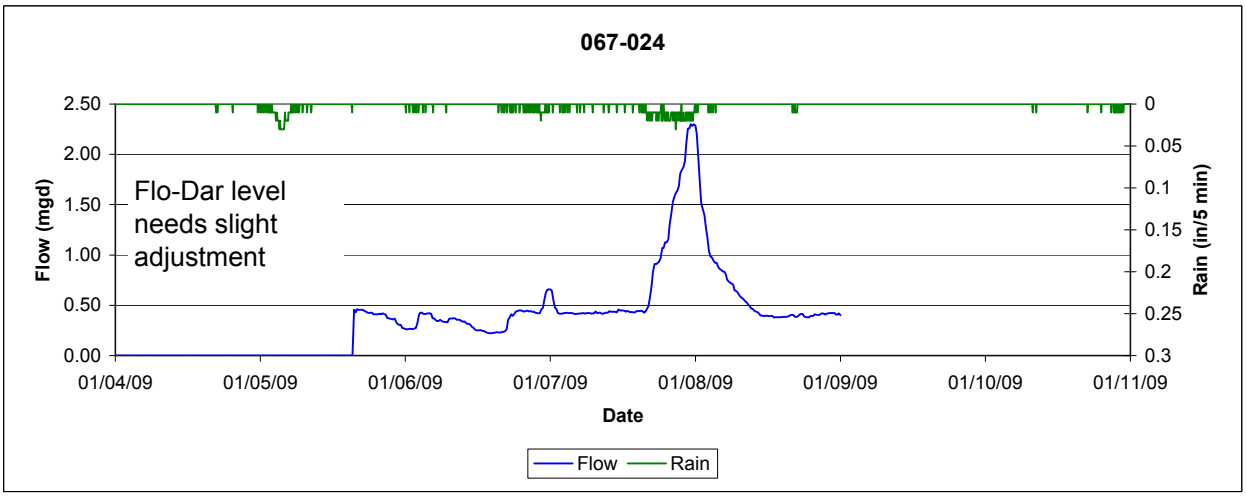

067-014
Flow (mgd)
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Rain (in/5 min)
0
0.05
0.1
0.15
0.2
0.25
0.3
01/04/09
01/05/09
01/06/09
01/07/09
01/08/09
01/09/09
01/10/09
01/11/09
Date
Flow
Rain

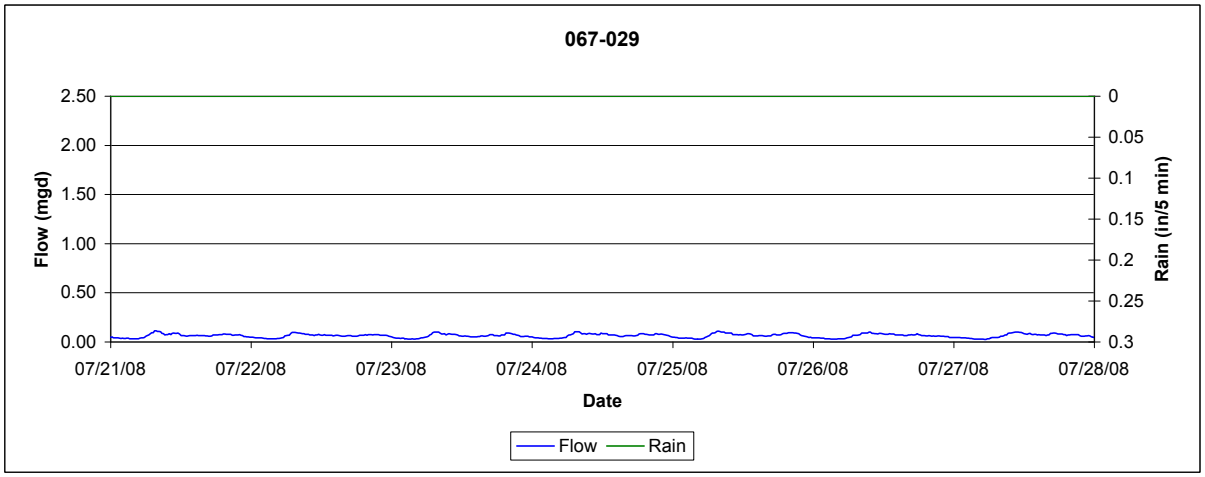

067-024
No data while instrument sent back to manufacturer for repairs
Flow (mgd)
Rain (in/5 min)
2.50
2.00
1.50
1.00
0.50
0.00
0
0.05
0.1
0.15
0.2
0.25
0.3
07/21/08
07/22/08
07/23/08
07/24/08
07/25/08
07/26/08
07/27/08
07/28/08
Date
Flow
Rain

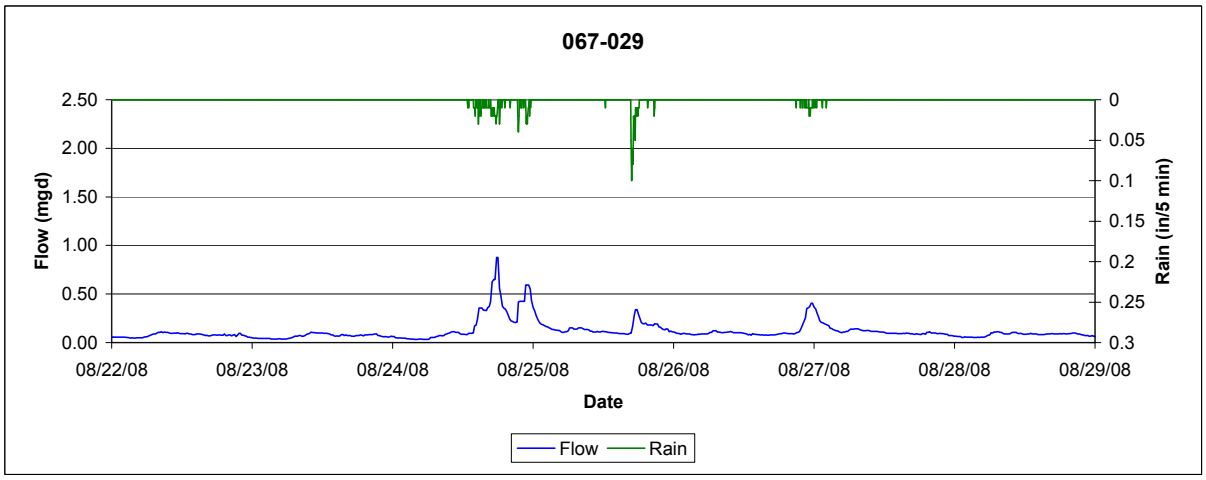

067-024
No data while instrument sent back to manufacturer for repairs
Flow (mgd)
Rain (in/5 min)
2.50
2.00
1.50
1.00
0.50
0.00
0
0.05
0.1
0.15
0.2
0.25
0.3
08/22/08
08/23/08
08/24/08
08/25/08
08/26/08
08/27/08
08/28/08
08/29/08
Date
Flow
Rain

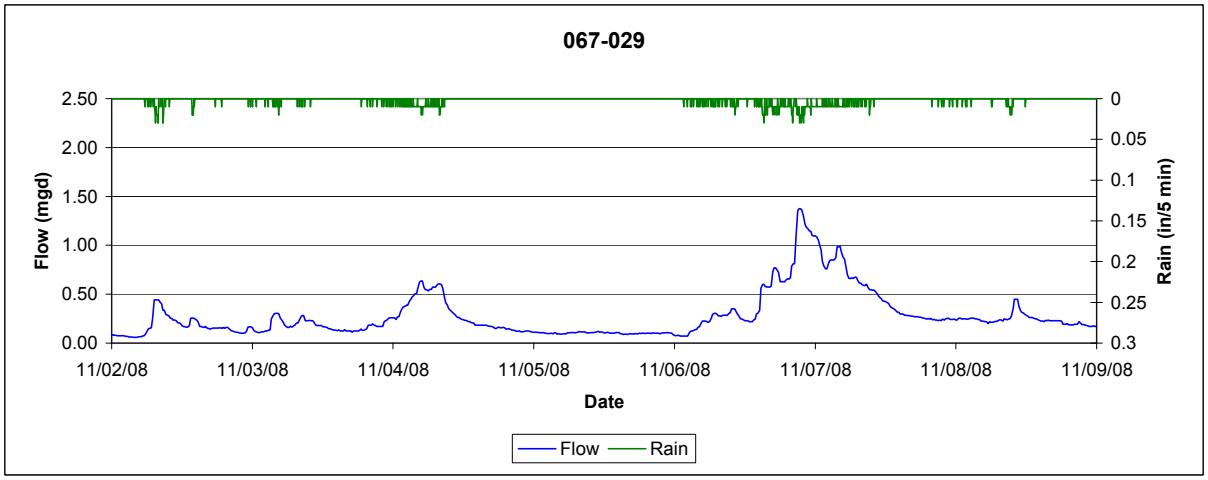

067-024
Instrument not responding to storm evfents, underestimating flow
Flow (mgd)
Rain (in/5 min)
2.50
2.00
1.50
1.00
0.50
0.00
0
0.05
0.1
0.15
0.2
0.25
0.3
11/02/08
11/03/08
11/04/08
11/05/08
11/06/08
11/07/08
11/08/08
11/09/08
Date
Flow
Rain

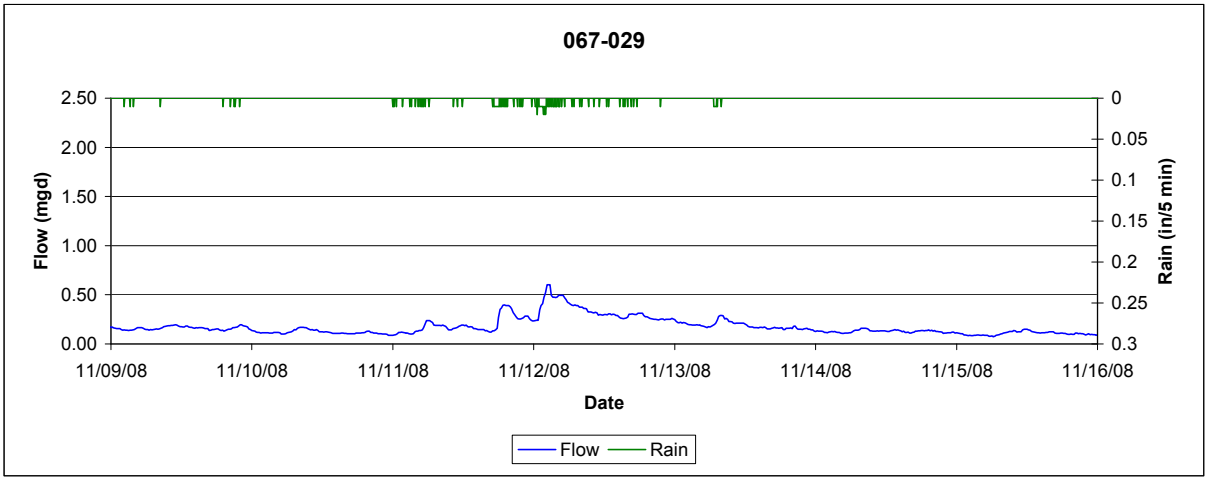

067-024
Instrument not responding to storm evfents, underestimating flow
Flow (mgd)
Rain (in/5 min)
2.50
2.00
1.50
1.00
0.50
0.00
0
0.05
0.1
0.15
0.2
0.25
0.3
11/09/08
11/10/08
11/11/08
11/12/08
11/13/08
11/14/08
11/15/08
11/16/08
Date
Flow
Rain

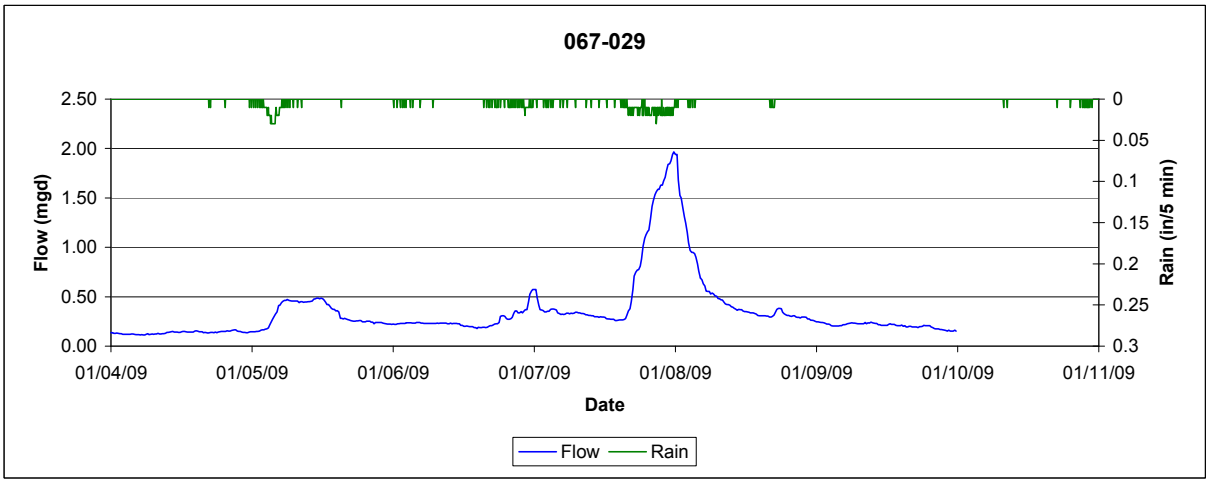

067-024
Flo-Dar level needs slight adjustment
Flow (mgd)
Rain (in/5 min)
2.50
2.00
1.50
1.00
0.50
0.00
0
0.05
0.1
0.15
0.2
0.25
0.3
01/04/09
01/05/09
01/06/09
01/07/09
01/08/09
01/09/09
01/10/09
01/11/09
Date
Flow
Rain

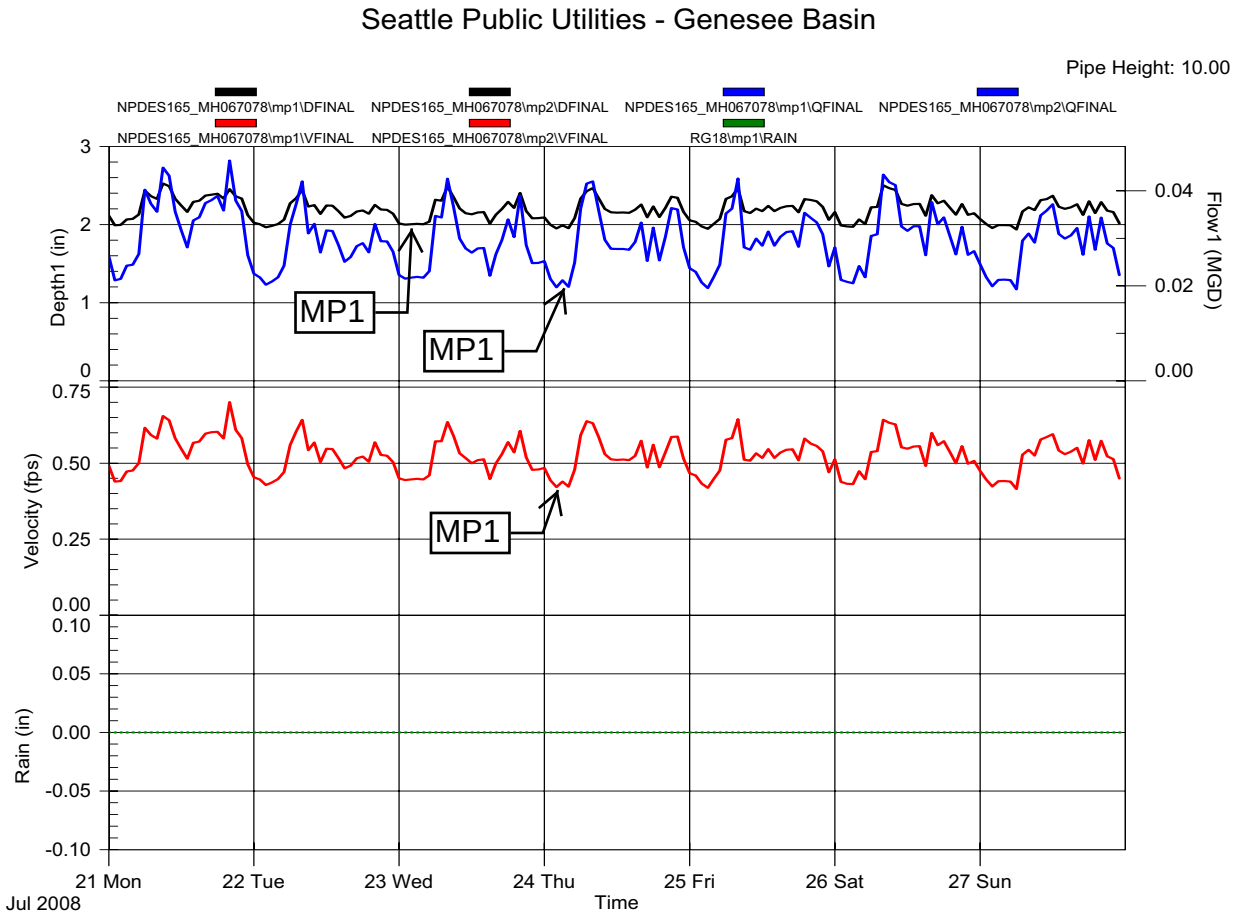

067-029
Flow (mgd)
2.50
2.00
1.50
1.00
0.50
0.00
Rain (in/5 min)
0
0.05
0.1
0.15
0.2
0.25
0.3
07/21/08
07/22/08
07/23/08
07/24/08
07/25/08
07/26/08
07/27/08
07/28/08
Date
Flow
Rain

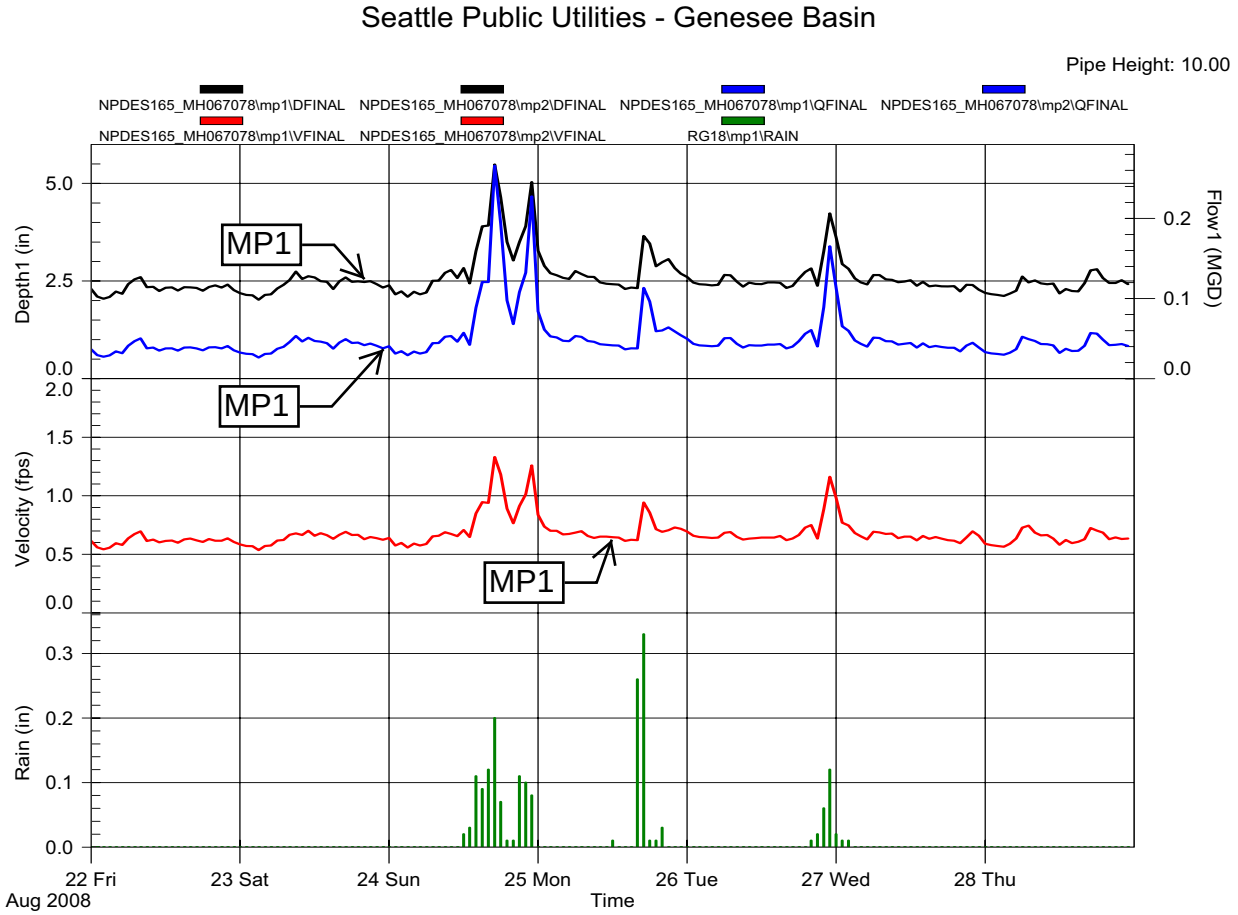

067-029
Flow (mgd)
2.50
2.00
1.50
1.00
0.50
0.00
Rain (in/5 min)
0
0.05
0.1
0.15
0.2
0.25
0.3
08/22/08
08/23/08
08/24/08
08/25/08
08/26/08
08/27/08
08/28/08
08/29/08
Date
Flow
Rain


067-029
Flow (mgd)
2.50
2.00
1.50
1.00
0.50
0.00
Rain (in/5 min)
0
0.05
0.1
0.15
0.2
0.25
0.3
11/02/08
11/03/08
11/04/08
11/05/08
11/06/08
11/07/08
11/08/08
11/09/08
Date
Flow
Rain

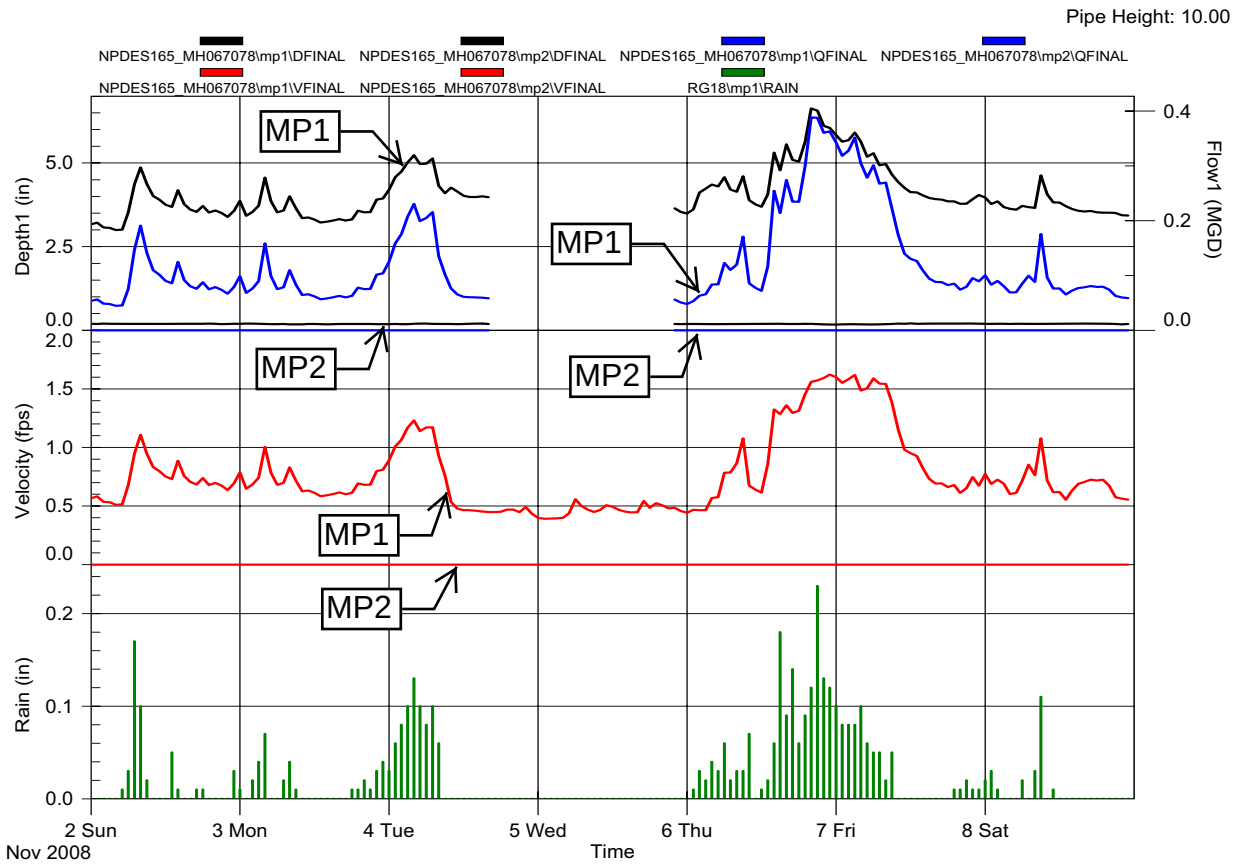

067-029
Flow (mgd)
2.50
2.00
1.50
1.00
0.50
0.00
Rain (in/5 min)
0
0.05
0.1
0.15
0.2
0.25
0.3
11/09/08
11/10/08
11/11/08
11/12/08
11/13/08
11/14/08
11/15/08
11/16/08
Date
Flow
Rain


067-029
Flow (mgd)
2.50
2.00
1.50
1.00
0.50
0.00
Rain (in/5 min)
0
0.05
0.1
0.15
0.2
0.25
0.3
01/04/09
01/05/09
01/06/09
01/07/09
01/08/09
01/09/09
01/10/09
01/11/09
Date
Flow
Rain

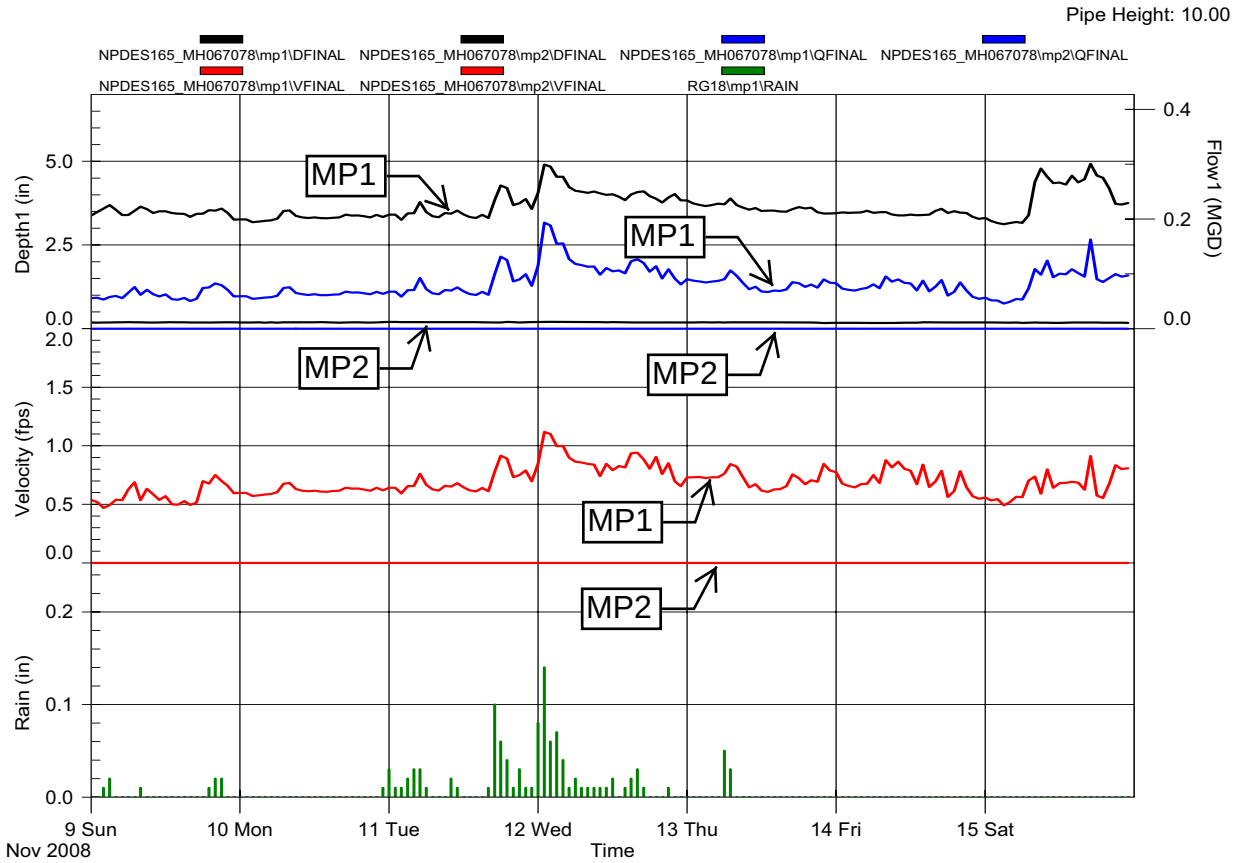

Seattle Public Utilities - Genesee Basin
Pipe Height: 10.00
NPDES165_MH067078\mp1\DFINAL
NPDES165_MH067078\mp2\DFINAL
NPDES165_MH067078\mp1\QFINAL
NPDES165_MH067078\mp2\QFINAL
NPDES165_MH067078\mp1\VFINAL
NPDES165_MH067078\mp2\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
MP1
21 Mon
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Jul 2008
Time

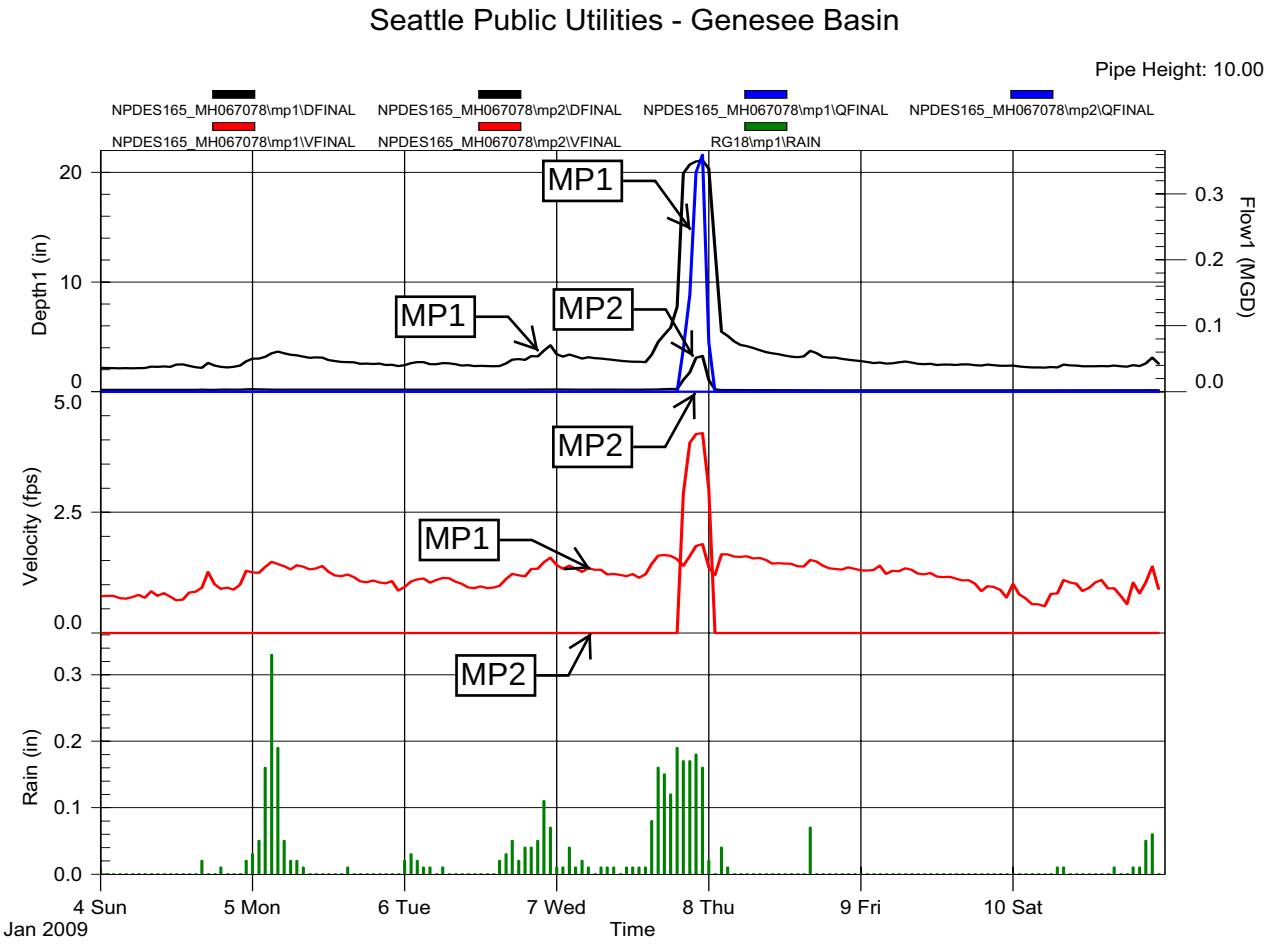

Seattle Public Utilities - Genesee Basin
Pipe Height: 10.00
NPDES165_MH067078\mp1\DFINAL
NPDES165_MH067078\mp2\DFINAL
NPDES165_MH067078\mp1\QFINAL
NPDES165_MH067078\mp2\QFINAL
NPDES165_MH067078\mp1\VFINAL
NPDES165_MH067078\mp2\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
MP1
22 Fri
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Aug 2008
Time

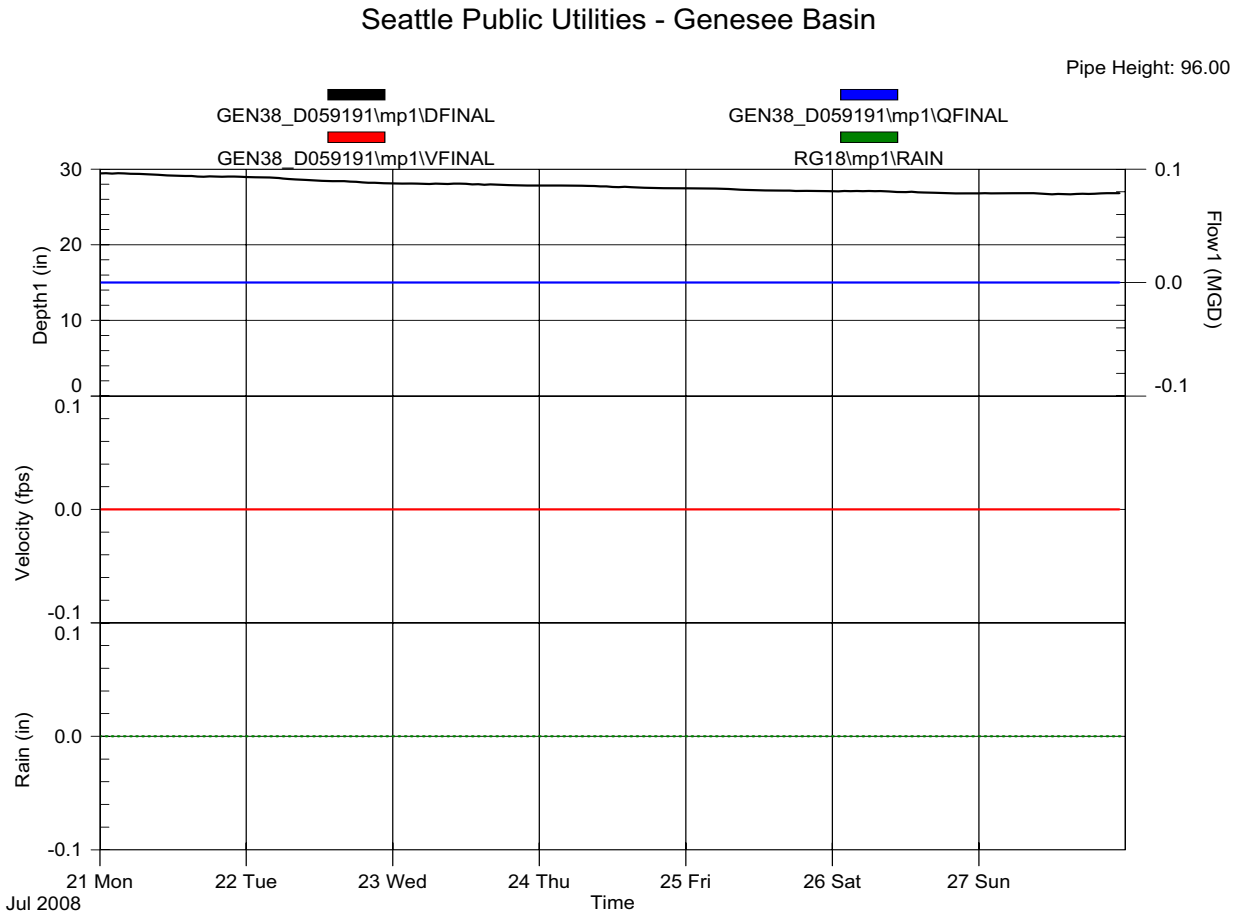
Seattle Public Utilities - Genesee Basin

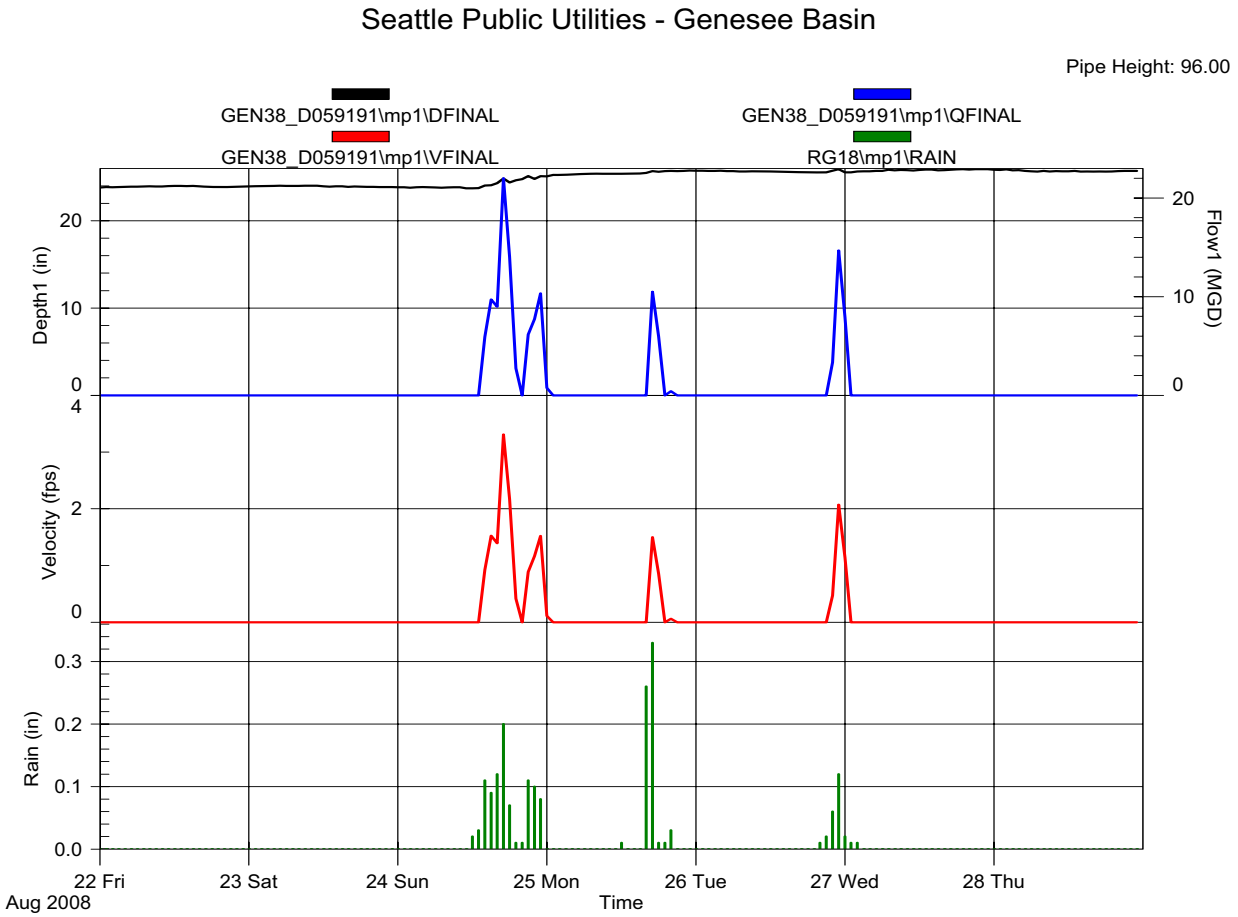


Seattle Public Utilities - Genesee Basin

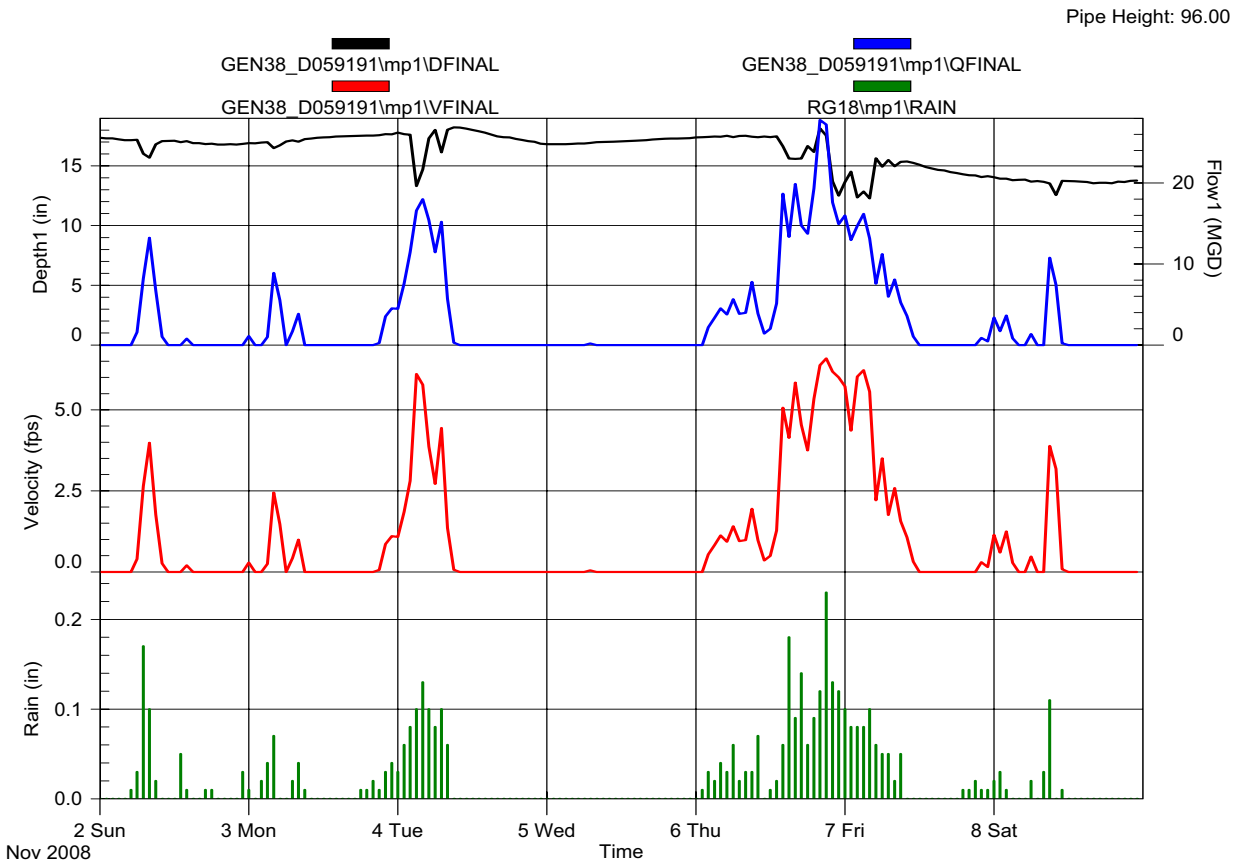



Seattle Public Utilities - Genesee Basin
Pipe Height: 10.00
NPDES165_MH067078\mp1\DFINAL
NPDES165_MH067078\mp2\DFINAL
NPDES165_MH067078\mp1\QFINAL
NPDES165_MH067078\mp2\QFINAL
NPDES165_MH067078\mp1\VFINAL
NPDES165_MH067078\mp2\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
MP1
MP2
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time

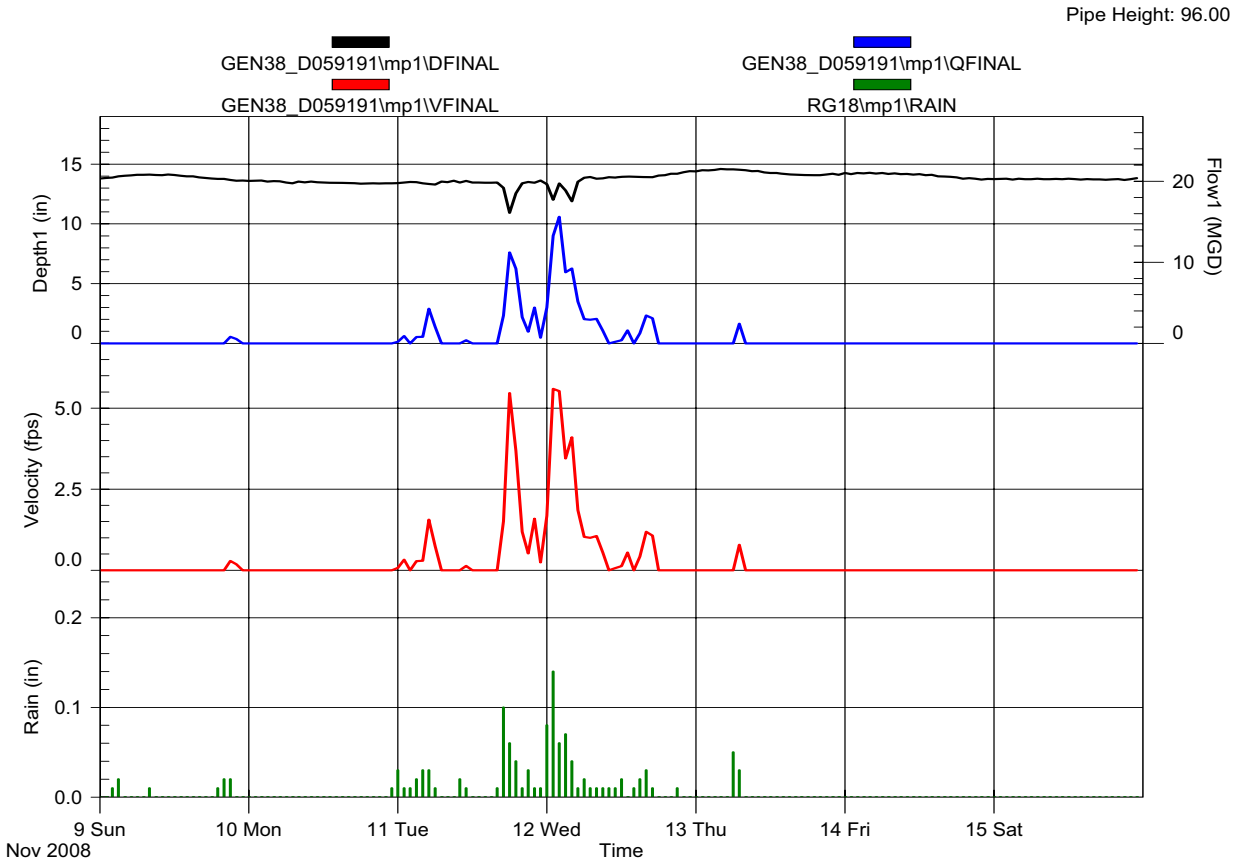

Seattle Public Utilities - Genesee Basin
Pipe Height: 96.00
GEN38_D059191\mp1\DFINAL
GEN38_D059191\mp1\QFINAL
GEN38_D059191\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
21 Mon
Jul 2008
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
27 Sun
Time

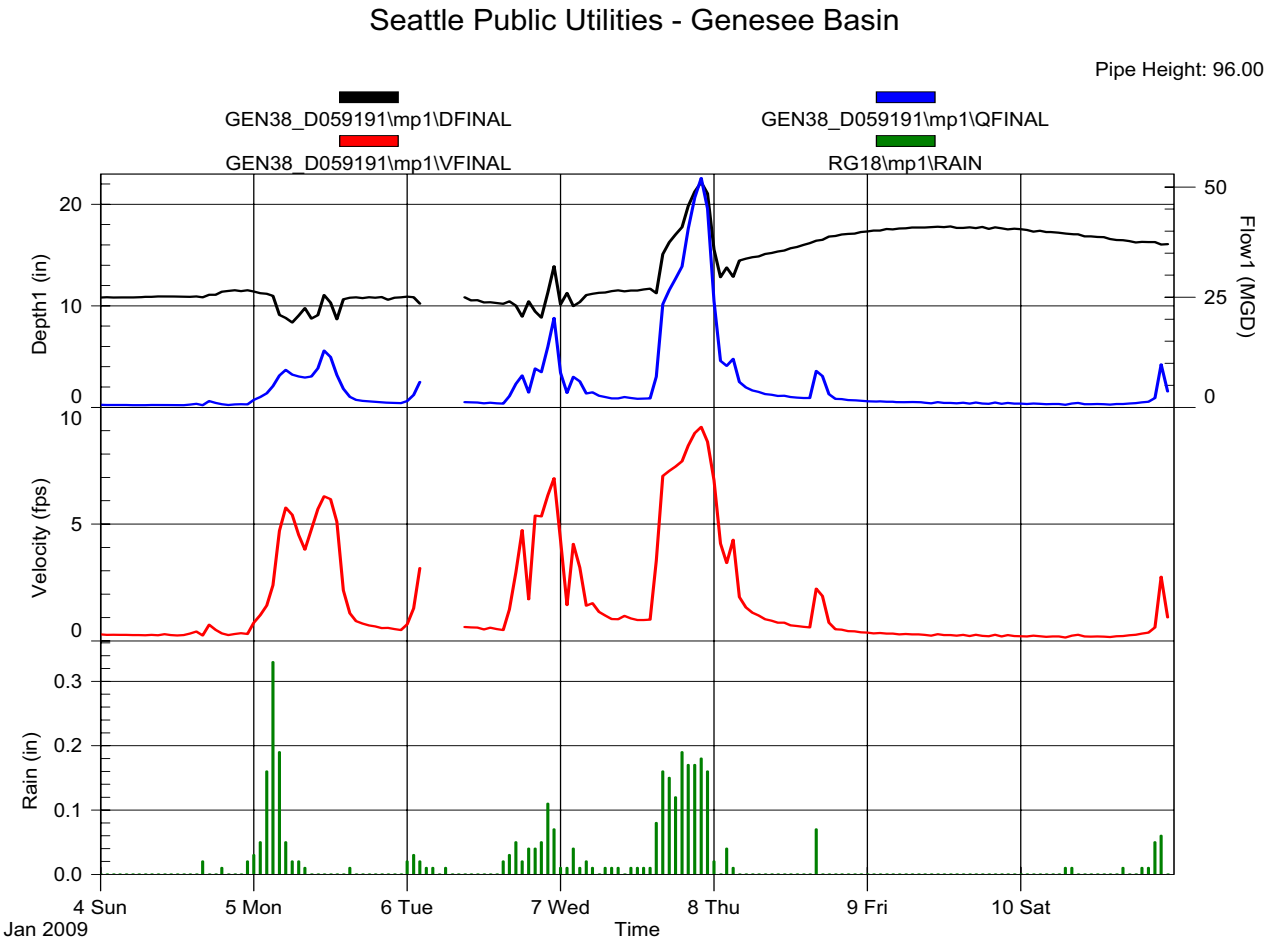

Seattle Public Utilities - Genesee Basin
Pipe Height: 96.00
GEN38_D059191\mp1\DFINAL
GEN38_D059191\mp1\QFINAL
GEN38_D059191\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
22 Fri
Aug 2008
23 Sat
24 Sun
25 Mon
26 Tue
27 Wed
28 Thu
Time

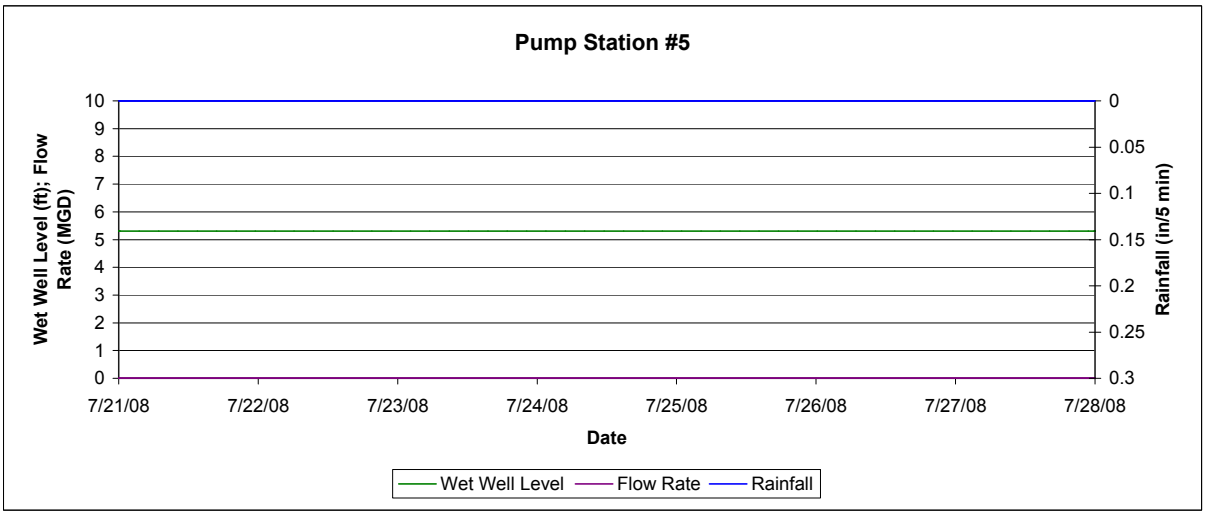
Seattle Public Utilities - Genesee Basin

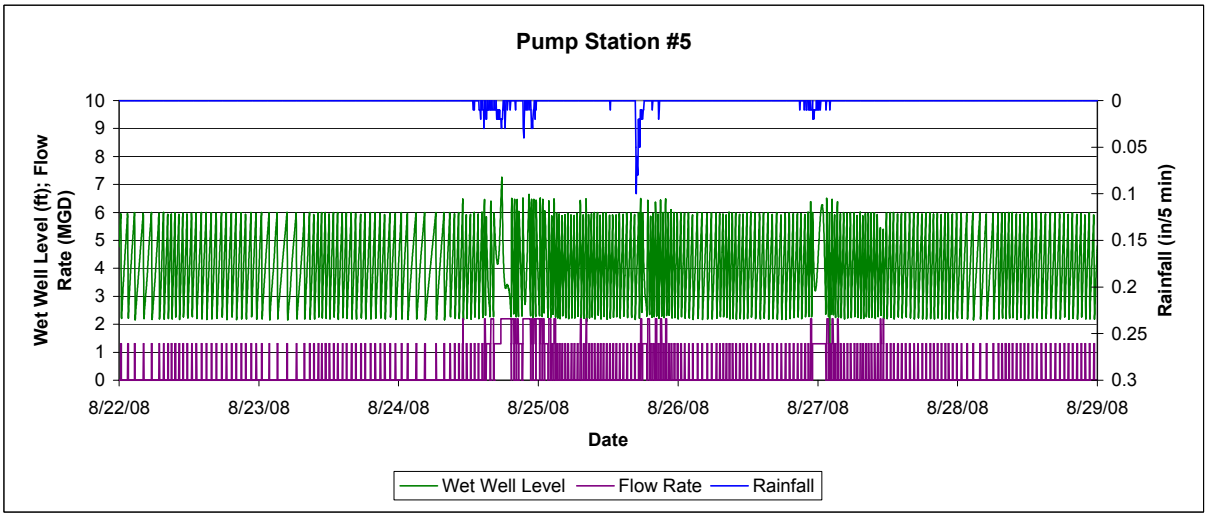


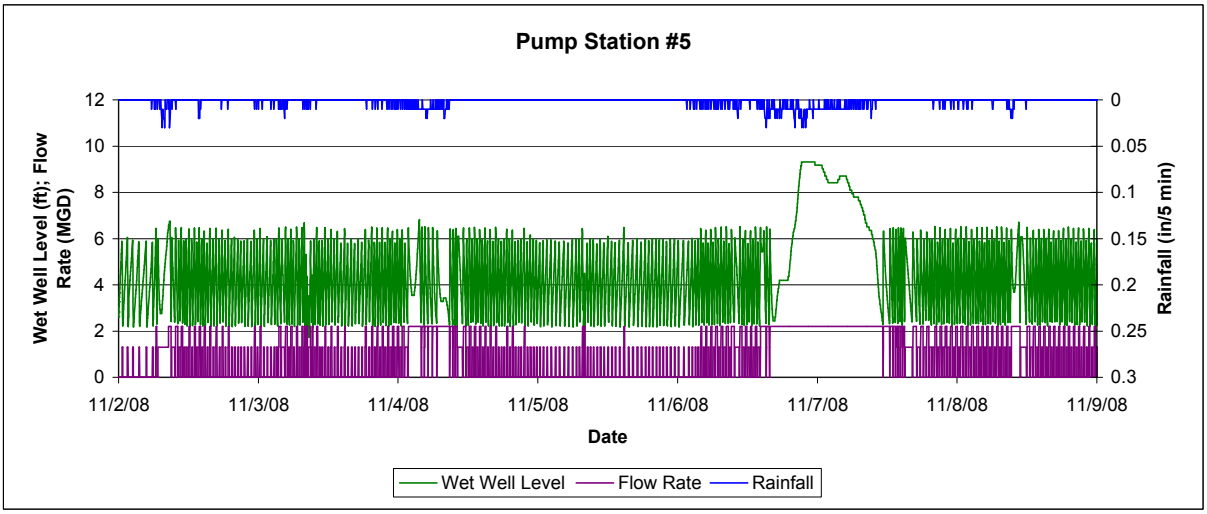
Seattle Public Utilities - Genesee Basin

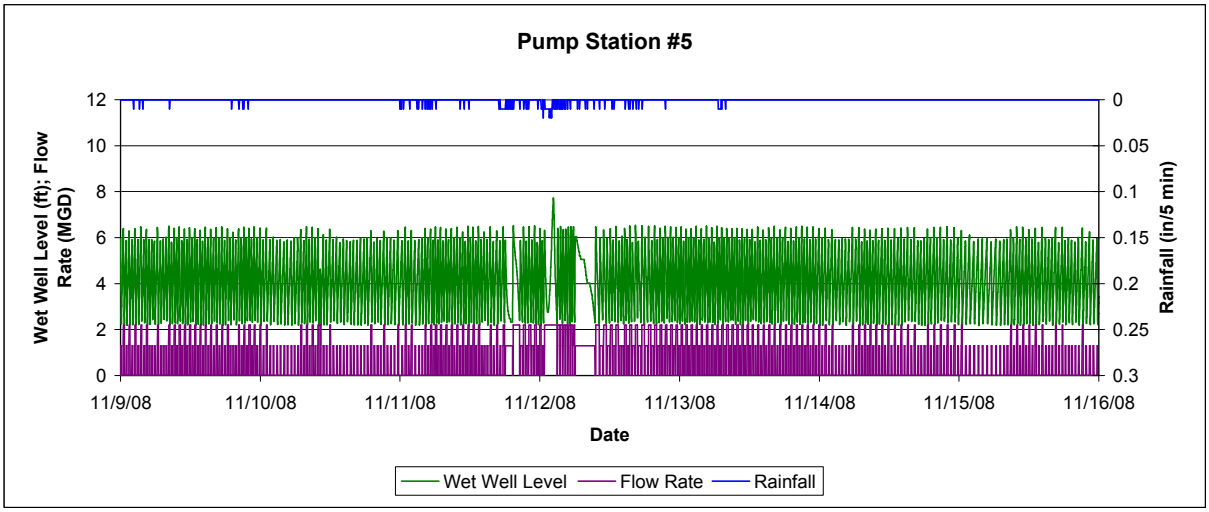


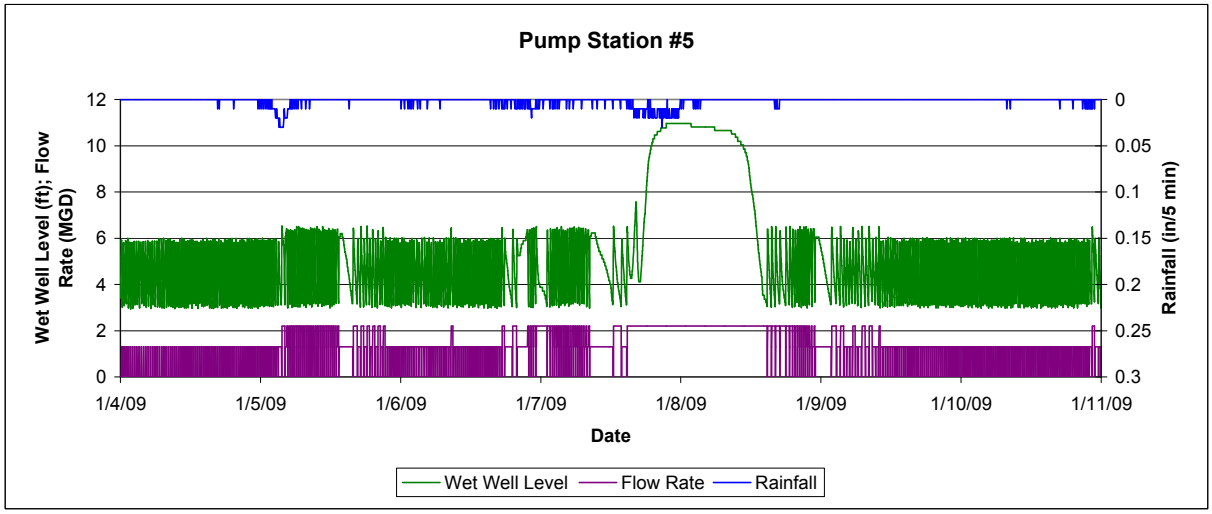

Seattle Public Utilities - Genesee Basin
Pipe Height: 96.00
GEN38_D059191\mp1\DFINAL
GEN38_D059191\mp1\QFINAL
GEN38_D059191\mp1\VFINAL
RG18\mp1\RAIN
Depth1 (in)
Flow1 (MGD)
Velocity (fps)
Rain (in)
4 Sun
Jan 2009
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
Time

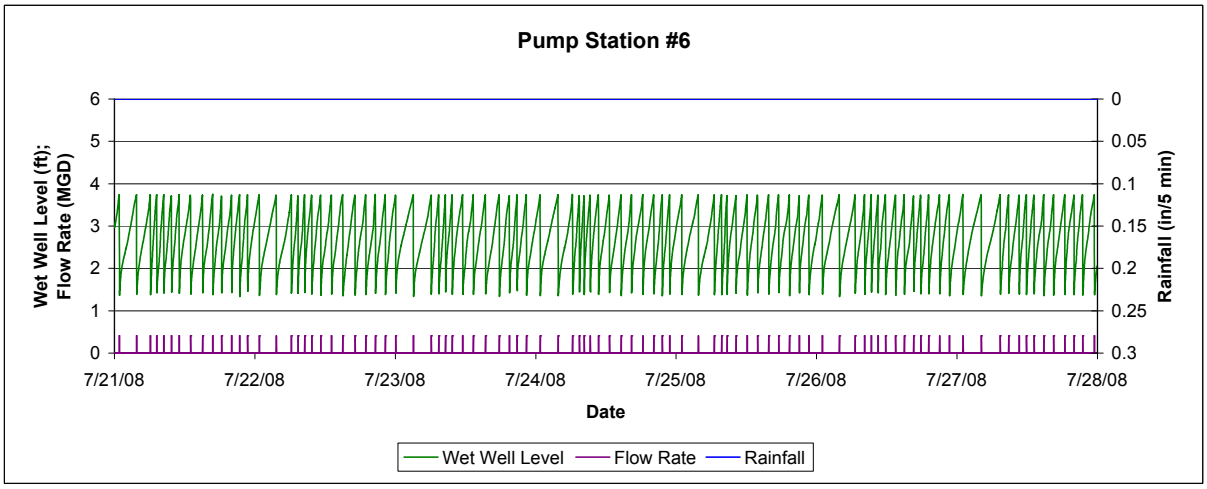

Pump Station #5
Wet Well Level (ft); Flow Rate (MGD)
Rainfall (in/5 min)
10
9
8
7
6
5
4
3
2
1
0
0
0.05
0.1
0.15
0.2
0.25
0.3
7/21/08
7/22/08
7/23/08
7/24/08
7/25/08
7/26/08
7/27/08
7/28/08
Date
Wet Well Level
Flow Rate
Rainfall

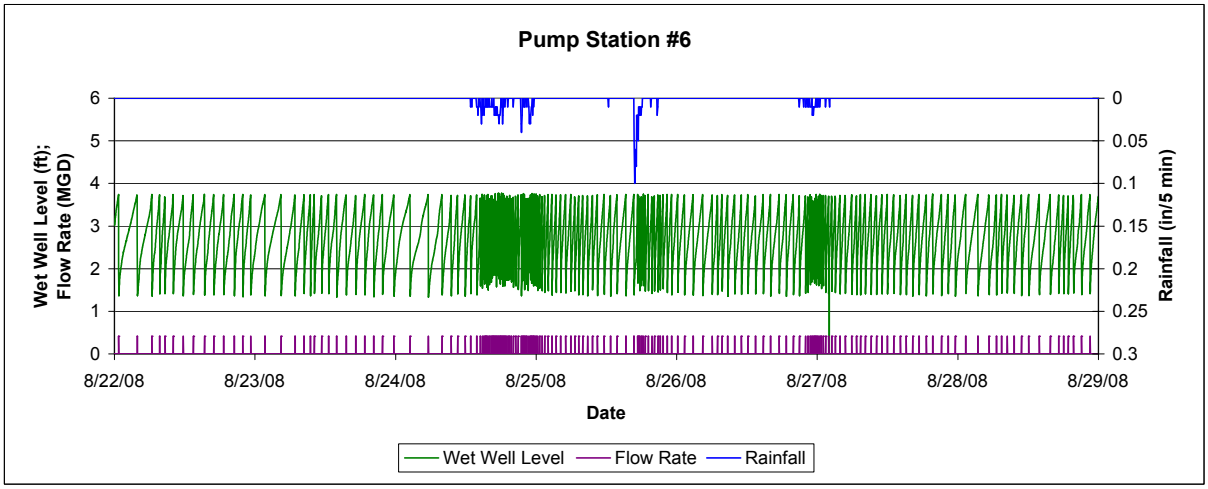

Pump Station #5
Wet Well Level (ft); Flow Rate (MGD)
Rainfall (in/5 min)
10
9
8
7
6
5
4
3
2
1
0
0
0.05
0.1
0.15
0.2
0.25
0.3
8/22/08
8/23/08
8/24/08
8/25/08
8/26/08
8/27/08
8/28/08
8/29/08
Date
Wet Well Level
Flow Rate
Rainfall

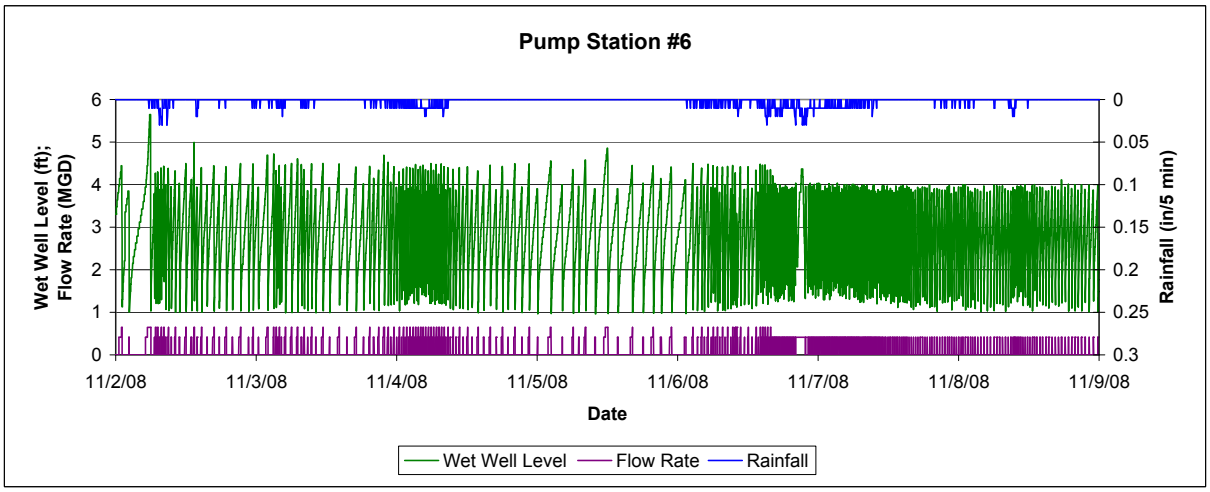

Pump Station #5
Wet Well Level (ft); Flow Rate (MGD)
Rainfall (in/5 min)
12
10
8
6
4
2
0
0
0.05
0.1
0.15
0.2
0.25
0.3
11/2/08
11/3/08
11/4/08
11/5/08
11/6/08
11/7/08
11/8/08
11/9/08
Date
Wet Well Level
Flow Rate
Rainfall

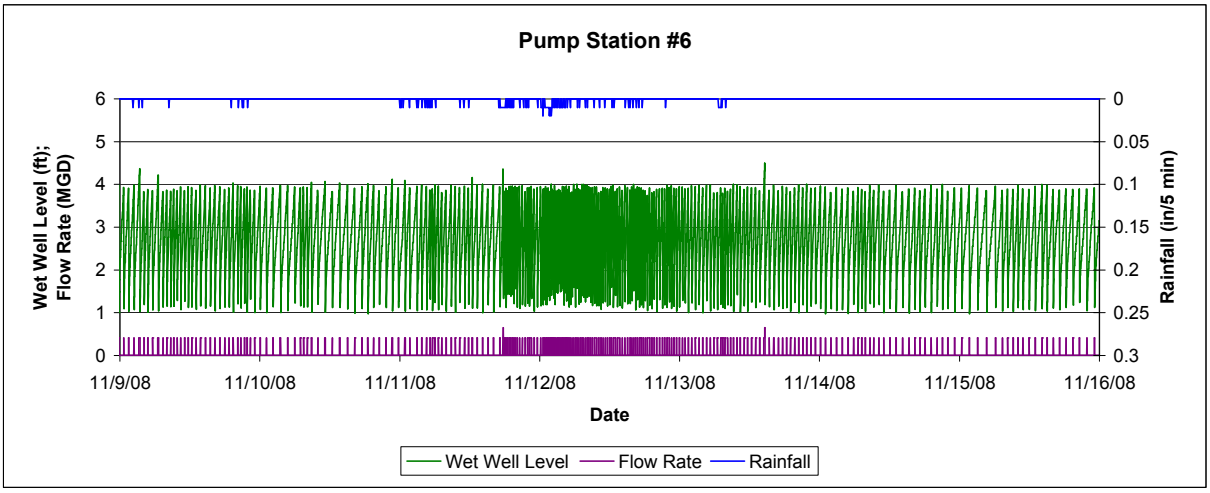

Pump Station #5
Wet Well Level (ft); Flow Rate (MGD)
Rainfall (in/5 min)
12
10
8
6
4
2
0
0
0.05
0.1
0.15
0.2
0.25
0.3
11/9/08
11/10/08
11/11/08
11/12/08
11/13/08
11/14/08
11/15/08
11/16/08
Date
Wet Well Level
Flow Rate
Rainfall

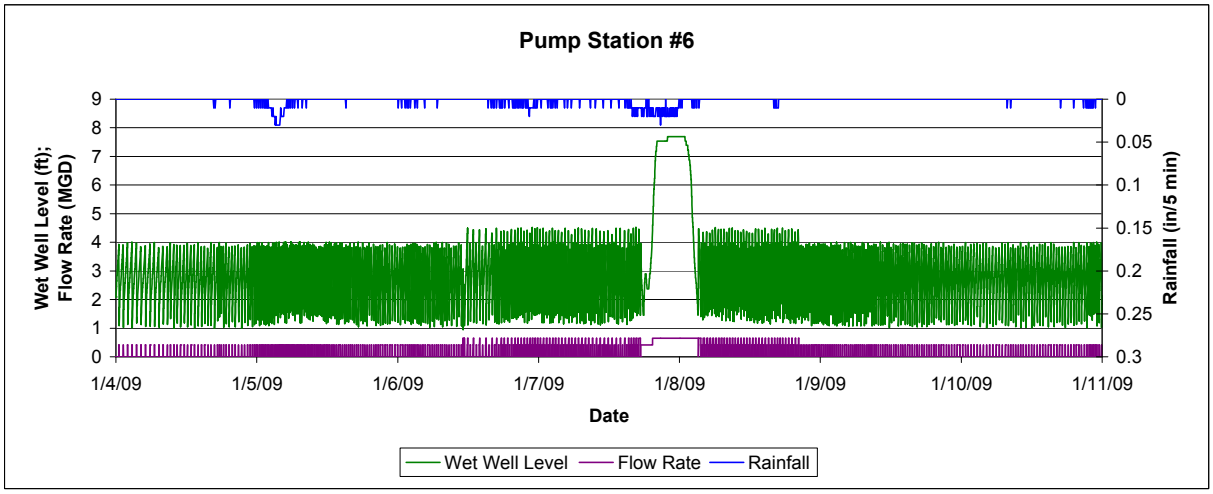

Pump Station #5
Wet Well Level (ft); Flow Rate (MGD)
Rainfall (in/5 min)
12
10
8
6
4
2
0
0
0.05
0.1
0.15
0.2
0.25
0.3
1/4/09
1/5/09
1/6/09
1/7/09
1/8/09
1/9/09
1/10/09
1/11/09
Date
Wet Well Level
Flow Rate
Rainfall

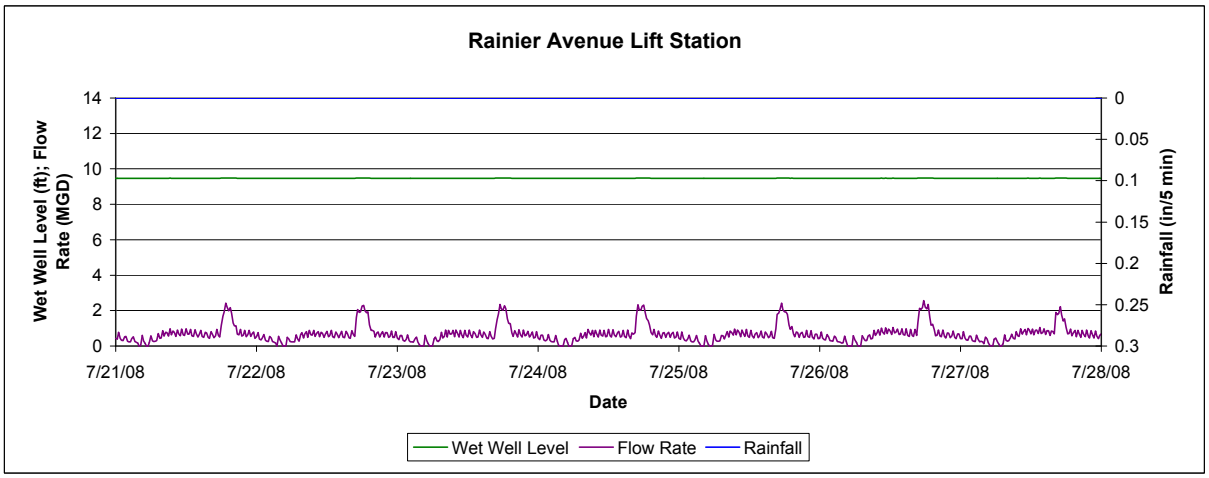

Pump Station #6
Wet Well Level (ft); Flow Rate (MGD)
Rainfall (in/5 min)
6
5
4
3
2
1
0
0
0.05
0.1
0.15
0.2
0.25
0.3
7/21/08
7/22/08
7/23/08
7/24/08
7/25/08
7/26/08
7/27/08
7/28/08
Date
Wet Well Level
Flow Rate
Rainfall

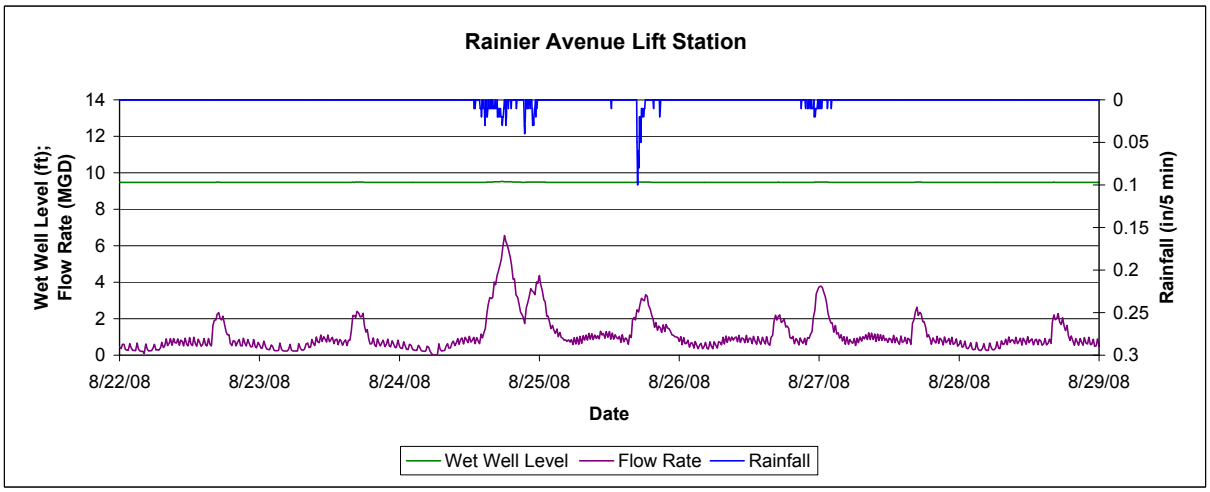

Pump Station #6
Wet Well Level (ft); Flow Rate (MGD)
Rainfall (in/5 min)
6
5
4
3
2
1
0
0
0.05
0.1
0.15
0.2
0.25
0.3
8/22/08
8/23/08
8/24/08
8/25/08
8/26/08
8/27/08
8/28/08
8/29/08
Date
Wet Well Level
Flow Rate
Rainfall

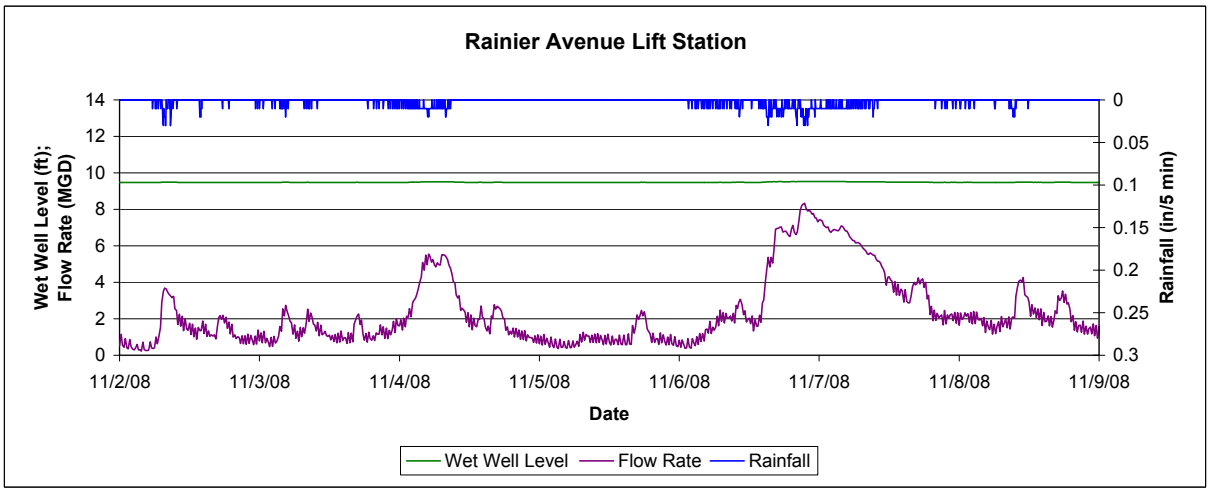

Pump Station #6
Wet Well Level (ft); Flow Rate (MGD)
Rainfall (in/5 min)
6
5
4
3
2
1
0
0
0.05
0.1
0.15
0.2
0.25
0.3
11/2/08
11/3/08
11/4/08
11/5/08
11/6/08
11/7/08
11/8/08
11/9/08
Date
Wet Well Level
Flow Rate
Rainfall

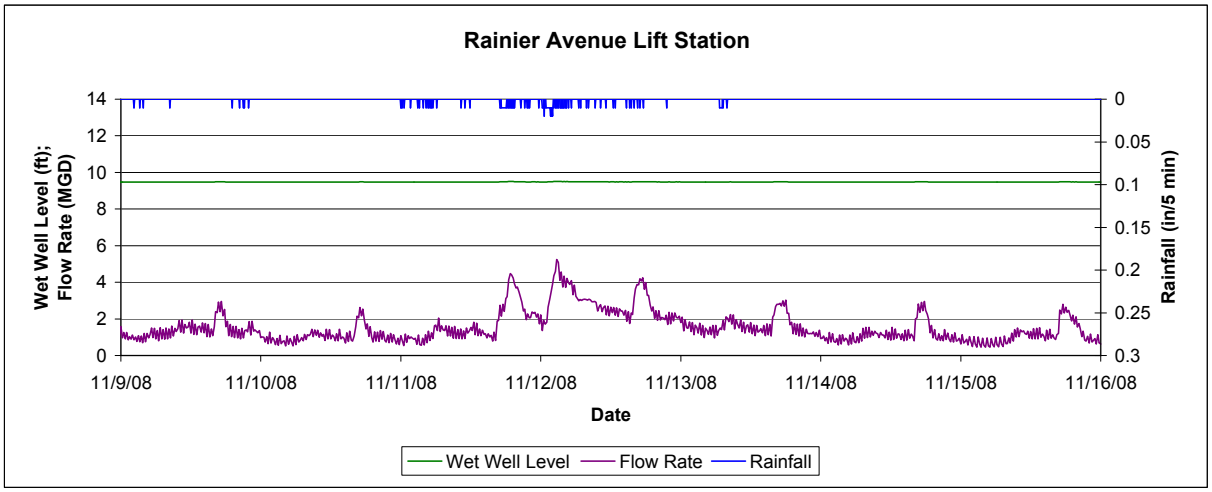

Pump Station #6
Wet Well Level (ft); Flow Rate (MGD)
Rainfall (in/5 min)
6
5
4
3
2
1
0
0
0.05
0.1
0.15
0.2
0.25
0.3
11/9/08
11/10/08
11/11/08
11/12/08
11/13/08
11/14/08
11/15/08
11/16/08
Date
Wet Well Level
Flow Rate
Rainfall

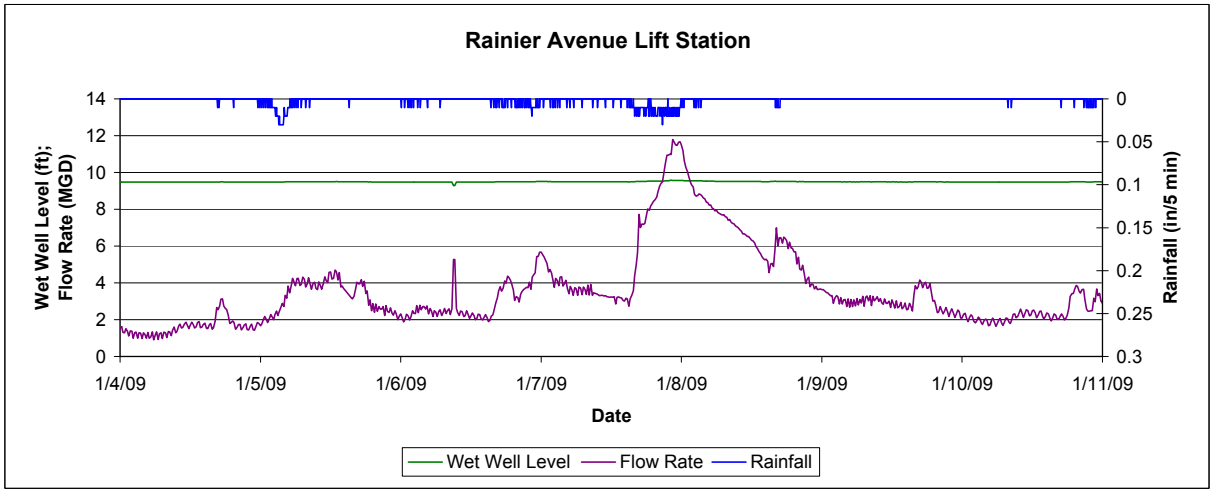

Pump Station #6
Wet Well Level (ft); Flow Rate (MGD)
Rainfall (in/5 min)
9
8
7
6
5
4
3
2
1
0
0
0.05
0.1
0.15
0.2
0.25
0.3
1/4/09
1/5/09
1/6/09
1/7/09
1/8/09
1/9/09
1/10/09
1/11/09
Date
Wet Well Level
Flow Rate
Rainfall


Rainier Avenue Lift Station
Wet Well Level (ft); Flow Rate (MGD)
Rainfall (in/5 min)
14
12
10
8
6
4
2
0
0
0.05
0.1
0.15
0.2
0.25
0.3
7/21/08
7/22/08
7/23/08
7/24/08
7/25/08
7/26/08
7/27/08
7/28/08
Date
Wet Well Level
Flow Rate
Rainfall


Rainier Avenue Lift Station
Wet Well Level (ft); Flow Rate (MGD)
Rainfall (in/5 min)
14
12
10
8
6
4
2
0
0
0.05
0.1
0.15
0.2
0.25
0.3
8/22/08
8/23/08
8/24/08
8/25/08
8/26/08
8/27/08
8/28/08
8/29/08
Date
Wet Well Level
Flow Rate
Rainfall


Rainier Avenue Lift Station
Wet Well Level (ft); Flow Rate (MGD)
Rainfall (in/5 min)
14
12
10
8
6
4
2
0
0
0.05
0.1
0.15
0.2
0.25
0.3
11/2/08
11/3/08
11/4/08
11/5/08
11/6/08
11/7/08
11/8/08
11/9/08
Date
Wet Well Level
Flow Rate
Rainfall

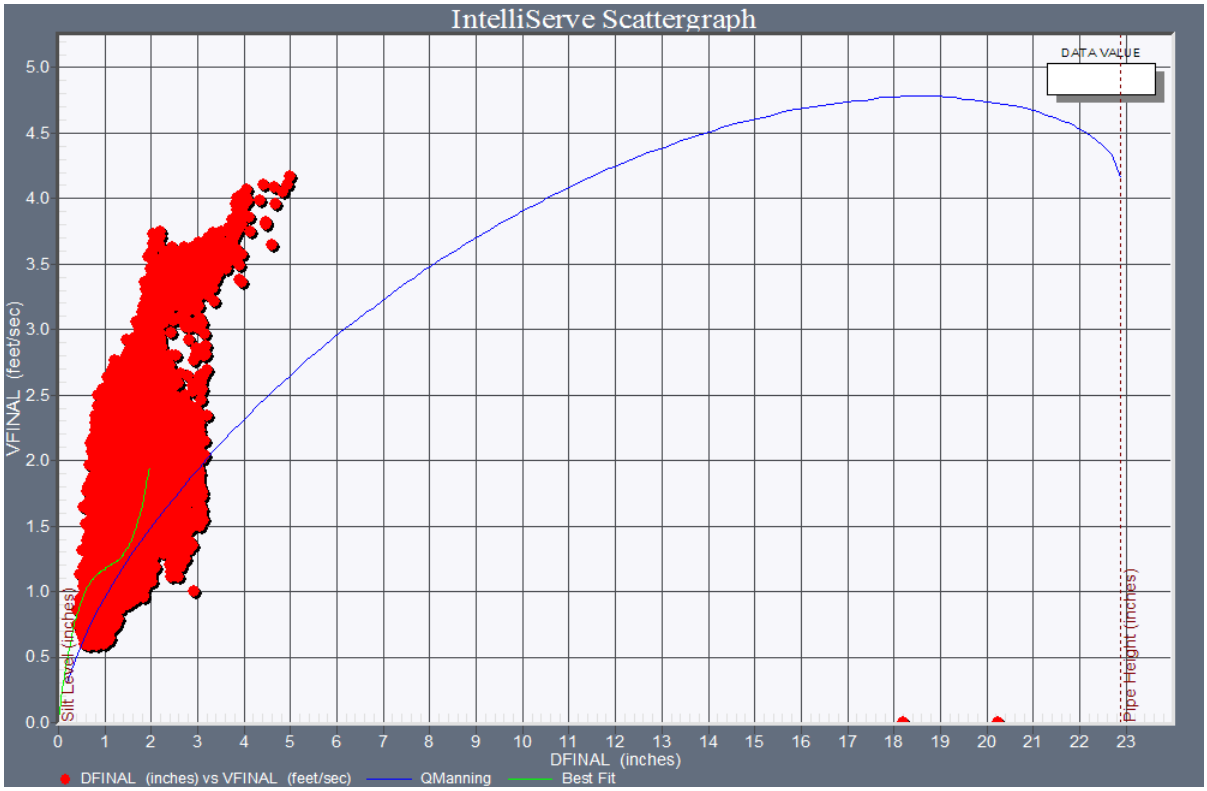

Rainier Avenue Lift Station
Wet Well Level (ft); Flow Rate (MGD)
Rainfall (in/5 min)
14
12
10
8
6
4
2
0
0
0.05
0.1
0.15
0.2
0.25
0.3
11/9/08
11/10/08
11/11/08
11/12/08
11/13/08
11/14/08
11/15/08
11/16/08
Date
Wet Well Level
Flow Rate
Rainfall


Rainier Avenue Lift Station
Wet Well Level (ft); Flow Rate (MGD)
Rainfall (in/5 min)
14
12
10
8
6
4
2
0
0
0.05
0.1
0.15
0.2
0.25
0.3
1/4/09
1/5/09
1/6/09
1/7/09
1/8/09
1/9/09
1/10/09
1/11/09
Date
Wet Well Level
Flow Rate
Rainfall

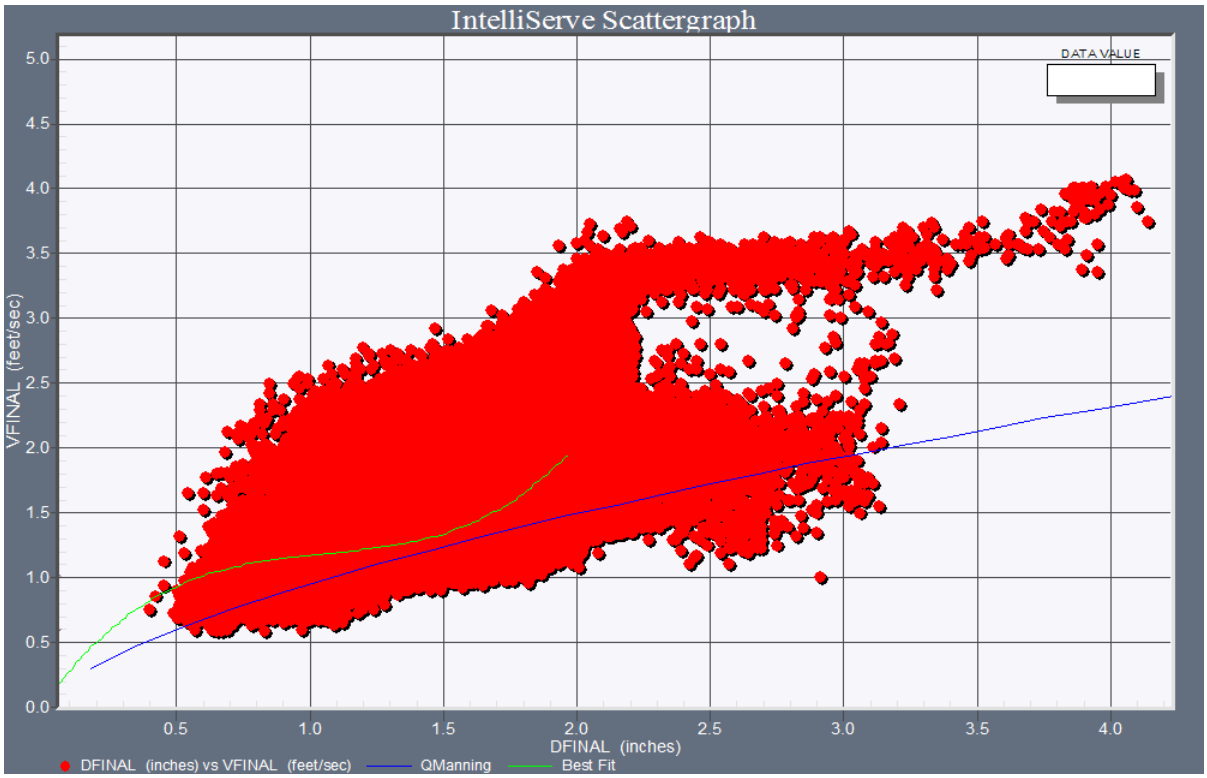
Appendix D: Flow Meter Scattergraphs

GEN38_059-121

Graph: Scattergraph
Location: GEN38_059121:1
Location Description: MH#059-121
Pipe Height (inches): 22.88 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 13:45

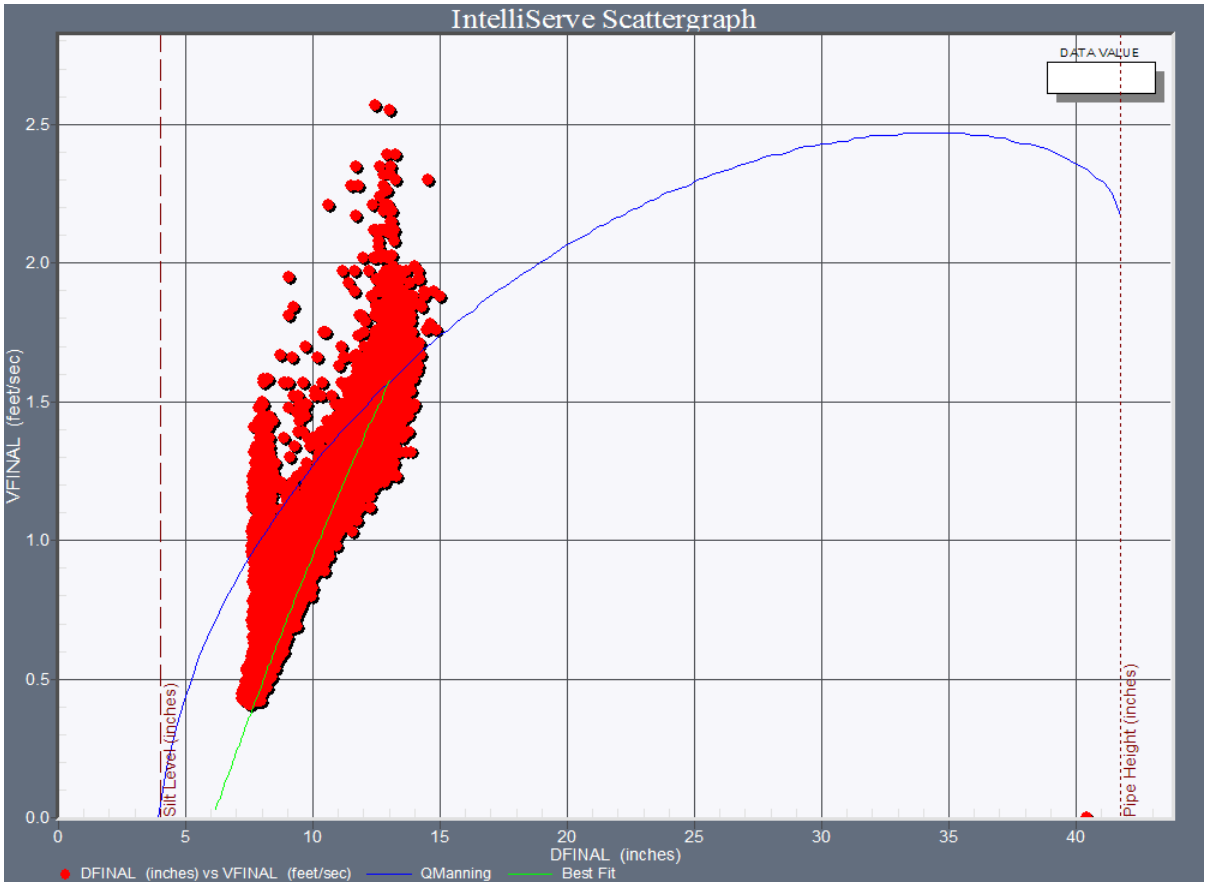


Close up

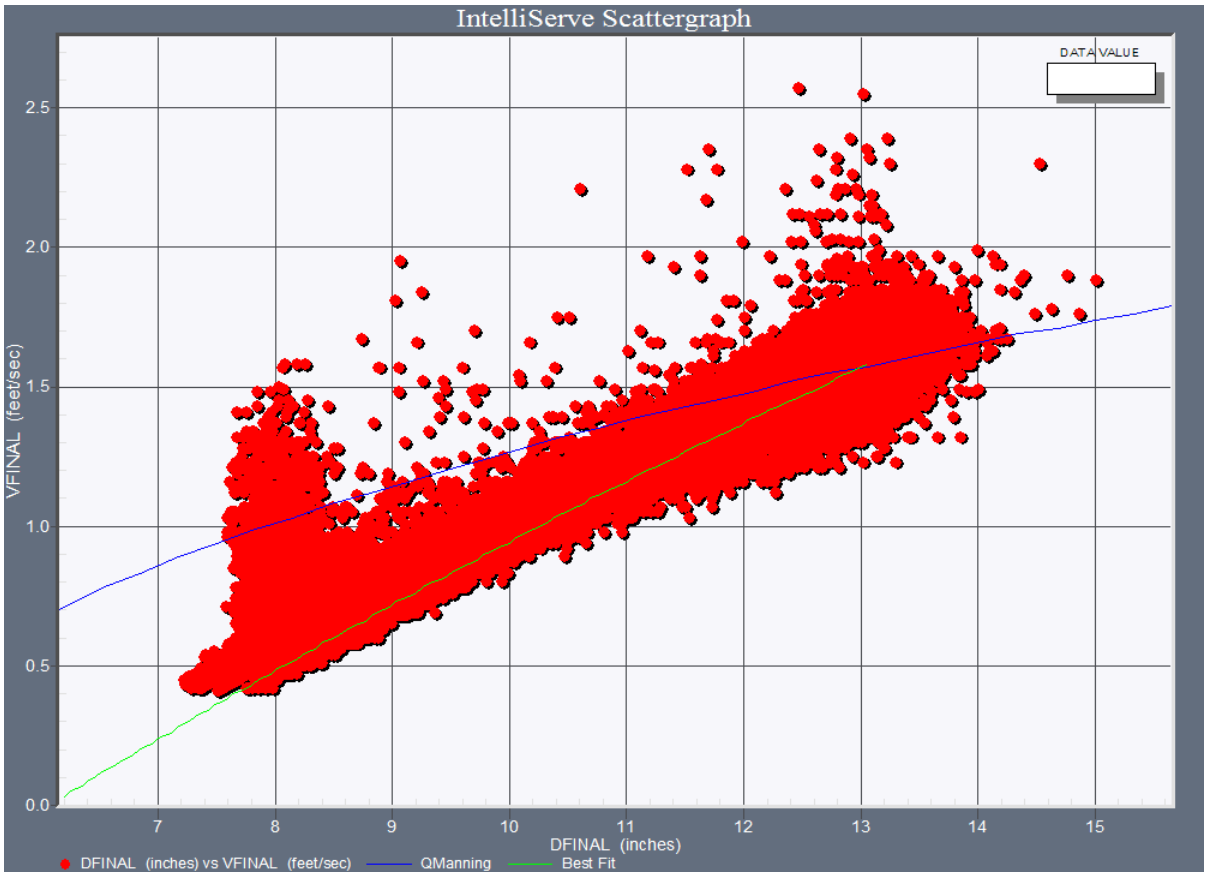

IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

GEN38_059-131

Graph: Scattergraph
Location: GEN38_059131:1
Location Description:
Pipe Height (inches): 41.75 **Silt Level (inches):** 4.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 14:15

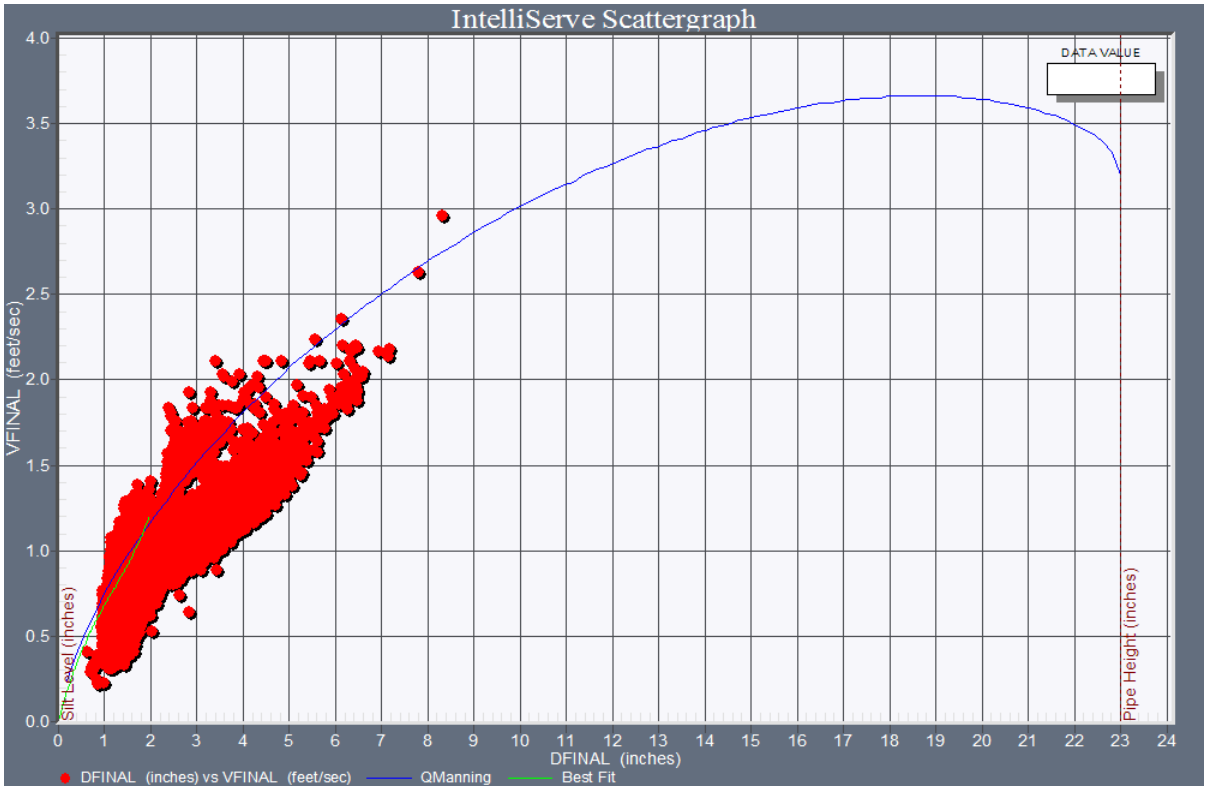


Close up

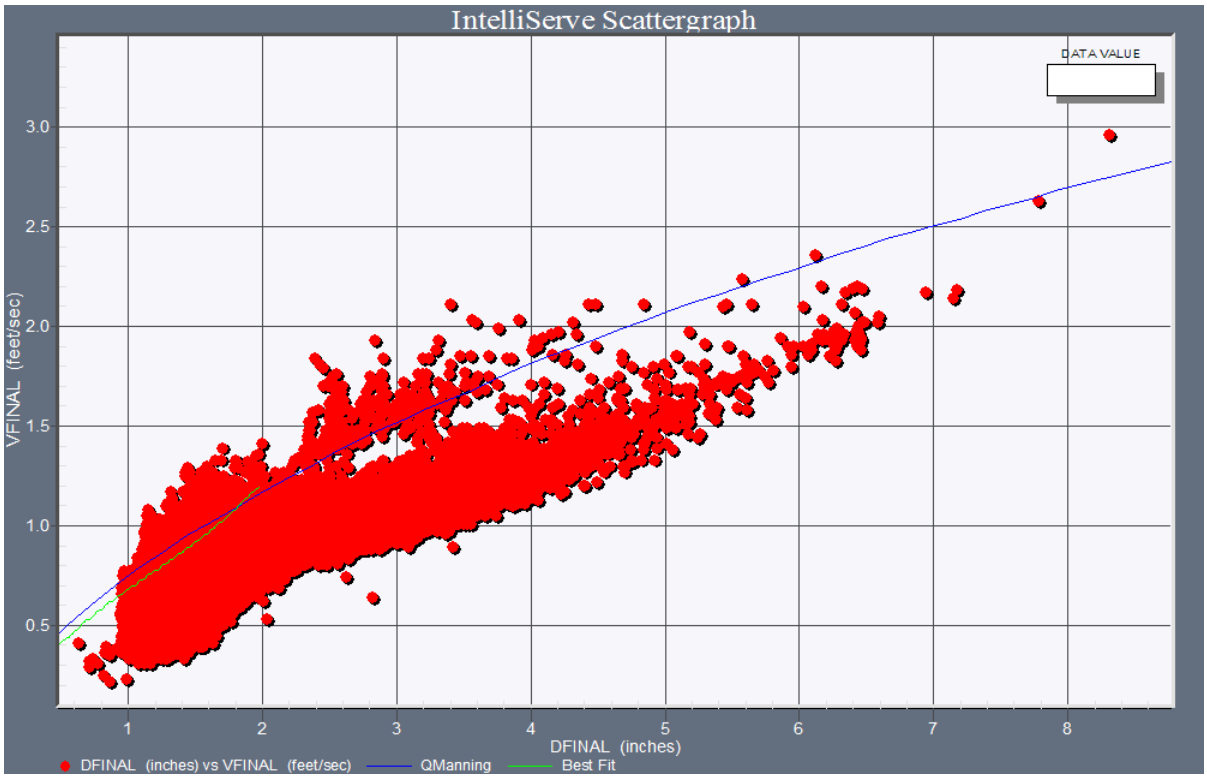

IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
2.5
2.0
1.5
1.0
0.5
0.0
7
8
9
10
11
12
13
14
15
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

GEN38_059-320

Graph: Scattergraph
Location: GEN38_059320:1
Location Description: MH#059-320
Pipe Height (inches): 23.00 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 14:30

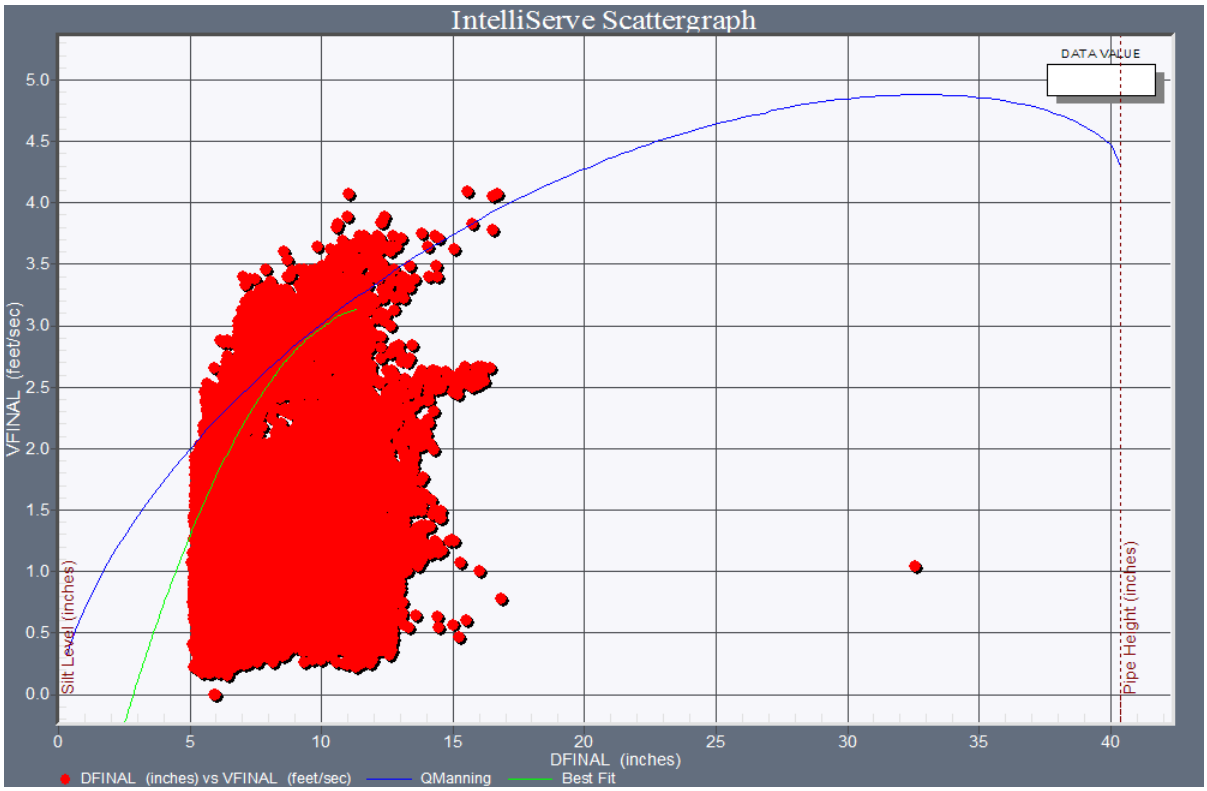


Close up

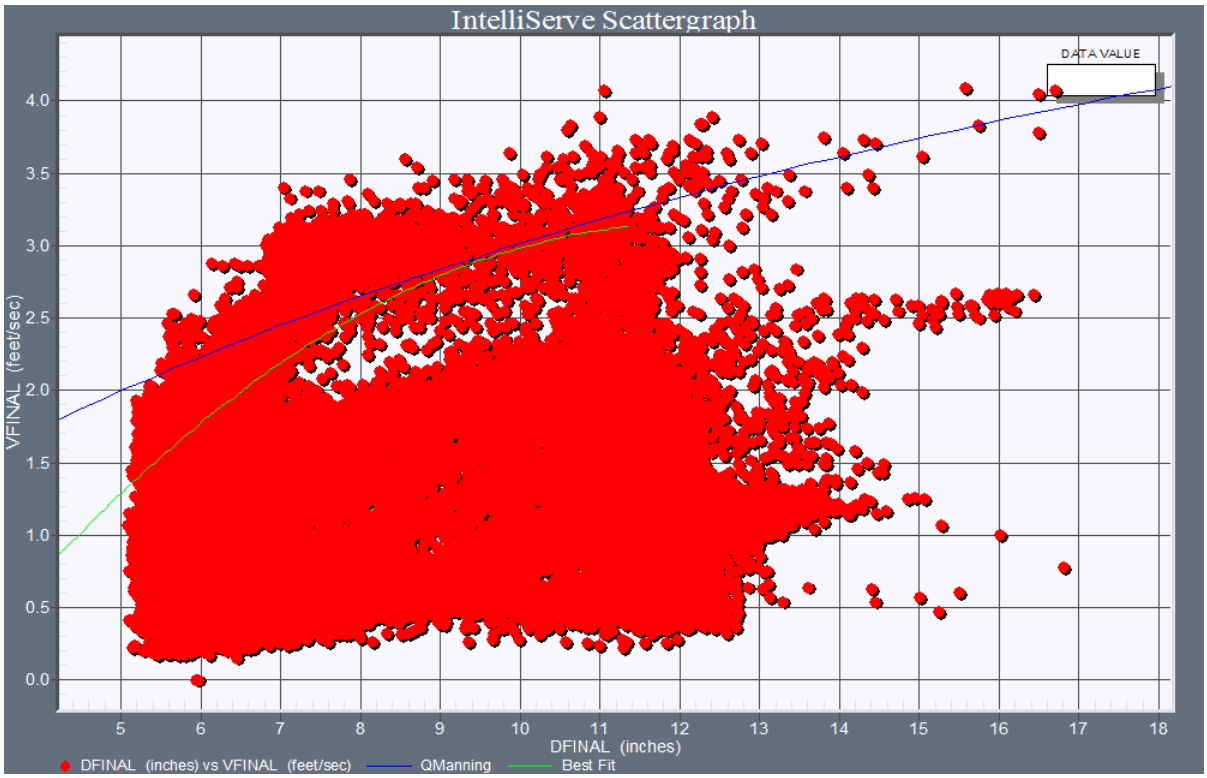

IntelliServe Scattergraph
DATA VALUE
3.0
2.5
2.0
1.5
1.0
0.5
VFINAL (feet/sec)
1
2
3
4
5
6
7
8
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

GEN38_059-332

Graph: Scattergraph
Location: GEN38_059332:1
Location Description: MH#059-332
Pipe Height (inches): 40.38 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 14:30



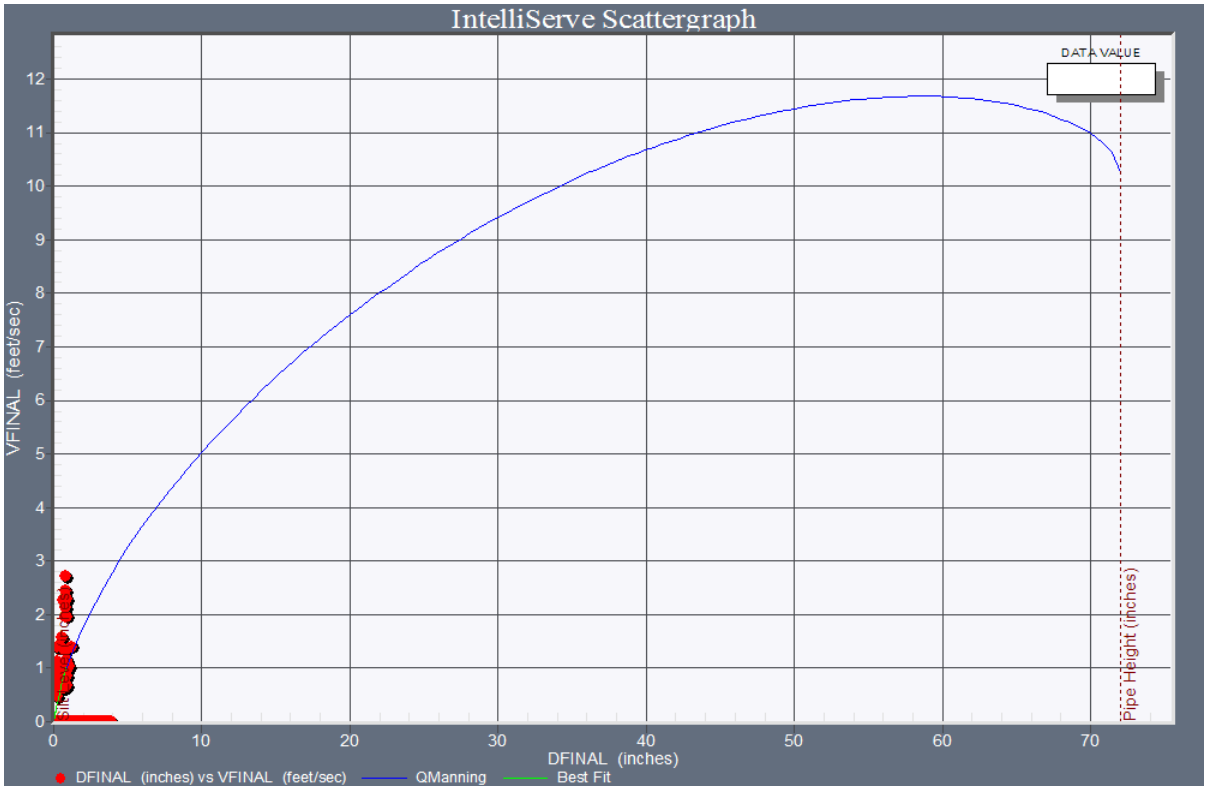
Close up


IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
5
6
7
8
9
10
11
12
13
14
15
16
17
18
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

GEN38_059-346

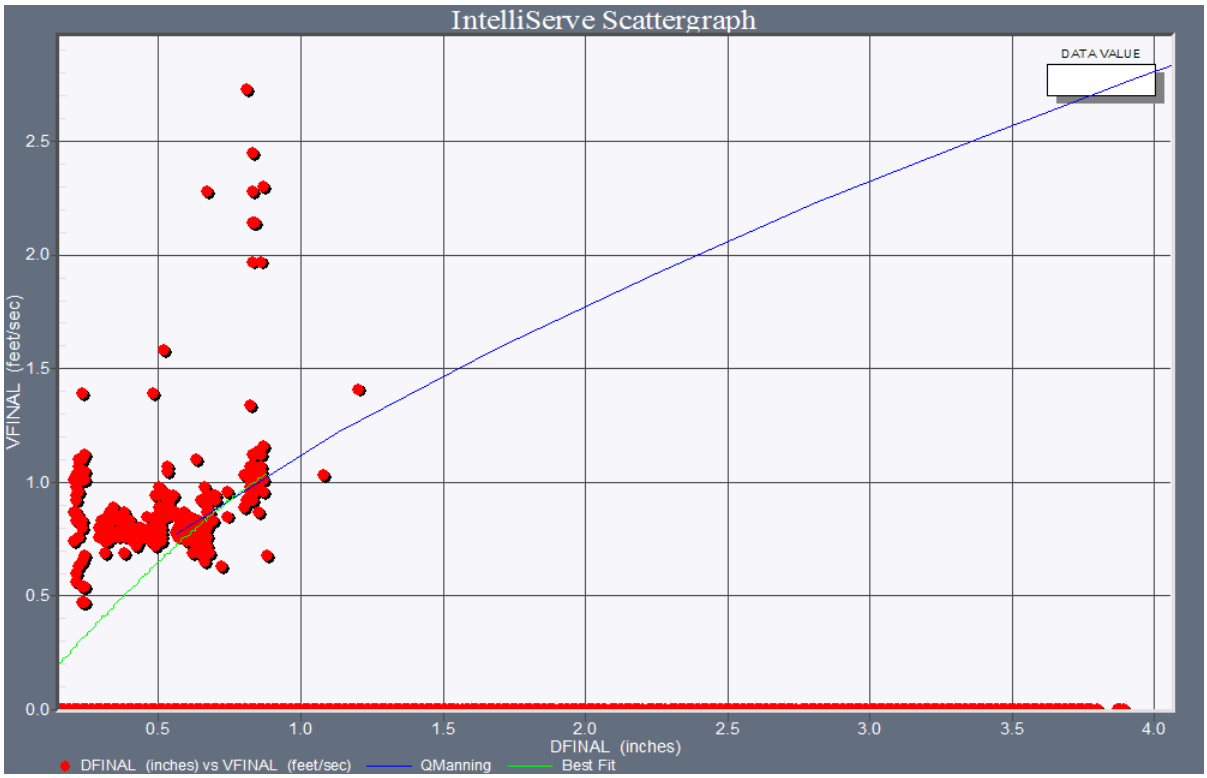
Note: GEN38_059346 was incorrectly labeled. This site is at MH 059-574, not MH 059-346. See Section 3.2 in the report for more details. Continued monitoring at this location can be found under the label GEN38_059574, which is upstream of NPDES38_MH059574.

Graph: Scattergraph
Location: GEN38_059346:1
Location Description:
Pipe Height (inches): 72.00 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 14:45



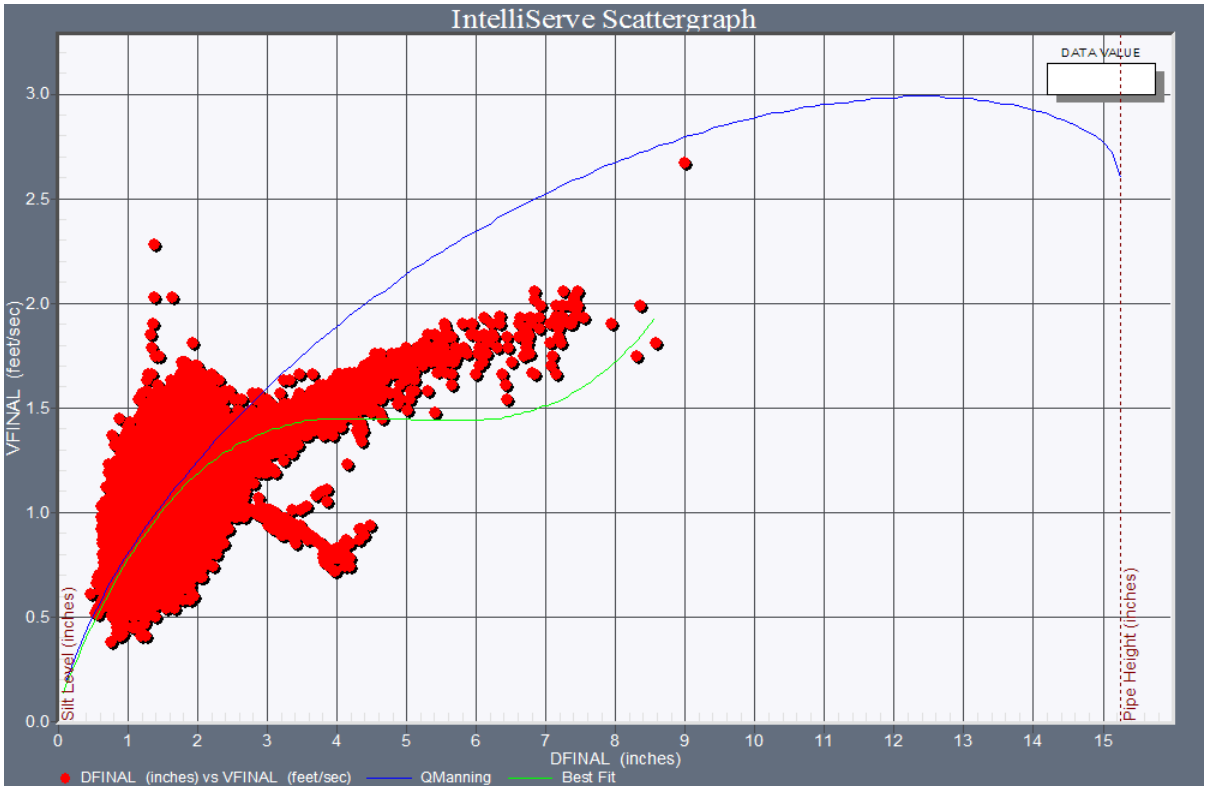
Note: GEN38_059346 was incorrectly labeled. See note on page D-9.

Close up

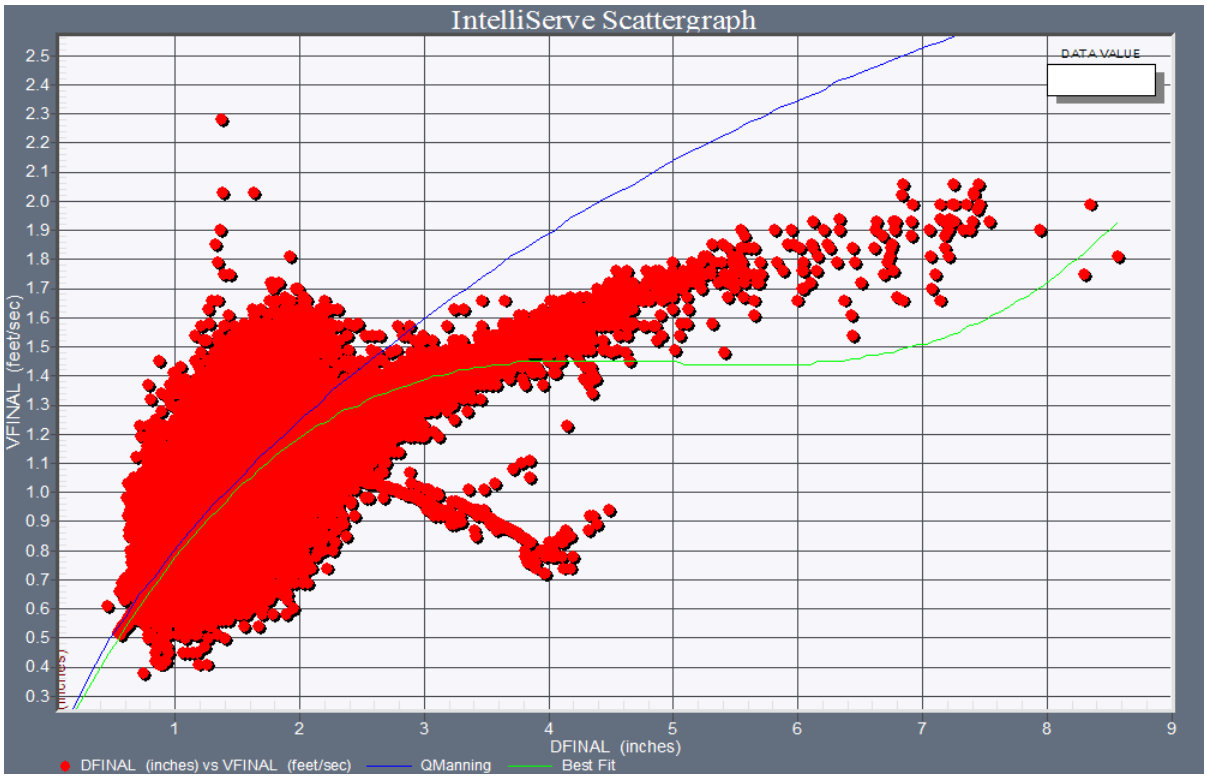


GEN38_059-371

Graph: Scattergraph
Location: GEN38_059371:1
Location Description: MH#059-371
Pipe Height (inches): 15.25 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 14:45

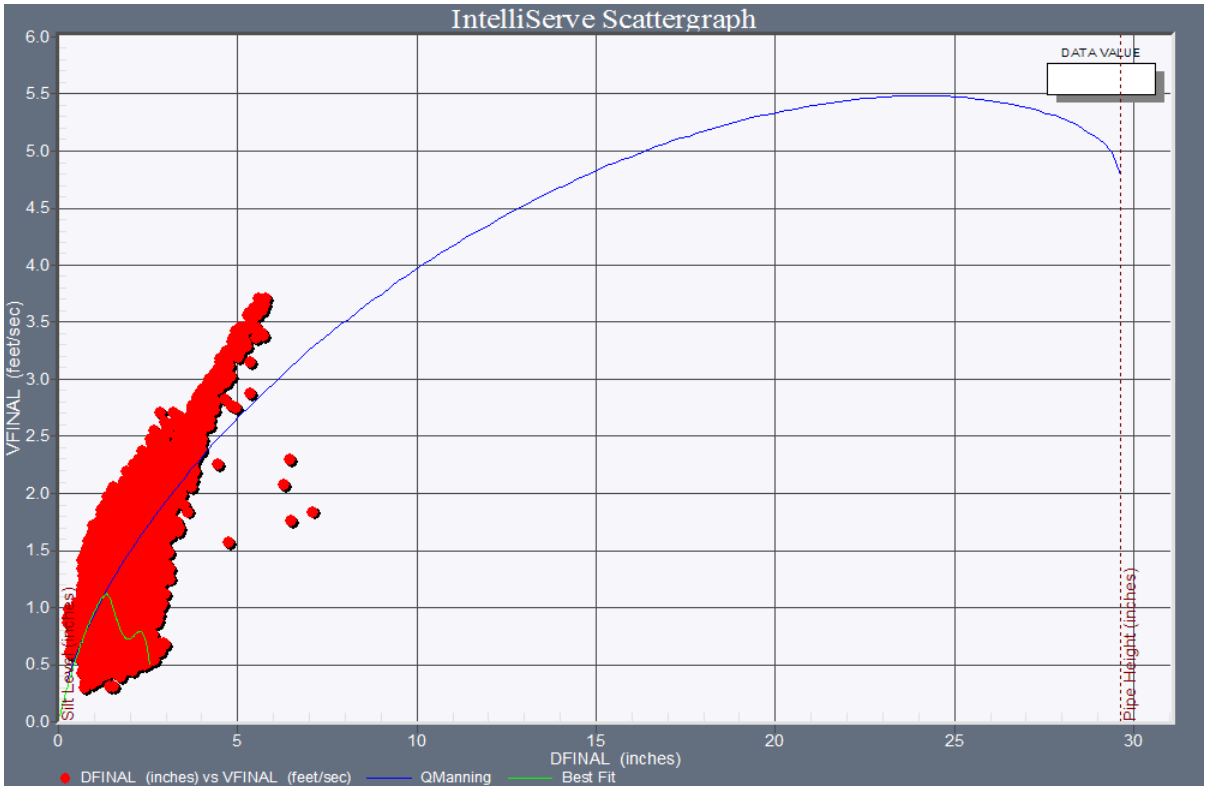


Close up

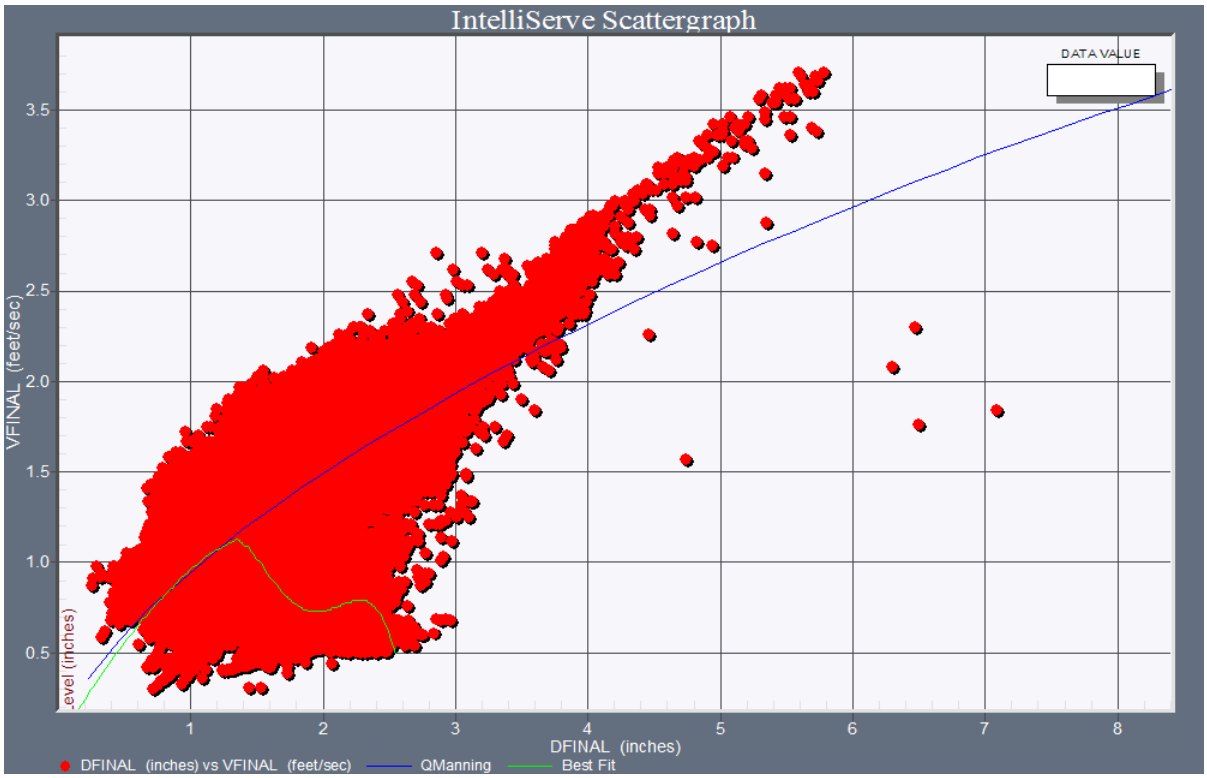

IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
2.5
2.4
2.3
2.2
2.1
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
1
2
3
4
5
6
7
8
9
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

GEN38_059-373

Graph: Scattergraph
Location: GEN38_059373:1
Location Description: MH#059-373
Pipe Height (inches): 29.63 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 15:00

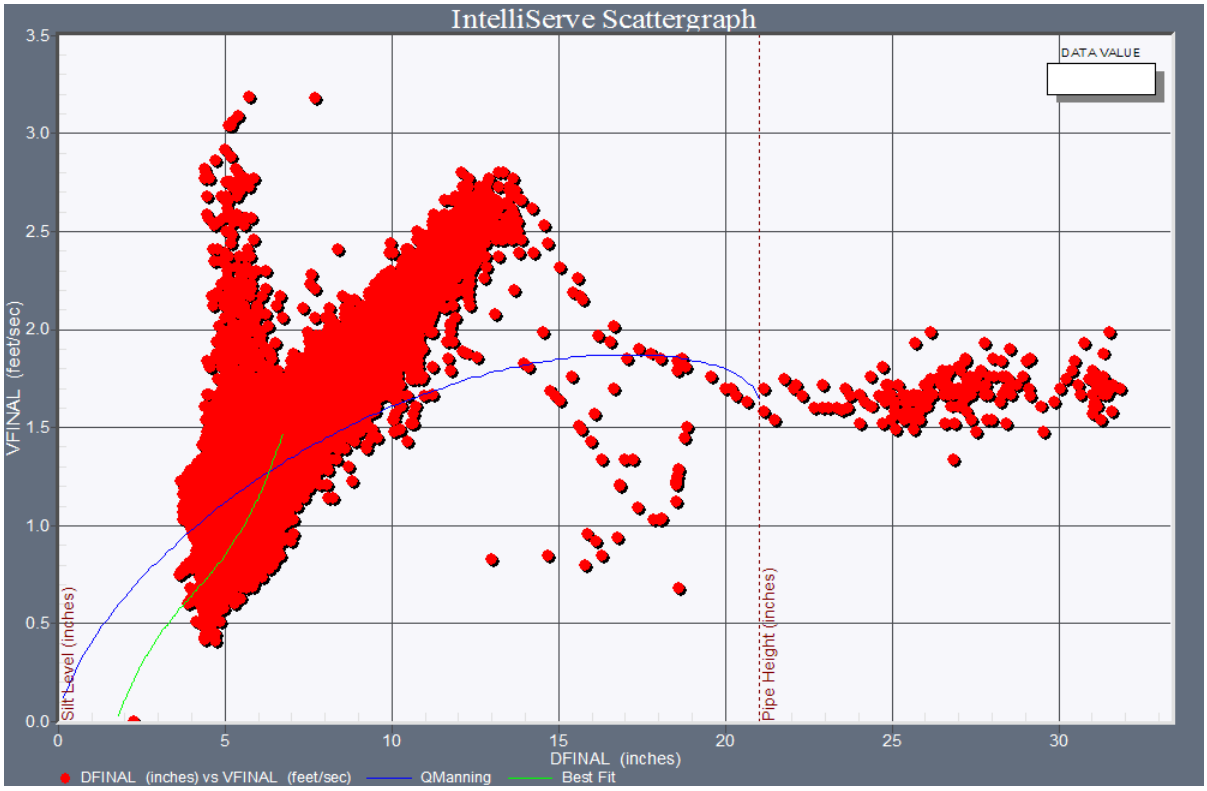


Close up


IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
Level (inches)
1
2
3
4
5
6
7
8
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

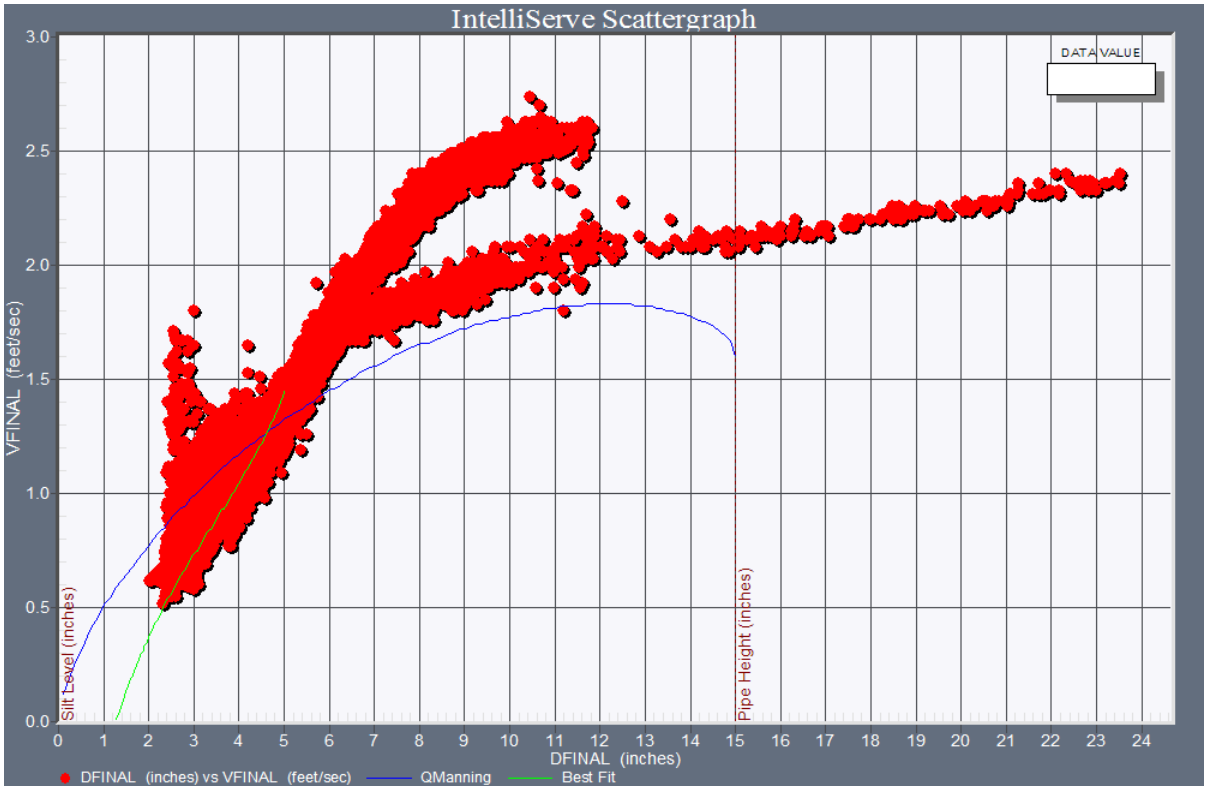
GEN38_059-398

Graph: Scattergraph
Location: GEN38_059398:1
Location Description: MH#059-398
Pipe Height (inches): 21.00 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 15:15



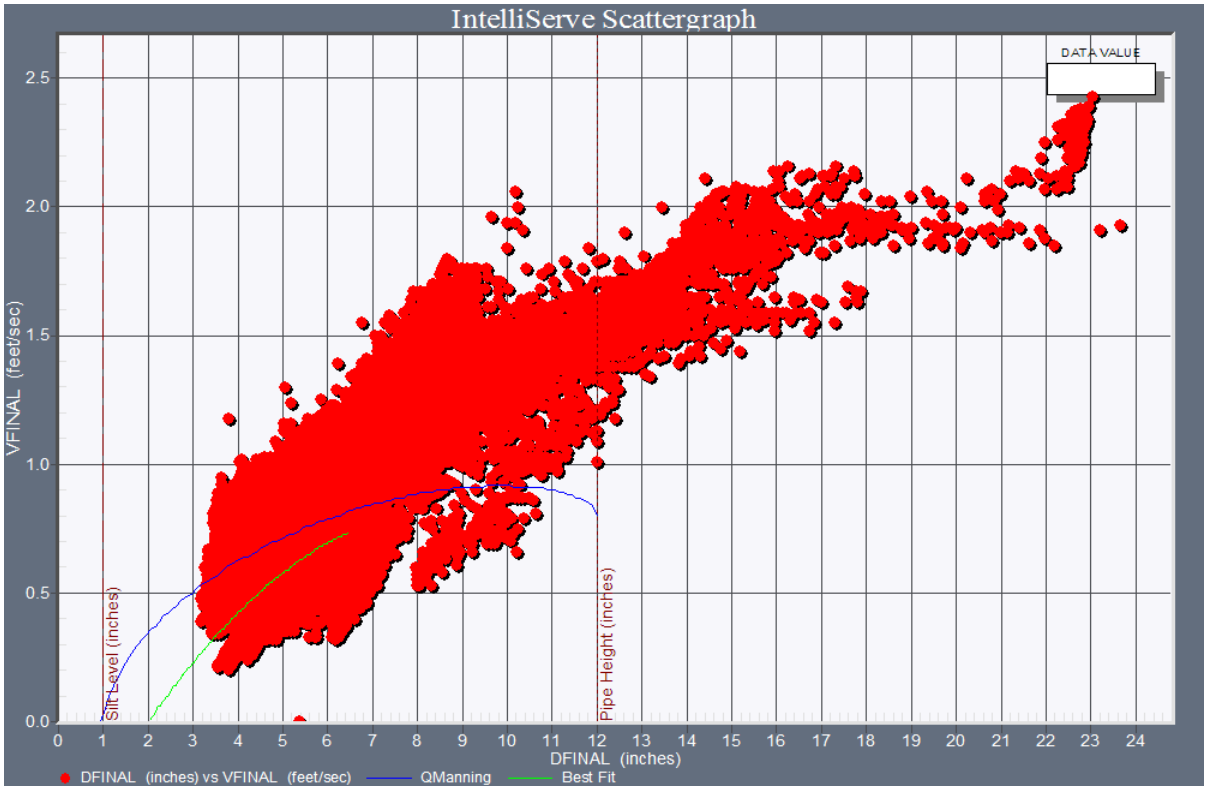
GEN38_059-404

Graph: Scattergraph
Location: GEN38_059404:1
Location Description: MH#059-404
Pipe Height (inches): 15.00 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 15:30



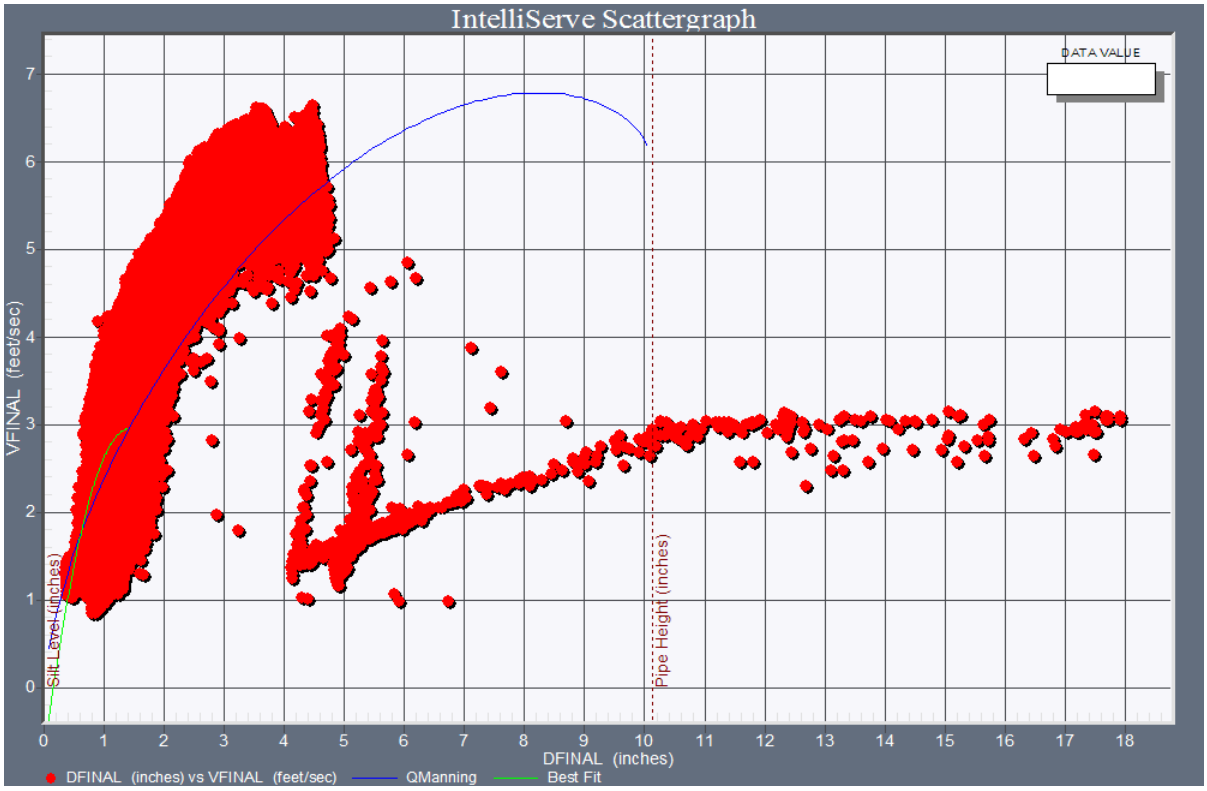
NPDES41B_059-406

Graph: Scattergraph
Location: NPDES041B_MH059406:1
Location Description: MH#059-406
Pipe Height (inches): 12.00 **Silt Level (inches):** 1.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 15:30



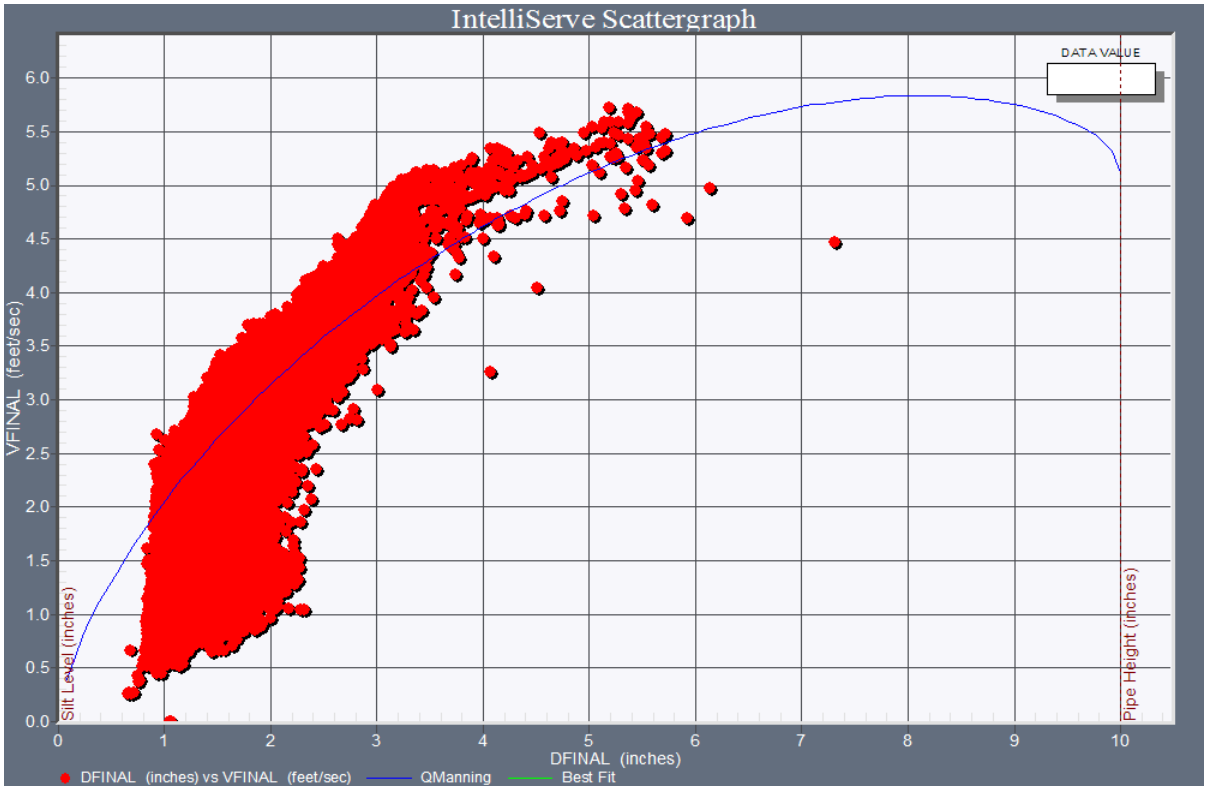
GEN40_059-407

Graph: Scattergraph
Location: GEN40_059407:1
Location Description: MH#059-407
Pipe Height (inches): 10.13 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 15:30

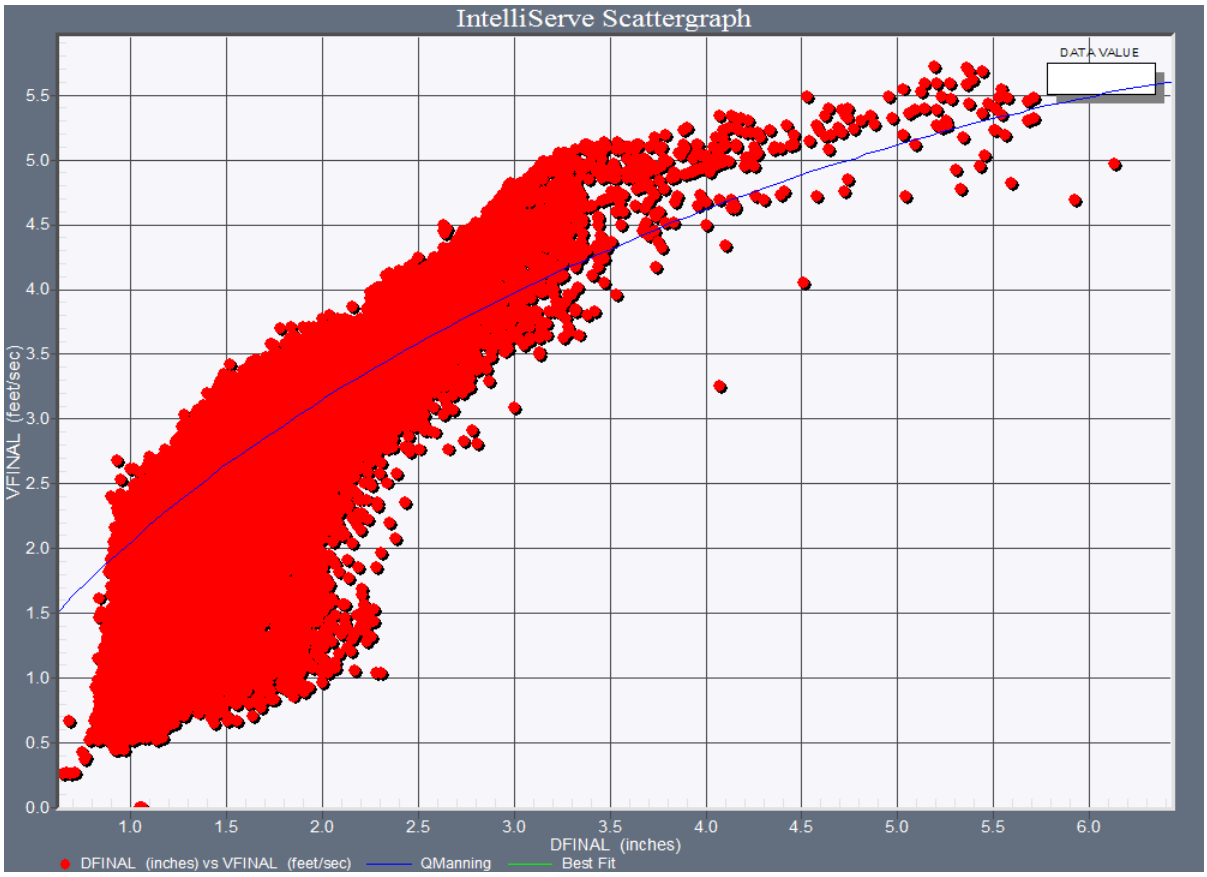


GEN40_059-409

Graph: Scattergraph
Location: GEN40_059409:1
Location Description: Manual Collect
Pipe Height (inches): 10.00 **Silt Level (inches):** 0
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 16:00

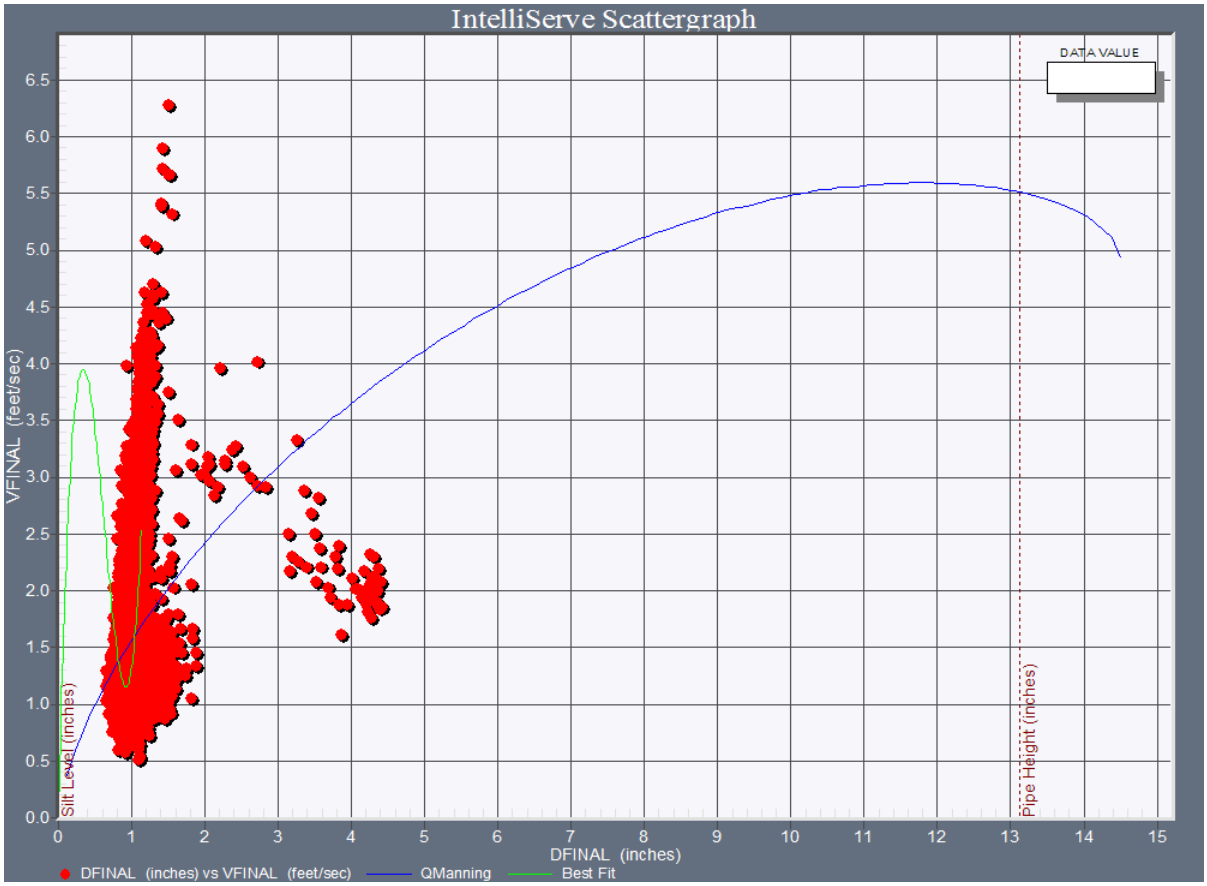


Close up

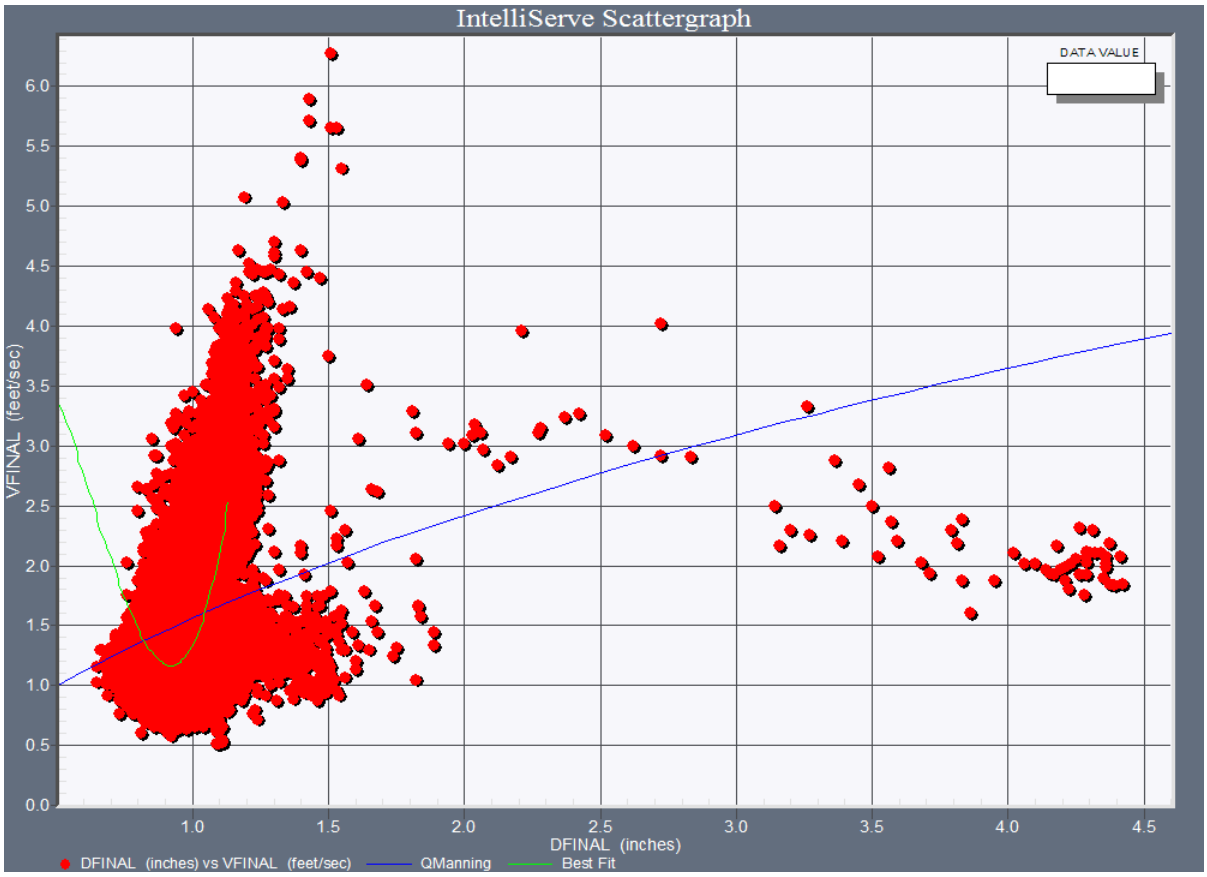

IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

NPDES41A_059-434

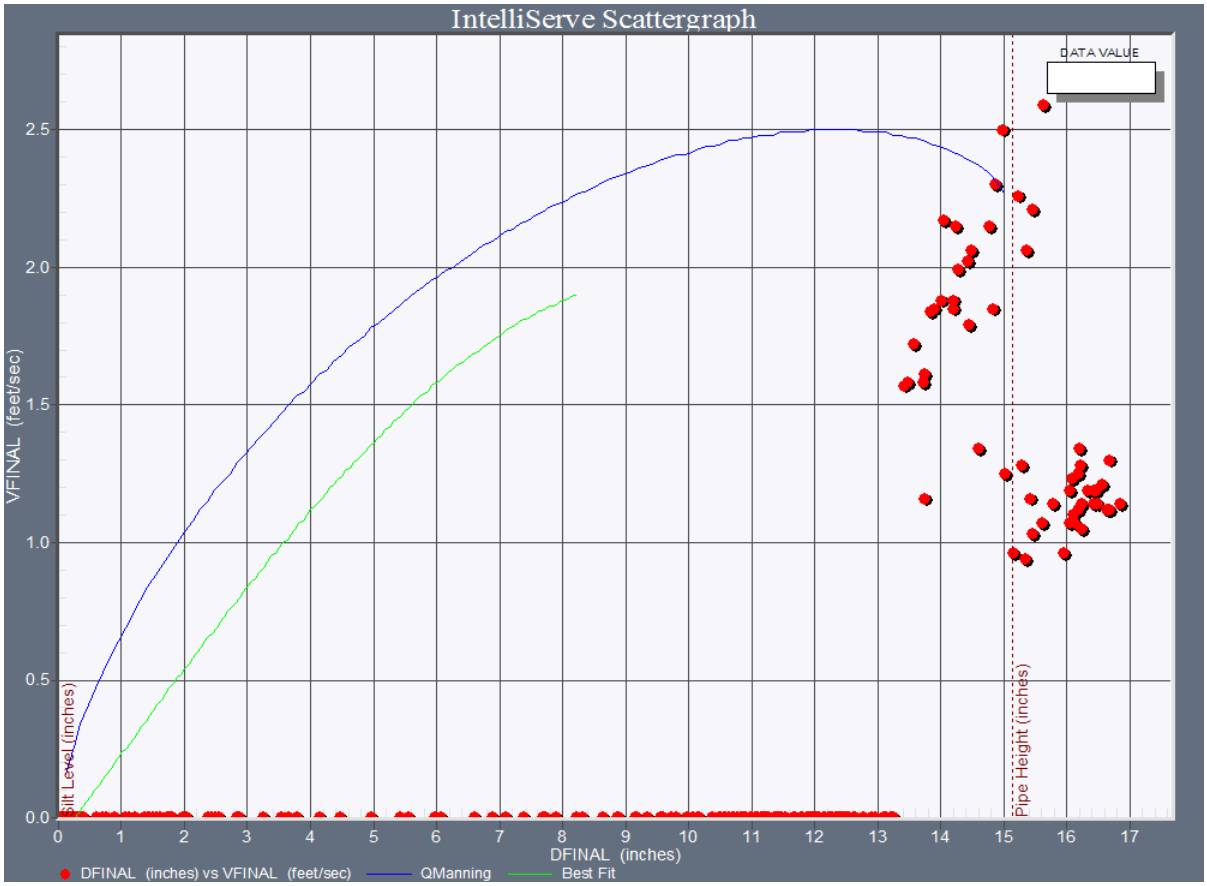
Graph: Scattergraph
Location: NPDES041A_MH059434:1
Location Description: MH#059-434
Pipe Height (inches): 13.12 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 16:15



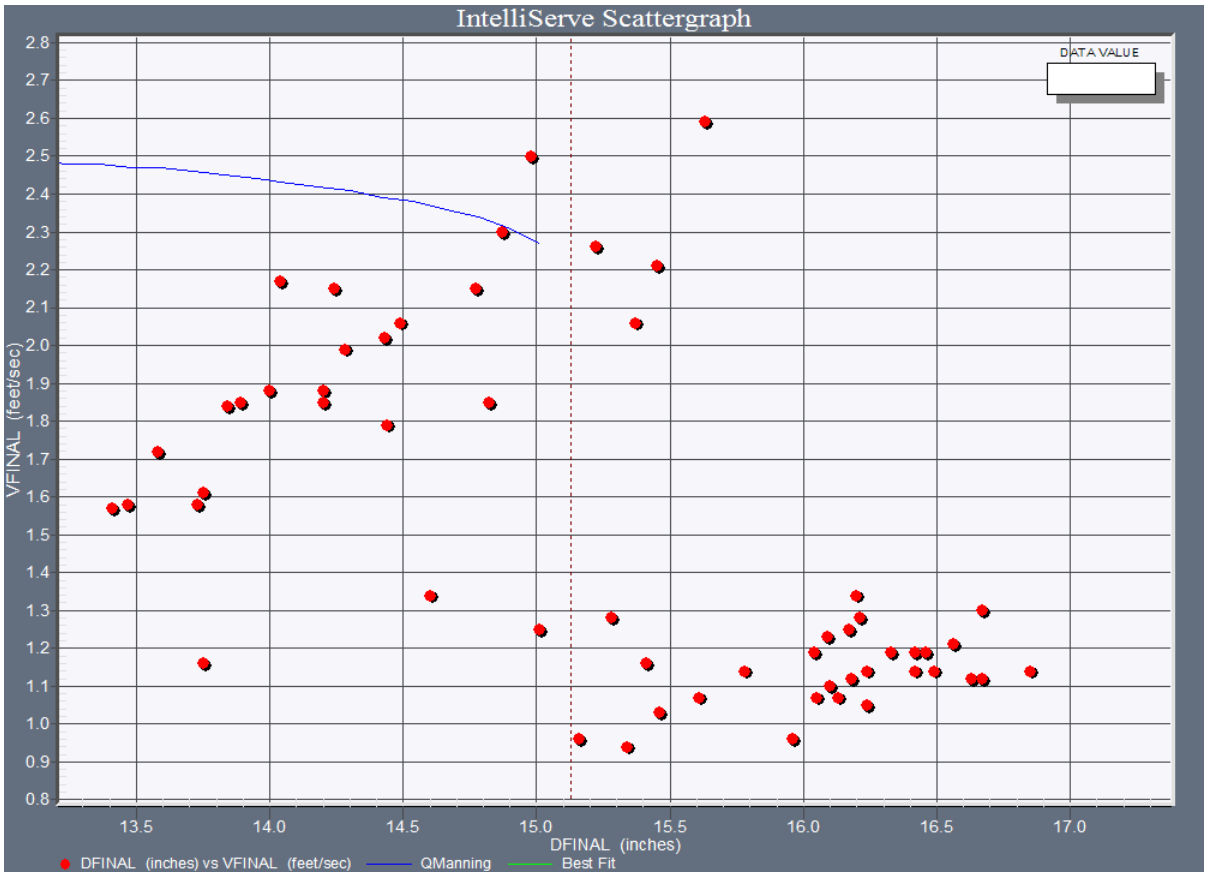
Close up


IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

Graph: Scattergraph
Location: NPDES041A_MH059434:2
Location Description: MH#059-434
Pipe Height (inches): 15.13 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 16:30

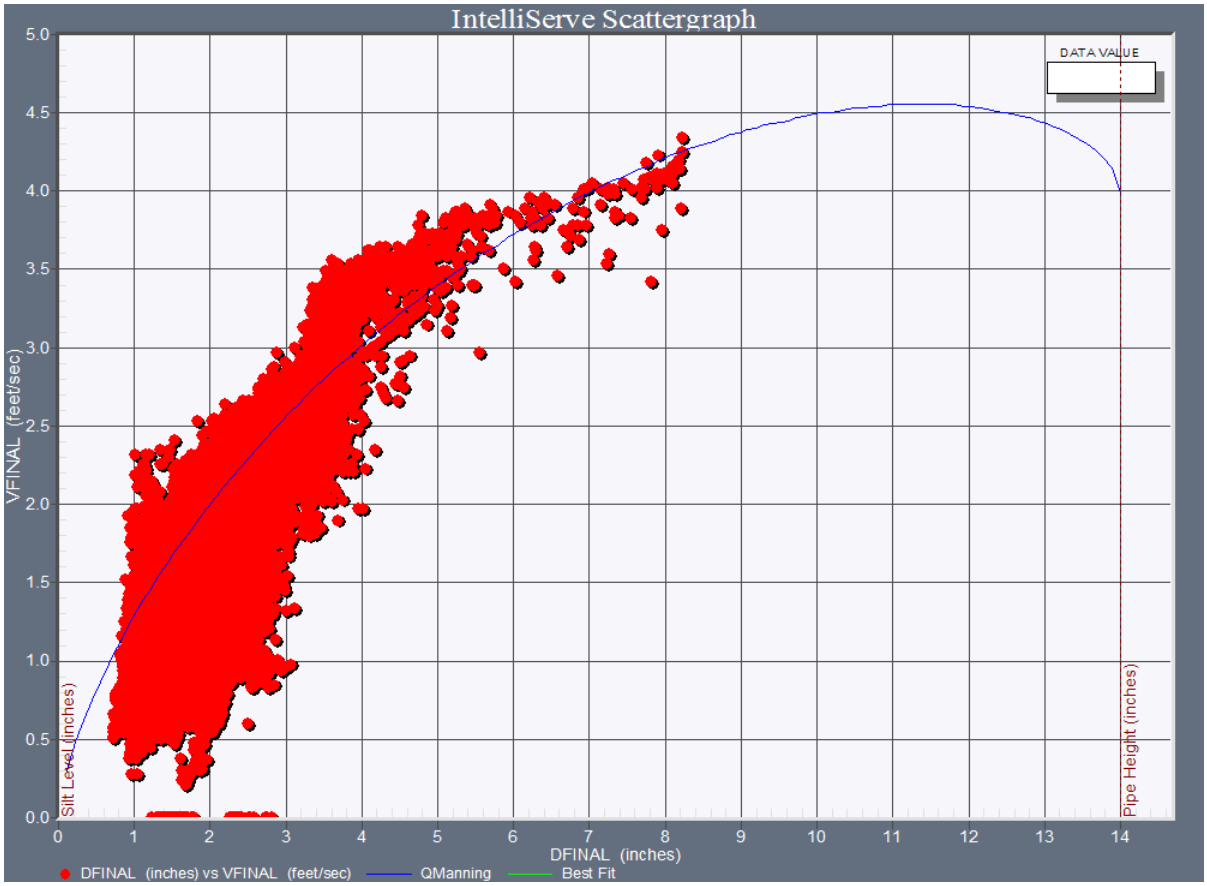


Close up

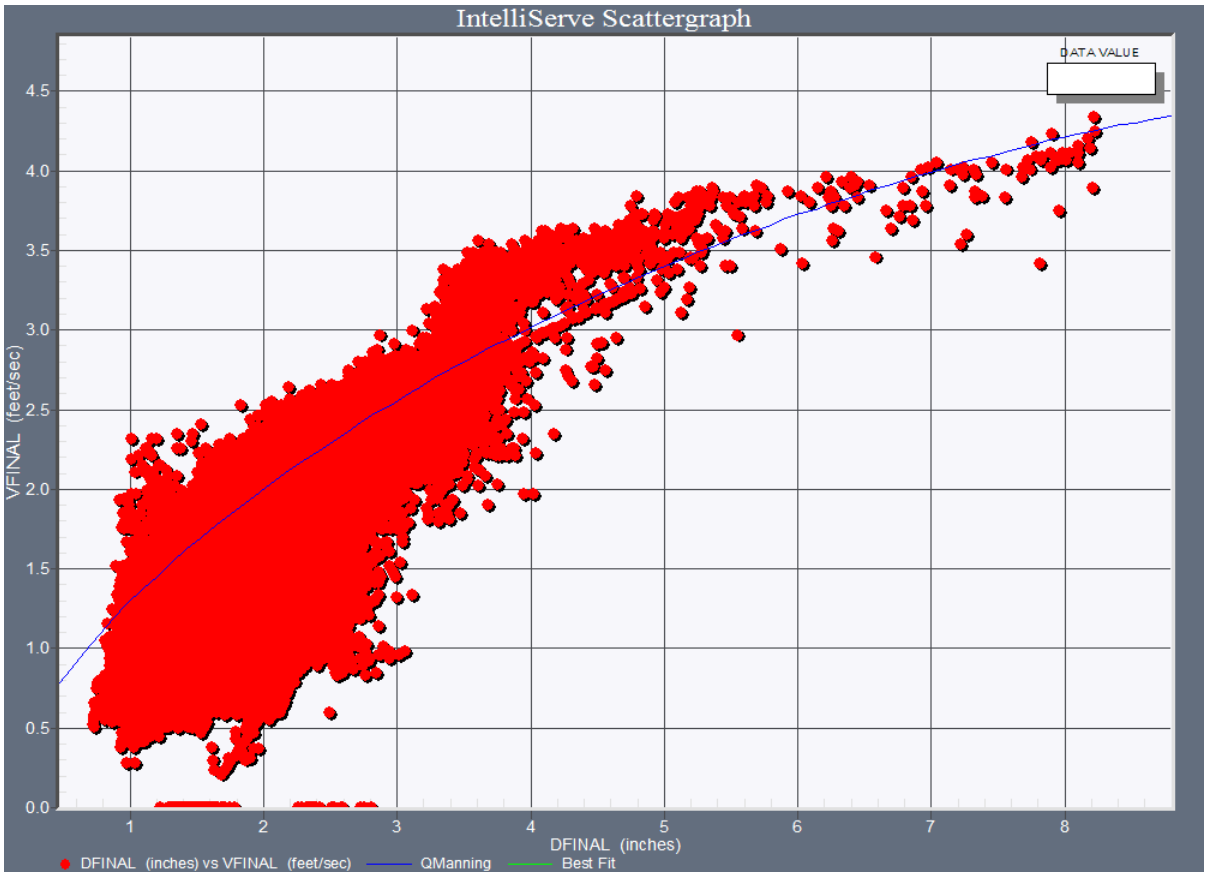

IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
13.5
14.0
14.5
15.0
15.5
16.0
16.5
17.0
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

GEN40_059-436

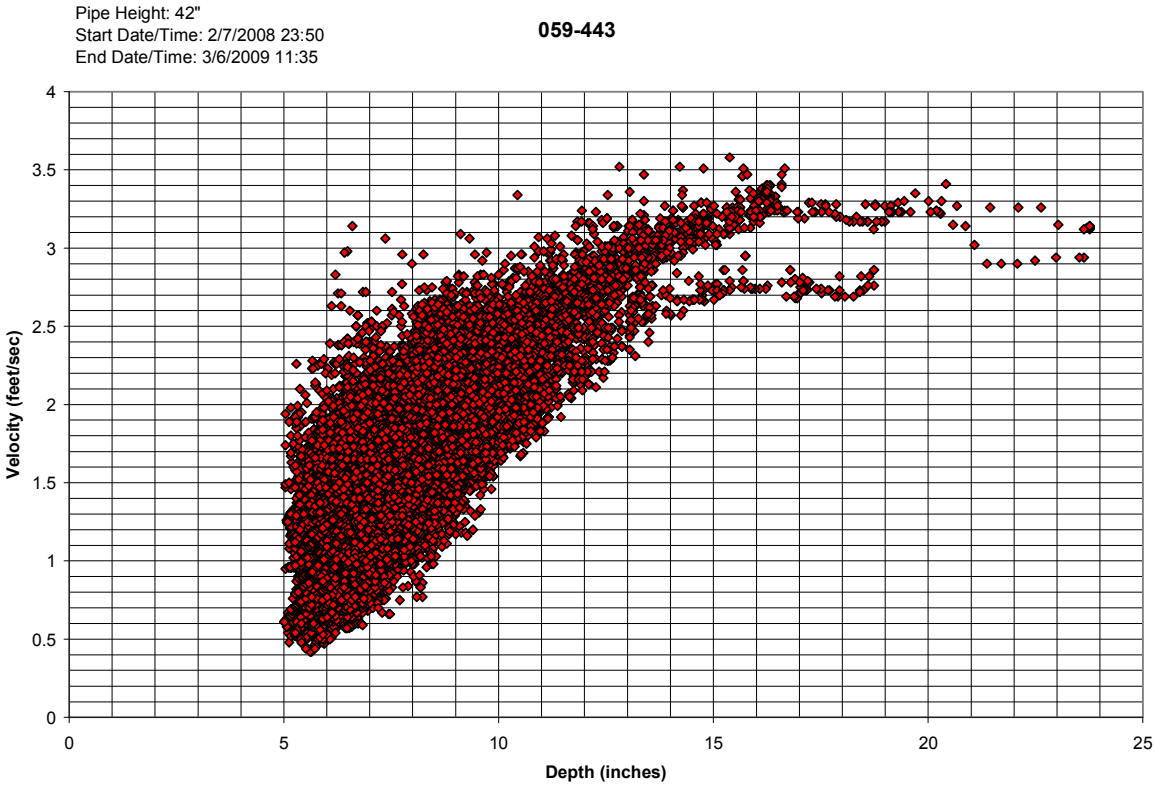
Graph: Scattergraph
Location: GEN40_059436:1
Location Description: Manual Collect
Pipe Height (inches): 14.00 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 16:30



Close up

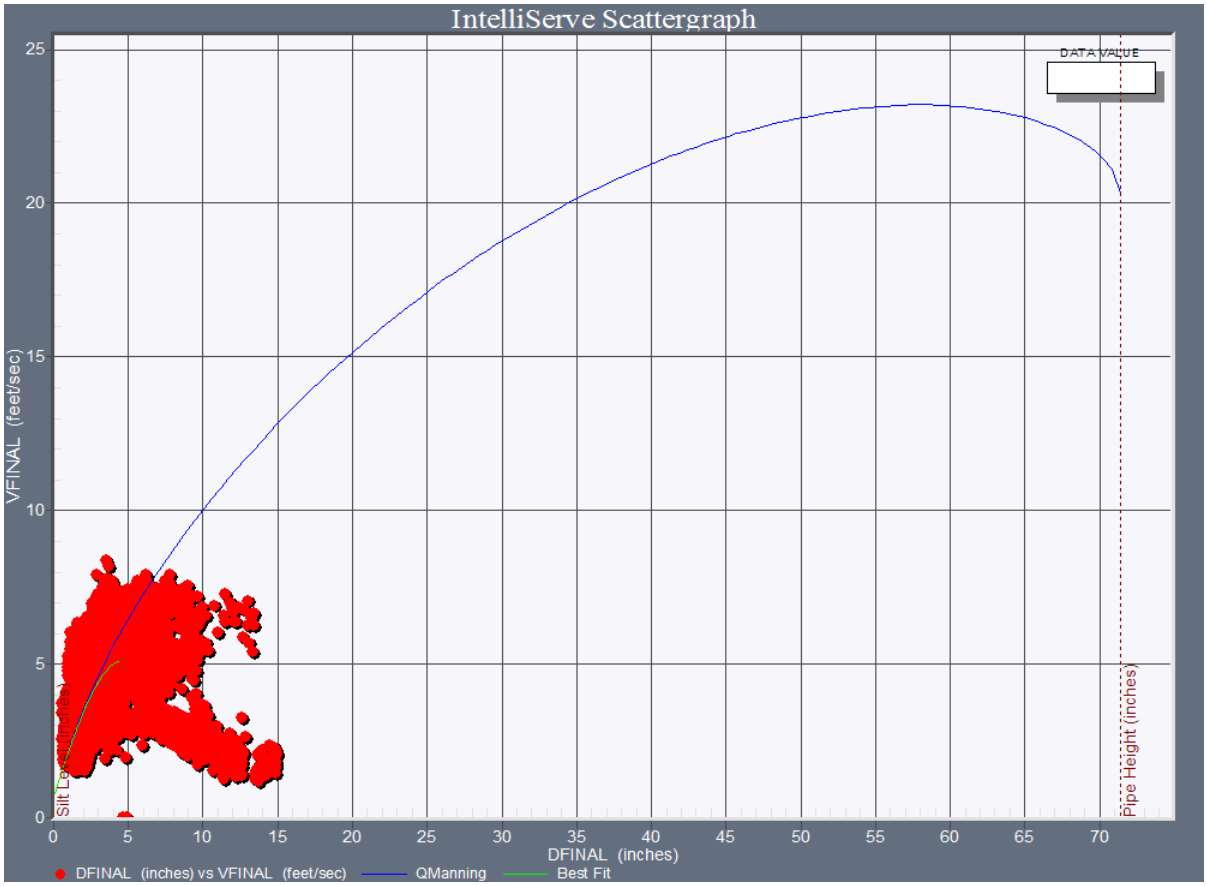

IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1
2
3
4
5
6
7
8
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

GEN38_059-443

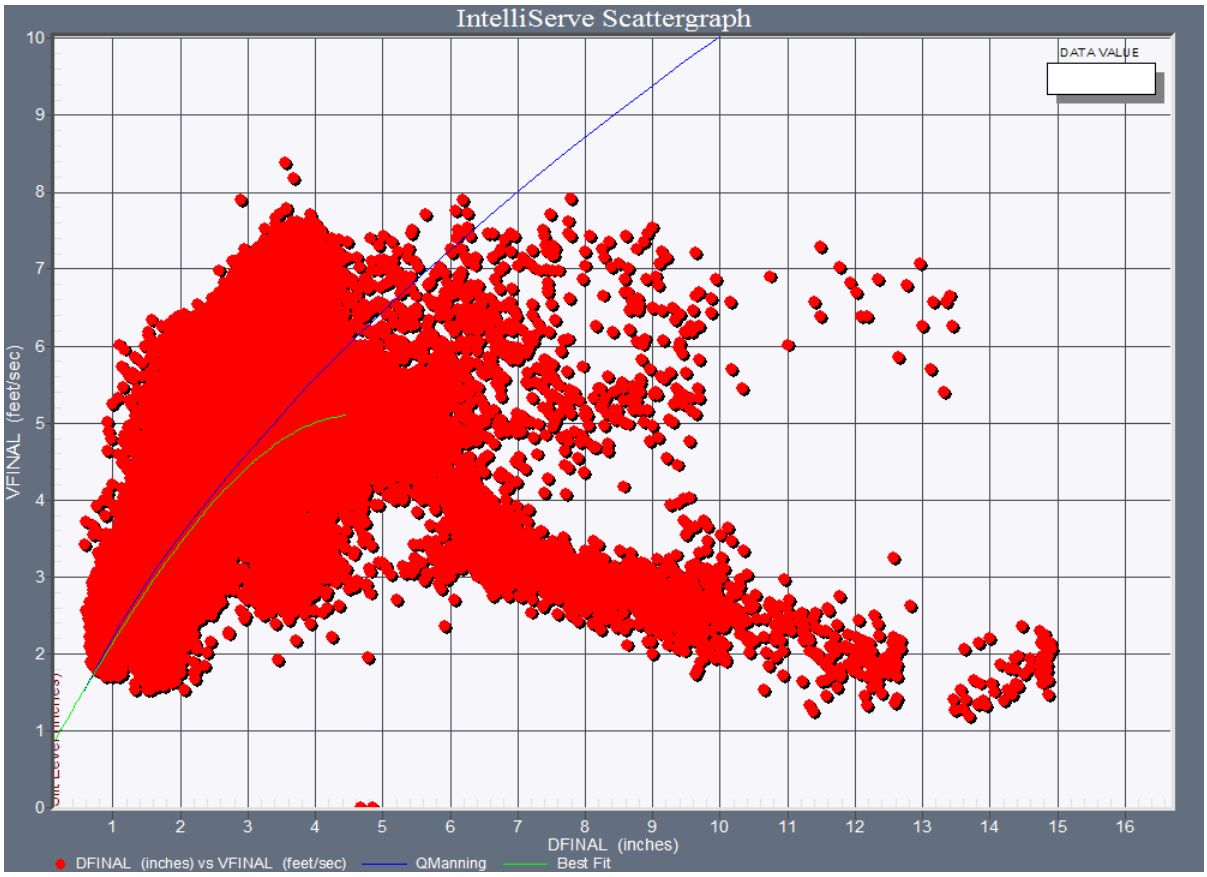


GEN38_059-451

Graph: Scattergraph
Location: GEN38_059451:1
Location Description: MH#059-498
Pipe Height (inches): 71.38 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 16:30



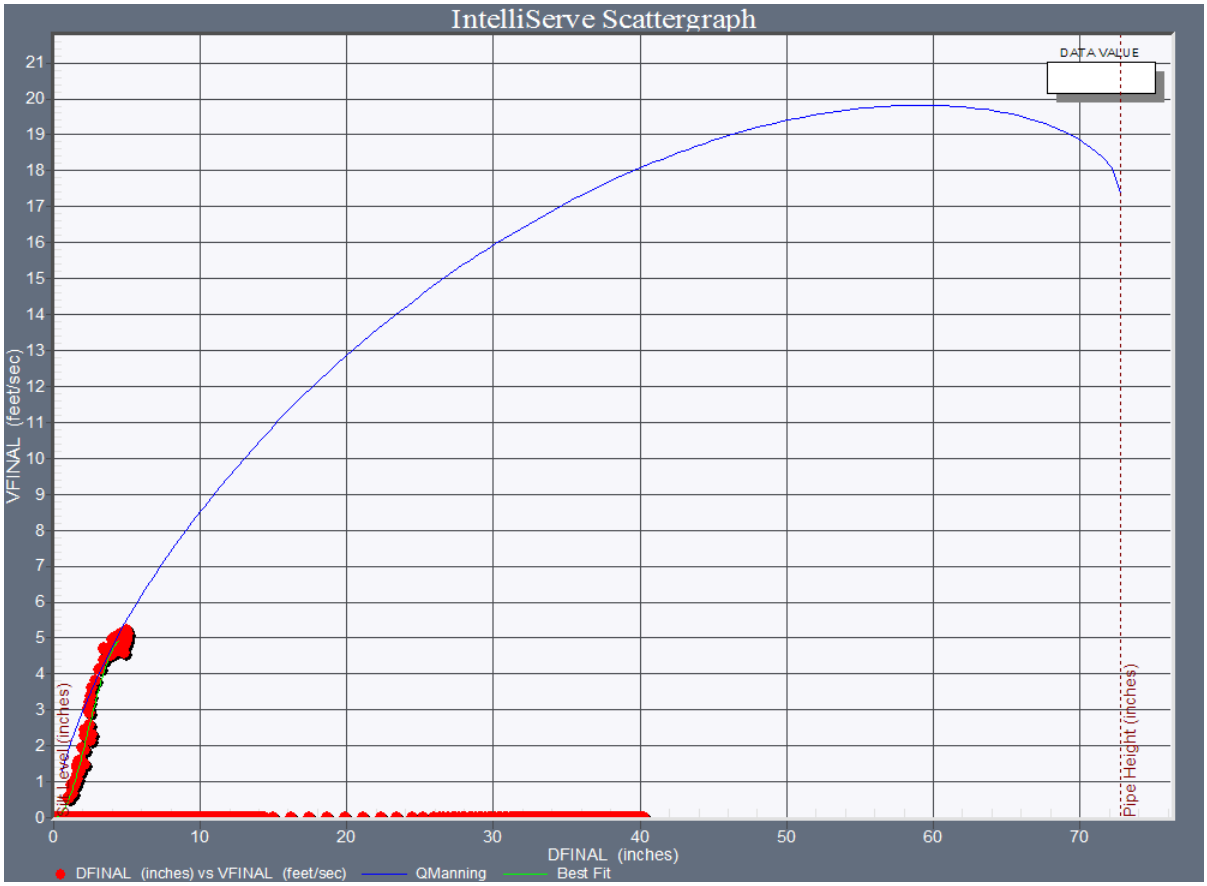
Close up


IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
DFINAL (inches)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

Note: NPDES_38 MH059451 was incorrectly labeled. This site is at MH 059-574, not MH 059-451. Continued monitoring at this site can be found under the label "NPDES038_MH059574." This site is also known as "Structure A". Please see Section 3.2 *059-451 "A" (Monitoring ID NPDES38_059-451, Structure "A")* in the report for more details.

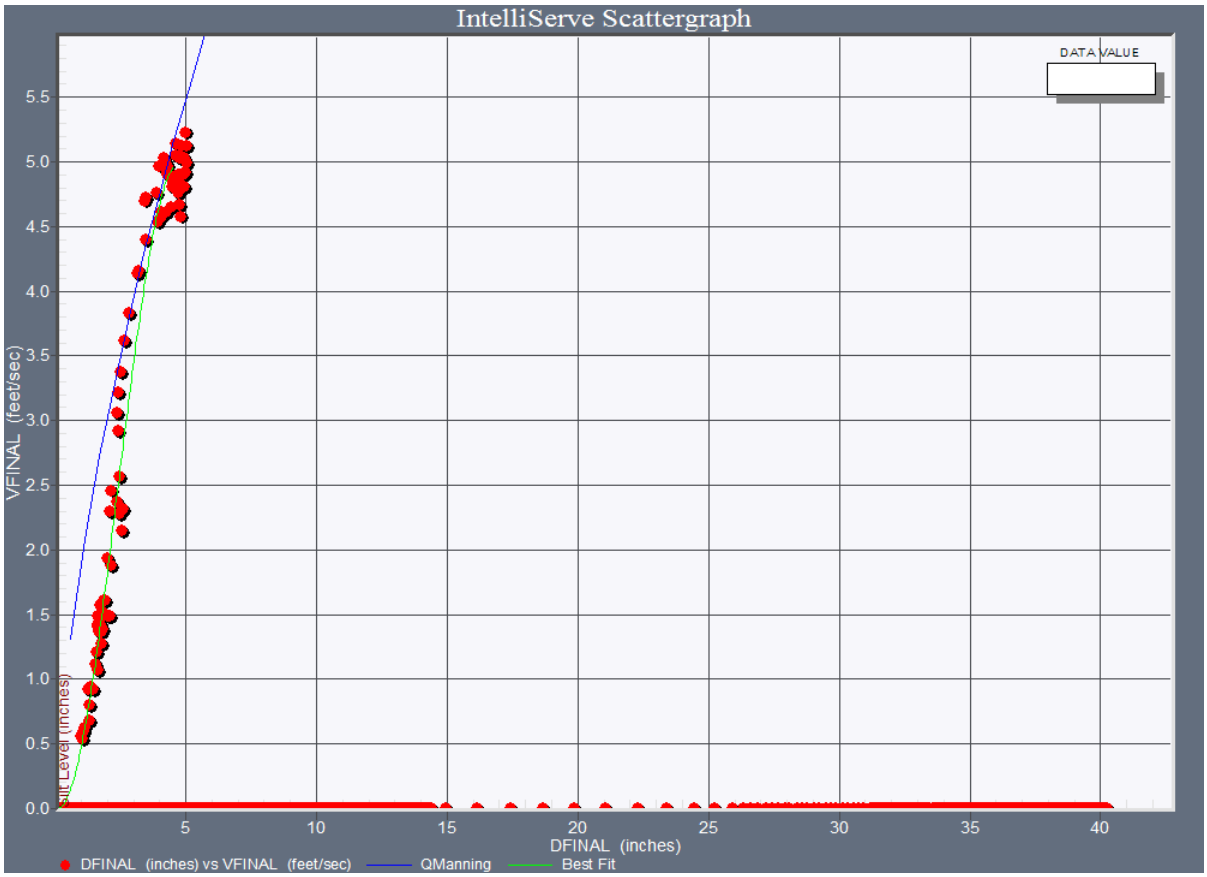
NPDES38_059-451, Structure A

Graph: Scattergraph
Location: NPDES038_MH059451:1
Location Description: MH#059-451
Pipe Height (inches): 72.75
Silt Level (inches): 0.00
Start Date/Time: 1-1-2008 00:00
End Date/Time: 5-31-2009 16:45



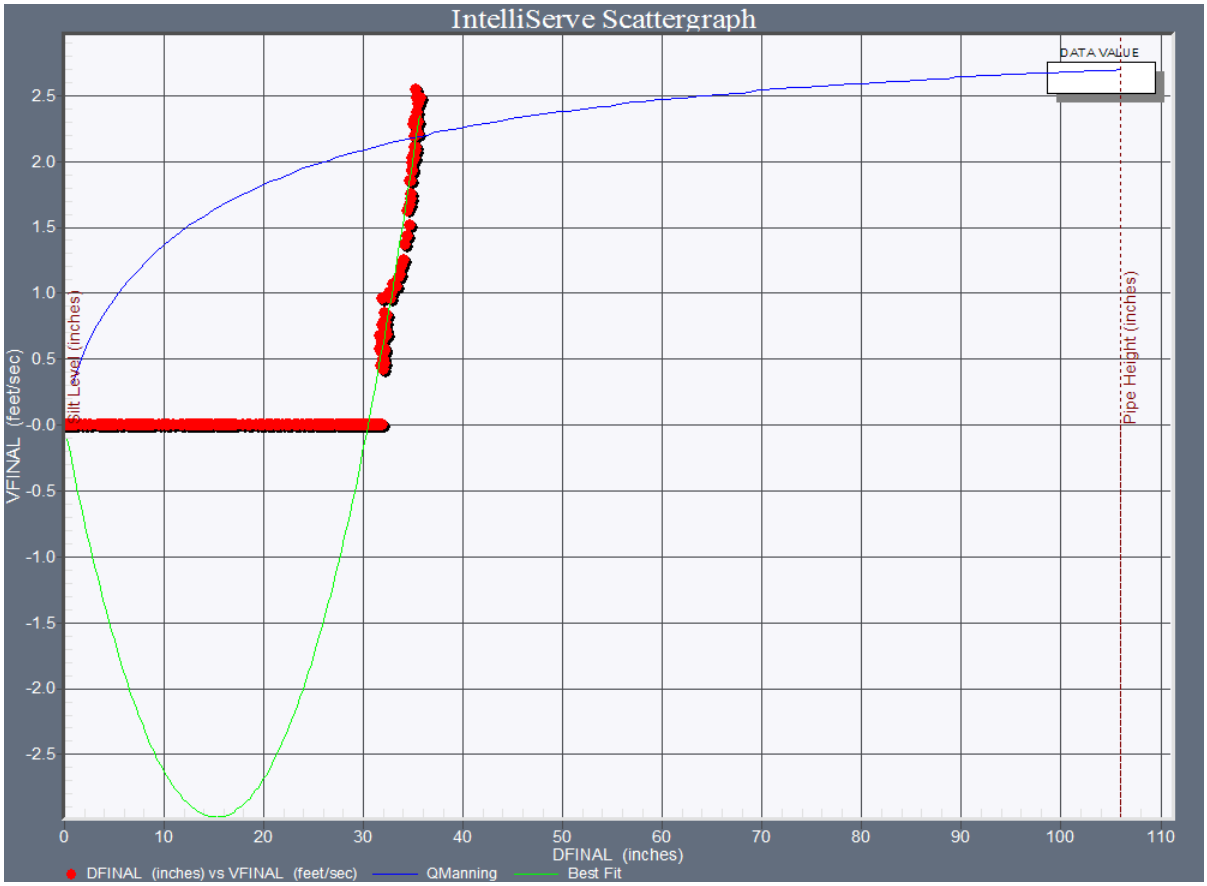
Note: NPDES_38 MH059451 was incorrectly labeled. See note on page D-35.

Close up



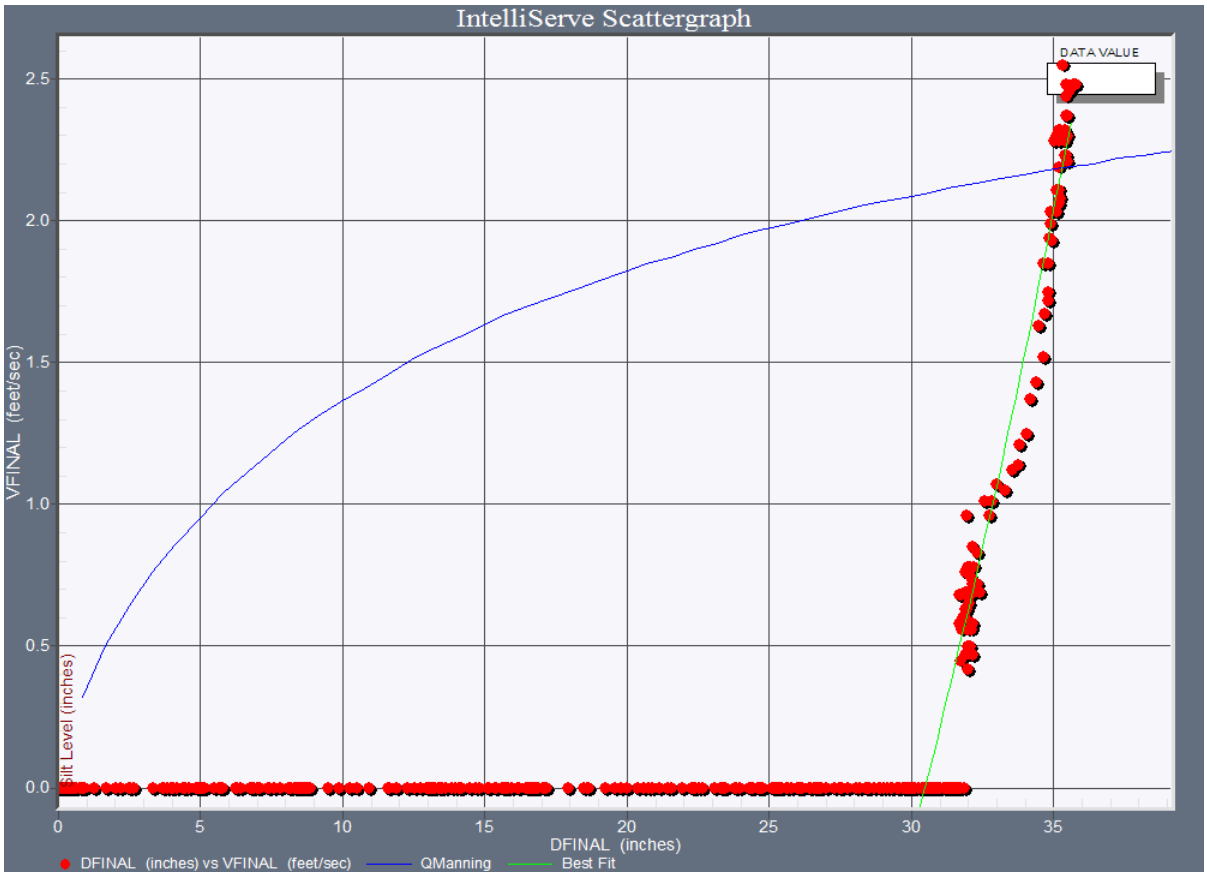
Note: NPDES_38 MH059451 was incorrectly labeled. See note on page D-35.

Graph: Scattergraph
Location: NPDES038_MH059451:2
Location Description: MH#059-451
Pipe Height (inches): 106.00 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 16:45



Note: NPDES_38 MH059451 was incorrectly labeled. See note on page D-35.

Close up



NPDES37_059-489

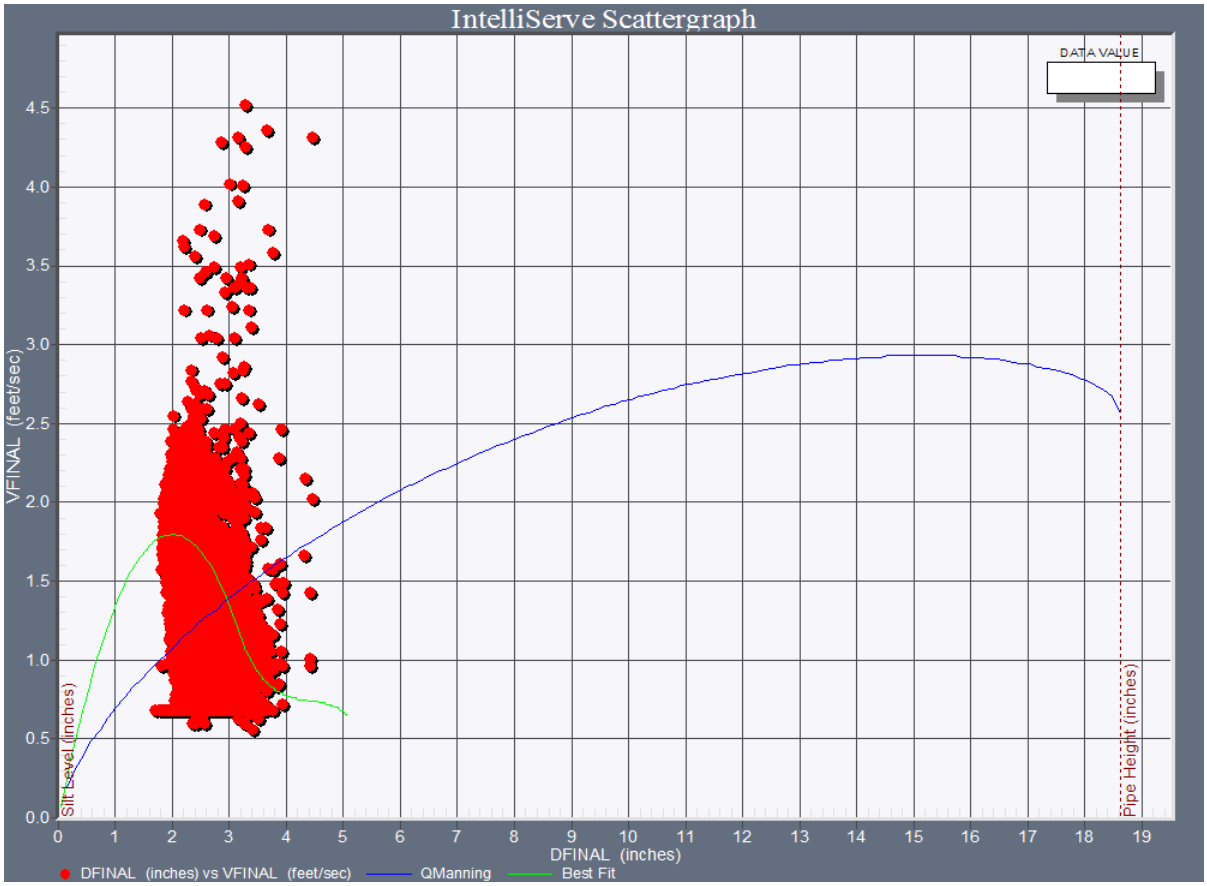
Graph: Scattergraph

Location: NPDES037_MH059489:1

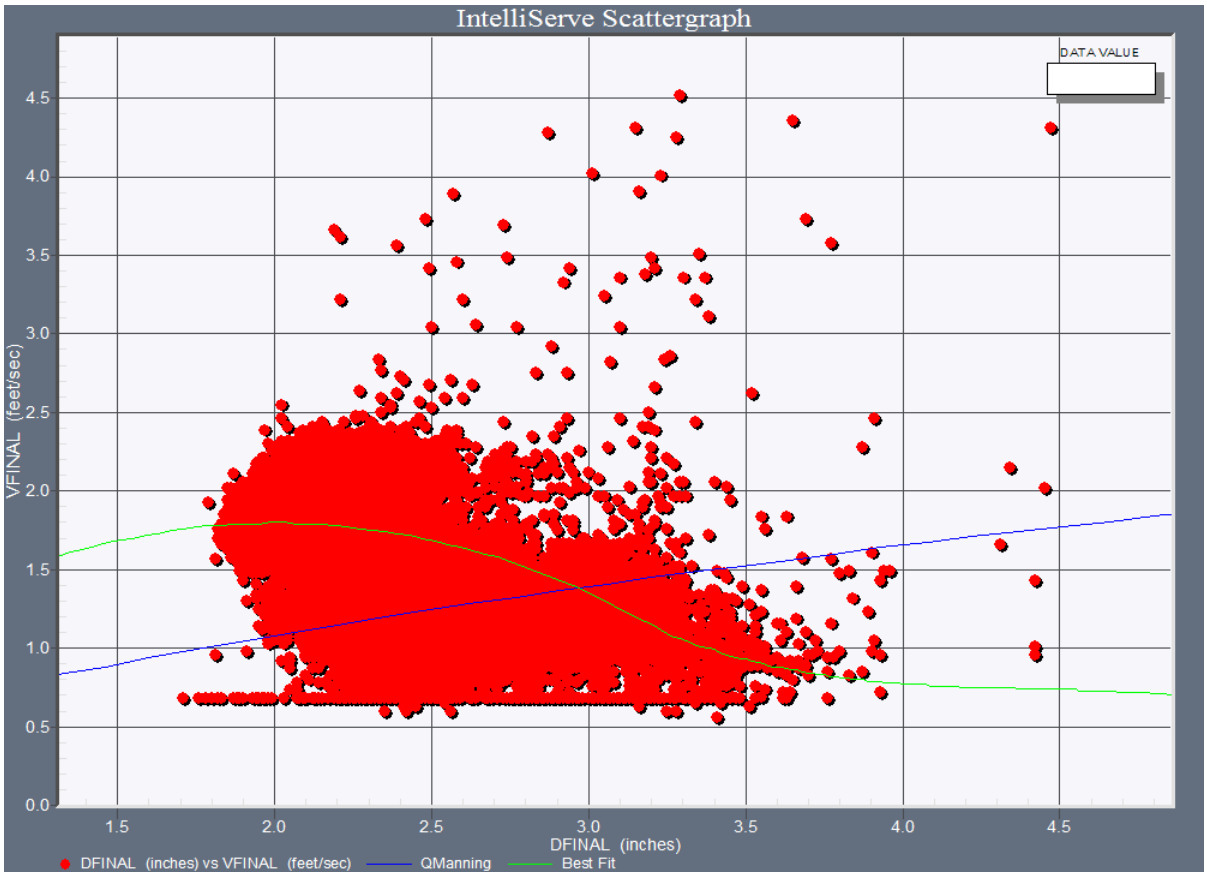
Location Description: MH#059-489

Pipe Height (inches): 18.63 Silt Level (inches): 0.00

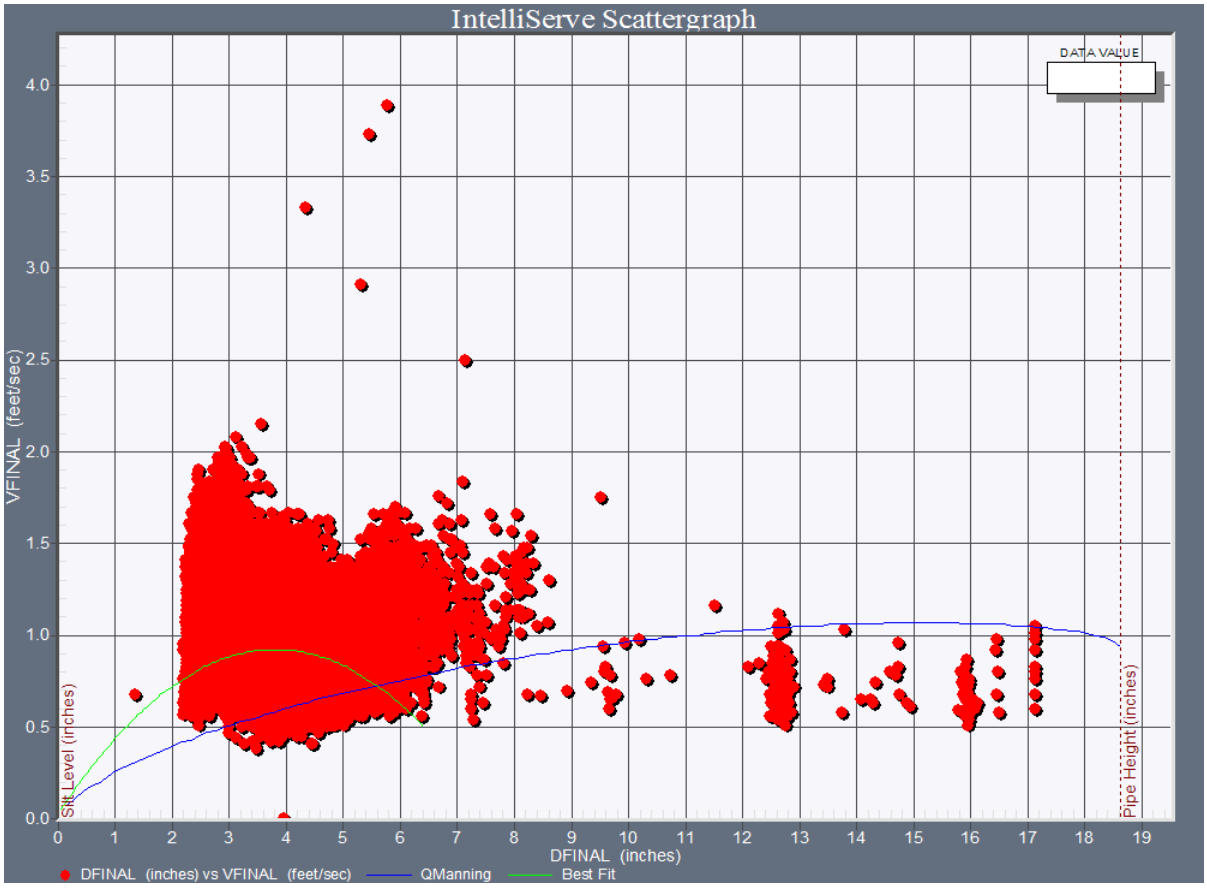
Start Date/Time: 1-1-2008 00:00 End Date/Time: 5-31-2009 13:30



Close up

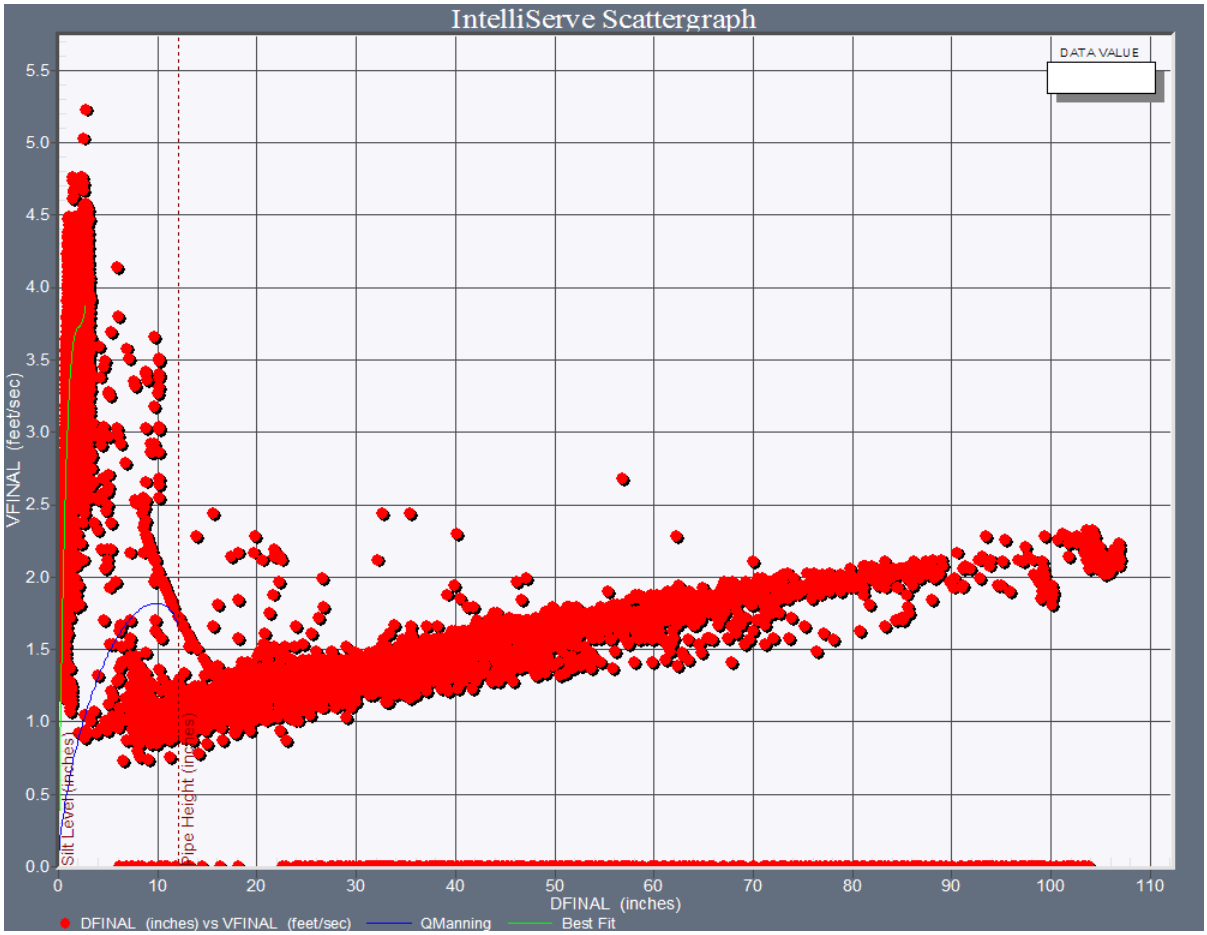

IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

Graph: Scattergraph
Location: NPDES037_MH059489:2
Location Description: MH#059-489
Pipe Height (inches): 18.63 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 13:30

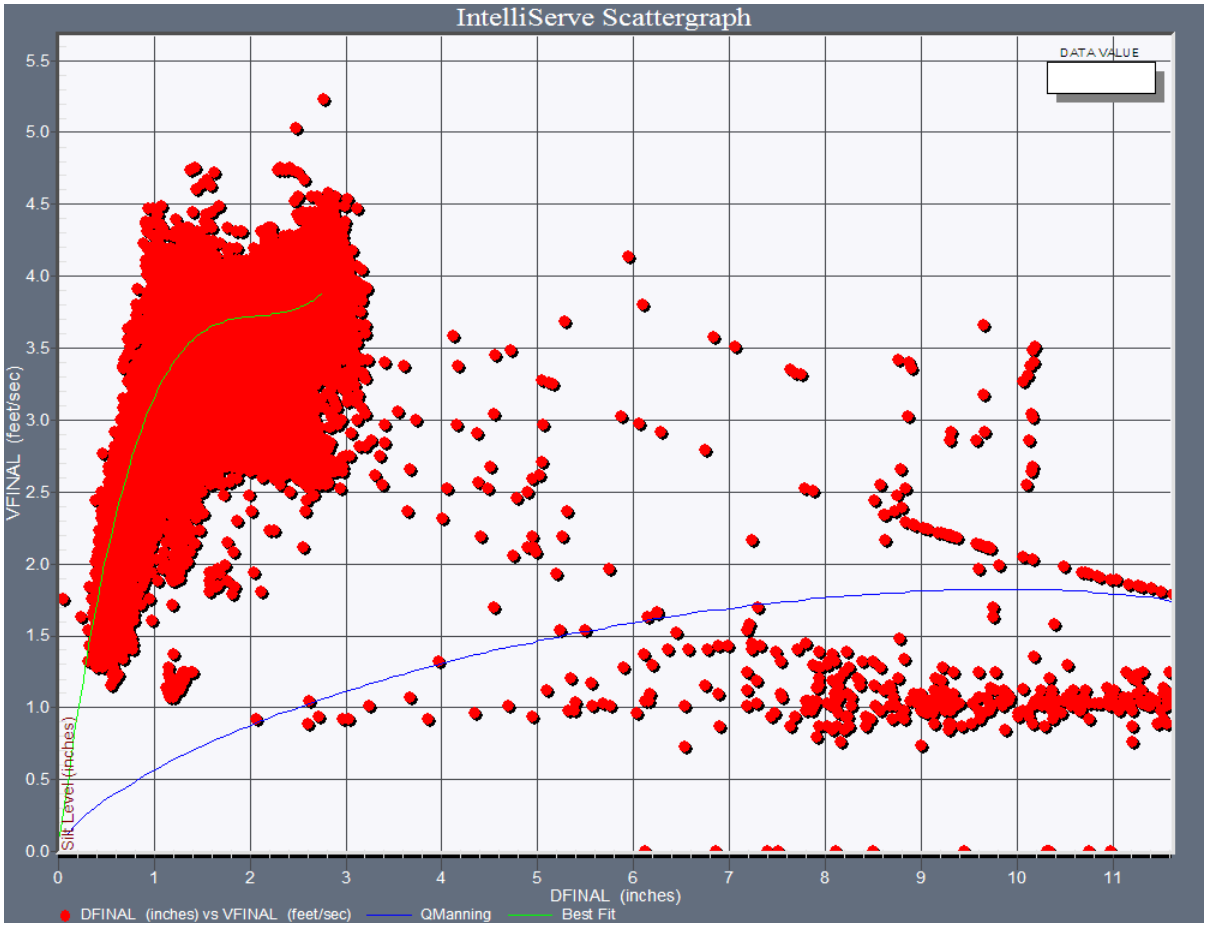


GEN40_059-490

Graph: Scattergraph
Location: GEN40_059490:1
Location Description: MH#059-490 -
Pipe Height (inches): 12.13 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 16:45

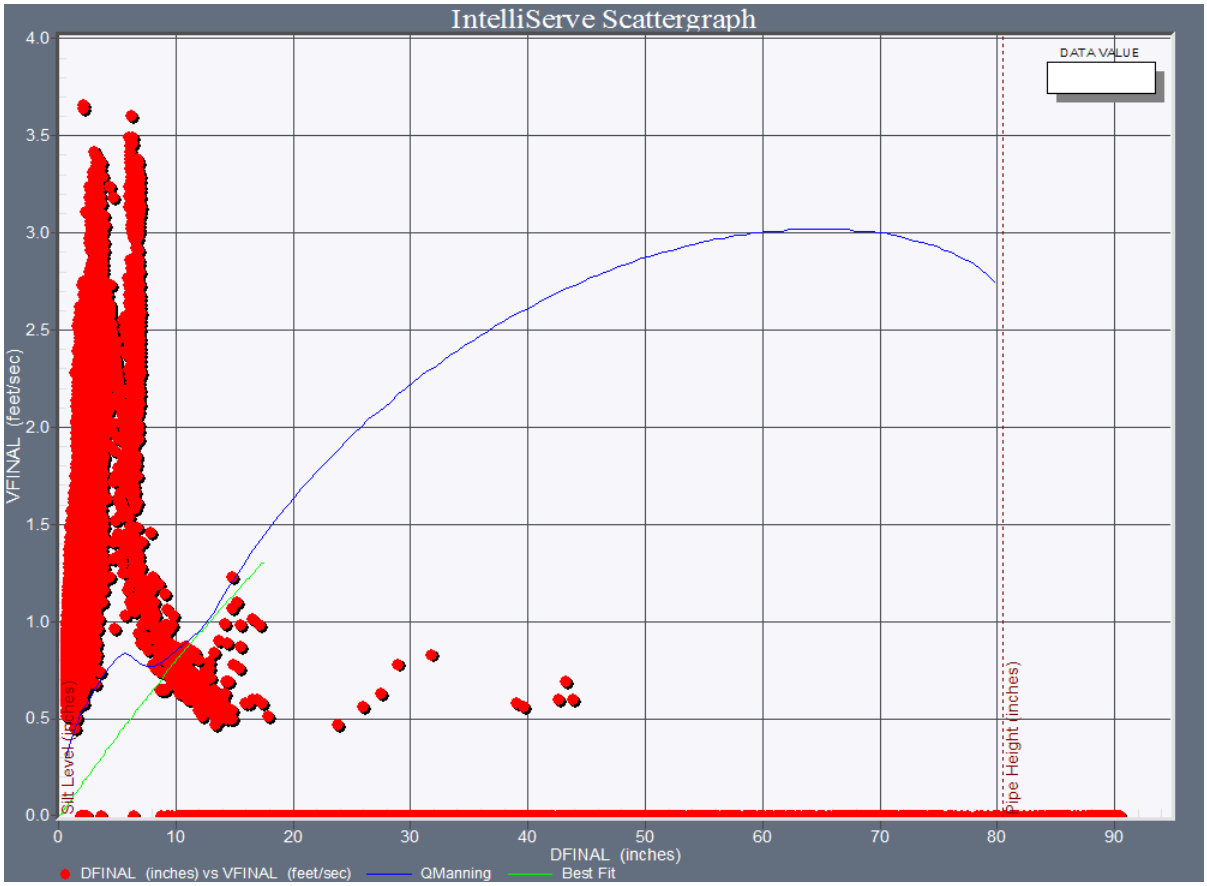


Close up

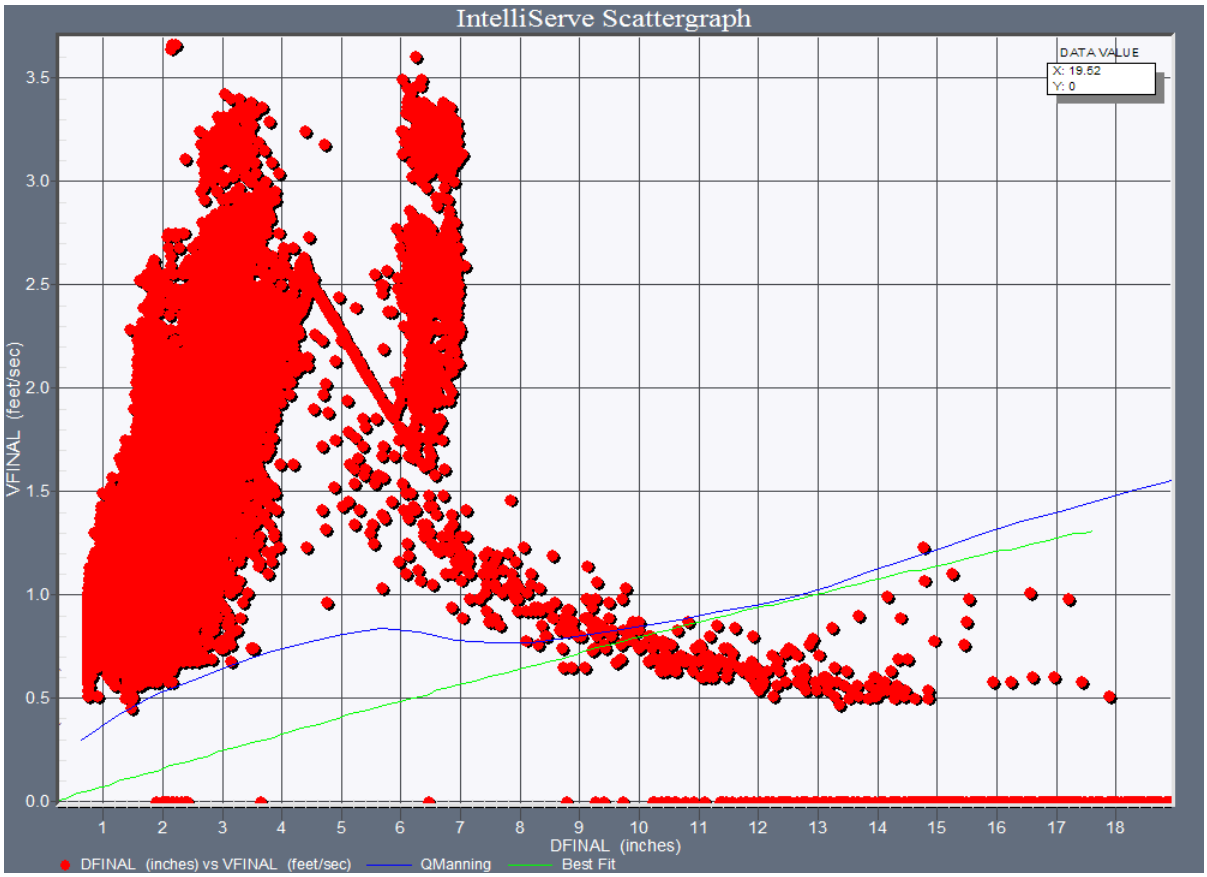

IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Silt Level (inches)
0
1
2
3
4
5
6
7
8
9
10
11
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

NPDES40_059-491

Graph: Scattergraph
Location: NPDES040_MH059491:1
Location Description: MH#059-491
Pipe Height (inches): 80.50 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 16:45

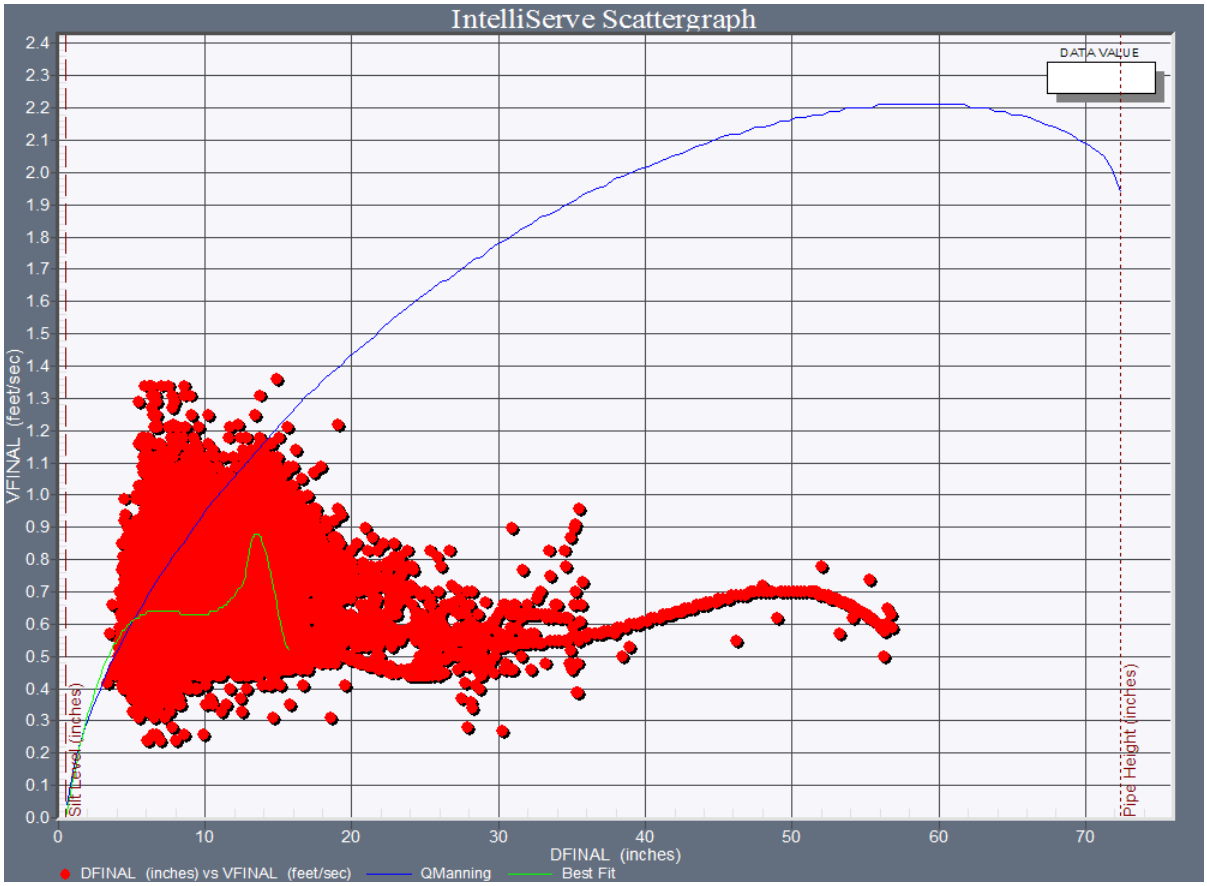


Close up

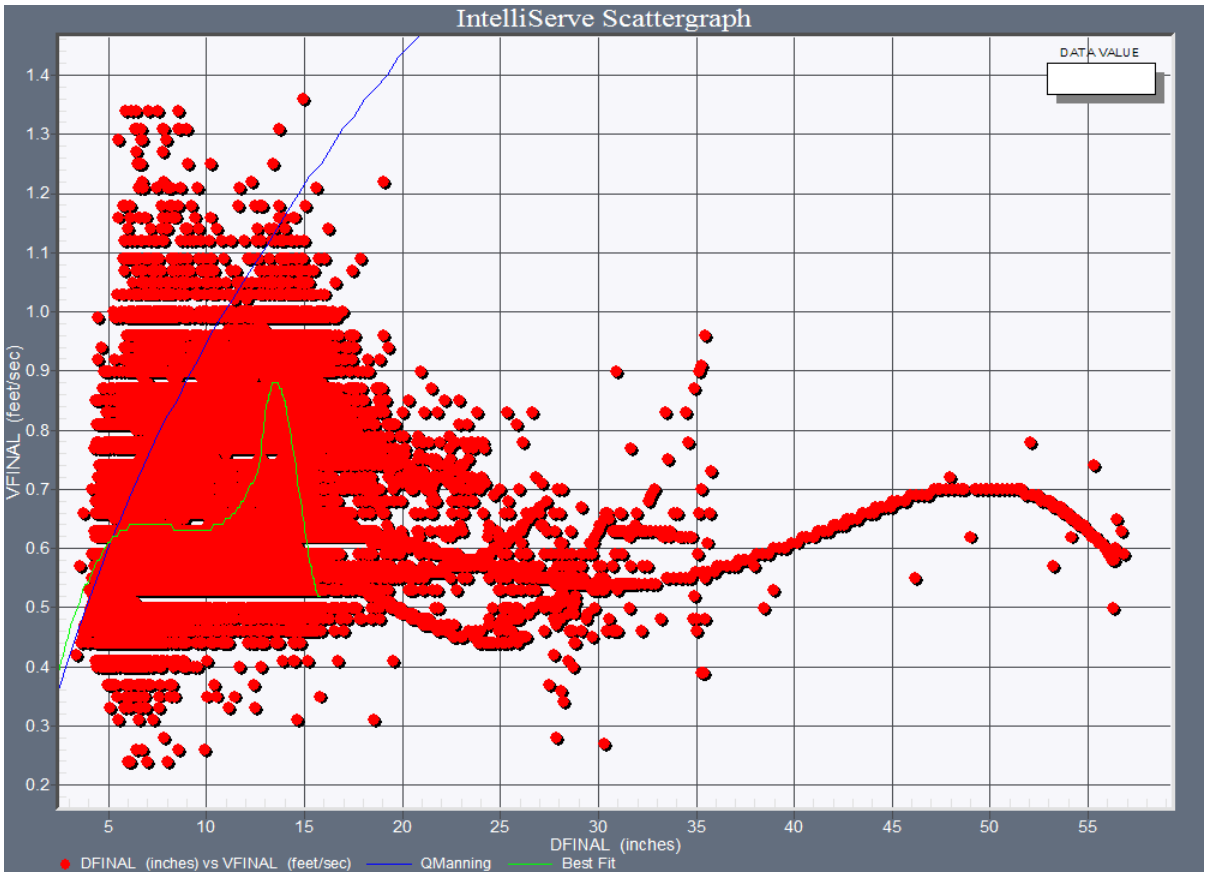

IntelliServe Scattergraph
DATA VALUE
X: 19.52
Y: 0
VFINAL (feet/sec)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

GEN38_059-498

Graph: Scattergraph
Location: GEN38_059498A:1
Location Description: MH#059-498
Pipe Height (inches): 72.38 **Silt Level (inches):** 0.50
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 17:00

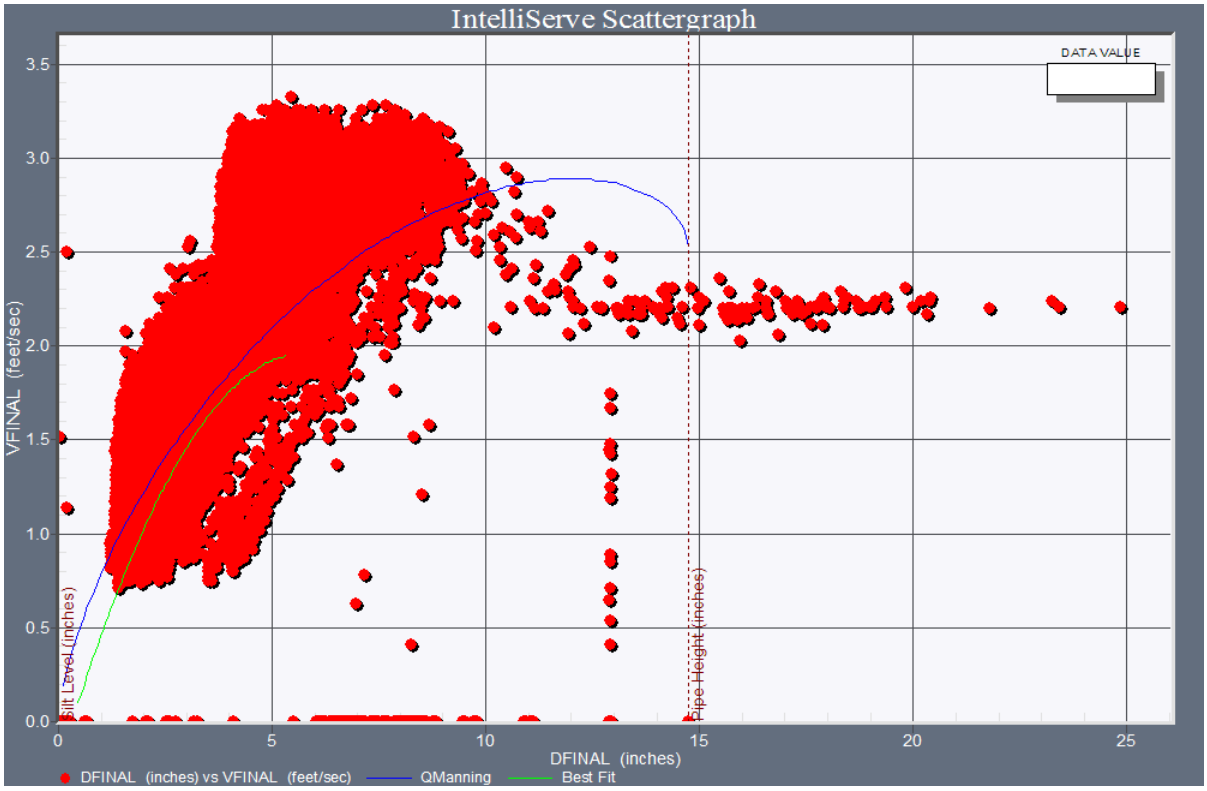


Close up

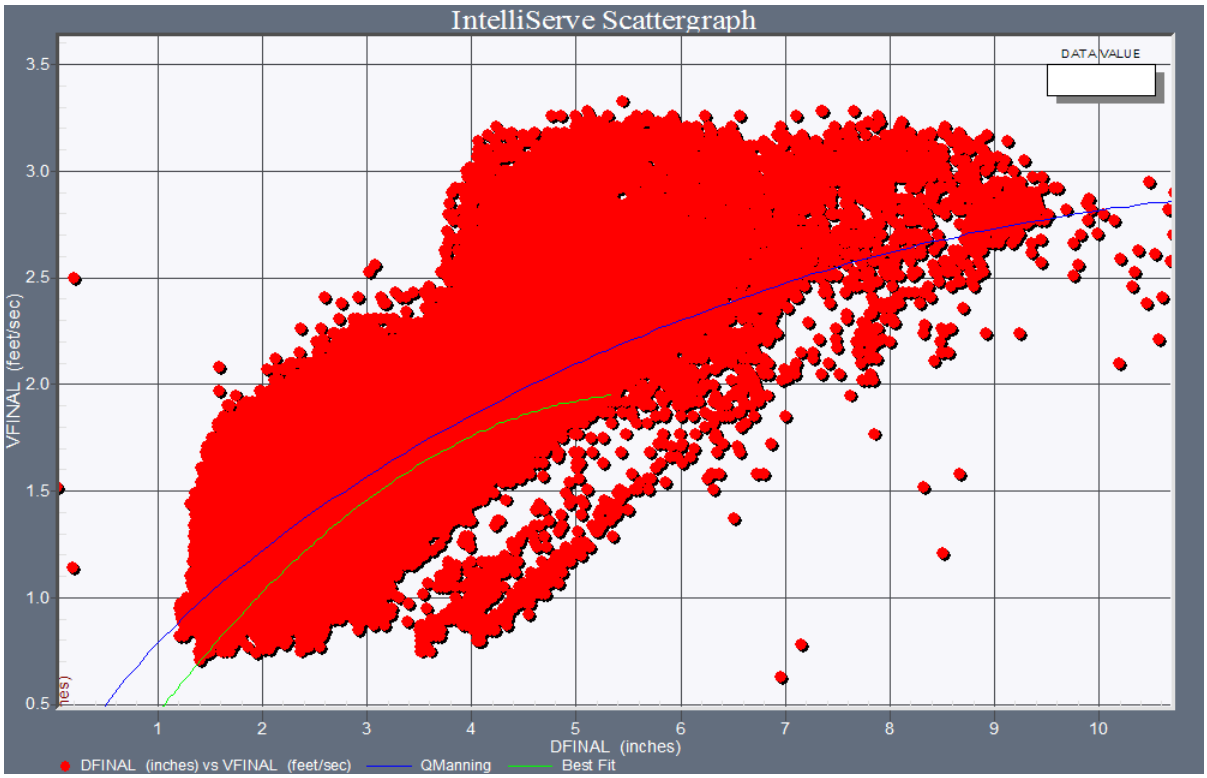

IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
5
10
15
20
25
30
35
40
45
50
55
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

GEN38_060W-012

Graph: Scattergraph
Location: GEN38_060W012:1
Location Description: MH#060W-012
Pipe Height (inches): 14.75 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 16:15

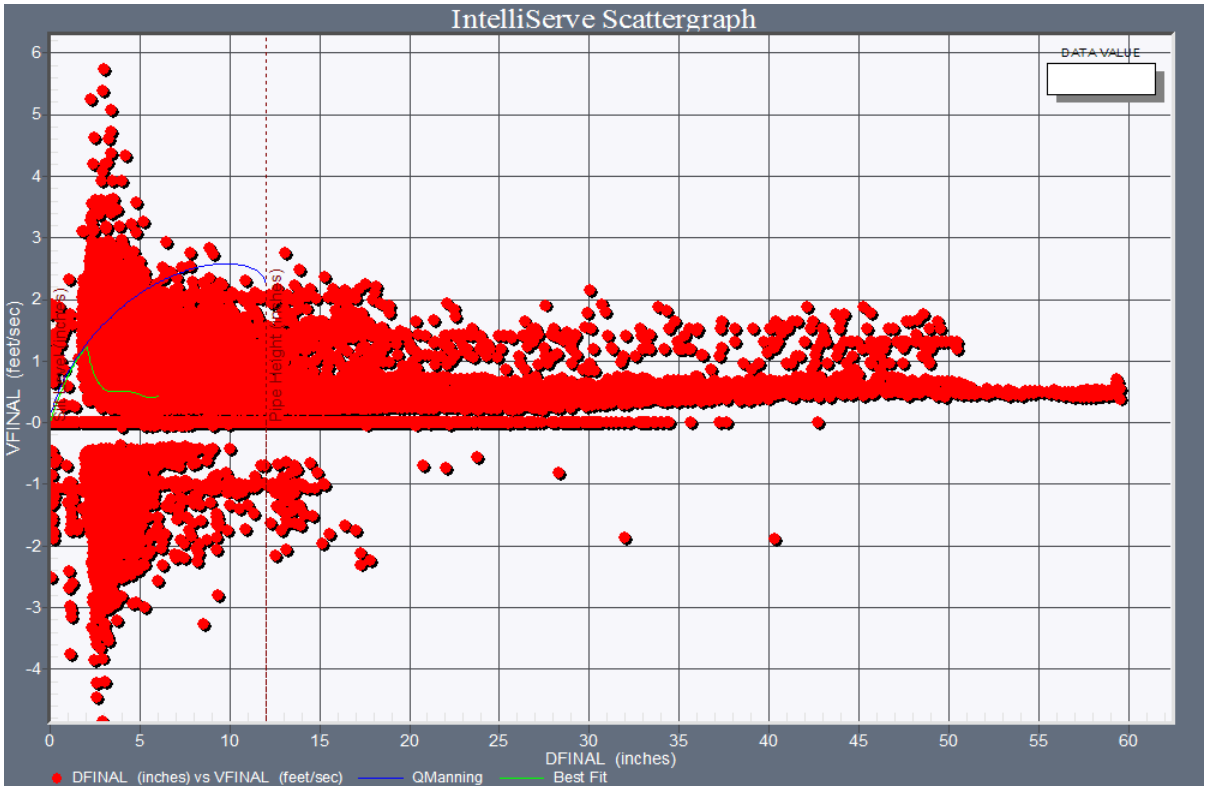


Close up


IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
1
2
3
4
5
6
7
8
9
10
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

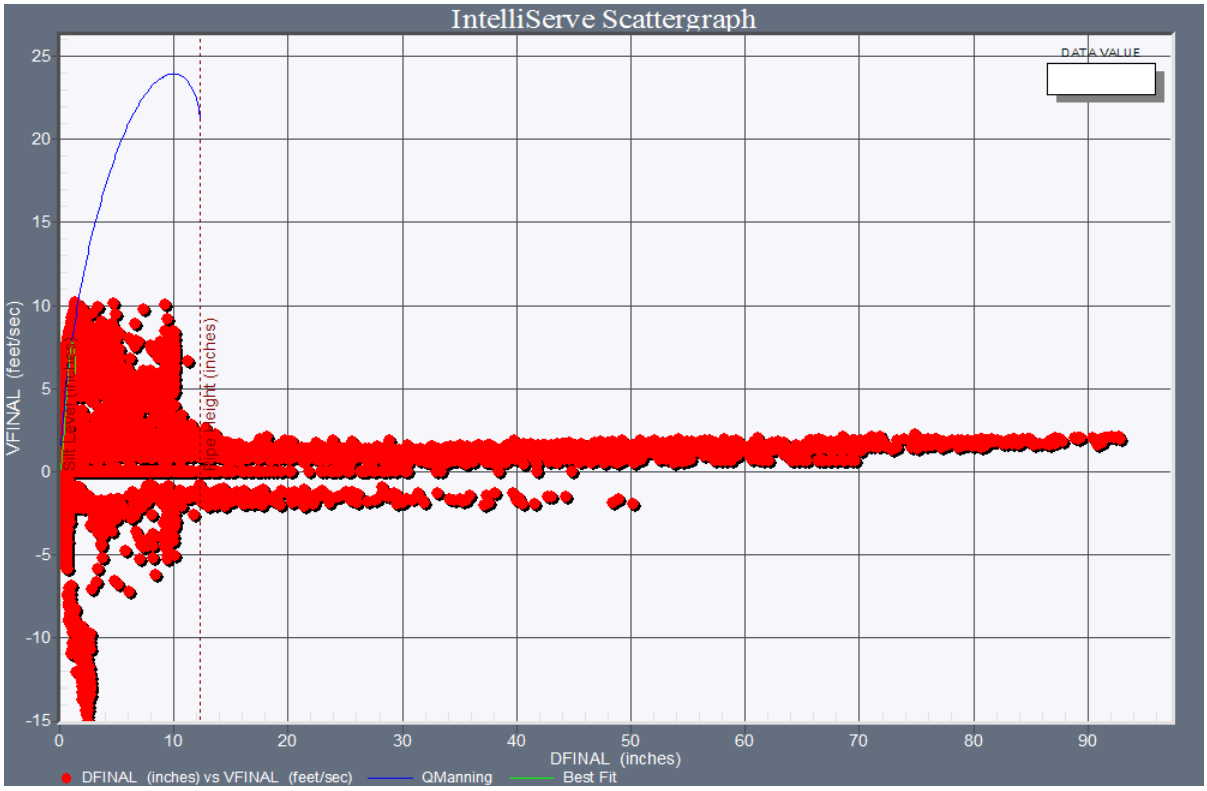
GEN42_060W-014

Graph: Scattergraph
Location: GEN42_060W014:1
Location Description: MH#060W-014
Pipe Height (inches): 12.00 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 16:15



GEN42_060W-019

Graph: Scattergraph
Location: GEN42_060W019:1
Location Description: MH#060W-019
Pipe Height (inches): 12.25 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 16:30



GEN43_060W-025 (No Graph)

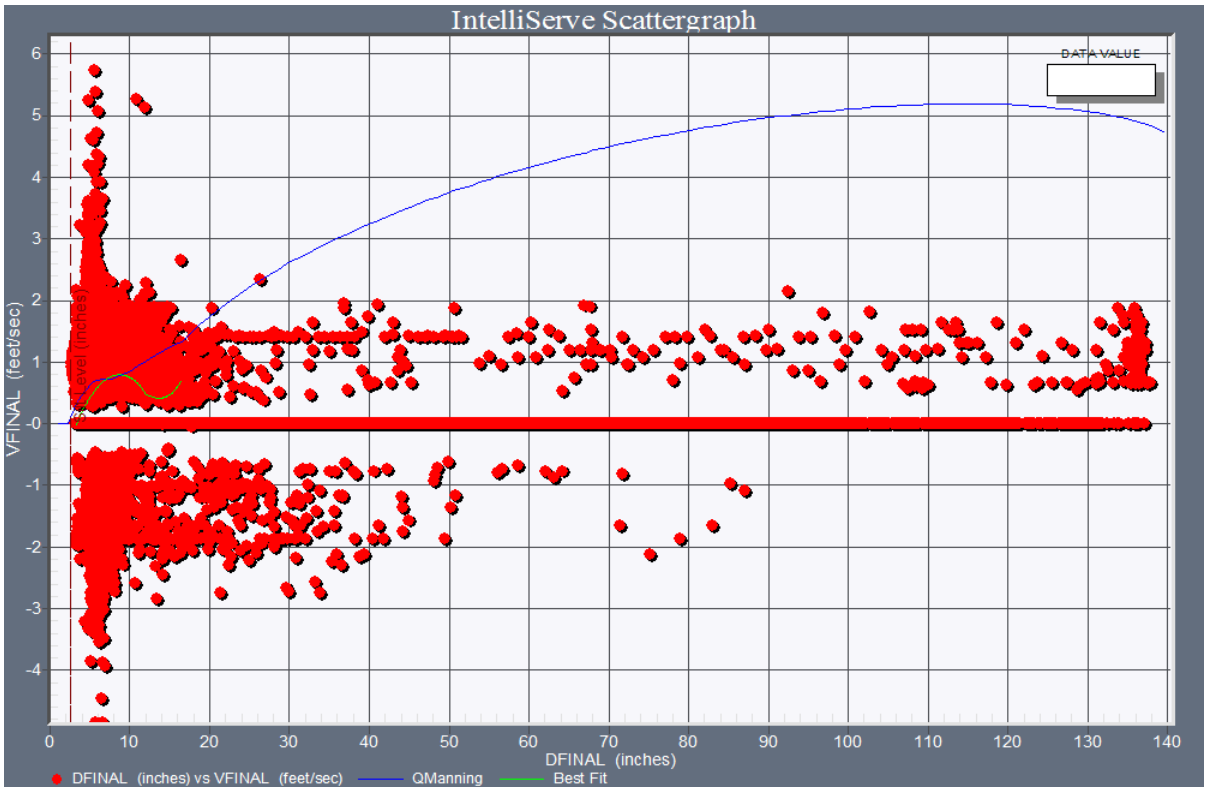
This site was removed in February, 2008. There is no scattergraph available for this data.

GEN43_060W-026 (No Graph)

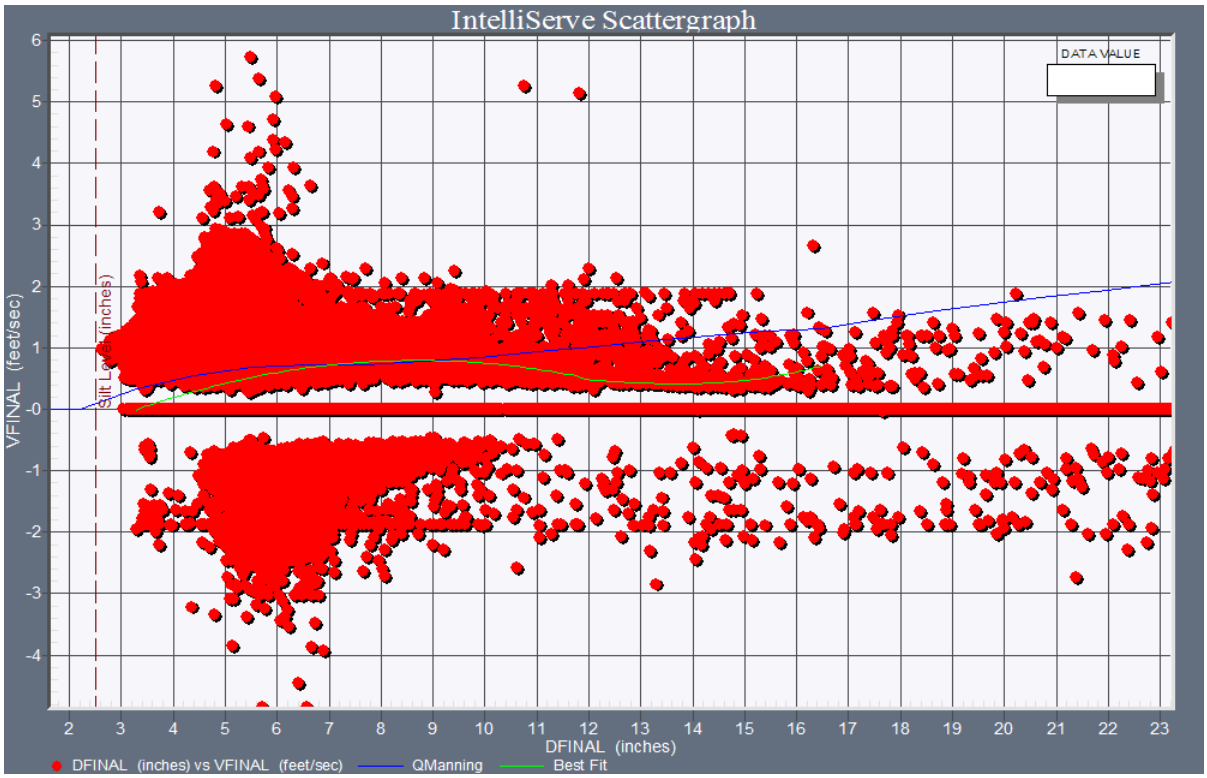
This site is measured using a DataGator type monitor, which does not measure depth and velocity distinctly. There is no scattergraph available for this data.

GEN42_060W-047

Graph:	Scattergraph		
Location:	GEN42_060W047:1		
Location Description:	MH#060W-047		
Pipe Height (inches):	140.75	**Silt Level (inches):**	2.50
Start Date/Time:	1-1-2008 00:00	**End Date/Time:**	5-31-2009 16:30

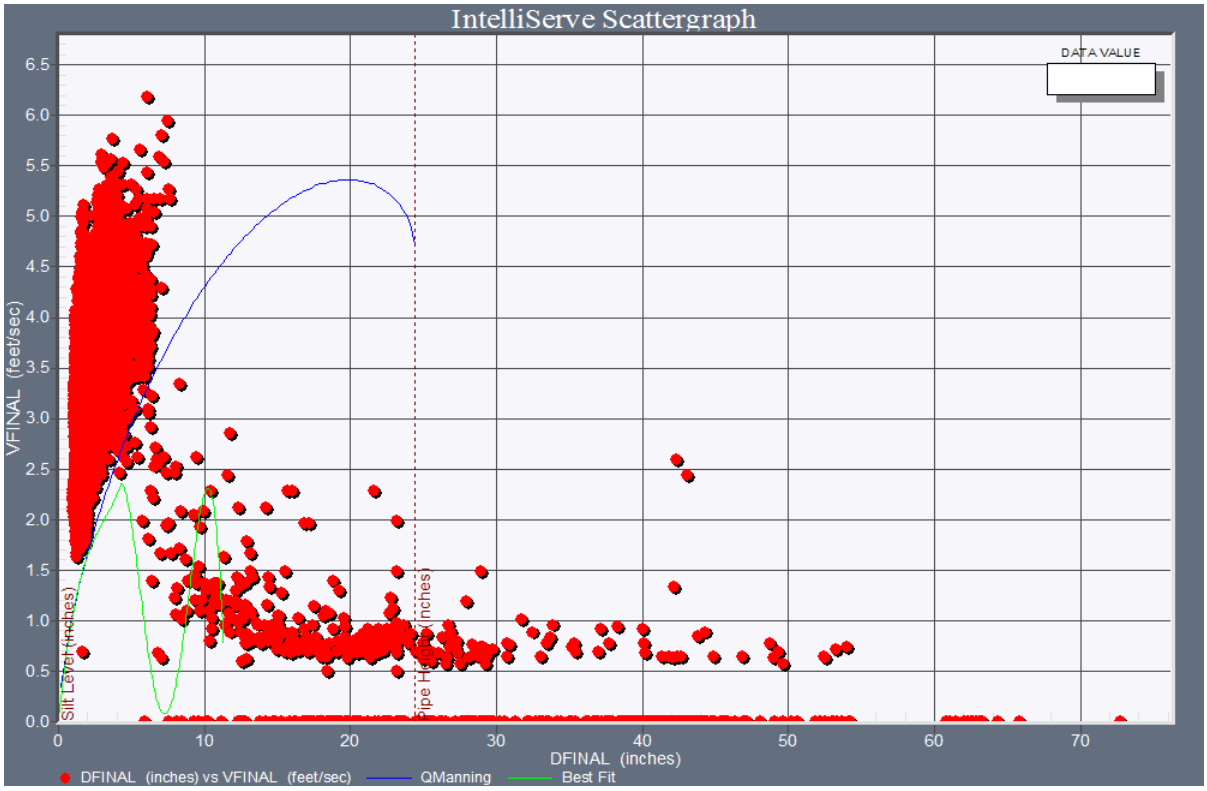


Close up

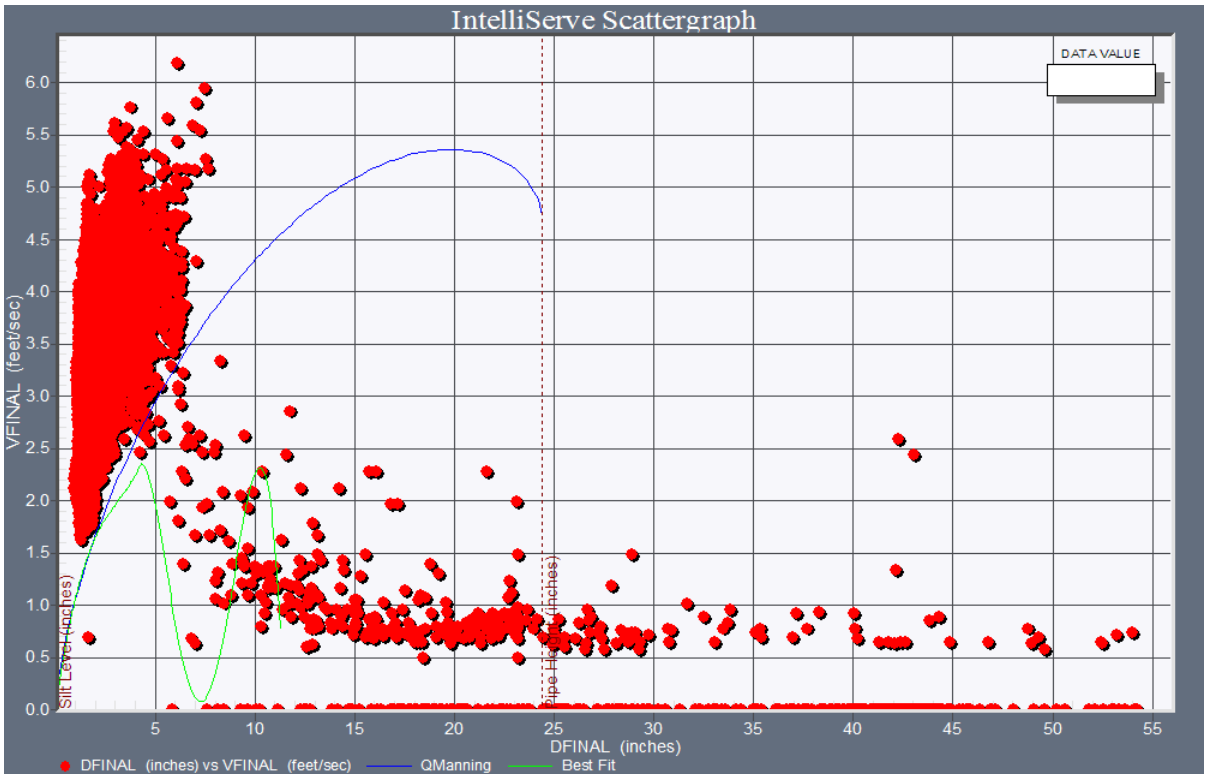

IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
6
5
4
3
2
1
-0
-1
-2
-3
-4
Silt Layer (inches)
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

NPDES43_060W-049

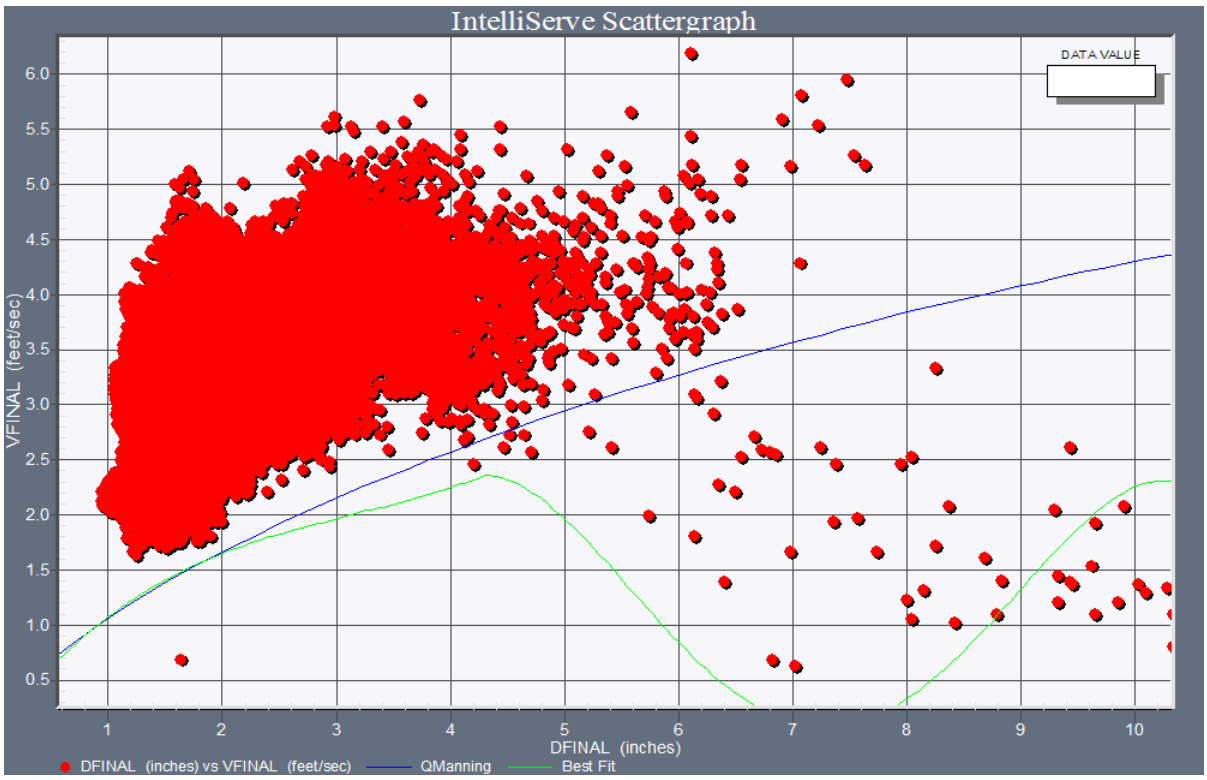
Graph: Scattergraph
Location: NPDES043_MH060W049:1
Location Description: MH#060W-049
Pipe Height (inches): 24.38 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 16:00



Close up

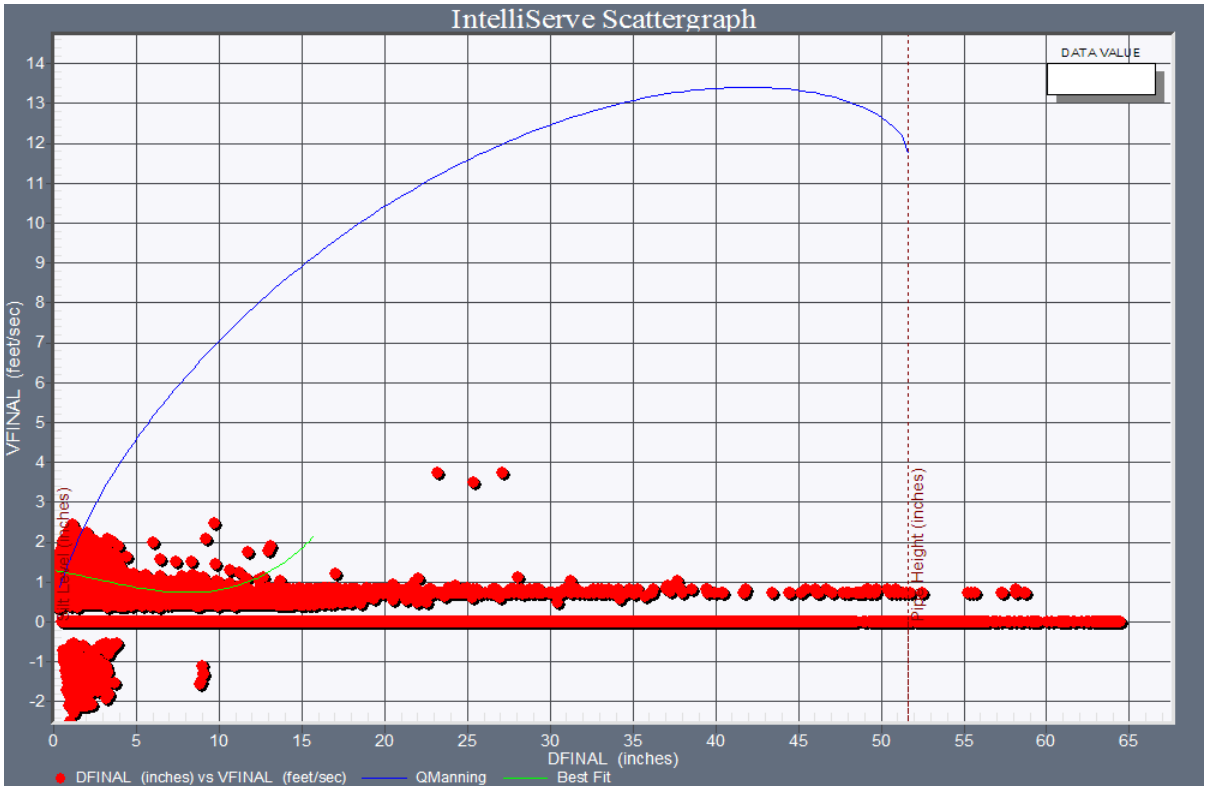


Close up

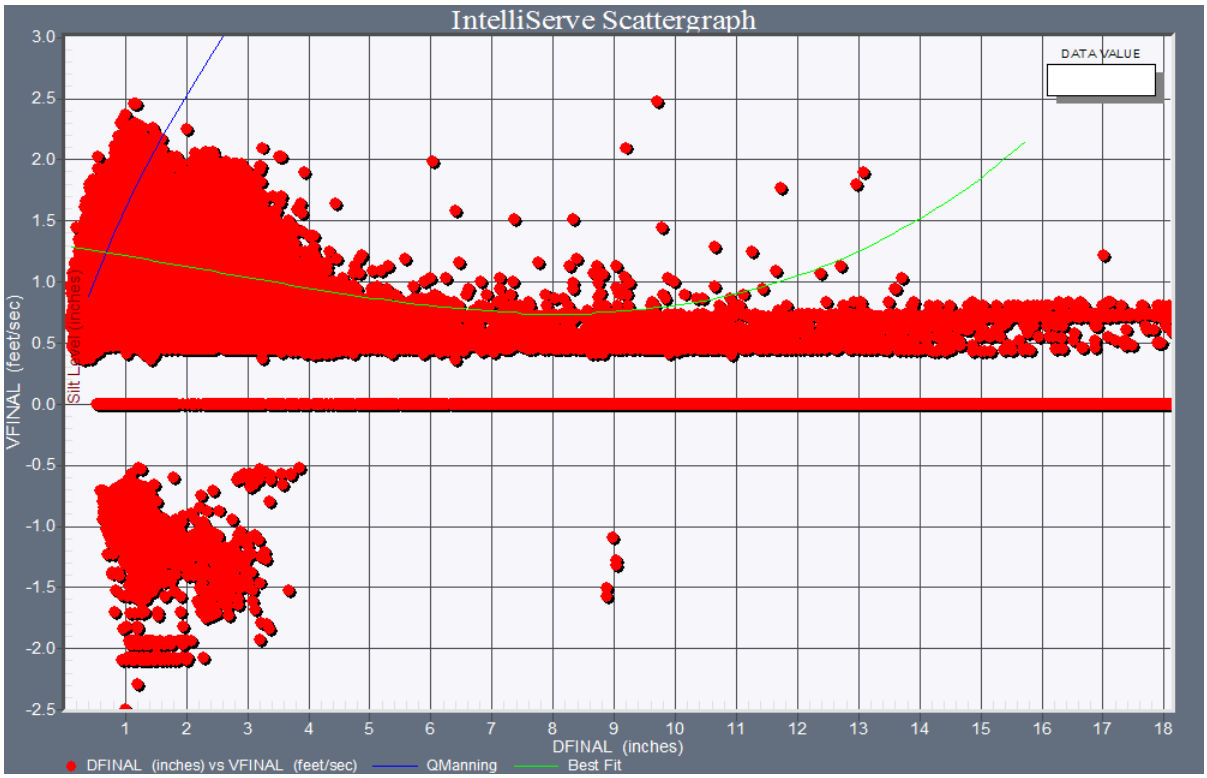


NPDES42_060W-052

Graph: Scattergraph
Location: NPDES042_MH060W052:1
Location Description: MH#060W-052
Pipe Height (inches): 51.63 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 10:45



Close up


IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
Silt Layer (inches)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

GEN43_067-014 (no graph)

This meter is a DataGator, and does not measure depth. Scattergraphs are not available for this site.

GEN43_067-024 (no graph)

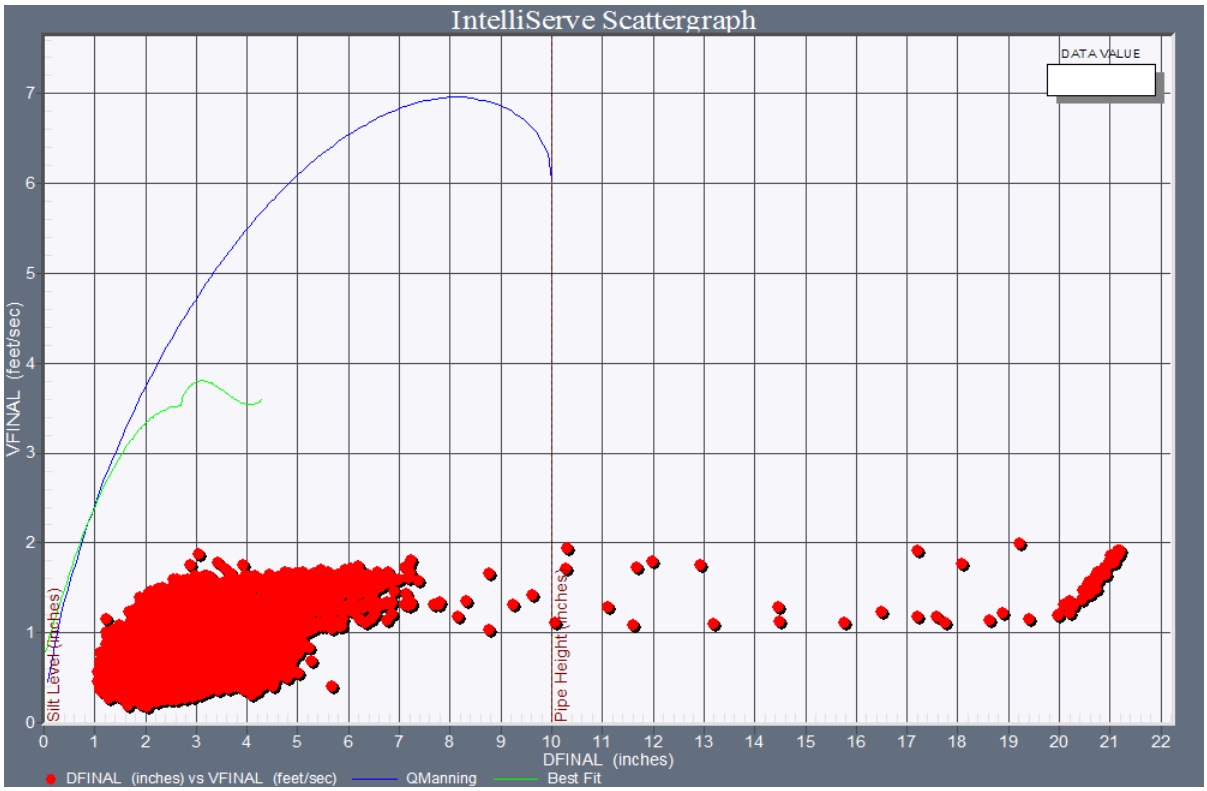
This meter is a DataGator, and does not measure depth. Scattergraphs are not available for this site.

GEN43_067-029 (no graph)

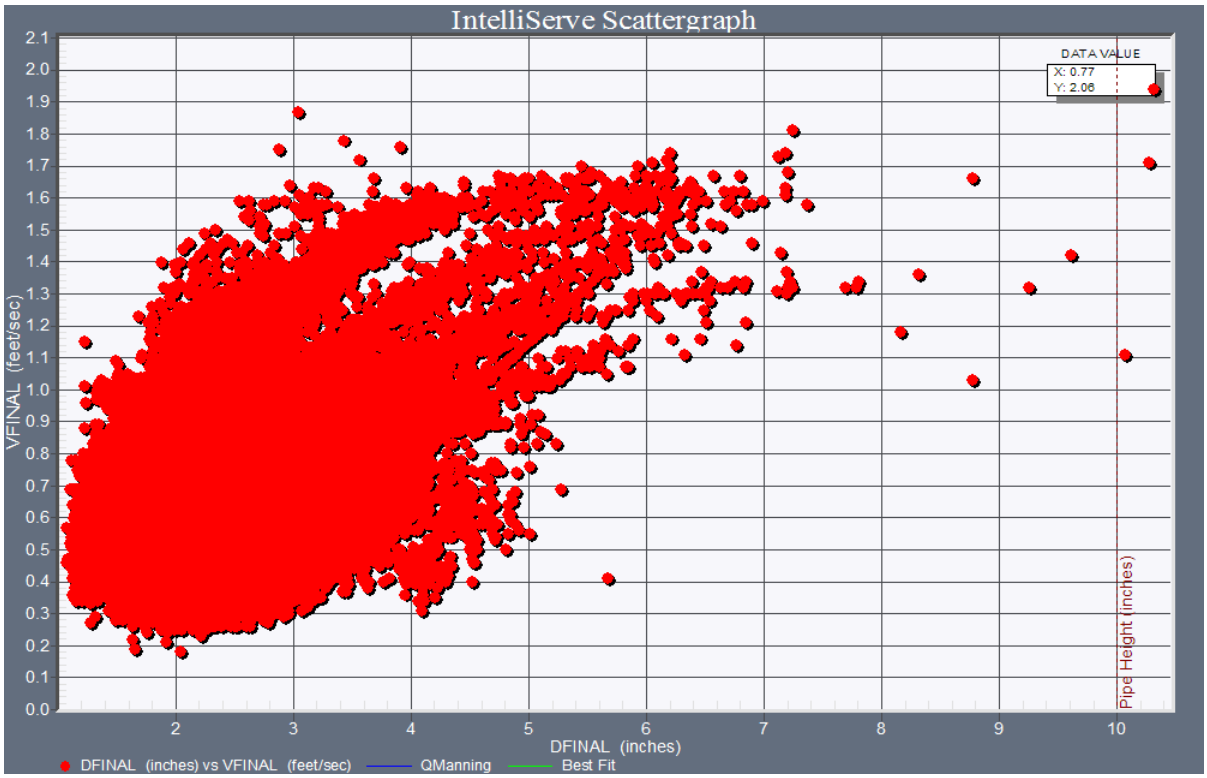
This meter is a DataGator, and does not measure depth. Scattergraphs are not available for this site.

NPDES165_067-078

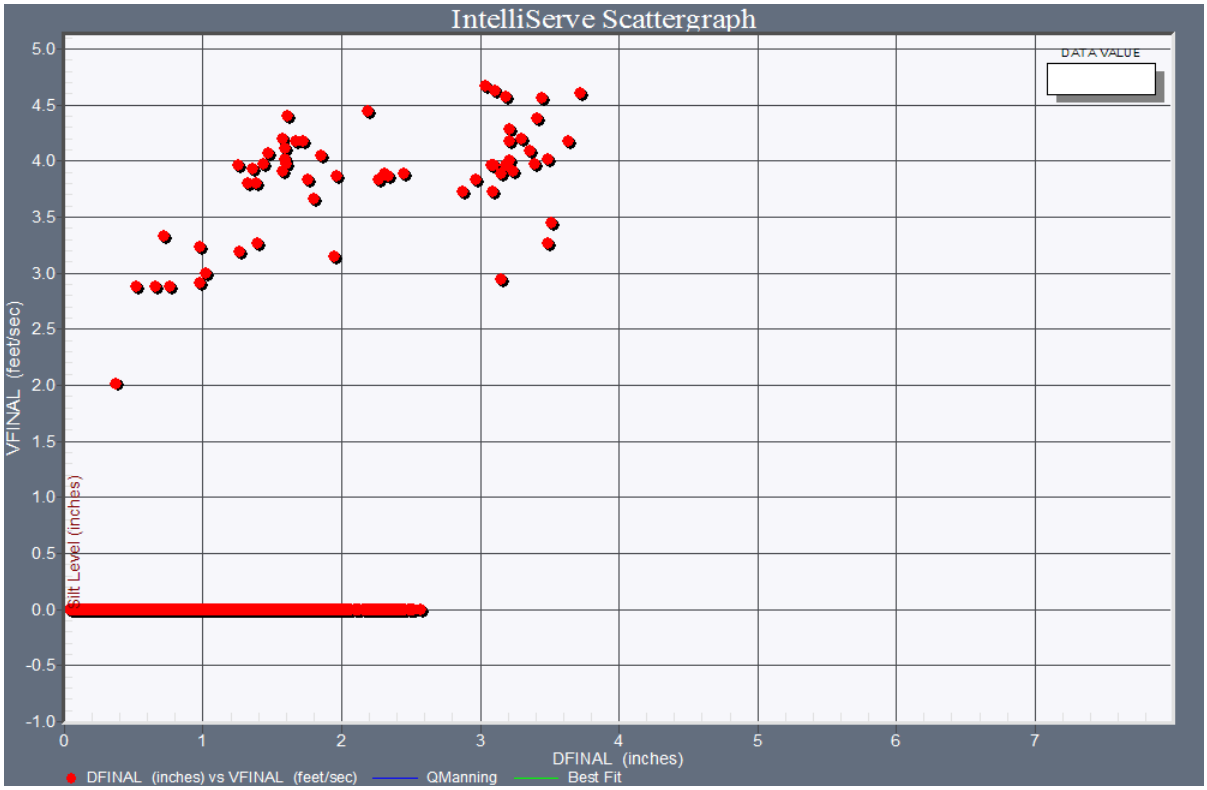
Graph: Scattergraph
Location: NPDES165_MH067078:1
Location Description: MH#067-078
Pipe Height (inches): 10.00 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 17:15



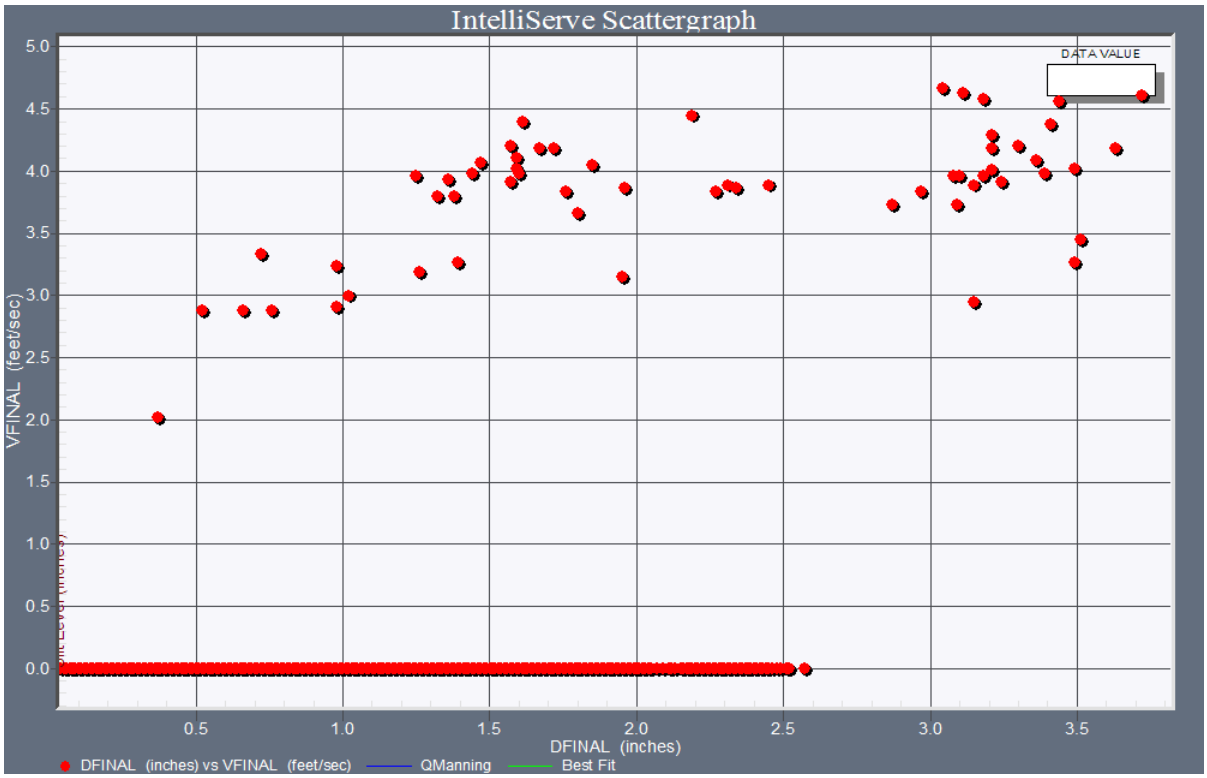
Close up


IntelliServe Scattergraph
DATA VALUE
X: 0.77
Y: 2.06
VFINAL (feet/sec)
DFINAL (inches)
Pipe Height (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

Graph: Scattergraph
Location: NPDES165_MH067078:2
Location Description: MH#067-078
Pipe Height (inches): 8.00 **Silt Level (inches):** 0.00
Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 16:15



Close up


IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

GEN38_D059-191

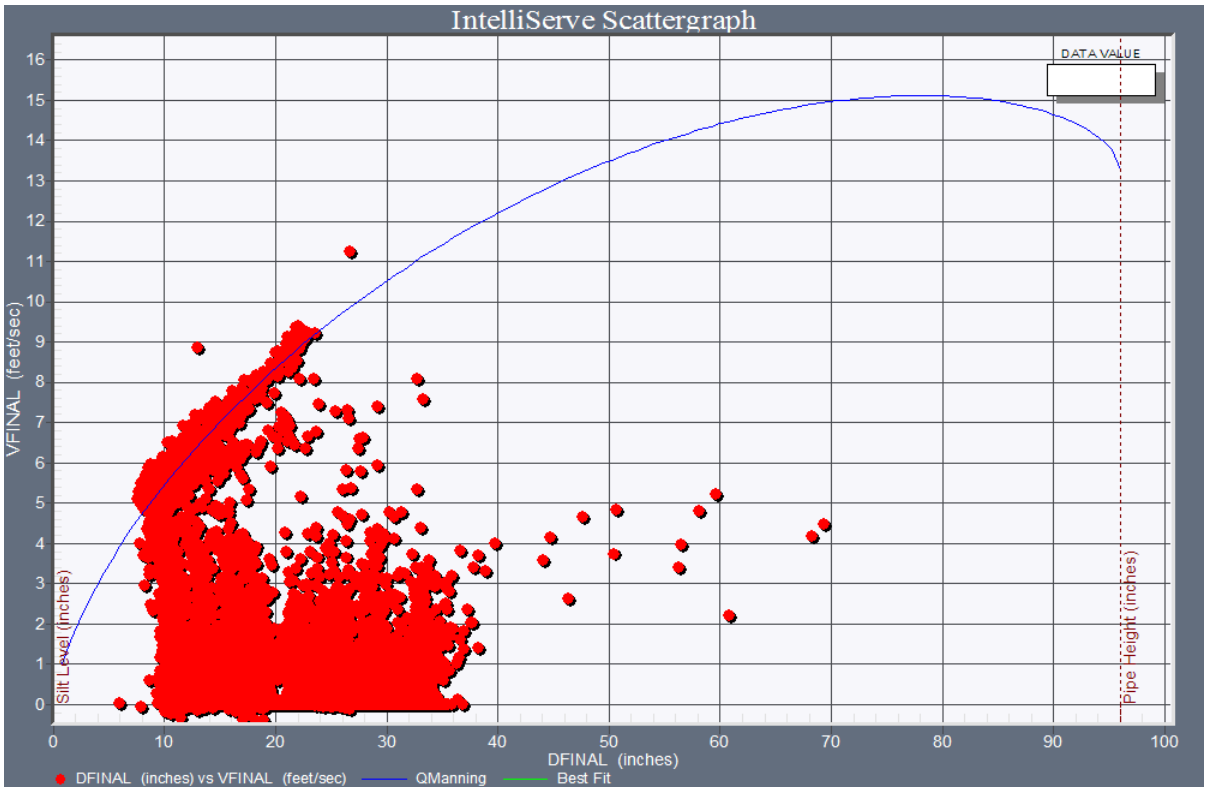
Graph: Scattergraph

Location: GEN38_D059191:1

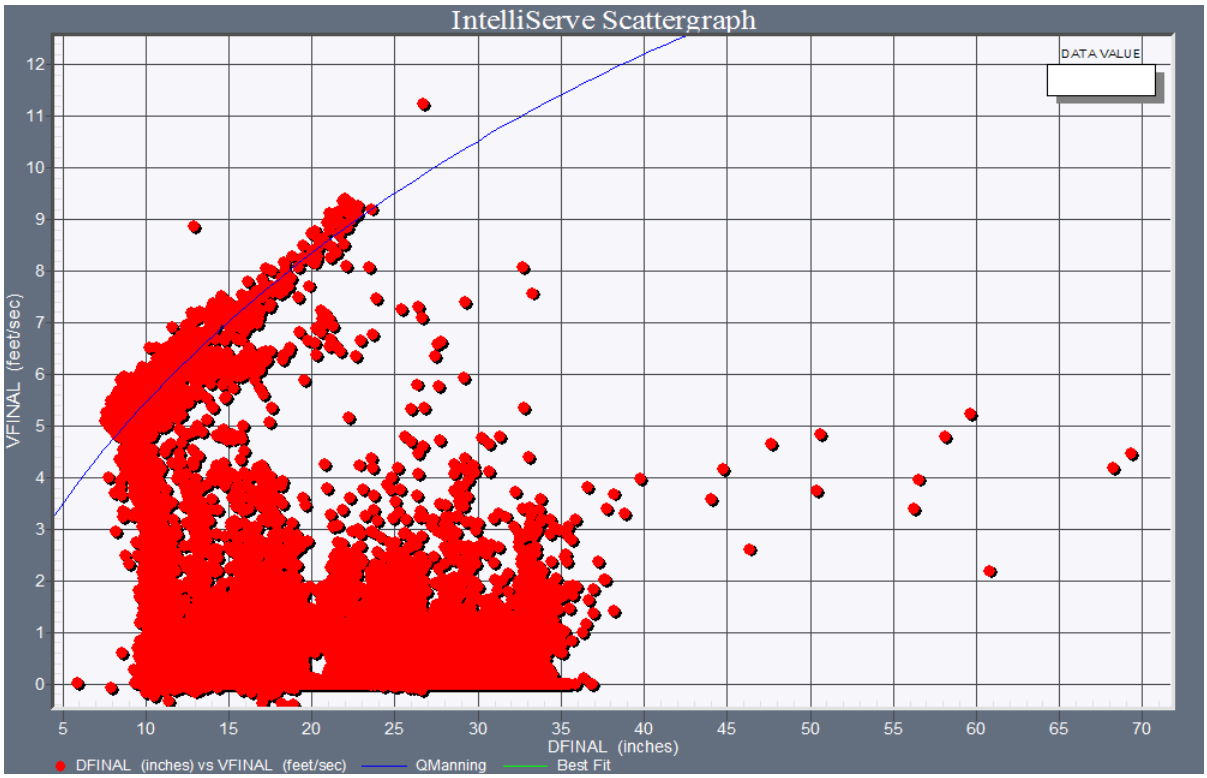
Location Description: MH#059191 - switch to a pulse meter
12/12/2008 - manual collect

Pipe Height (inches): 96.00 **Silt Level (inches):** 0

Start Date/Time: 1-1-2008 00:00 **End Date/Time:** 5-31-2009 14:30



Close up


IntelliServe Scattergraph
DATA VALUE
VFINAL (feet/sec)
0
1
2
3
4
5
6
7
8
9
10
11
12
5
10
15
20
25
30
35
40
45
50
55
60
65
70
DFINAL (inches)
DFINAL (inches) vs VFINAL (feet/sec)
QManning
Best Fit

Pump Station #5 (No Graph)

Pipe flow and pipe velocity are not measured at Pump Station #5. A Scattergraphs is not available for this data.

Pump Station #6 (No Graph)

Pipe flow and pipe velocity are not measured at Pump Station #6. A Scattergraphs is not available for this data.

Rainier Avenue Lift Station (No Graph)

Pipe flow and pipe velocity are not measured at Rainier Avenue Lift Station. A Scattergraphs is not available for this data.

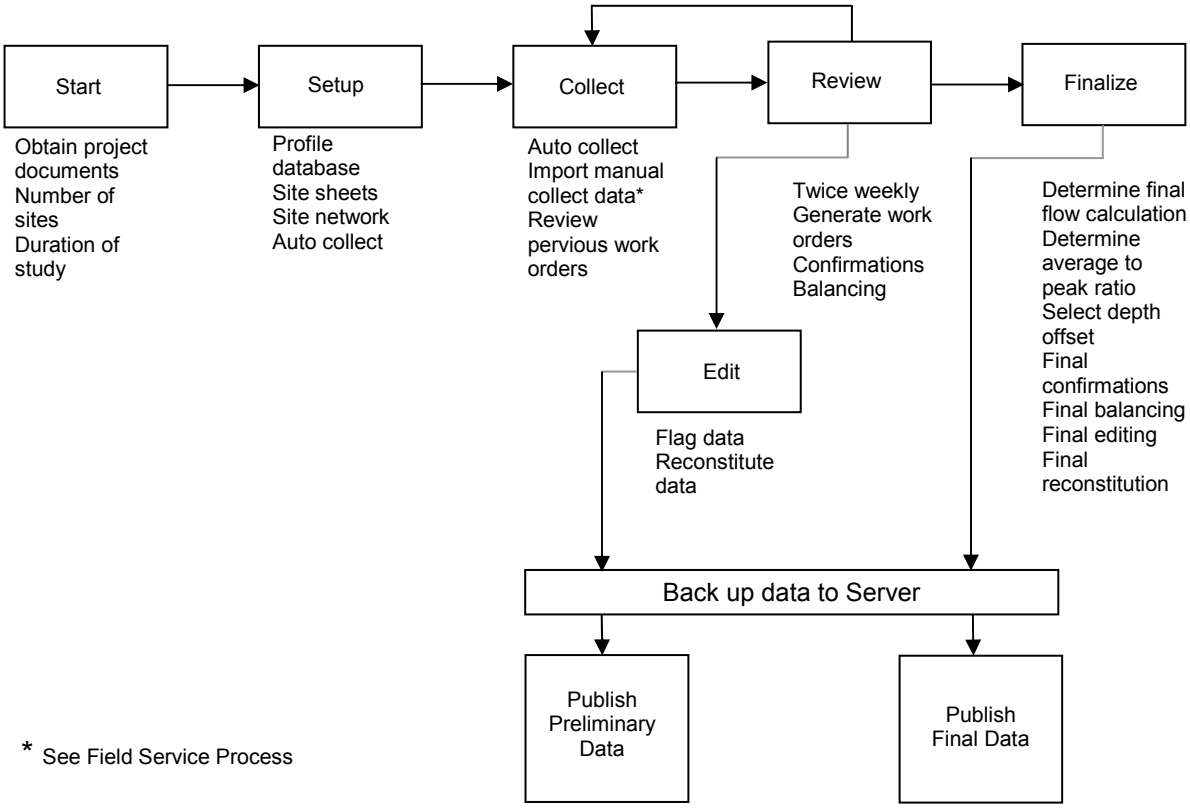
Appendix E: ADS Data Finalization Procedure

ADS Environmental has finalized data for the Genesee Flow Monitoring Project for each of the temporary and permanent sites. The finalization process occurred once for Phase I data (January 15, 2008 to June 10, 2008), and monthly for Phase II data (June 11, 2008 to May 31, 2009). The following is a description of the data finalization process, as provided by ADS.

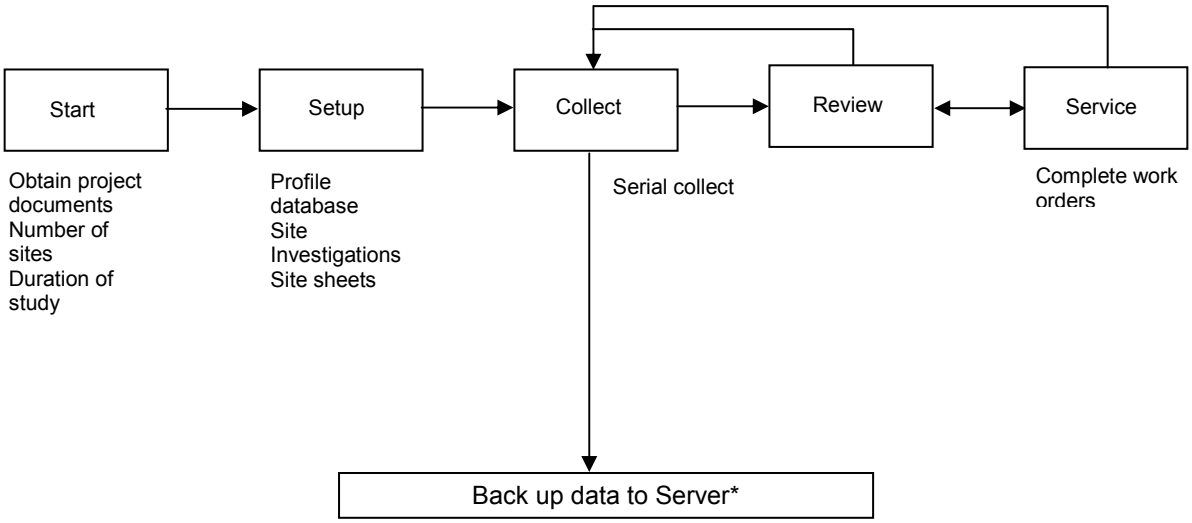
ADS Data Finalization: Basic Steps

- Determine final depth(ultrasonic/pressure) entity (apply to data set)
- Determine final pipe dimensions (obtain from confirmations, apply to data set)
- Determine final silt level (obtain from confirmations, apply to data set)
- Determine velocity average to peak ratio (obtain from confirmations, apply to data set)
- Review depth and velocity data for bias (obtain from confirmations, apply offsets to data set if needed)
- Edit depth and velocity data (remove erroneous data points)
- Reconstitute depth and velocity data (estimate invalid data)
- Determine final quantity (flow) equation to be used (apply to data set)
- Check final data set (Scattergraph, Hydrograph)
- Check dry weather flow (quantity) balance for upstream and downstream meters

Flow Diagram for Data Analysis Process



Flow Diagram for Field Service Process



* See Data Analysis Process

Appendix F: ADS Service History Report

Service History Report

ADS ENVIRONMENTAL SERVICES®

Customer *Genesee*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059121	5/6/2009	5/7/2009	Confirmation(PVD)	Confirmation(PVD)	1300006674	
	4/29/2009	4/30/2009	Confirmation(PVD)	Confirmation(Profile/Weir)	1300006614	
	4/27/2009	4/30/2009	Battery low - Monitor	Replaced Battery - Monitor	1300006577	
	4/6/2009	4/9/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300006328	
	3/16/2009	3/26/2009	Pressure drifting	Scrub/Clean Sensors	1300006099	
	3/3/2009	3/3/2009	Battery low - Monitor	Replaced Battery - Monitor	1300005912	
	2/9/2009	2/10/2009	Battery low - Monitor	Replaced Battery - Monitor	1300005703	
	1/7/2009	1/8/2009	Pressure problem	Replaced Pressure Sensor	1300005281	
	12/30/2008	1/6/2009	Battery low - Monitor	Replaced Battery - Monitor	1300005133	
	12/30/2008	1/6/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300005133	
	12/30/2008	1/6/2009	Pressure drifting	No problem	1300005133	
	12/22/2008	12/22/2008	Battery Low - Wireless	No problem	1300005075	
	12/18/2008	12/18/2008	Battery Low - Wireless	No problem	1300005039	
	12/16/2008	12/16/2008	Battery Low - Wireless	No problem	1300004984	
	10/27/2008	10/28/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300004452	
	9/29/2008	9/30/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300004201	
	8/18/2008	8/20/2008	Pressure problem	Other	1300003758	
	8/13/2008	8/15/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300003721	

Customer *Genesee*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059121	8/4/2008	8/5/2008	Flow change	Replaced Velocity Sensor	1300003603	
	8/4/2008	8/5/2008	Pressure problem	Replaced Pressure Sensor	1300003603	
	7/31/2008	7/31/2008		Replaced Pressure Sensor	1300003567	
	7/31/2008	7/31/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003567	
	7/28/2008	7/29/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003532	
	7/24/2008	7/24/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003489	
	7/24/2008	7/24/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003489	
	7/15/2008	7/16/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300003398	
	7/3/2008	7/3/2008	Pressure drifting	Other	1300003257	
	7/1/2008	7/1/2008	Pressure drifting	Scrub/Clean Sensors	1300003225	
	6/20/2008	6/24/2008			1300003141	
	4/29/2008	4/29/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300002418	
	3/24/2008	3/25/2008	Battery low - Monitor	Replaced Battery - Monitor	1300001951	
	2/12/2008	2/14/2008	Pressure problem	Scrub/Clean Sensors	1300001513	
	1/25/2008	2/1/2008		Confirmation(Profile/Weir)	1300001387	

Service History Report

Customer *Genesee*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059131	4/13/2009	4/16/2009	Battery low - Monitor	Replaced Battery - Wireless	1300006423	
	3/4/2009	3/10/2009	Velocity - spikes/drop out in mins	No problem	1300005972	
	2/4/2009	2/5/2009	Velocity - spikes/drop out	Scrub/Clean Sensors	1300005659	
	1/14/2009	1/15/2009	Battery low - Monitor	Replaced Battery - Monitor	1300005376	
	1/7/2009	1/7/2009	Communication problem	No problem	1300005282	
	12/30/2008	1/8/2009	Communication problem	Replaced Battery - Wireless	1300005134	
	12/30/2008	1/8/2009	Communication problem	Manual Collect	1300005134	
	12/22/2008	12/22/2008	Communication problem	No problem	1300005076	
	12/18/2008	12/18/2008	Communication problem	No problem	1300005040	
	12/16/2008	12/16/2008	Communication problem	Manual Collect	1300004985	
	10/13/2008	10/14/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300004345	
	10/8/2008	10/14/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004303	
	10/6/2008	10/8/2008	Communication problem	Reset Monitor/Board	1300004267	
	10/1/2008	10/1/2008	Communication problem	No problem	1300004231	
	9/29/2008	9/30/2008	Communication problem	Manual Collect	1300004203	
	9/24/2008	9/25/2008	Communication problem	Replaced Battery - Wireless	1300004161	
	9/22/2008	9/23/2008	Communication problem	Collected Data	1300004129	
	9/17/2008	9/18/2008	Communication problem	Collected Data	1300004097	

Customer *Genesee*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059131	9/15/2008	9/16/2008	Communication problem	Collected Data	1300004073	
	9/10/2008	9/11/2008	Communication problem	Collected Data	1300004040	
	9/8/2008	9/9/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300004001	
	9/8/2008	9/9/2008	Communication problem	Collected Data	1300004009	
	9/8/2008	9/9/2008	Communication problem	Collected Data	1300004001	
	9/3/2008	9/4/2008	Battery Low - Wireless	Replaced Monitor	1300003958	
	8/20/2008	8/22/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003807	
	7/15/2008	7/16/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003399	
	6/5/2008	6/5/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300002951	
	5/20/2008	5/20/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300002742	
	5/20/2008	5/20/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002742	
	5/8/2008	5/8/2008	Battery low - Monitor		1300002572	
	5/6/2008	5/6/2008	Battery low - Monitor	No problem	1300002531	
	4/29/2008	4/29/2008	Confirmation(Profile)	Confirmation(Profile/Weir)	1300002422	
	3/31/2008	4/1/2008	Velocity - Erratic data	Scrub/Clean Sensors	1300002044	
	3/31/2008	4/1/2008	Velocity - Erratic data		1300002044	
	3/12/2008	3/18/2008	Battery low - Monitor	Replaced Battery - Monitor	1300001814	
	3/12/2008	3/18/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300001814	
	2/12/2008	2/14/2008	Velocity problem	Scrub/Clean Sensors	1300001514	
	1/16/2008	1/23/2008	Communication problem	Collected Data	1300001325	

Service History Report

Customer *Genesee*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059320	4/27/2009	4/28/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300006578	
	4/27/2009	4/28/2009	Velocity - spikes/drop out	Scrub/Clean Sensors	1300006578	
	4/6/2009	4/9/2009	Velocity - spikes/drop out	Scrub/Clean Sensors	1300006329	
	3/16/2009	3/17/2009	Pressure drifting	Replaced Monitor	1300006100	
	2/18/2009	2/19/2009	Communication problem	Manual Collect	1300005802	
	2/16/2009	2/17/2009	Communication problem	Manual Collect	1300005773	
	2/11/2009	2/12/2009	Communication problem	Replaced Battery - Wireless	1300005729	
	2/11/2009	2/12/2009	Communication problem	Replaced Battery - Monitor	1300005729	
	2/11/2009	2/12/2009	Communication problem	Manual Collect	1300005729	
	1/26/2009	1/27/2009	Communication problem	Manual Collect	1300005510	
	1/14/2009	1/15/2009	Communication problem	Manual Collect	1300005377	
	1/7/2009	1/8/109	Communication problem	Manual Collect	1300005283	
	12/16/2008	12/16/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004986	
	12/4/2008	12/4/2008	Communication problem	No problem	1300004817	
	12/1/2008	12/1/2008	Communication problem	No problem	1300004776	
	11/19/2008	11/20/2008	Communication problem	Reset Monitor/Board	1300004676	
	11/17/2008	11/18/2008	Communication problem	Reset Monitor/Board	1300004630	
	11/12/2008	11/13/2008	Communication problem	Reset Monitor/Board	1300004592	

Customer *Genesee*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059320	11/5/2008	11/5/2008	Communication problem	No problem	1300004539	
	10/23/2008	10/23/2008	Communication problem	Adjusted Other	1300004421	
	10/20/2008	10/20/2008	Communication problem	No problem	1300004398	
	10/13/2008	10/14/2008	Communication problem	Adjusted Other	1300004338	
	10/13/2008	10/14/2008	Confirmation(Profile)	Profile - Velocity	1300004338	
	9/24/2008	9/25/2008	Velocity - spikes/drop out	Replaced Monitor	1300004170	
	9/22/2008	9/23/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300004135	
	9/10/2008	9/11/2008	Communication problem	Collected Data	1300004041	
	9/8/2008	9/9/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004002	
	9/8/2008	9/9/2008	Communication problem	Collected Data	1300004002	
	9/8/2008	9/9/2008	Communication problem	Collected Data	1300004010	
	9/3/2008	9/4/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003948	
	9/1/2008	9/2/2008	Communication problem	Replaced Monitor	1300003925	
	8/28/2008	8/28/2008	Communication problem	Manual Collect	1300003902	
	8/25/2008	8/26/2008	Communication problem	Manual Collect	1300003840	
	8/20/2008	8/21/2008	Communication problem	Manual Collect	1300003803	
	8/18/2008	8/19/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300003754	
	8/13/2008	8/14/2008	Battery low - Monitor	Replaced Monitor	1300003720	
	7/31/2008	7/31/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003568	
	7/28/2008	7/29/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003534	

Customer *Genesee*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059320	7/17/2008	7/17/2008	Communication problem	Collected Data	1300003421	
	7/15/2008	7/15/2008	Communication problem	Collected Data	1300003394	
	7/10/2008	7/10/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300003350	
	7/10/2008	7/10/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003350	
	6/23/2008	6/24/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003155	
	6/5/2008	6/5/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002947	
	5/29/2008	5/29/2008	Communication problem	Collected Data	1300002850	
	5/27/2008	5/27/2008	Communication problem	Manual Collect	1300002799	
	5/22/2008	5/22/2008	Communication problem	Collected Data	1300002771	
	5/8/2008	5/8/2008	Communication problem	Collected Data	1300002564	
	5/1/2008	5/1/2008	Communication problem	Collected Data	1300002456	
	4/29/2008	4/29/2008	Communication problem	Collected Data	1300002411	
	4/21/2008	4/22/2008	Communication problem	Collected Data	1300002305	
	4/17/2008	4/18/2008	Communication problem	Collected Data	1300002243	
	4/11/2008	4/14/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002172	
	2/26/2008	2/27/2008	Velocity - spikes/drop out in mins	Scrub/Clean Sensors	1300001638	
	1/28/2008	1/30/2008	Pressure problem	Scrub/Clean Sensors	1300001416	
	1/16/2008	1/23/2008	Communication problem		1300001326	
	12/27/2007	12/27/2007	Battery low - Monitor	Replaced Battery - Monitor	1300001057	

Service History Report

ADS ENVIRONMENTAL SERVICES®

Customer *Genesee*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059332	3/25/2009	3/26/2009	Pressure drifting	Replaced Pressure Sensor	1300006208	
	3/16/2009	3/16/2009	Pressure drifting	No problem	1300006101	
	3/11/2009	3/12/2009	Communication problem	Replaced Monitor	1300006057	
	3/11/2009	3/12/2009	Communication problem	Manual Collect	1300006057	
	3/9/2009	3/10/2009	Communication problem	Manual Collect	1300006024	
	3/9/2009	3/10/2009	Pressure drifting	Replaced Pressure Sensor	1300006024	
	3/4/2009	3/3/2009	Communication problem	Manual Collect	1300005973	
	3/4/2009	3/3/2009	Pressure drifting	Activated Monitor	1300005973	
	3/3/2009	3/3/2009	Communication problem	Manual Collect	1300005913	
	2/25/2009	2/26/2009	Communication problem	Replaced Pressure Desiccant (Dryer)	1300005844	
	2/25/2009	2/26/2009	Communication problem	Manual Collect	1300005844	
	2/23/2009	2/24/2009	Communication problem	Manual Collect	1300005823	
	2/18/2009	2/19/2009	Communication problem	Manual Collect	1300005803	
	2/16/2009	2/17/2009	Communication problem	Manual Collect	1300005774	
	2/11/2009	2/12/2009	Communication problem	Manual Collect	1300005730	
	2/9/2009	2/10/2009	Communication problem	Manual Collect	1300005704	
	2/4/2009	2/5/2009	Communication problem	Manual Collect	1300005660	
	2/3/2009	2/3/2009	Communication problem	Manual Collect	1300005592	

Customer *Genesee*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059332	1/28/2009	1/30/2009	Communication problem	Reset Monitor/Board	1300005529	
	1/28/2009	1/30/2009	Communication problem	Replaced Battery - Wireless	1300005529	
	1/28/2009	1/30/2009	Velocity - Erratic data	Scrub/Clean Sensors	1300005529	
	1/26/2009	1/27/2009	Communication problem	Manual Collect	1300005501	
	1/22/2009	1/22/2009	Communication problem	Manual Collect	1300005437	
	1/20/2009	1/20/2009	Communication problem	No problem	1300005401	
	1/14/2009	1/15/2009	Communication problem	Manual Collect	1300005378	
	1/13/2009	1/13/2009	Communication problem	Manual Collect	1300005348	
	1/7/2009	1/8/2009	Communication problem	Manual Collect	1300005284	
	12/30/2008	1/6/2009	Communication problem	Manual Collect	1300005135	
	12/22/2008	12/22/2008	Communication problem	No problem	1300005077	
	12/18/2008	12/18/2008	Communication problem	Manual Collect	1300005041	
	12/16/2008	12/16/2008	Communication problem	Manual Collect	1300004987	
	12/11/2008	12/11/2008	Communication problem	Adjusted Other	1300004925	
	12/9/2008	12/9/2008	Communication problem	Manual Collect	1300004896	
	12/4/2008	12/4/2008	Communication problem	Manual Collect	1300004818	
	12/1/2008	12/1/2008	Communication problem	No problem	1300004775	
	11/25/2008	11/25/2008	Communication problem	Reset Monitor/Board	1300004715	
	11/19/2008	11/20/2008	Communication problem	Reset Monitor/Board	1300004677	
	11/17/2008	11/18/2008	Communication problem	Reset Monitor/Board	1300004631	

Customer *Genesee*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059332	11/17/2008	11/17/2008	Other	No problem	1300004618	
	11/14/2008	11/14/2008	Velocity - Zeros	Re-Install - Ring	1300004619	
	11/12/2008	11/13/2008	Communication problem	Manual Collect	1300004593	
	11/10/2008	11/11/2008	Communication problem	Reset Monitor/Board	1300004566	
	11/5/2008	11/6/2008	Communication problem	Hook-up - Other	1300004540	
	11/3/2008	11/4/2008	Velocity - Zeros	No problem	1300004517	
	10/30/2008	10/30/2008	Communication problem	Reset Monitor/Board	1300004481	
	10/27/2008	10/28/2008	Communication problem	Hook-up - Other	1300004446	
	10/23/2008	10/23/2008	Communication problem	Adjusted Other	1300004422	
	10/20/2008	10/21/2008	Communication problem	Manual Collect	1300004399	
	10/15/2008	10/16/2008	Communication problem	Adjusted Other	1300004365	
	10/13/2008	10/14/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300004346	
	10/8/2008	10/8/2008	Communication problem	No problem	1300004297	
	10/6/2008	10/7/2008	Communication problem	Hook-up - Other	1300004268	
	9/29/2008	9/30/2008	Velocity problem	Adjusted Other	1300004208	
	9/22/2008	9/23/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300004136	
	9/17/2008	9/18/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300004104	
	9/8/2008	9/9/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004017	
	9/8/2008	9/9/2008	Velocity problem	Scrub/Clean Sensors	1300004017	
	8/20/2008	8/21/2008	Velocity - spikes/drop out	Other	1300003808	

Customer *Genesee*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059332	8/18/2008	8/19/2008	Velocity - spikes/drop out	Replaced Monitor	1300003755	
	8/11/2008	8/12/2008	Velocity - spikes/drop out	Replaced Velocity Sensor	1300003685	
	8/6/2008	8/7/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003638	
	8/6/2008	8/7/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003638	
	8/4/2008	8/5/2008	Communication problem	Collected Data	1300003593	
	7/31/2008	8/5/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003559	
	7/31/2008	8/5/2008	Battery low - Monitor		1300003559	
	7/28/2008	7/29/2008	Velocity - spikes/drop out	Rotate Velocity Sensor	1300003535	
	7/8/2008	7/9/2008		Scrub/Clean Sensors	1300003322	
	7/8/2008	7/9/2008	Pressure drifting	Scrub/Clean Sensors	1300003322	
	7/8/2008	7/8/2008	Pressure drifting	Other	1300003322	
	6/19/2008	6/19/2008	Communication problem	Collected Data	1300003124	
	6/17/2008	6/17/2008	Communication problem	Collected Data	1300003085	
	6/12/2008	6/12/2008	Communication problem	Collected Data	1300003041	
	6/10/2008	6/10/2008	Communication problem	Collected Data	1300003010	
	6/5/2008	6/5/2008	Communication problem	Calibrated Rain Gauge	1300002944	
	6/3/2008	6/3/2008	Communication problem	Collected Data	1300002915	
	5/29/2008	5/29/2008	Communication problem	Collected Data	1300002851	
	5/27/2008	5/27/2008	Communication problem	Collected Data	1300002800	
	5/22/2008	5/22/2008	Communication problem	Collected Data	1300002772	

Customer *Genesee*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059332	5/15/2008	5/15/2008	Communication problem	Collected Data	1300002668	
	5/13/2008	5/13/2008	Communication problem	Collected Data	1300002641	
	5/8/2008	5/8/2008	Communication problem	Collected Data	1300002565	
	5/6/2008	5/6/2008	Communication problem	Collected Data	1300002523	
	5/1/2008	5/1/2008	Communication problem	Collected Data	1300002457	
	4/29/2008	4/29/2008	Communication problem	Collected Data	1300002412	
	4/24/2008	4/24/2008	Communication problem	Collected Data	1300002352	
	4/21/2008	4/22/2008	Communication problem	Collected Data	1300002306	
	4/17/2008	4/17/2008	Communication problem	Collected Data	1300002244	
	4/15/2008	4/15/2008	Communication problem	Collected Data	1300002219	
	4/11/2008	4/15/2008	Communication problem	Collected Data	1300002165	
	4/8/2008	4/8/2008	Communication problem	Collected Data	1300002124	
	4/3/2008	4/4/2008	Communication problem	Collected Data	1300002085	
	3/27/2008	3/31/2008	Confirmation(Profile)	Confirmation(Profile/Weir)	1300001997	
	3/27/2008	3/31/2008	Confirmation(Profile)	Configured - Analog I/O board	1300001997	
	3/24/2008	3/26/2008	Communication problem	Collected Data	1300001940	
	3/19/2008	3/20/2008	Communication problem	Collected Data	1300001904	
	3/17/2008	3/17/2008	Communication problem	Collected Data	1300001844	
	3/12/2008	3/13/2008	Communication problem	Collected Data	1300001816	
	3/7/2008	3/10/2008	Communication problem	Collected Data	1300001750	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059332	3/3/2008	3/4/2008	Communication problem	Scrub/Clean Sensors	1300001686	
	2/25/2008	2/26/2008	Communication problem	Collected Data	1300001608	
	2/12/2008	2/14/2008	Pressure problem	Replaced Pressure Desiccant (Dryer)	1300001515	
	1/28/2008	1/29/2008	Communication problem	Collected Data	1300001411	
	1/16/2008	1/23/2008	Communication problem	Manual Collect	1300001265	
	1/7/2008	1/15/2008	Communication problem	Collected Data	1300001164	
	1/3/2008	1/4/2008	Communication problem	Collected Data	1300001132	
	12/31/2007	1/2/2008	Communication problem	Collected Data	1300001092	
	12/26/2007	12/28/2007	Communication problem	Collected Data	1300001033	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059346	6/11/2009	6/11/2009	Communication problem	Manual Collect	1300007010	Note: GEN38_059346 was incorrectly labeled. This site is at MH 059-574, not MH 059-346. See Section 3.2 in the report for more details. Continued monitoring at this location can be found under the label GEN38_059574, which is upstream of NPDES38_MH059574.
	6/8/2009	6/9/2009	Communication problem	Manual Collect	1300006971	
	6/3/2009	6/4/2009	Communication problem	Manual Collect	1300006945	
	5/27/2009	5/27/2009	Communication problem	Manual Collect	1300006872	
	5/26/2009	5/26/2009	Communication problem	Manual Collect	1300006851	
	5/21/2009	5/21/2009	Communication problem	Manual Collect	1300006837	
	5/19/2009	5/19/2009	Communication problem	Manual Collect	1300006819	
	5/13/2009	5/14/2009	Communication problem	Manual Collect	1300006803	
	5/11/2009	5/12/2009	Communication problem	Manual Collect	1300006709	
	5/6/2009	5/7/2009	Communication problem	Replaced Battery - Wireless	1300006682	
	5/6/2009	5/7/2009	Communication problem	Replaced Battery - Monitor	1300006682	
	5/6/2009	5/7/2009	Communication problem	Manual Collect	1300006682	
	4/21/2009	4/21/2009	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300006541	
	3/25/2009	3/26/2009	Confirmation(PVD)	Confirmation(Profile/Weir)	1300006217	
	3/16/2009	3/17/2009	Battery low - Monitor	Replaced Battery - Monitor	1300006110	
	2/23/2009	2/24/2009	Confirmation(PVD)	Confirmation(PVD)	1300005824	
	1/28/2009	1/30/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300005537	
	1/28/2009	1/30/2009	Confirmation(PVD)	Confirmation(Profile/Weir)	1300005537	

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Note: GEN38_059346 was incorrectly labeled. See note on previous page.

Site Name	*Reported*	*Site Visit*	*Problem*	*Resolution*	*WorkOrderID*	*RefNo:*
GEN38_059346	1/22/2009	1/22/2009	Communication problem	Manual Collect	1300005446	
	10/27/2008	10/28/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300004453	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059371	5/27/2009	5/27/2009	Communication problem	Manual Collect	1300006863	
	5/26/2009	6/2/2009	Communication problem	No problem	1300006843	
	5/26/2009	5/26/2009	Communication problem	Manual Collect	1300006844	
	4/27/2009	4/28/2009	Velocity - spikes/drop out	Scrub/Clean Sensors	1300006579	
	4/22/2009	4/23/2009	Velocity - spikes/drop out	Scrub/Clean Sensors	1300006556	
	4/21/2009	4/21/2009	Battery low - Monitor	Replaced Battery - Monitor	1300006523	
	3/30/2009	3/31/2009	Velocity - spikes/drop out	Scrub/Clean Sensors	1300006247	
	3/25/2009	3/26/2009	Ultrasonic - spikes	Scrub/Clean Sensors	1300006209	
	3/11/2009	3/12/2009	Communication problem	Scrub/Clean Sensors	1300006058	
	3/11/2009	3/12/2009	Communication problem	Replaced Battery - Monitor	1300006058	
	3/11/2009	3/12/2009	Communication problem	Manual Collect	1300006058	
	3/9/2009	3/10/2009	Communication problem	Manual Collect	1300006025	
	3/4/2009	3/5/2009	Communication problem	Manual Collect	1300005974	
	2/3/2009	2/3/2009	Ultrasonic - spikes	Replaced Battery - Wireless	1300005601	
	2/3/2009	2/3/2009	Ultrasonic - spikes	Scrub/Clean Sensors	1300005601	
	2/3/2009	2/3/2009	Velocity - spikes/drop out	Scrub/Clean Sensors	1300005601	
	1/26/2009	1/27/2009	Communication problem	Manual Collect	1300005502	
	1/22/2009	1/22/2009	Communication problem	Manual Collect	1300005438	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059371	1/20/2009	1/20/2009	Communication problem	No problem	1300005402	
	1/14/2009	1/15/2009	Communication problem	Manual Collect	1300005379	
	1/13/2009	1/27/2009	Communication problem	Manual Collect	1300005349	
	1/7/2009	1/8/2009	Communication problem	Manual Collect	1300005285	
	12/30/2008	1/6/2009	Communication problem	Manual Collect	1300005136	
	12/22/2008	12/29/2008	Communication problem	Manual Collect	1300005078	
	12/9/2008	12/9/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300004898	
	12/9/2008	12/9/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300004898	
	12/1/2008	12/1/2008	Ultrasonic - spikes	No problem	1300004774	
	11/18/2008	11/18/2008	Battery low - Monitor	No problem	1300004641	
	11/17/2008	11/18/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004627	
	11/12/2008	11/13/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300004601	
	9/17/2008	9/18/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004103	
	8/18/2008	8/19/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003757	
	8/11/2008	8/20/2008	Velocity - spikes/drop out	No problem	1300003686	
	8/6/2008	8/7/2008	Communication problem	Replaced Monitor	1300003632	
	7/31/2008	7/31/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300003560	
	7/22/2008	7/22/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003463	
	7/22/2008	7/22/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003463	
	7/15/2008	7/15/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003391	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059371	7/8/2008	7/9/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003315	
	7/1/2008	7/1/2008	Battery low - Monitor	Scrub/Clean Sensors	1300003226	
	6/23/2008	6/24/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003156	
	6/3/2008	6/3/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002921	
	5/27/2008	5/27/2008	Communication problem	Manual Collect	1300002801	
	5/6/2008	5/6/2008	Communication problem	Replaced Monitor	1300002524	
	4/11/2008	4/14/2008	Communication problem	Collected Data	1300002166	
	4/8/2008	4/8/2008	Velocity problem	Scrub/Clean Sensors	1300002130	
	4/3/2008	4/4/2008	Communication problem	Collected Data	1300002086	
	3/31/2008	4/2/2008	Communication problem	Manual Collect	1300002036	
	3/24/2008	3/25/2008	Communication problem	Collected Data	1300001941	
	3/12/2008	3/17/2008	Velocity - Erratic data	Scrub/Clean Sensors	1300001815	
	3/3/2008	3/4/2008	Velocity - Erratic data	Scrub/Clean Sensors	1300001684	
	2/12/2008	2/14/2008	Pressure problem	Other	1300001516	
	1/28/2008	1/29/2008	Communication problem	Manual Collect	1300001412	
	1/16/2008	1/23/2008	Communication problem	Collected Data	1300001327	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059373	5/27/2009	5/27/2009	Communication problem	Manual Collect	1300006864	
	5/26/2009	5/26/2009	Communication problem	Manual Collect	1300006845	
	5/21/2009	5/21/2009	Communication problem	Manual Collect	1300006831	
	5/19/2009	5/19/2009	Communication problem	Manual Collect	1300006813	
	5/18/2009	5/18/2009	Analog I/O problem	No problem	1300006812	
	5/13/2009	5/14/2009	Communication problem	Manual Collect	1300006795	
	5/11/2009	5/12/2009	Communication problem	Manual Collect	1300006702	
	5/6/2009	5/7/2009	Communication problem	Manual Collect	1300006675	
	5/4/2009	5/5/2009	Communication problem	Manual Collect	1300006642	
	4/29/2009	4/30/2009	Communication problem	Manual Collect	1300006616	
	4/27/2009	4/28/2009	Communication problem	Manual Collect	1300006580	
	4/27/2009	4/28/2009	Pressure drifting	Replaced Pressure Sensor	1300006580	
	4/22/2009	4/23/2009	Communication problem	Manual Collect	1300006557	
	4/21/2009	4/21/2009	Communication problem	Manual Collect	1300006524	
	4/16/2009	4/16/2009	Communication problem	Manual Collect	1300006476	
	4/13/2009	4/14/2009	Communication problem	Manual Collect	1300006425	
	4/8/2009	4/9/2009	Communication problem	Manual Collect	1300006382	
	4/6/2009	4/7/2009	Communication problem	Manual Collect	1300006330	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059373	4/1/2009	4/2/2009	Communication problem	Manual Collect	1300006305	
	3/30/2009	3/31/2009	Communication problem	Manual Collect	1300006248	
	3/30/2009	3/31/2009	Pressure drifting	Scrub/Clean Sensors	1300006248	
	3/25/2009	3/26/2009	Communication problem	Manual Collect	1300006210	
	3/18/2009	3/19/2009	Communication problem	Manual Collect	1300006134	
	3/16/2009	3/17/2009	Communication problem	Manual Collect	1300006102	
	3/11/2009	3/12/2009	Communication problem	Scrub/Clean Sensors	1300006059	
	3/11/2009	3/12/2009	Communication problem	Manual Collect	1300006059	
	3/9/2009	3/10/2009	Communication problem	Manual Collect	1300006026	
	3/4/2009	3/5/2009	Communication problem	Manual Collect	1300005975	
	3/3/2009	3/3/2009	Communication problem	Manual Collect	1300005914	
	2/25/2009	2/26/2009	Communication problem	Manual Collect	1300005845	
	2/23/2009	2/24/2009	Communication problem	Manual Collect	1300005825	
	2/18/2009	2/19/2009	Communication problem	Manual Collect	1300005804	
	2/16/2009	2/17/2009	Communication problem	Manual Collect	1300005775	
	2/11/2009	2/12/2009	Communication problem	Manual Collect	1300005731	
	2/9/2009	2/10/2009	Communication problem	Manual Collect	1300005705	
	2/4/2009	2/5/2009	Communication problem	Manual Collect	1300005661	
	2/4/2009	2/5/2009	Ultrasonic - Low number of good pairs	Scrub/Clean Sensors	1300005661	
	2/4/2009	2/5/2009	Velocity - Erratic data	Scrub/Clean Sensors	1300005661	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059373	2/3/2009	2/3/2009	Communication problem	Manual Collect	1300005593	
	1/28/2009	1/29/2009	Communication problem	Manual Collect	1300005530	
	1/26/2009	1/27/2009	Communication problem	Manual Collect	1300005503	
	1/22/2009	1/22/2009	Communication problem	Manual Collect	1300005439	
	1/20/2009	1/20/2009	Communication problem	No problem	1300005403	
	1/14/2009	1/15/2009	Communication problem	Manual Collect	1300005380	
	1/13/2009	1/13/2009	Communication problem	Manual Collect	1300005350	
	1/7/2009	1/8/2009	Communication problem	Manual Collect	1300005286	
	1/7/2009	1/8/2009	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300005286	
	12/30/2008	1/6/2009	Communication problem	Manual Collect	1300005137	
	12/30/2008	1/6/2009	Pressure drifting	Scrub/Clean Sensors	1300005137	
	12/22/2008	12/29/2008	Communication problem	Manual Collect	1300005079	
	12/18/2008	12/18/2008	Communication problem	No problem	1300005042	
	12/16/2008	12/16/2008	Communication problem	Manual Collect	1300004988	
	12/11/2008	12/11/2008	Communication problem	No problem	1300004926	
	12/9/2008	12/9/2008	Communication problem	Adjusted Other	1300004897	
	12/4/2008	12/4/2008	Communication problem	No problem	1300004819	
	12/2/2008	12/2/2008	Communication problem	No problem	1300004805	
	11/25/2008	11/25/2008	Communication problem	Adjusted Other	1300004716	
	11/19/2008	11/20/2008	Communication problem	Reset Monitor/Board	1300004678	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059373	11/19/2008	11/20/2008	Communication problem	Replaced Battery - Wireless	1300004678	
	11/18/2008	11/18/2008	Battery low - Monitor	No problem	1300004642	
	11/17/2008	11/18/2008	Communication problem	Reset Monitor/Board	1300004632	
	11/12/2008	11/13/2008	Communication problem	Reset Monitor/Board	1300004594	
	11/10/2008	11/11/2008	Communication problem	Reset Monitor/Board	1300004567	
	11/5/2008	11/6/2008	Communication problem	Hook-up - Other	1300004541	
	10/30/2008	10/30/2008	Communication problem	Reset Monitor/Board	1300004484	
	10/20/2008	10/20/2008	Communication problem	No problem	1300004400	
	10/15/2008	10/16/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004362	
	10/13/2008	10/14/2008	Communication problem	Adjusted Other	1300004339	
	10/8/2008	10/9/2008	Communication problem	Reset Monitor/Board	1300004298	
	9/22/2008	9/22/2008	Communication problem	No problem	1300004130	
	9/15/2008	9/16/2008	Communication problem	Collected Data	1300004074	
	9/1/2008	9/2/2008	Communication problem	Collected Data	1300003926	
	8/28/2008	8/28/2008	Communication problem	Collected Data	1300003903	
	8/18/2008	8/19/2008	Flow change	Scrub/Clean Sensors	1300003756	
	8/18/2008	8/19/2008	Flow change	Confirmation(Profile/Weir)	1300003756	
	8/13/2008	8/14/2008	Communication problem	No problem	1300003714	
	8/11/2008	8/12/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003687	
	8/6/2008	8/7/2008	Flow change	Other	1300003640	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059373	8/4/2008	8/5/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300003598	
	7/28/2008	7/29/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003533	
	7/17/2008	7/17/2008	Communication problem	Collected Data	1300003422	
	7/15/2008	7/15/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300003392	
	7/15/2008	7/15/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003392	
	7/15/2008	7/15/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003392	
	7/8/2008	7/9/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003316	
	7/1/2008	7/1/2008	Communication problem	Collected Data	1300003220	
	7/1/2008	7/1/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003220	
	6/19/2008	6/19/2008	Communication problem	Collected Data	1300003125	
	6/17/2008	6/17/2008	Communication problem	Collected Data	1300003086	
	6/12/2008	6/12/2008	Communication problem	Collected Data	1300003042	
	6/10/2008	6/10/2008	Communication problem	Collected Data	1300003011	
	6/3/2008	6/3/2008	Communication problem	Collected Data	1300002916	
	5/27/2008	5/27/2008	Communication problem	Manual Collect	1300002802	
	5/22/2008	5/22/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300002784	
	5/13/2008	5/13/2008	Battery low - Monitor	Replaced Battery - Monitor	1300002651	
	5/8/2008	5/8/2008	Communication problem	Collected Data	1300002566	
	5/6/2008	5/6/2008	Communication problem	Collected Data	1300002525	
	5/1/2008	5/1/2008	Communication problem	Collected Data	1300002458	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059373	4/29/2008	4/29/2008	Communication problem	Collected Data	1300002413	
	4/24/2008	4/24/2008	Communication problem	Collected Data	1300002346	
	4/21/2008	4/22/2008	Communication problem	Collected Data	1300002307	
	4/17/2008	4/17/2008	Communication problem	Collected Data	1300002245	
	4/15/2008	4/15/2008	Communication problem	Collected Data	1300002220	
	4/11/2008	4/11/2008	Communication problem	Collected Data	1300002167	
	4/8/2008	4/8/2008	Communication problem	Collected Data	1300002125	
	4/3/2008	4/4/2008	Communication problem	Collected Data	1300002087	
	3/31/2008	4/2/2008	Communication problem	Collected Data	1300002037	
	3/27/2008	3/28/2008	Communication problem	Collected Data	1300001998	
	3/24/2008	3/25/2008	Communication problem	Collected Data	1300001942	
	3/19/2008	3/20/2008	Communication problem	Collected Data	1300001905	
	3/17/2008	3/17/2008	Communication problem	Collected Data	1300001845	
	3/12/2008	3/12/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300001810	
	3/7/2008	3/10/2008	Communication problem	Collected Data	1300001751	
	3/3/2008	3/4/2008	Communication problem	Collected Data	1300001687	
	2/25/2008	2/26/2008	Communication problem	Collected Data	1300001609	
	2/1/2008	2/4/2008	Communication problem	Collected Data	1300001457	
	2/1/2008	2/4/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300001457	
	1/28/2008	1/29/2008	Communication problem	Manual Collect	1300001413	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059373	1/16/2008	1/23/2008	Communication problem	Collected Data	1300001266	
	1/7/2008	1/15/2008	Communication problem	Manual Collect	1300001165	
	1/3/2008	1/4/2008	Communication problem	Collected Data	1300001133	
	12/31/2007	1/2/2008	Communication problem	Collected Data	1300001093	
	12/26/2007	12/28/2007	Communication problem	Collected Data	1300001034	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059398	6/8/2009	6/9/2009	Communication problem	Manual Collect	1300006972	
	6/3/2009	6/4/2009	Communication problem	Manual Collect	1300006944	
	5/26/2009	5/26/2009	Communication problem	Manual Collect	1300006846	
	5/21/2009	5/21/2009	Communication problem	Manual Collect	1300006832	
	5/19/2009	5/19/2009	Communication problem	Manual Collect	1300006814	
	5/13/2009	5/14/2009	Communication problem	Manual Collect	1300006796	
	5/11/2009	5/12/2009	Communication problem	Manual Collect	1300006703	
	5/6/2009	5/7/2009	Communication problem	Manual Collect	1300006676	
	5/4/2009	5/5/2009	Communication problem	Manual Collect	1300006643	
	4/29/2009	4/30/2009	Communication problem	Manual Collect	1300006615	
	4/27/2009	4/28/2009	Communication problem	Manual Collect	1300006581	
	4/21/2009	4/21/2009	Communication problem	No problem	1300006525	
	4/16/2009	4/16/2009	Communication problem	No problem	1300006477	
	4/13/2009	4/14/2009	Communication problem	Manual Collect	1300006426	
	4/8/2009	4/9/2009	Communication problem	Manual Collect	1300006383	
	4/6/2009	4/7/2009	Communication problem	Manual Collect	1300006331	
	4/1/2009	4/2/2009	Communication problem	Manual Collect	1300006306	
	3/30/2009	3/31/2009	Communication problem	Manual Collect	1300006249	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059398	3/25/2009	3/26/2009	Communication problem	Manual Collect	1300006211	
	3/16/2009	3/17/2009	Battery low - Monitor	Replaced Battery - Monitor	1300006103	
	2/18/2009	2/19/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300005809	
	2/11/2009	2/12/2009	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300005732	
	1/26/2009	1/27/2009	Communication problem	Replaced Monitor	1300005504	
	1/26/2009	1/27/2009	Communication problem	Manual Collect	1300005504	
	1/22/2009	1/22/2009	Communication problem	Manual Collect	1300005440	
	1/20/2009	1/20/2009	Communication problem	No problem	1300005404	
	1/14/2009	1/15/2009	Communication problem	Manual Collect	1300005381	
	1/13/2009	1/13/2009	Communication problem	Manual Collect	1300005351	
	1/7/2009	1/8/2009	Communication problem	Manual Collect	1300005287	
	12/30/2008	1/6/2009	Communication problem	Manual Collect	1300005138	
	12/22/2008	12/22/2008	Battery low - Monitor	No problem	1300005080	
	12/18/2008	12/18/2008	Communication problem	No problem	1300005043	
	12/16/2008	12/16/2008	Communication problem	No problem	1300004989	
	12/11/2008	12/11/2008	Communication problem	Manual Collect	1300004927	
	12/9/2008	12/9/2008	Communication problem	Manual Collect	1300004899	
	11/17/2008	11/18/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004628	
	11/3/2008	11/4/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300004516	
	11/3/2008	11/4/2008	Battery Low - Wireless	Replaced Analog board	1300004516	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059398	10/8/2008	10/14/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004304	
	9/24/2008	9/30/2008	Communication problem	Manual Collect	1300004162	
	9/8/2008	9/9/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300004018	
	9/8/2008	9/9/2008	Velocity problem	Scrub/Clean Sensors	1300004018	
	9/1/2008	9/2/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003932	
	8/28/2008	8/28/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003841	
	8/20/2008	8/21/2008	Battery low - Monitor		1300003809	
	8/20/2008	8/21/2008	Pressure drifting	Replaced Pressure Desiccant (Dryer)	1300003809	
	8/20/2008	8/20/2008	Battery low - Monitor	Replaced Battery - GSM/GPRS	1300003809	
	8/20/2008	8/20/2008	Pressure drifting	Other	1300003809	
	7/28/2008	7/29/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003536	
	7/24/2008	7/24/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003490	
	7/24/2008	7/24/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003490	
	7/22/2008	7/23/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003464	
	7/22/2008	7/23/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003464	
	7/17/2008	7/17/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003426	
	7/17/2008	7/17/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003426	
	7/15/2008	7/15/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003401	
	7/15/2008	7/15/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003401	
	7/8/2008	7/9/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003317	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059398	7/3/2008	7/3/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003249	
	7/1/2008	7/1/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003227	
	6/23/2008	6/24/2008	Velocity - spikes/drop out	Rotate Velocity Sensor	1300003157	
	6/19/2008	6/19/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003129	
	6/12/2008	6/12/2008	Ultrasonic - Erratic data	Replaced Ultrasonic Sensor	1300003044	
	6/10/2008	6/10/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003009	
	6/5/2008	6/5/2008	Velocity - spikes/drop out	Rotate Velocity Sensor	1300002948	
	6/3/2008	6/3/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002922	
	5/29/2008	5/29/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002854	
	5/27/2008	5/27/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300002806	
	5/20/2008	5/20/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002743	
	5/13/2008	5/13/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300002646	
	5/8/2008	5/8/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002570	
	4/24/2008	4/24/2008	Communication problem	Manual Collect	1300002347	
	4/21/2008	4/22/2008	Velocity problem	Replaced Velocity Sensor	1300002311	
	4/17/2008	4/18/2008	Velocity - Erratic data	Scrub/Clean Sensors	1300002249	
	4/11/2008	4/11/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002173	
	4/8/2008	4/8/2008	Communication problem	Replaced Monitor	1300002126	
	4/3/2008	4/4/2008	Communication problem	Collected Data	1300002088	
	3/31/2008	4/3/2008	Communication problem	Collected Data	1300002038	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059398	3/24/2008	3/25/2008	Communication problem	Collected Data	1300001943	
	3/17/2008	3/17/2008	Communication problem	Collected Data	1300001846	
	3/3/2008	3/4/2008	Velocity - Erratic data	Scrub/Clean Sensors	1300001685	
	2/25/2008	2/26/2008	Battery low - Monitor	Replaced Battery - Monitor	1300001614	
	1/30/2008	1/31/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300001450	
	1/16/2008	1/23/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300001220	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059404	4/29/2009	4/30/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300006629	
	1/28/2009	1/29/2009	Battery low - Monitor	Replaced Battery - Monitor	1300005531	
	1/14/2009	1/15/2009	Communication problem	Replaced Monitor	1300005382	
	1/14/2009	1/15/2009	Communication problem	Manual Collect	1300005382	
	1/13/2009	1/13/2009	Communication problem	Manual Collect	1300005352	
	1/7/2009	1/8/2009	Communication problem	Manual Collect	1300005288	
	12/30/2008	1/6/2009	Communication problem	Manual Collect	1300005139	
	12/22/2008	12/22/2008	Communication problem	No problem	1300005081	
	12/18/2008	12/18/2008	Communication problem	No problem	1300005044	
	12/16/2008	12/16/2008	Communication problem	Manual Collect	1300004990	
	12/9/2008	12/9/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300004900	
	10/15/2008	10/16/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004363	
	10/8/2008	10/16/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004305	
	9/29/2008	9/30/2008	Communication problem	Adjusted Other	1300004204	
	9/8/2008	9/9/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300004019	
	8/18/2008	8/20/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300003761	
	8/13/2008	8/14/2008	Communication problem	No problem	1300003715	
	8/11/2008	8/12/2008	Communication problem	Collected Data	1300003689	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059404	8/4/2008	8/5/2008	Communication problem	Collected Data	1300003594	
	7/8/2008	7/9/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003318	
	7/8/2008	7/8/2008	Velocity - spikes/drop out	Rotate Velocity Sensor	1300003318	
	6/17/2008	6/17/2008	Pressure problem		1300003089	
	5/29/2008	5/29/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300002860	
	5/29/2008	5/29/2008	Pressure drifting	Replaced Pressure Desiccant (Dryer)	1300002860	
	5/20/2008	5/21/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002744	
	5/13/2008	5/13/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002644	
	5/8/2008	5/8/2008	Velocity - spikes/drop out	Replaced Velocity Sensor	1300002571	
	5/6/2008	5/6/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002532	
	3/19/2008	3/20/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300001902	
	3/12/2008	3/12/2008	Battery low - Monitor	Replaced Battery - Monitor	1300001813	
	2/26/2008	2/27/2008	Communication problem	Collected Data	1300001639	
	1/10/2008	1/11/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300001221	
	1/8/2008	1/11/2008	Battery low - Monitor	Replaced Battery - Monitor	1300001183	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES041B_MH059406	6/29/2009	6/30/2009	Velocity - Zeros	Scrub/Clean Sensors	1300007231	
	6/22/2009	6/4/2009	Velocity - Zeros	Scrub/Clean Sensors	1300007113	
	6/15/2009	6/17/2009	Velocity - Zeros	Other	1300007202	
	6/15/2009	6/17/2009	Velocity problem	Scrub/Clean Sensors	1300007032	
	6/15/2009	6/17/2009	Velocity problem	Other	1300007032	
	6/8/2009	6/8/2009	Velocity problem	Replaced Velocity Sensor	1300006992	
	6/5/2009	6/5/2009	Communication problem	Manual Collect	1300006959	
	6/5/2009	6/5/2009	Communication problem	Replaced Antenna	1300006959	
	6/5/2009	6/5/2009	Velocity problem	Replaced Velocity Sensor	1300007192	
	6/4/2009	6/8/2009	Velocity - Zeros	Replaced Velocity Sensor	1300006951	
	6/2/2009	6/3/2009	Communication problem	Manual Collect	1300006899	
	6/2/2009	6/3/2009	Velocity problem	Scrub/Clean Sensors	1300006911	
	6/1/2009	6/1/2009	Communication problem	Manual Collect	1300006880	
	5/29/2009	5/29/2009	Communication problem	Manual Collect	1300007173	
	5/26/2009	5/27/2009	Communication problem	Scrub/Clean Sensors	1300007162	
	5/26/2009	5/27/2009	Communication problem	Manual Collect	1300007162	
	5/11/2009	5/11/2009	Ultrasonic - spikes	Re-Install	1300006777	
	4/15/2009	4/15/2009	Ultrasonic - spikes	Scrub/Clean Sensors	1300006486	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES041B_MH059406	2/23/2009	2/23/2009	Battery low - Monitor	Replaced Battery - Monitor	1300005872	
	2/23/2009	2/23/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300005872	
	1/12/2009	1/20/2009	Pressure problem	Other	1300005339	
	12/29/2008	12/29/2008	Communication problem	Manual Collect	1300005176	
	12/26/2008	12/26/2008	Communication problem	Manual Collect	1300005212	
	12/24/2008	12/24/2008	Communication problem	Manual Collect	1300005197	
	12/15/2008	12/16/2008	Communication problem	No problem	1300004968	
	12/8/2008	12/8/2008	Communication problem	Manual Collect	1300004865	
	12/8/2008	12/8/2008	Communication problem	Activated Monitor	1300004865	
	12/1/2008	12/1/2008	Communication problem	Manual Collect	1300004758	
	11/5/2008	11/21/2008	Pressure problem	Replaced Pressure Sensor	1300004528	
	9/3/2008	9/3/2008	Confirmation(Profile)	Confirmation(Profile/Weir)	1300003940	
	8/14/2008	8/14/2008	Pressure drifting	Other	1300003724	
	7/28/2008	7/28/2008	Communication problem	Manual Collect	1300003646	
	7/14/2008	7/15/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003374	
	7/14/2008	7/15/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300003374	
	7/7/2008	7/9/2008	Confirmation(Profile)	Confirmation(Profile/Weir)	1300003309	
	6/5/2008	6/9/2008	Confirmation(Profile)	Confirmation(Profile/Weir)	1300002962	
	5/12/2008	5/13/2008	Ultrasonic problem	Pipe Surcharged	1300002620	
	4/29/2008	5/2/2008	Velocity - Zeros	Replaced Velocity Board	1300002426	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES041B_MH059406	4/28/2008	4/29/2008	Velocity - Zeros	Scrub/Clean Sensors	1300002398	
	4/25/2008	4/25/2008	Velocity - Zeros	Scrub/Clean Sensors	1300002339	
	4/23/2008	4/25/2008	Communication problem	No problem	1300002340	
	4/14/2008	4/14/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300002207	
	4/9/2008	4/10/2008	Velocity - Zeros	Scrub/Clean Sensors	1300002160	
	4/7/2008	4/7/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002119	
	3/31/2008	3/31/2008	Velocity - Zeros	Scrub/Clean Sensors	1300002049	
	3/17/2008	3/25/2008	Battery low - Monitor	No problem	1300001886	
	3/11/2008	3/12/2008	Velocity - Zeros	Scrub/Clean Sensors	1300001786	
	3/6/2008	3/7/2008	Velocity problem	Scrub/Clean Sensors	1300001747	
	2/27/2008	2/28/2008	Velocity - Zeros	Scrub/Clean Sensors	1300001654	
	2/18/2008	2/18/2008	Communication problem	Reset Monitor/Board	1300001561	
	1/17/2008	1/18/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300001305	
	12/27/2007	12/28/2007	Pressure drifting	Activated Monitor	1300001062	
	12/12/2007	2/19/2008	Velocity - spikes/drop out	No problem	1300001312	
	12/11/2007	12/11/2007	Ultrasonic - spikes	No problem	1300001311	
	12/11/2007	12/11/2007	Velocity - spikes/drop out	No problem	1300001311	
	12/10/2007	12/11/2007	Velocity - spikes/drop out	Scrub/Clean Sensors	1300000918	
	11/12/2007	11/12/2007	Other	Other	1300000731	
	11/2/2007	11/9/2007	Velocity - Zeros	Scrub/Clean Sensors	1300000684	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES041B_MH059406	10/10/2007	10/10/2007	Other	Other	1300000572	
	10/3/2007	10/4/2007	Velocity problem	Scrub/Clean Sensors	1300000528	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059407	6/11/2009	6/11/2009	Communication problem	Manual Collect	1300007013	
	6/8/2009	6/8/2009	Communication problem	No problem	1300006973	
	6/3/2009	6/4/2009	Communication problem	Manual Collect	1300006947	
	6/3/2009	6/4/2009	Communication problem	Replaced Antenna	1300006947	
	5/27/2009	5/27/2009	Communication problem	Manual Collect	1300006866	
	5/26/2009	5/26/2009	Communication problem	Manual Collect	1300006847	
	5/21/2009	5/21/2009	Communication problem	Manual Collect	1300006833	
	5/19/2009	5/19/2009	Communication problem	Manual Collect	1300006815	
	5/13/2009	5/14/2009	Communication problem	Manual Collect	1300006798	
	5/11/2009	5/12/2009	Communication problem	Manual Collect	1300006705	
	5/6/2009	5/7/2009	Communication problem	Manual Collect	1300006678	
	5/4/2009	5/5/2009	Communication problem	Manual Collect	1300006644	
	4/29/2009	4/30/2009	Communication problem	Manual Collect	1300006617	
	4/27/2009	4/28/2009	Communication problem	Manual Collect	1300006582	
	4/27/2009	4/28/2009	Pressure drifting	Activated Monitor	1300006582	
	4/22/2009	4/23/2009	Communication problem	Manual Collect	1300006559	
	4/21/2009	4/21/2009	Communication problem	Manual Collect	1300006526	
	4/16/2009	4/16/2009	Communication problem	Manual Collect	1300006479	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059407	4/13/2009	4/14/2009	Communication problem	Manual Collect	1300006428	
	4/8/2009	4/9/2009	Communication problem	Manual Collect	1300006386	
	4/6/2009	4/7/2009	Communication problem	Manual Collect	1300006333	
	4/1/2009	4/2/2009	Communication problem	Manual Collect	1300006308	
	3/30/2009	3/31/2009	Communication problem	Manual Collect	1300006251	
	3/25/2009	3/26/2009	Communication problem	Manual Collect	1300006214	
	3/18/2009	3/19/2009	Communication problem	Manual Collect	1300006137	
	3/16/2009	3/17/2009	Communication problem	Manual Collect	1300006106	
	3/11/2009	3/12/2009	Communication problem	Manual Collect	1300006061	
	3/9/2009	3/10/2009	Communication problem	Manual Collect	1300006028	
	3/4/2009	3/5/2009	Communication problem	Manual Collect	1300005978	
	3/3/2009	3/3/2009	Communication problem	Manual Collect	1300005916	
	2/25/2009	2/26/2009	Communication problem	Manual Collect	1300005846	
	2/23/2009	2/24/2009	Communication problem	Manual Collect	1300005826	
	2/18/2009	2/19/2009	Communication problem	Manual Collect	1300005805	
	2/16/2009	2/17/2009	Communication problem	Manual Collect	1300005776	
	2/11/2009	2/12/2009	Communication problem	Manual Collect	1300005734	
	2/9/2009	2/10/2009	Communication problem	Manual Collect	1300005707	
	2/4/2009	2/5/2009	Communication problem	Manual Collect	1300005663	
	2/3/2009	2/3/2009	Communication problem	Manual Collect	1300005595	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059407	1/28/2009	1/29/2009	Communication problem	Manual Collect	1300005532	
	1/26/2009	1/27/2009	Communication problem	Manual Collect	1300005511	
	1/14/2009	1/13/2009	Communication problem	Collected Data	1300005385	
	1/13/2009	1/13/2009	Communication problem	Manual Collect	1300005354	
	1/7/2009	1/8/2009	Communication problem	Manual Collect	1300005292	
	12/30/2008	1/6/2009	Communication problem	Manual Collect	1300005141	
	12/30/2008	1/6/2009	Pressure problem	No problem	1300005141	
	12/22/2008	12/22/2008	Communication problem	No problem	1300005083	
	12/18/2008	12/18/2008	Communication problem	Manual Collect	1300005046	
	12/16/2008	12/16/2008	Communication problem	Manual Collect	1300004994	
	12/11/2008	12/11/2008	Velocity - spikes/drop out	Replaced Velocity Sensor	1300004930	
	12/9/2008	12/9/2008	Communication problem	Manual Collect	1300004911	
	12/4/2008	12/4/2008	Communication problem	No problem	1300004821	
	12/2/2008	12/2/2008	Communication problem	No problem	1300004801	
	11/26/2008	11/26/2008	Communication problem	Reset Monitor/Board	1300004748	
	11/26/2008	11/26/2008	Communication problem	Replaced Monitor	1300004748	
	11/25/2008	11/25/2008	Communication problem	Adjusted Other	1300004719	
	11/19/2008	11/20/2008	Communication problem	Reset Monitor/Board	1300004680	
	11/19/2008	11/20/2008	Communication problem	Replaced Battery - Wireless	1300004680	
	11/12/2008	11/13/2008	Communication problem	Reset Monitor/Board	1300004597	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059407	11/10/2008	11/11/2008	Communication problem	Reset Monitor/Board	1300004569	
	11/5/2008	11/6/2008	Communication problem	Hook-up - Other	1300004543	
	10/30/2008	10/30/2008	Communication problem	Reset Monitor/Board	1300004486	
	10/27/2008	10/28/2008	Communication problem	Hook-up - Other	1300004448	
	10/23/2008	10/23/2008	Communication problem	Adjusted Other	1300004424	
	10/20/2008	10/21/2008	Communication problem	Adjusted Other	1300004402	
	10/15/2008	10/16/2008	Communication problem	Adjusted Other	1300004367	
	10/13/2008	10/14/2008	Communication problem	Adjusted Other	1300004342	
	10/8/2008	10/9/2008	Communication problem	Manual Collect	1300004300	
	10/6/2008	10/7/2008	Communication problem	Hook-up - Other	1300004270	
	10/1/2008	10/1/2008	Communication problem	No problem	1300004232	
	9/29/2008	9/30/2008	Communication problem	Adjusted Other	1300004205	
	9/24/2008	9/24/2008	Communication problem		1300004165	
	9/24/2008	9/24/2008	Communication problem	No problem	1300004165	
	9/22/2008	9/23/2008	Communication problem	Collected Data	1300004132	
	9/17/2008	9/18/2008	Communication problem	Collected Data	1300004099	
	9/15/2008	9/16/2008	Communication problem	Collected Data	1300004076	
	9/10/2008	9/11/2008	Communication problem	Collected Data	1300004042	
	9/8/2008	9/9/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004012	
	9/8/2008	9/9/2008	Communication problem	Collected Data	1300004012	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059407	9/8/2008	9/9/2008	Communication problem	Collected Data	1300004004	
	9/3/2008	9/4/2008	Communication problem	Collected Data	1300003952	
	9/1/2008	9/2/2008	Communication problem	Manual Collect	1300003927	
	8/28/2008	8/28/2008	Communication problem	Collected Data	1300003904	
	8/26/2008	8/26/2008	Communication problem	Collected Data	1300003842	
	8/20/2008	8/21/2008	Communication problem	Collected Data	1300003804	
	8/18/2008	8/19/2008	Communication problem	Manual Collect	1300003751	
	8/13/2008	8/14/2008	Communication problem	Collected Data	1300003717	
	8/11/2008	8/12/2008	Communication problem	Collected Data	1300003690	
	8/6/2008	8/7/2008		Replaced Battery - Wireless	1300003634	
	8/6/2008	8/7/2008	Communication problem	Collected Data	1300003634	
	8/4/2008	8/5/2008	Communication problem	Collected Data	1300003595	
	7/31/2008	7/31/2008	Communication problem	Collected Data	1300003564	
	7/28/2008	7/29/2008	Communication problem	Collected Data	1300003539	
	7/24/2008	7/24/2008	Communication problem	Collected Data	1300003493	
	7/22/2008	7/22/2008	Communication problem	Collected Data	1300003460	
	7/17/2008	7/17/2008	Communication problem	Collected Data	1300003423	
	7/10/2008	7/10/2008	Communication problem	Collected Data	1300003344	
	7/8/2008	7/8/2008	Communication problem	Collected Data	1300003311	
	7/3/2008	7/3/2008	Communication problem	Collected Data	1300003253	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059407	7/1/2008	7/1/2008	Communication problem	Collected Data	1300003222	
	6/26/2008	6/26/2008	Communication problem	Scrub/Clean Sensors	1300003192	
	6/23/2008	6/24/2008	Communication problem	Collected Data	1300003162	
	6/19/2008	6/19/2008	Communication problem	No problem	1300003126	
	6/17/2008	6/17/2008	Communication problem	Collected Data	1300003087	
	6/5/2008	6/5/2008	Communication problem	Collected Data	1300002945	
	6/3/2008	6/3/2008	Communication problem	Collected Data	1300002918	
	5/27/2008	5/27/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300002807	
	5/8/2008	5/8/2008	Communication problem	Collected Data	1300002567	
	5/6/2008	5/6/2008	Communication problem	Collected Data	1300002526	
	5/1/2008	5/1/2008	Communication problem	Collected Data	1300002459	
	4/29/2008	4/29/2008	Communication problem	Collected Data	1300002414	
	4/24/2008	4/24/2008	Communication problem	Manual Collect	1300002348	
	4/21/2008	4/22/2008	Communication problem	Collected Data	1300002308	
	4/15/2008	4/15/2008	Communication problem	Collected Data	1300002221	
	4/11/2008	4/14/2008	Communication problem	Collected Data	1300002169	
	4/8/2008	4/8/2008	Communication problem	Collected Data	1300002127	
	4/3/2008	4/4/2008	Communication problem	Collected Data	1300002089	
	3/31/2008	3/31/2008	Communication problem	Collected Data	1300002040	
	3/24/2008	3/25/2008	Confirmation(Profile)	Confirmation(Profile/Weir)	1300001949	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059407	3/19/2008	3/20/2008	Communication problem	Collected Data	1300001907	
	3/17/2008	3/17/2008	Communication problem	Collected Data	1300001848	
	3/7/2008	3/10/2008	Communication problem	Collected Data	1300001753	
	3/3/2008	3/4/2008	Communication problem	Collected Data	1300001689	
	1/28/2008	1/29/2008	Communication problem	Collected Data	1300001414	
	1/16/2008	1/23/2008	Communication problem	Collected Data	1300001268	
	1/7/2008	1/15/2008	Communication problem	Collected Data	1300001166	
	12/31/2007	1/2/2008			1300001096	
	12/31/2007	1/2/2008	Other	Other	1300001096	
	12/31/2007	1/2/2008	Velocity - Zeros	Scrub/Clean Sensors	1300001095	
	12/26/2007	12/28/2007	Communication problem	Manual Collect	1300001035	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059409	5/27/2009	5/27/2009	Communication problem	Manual Collect	1300006867	
	5/26/2009	5/26/2009	Communication problem	Manual Collect	1300006848	
	5/21/2009	5/21/2009	Communication problem	Manual Collect	1300006834	
	5/19/2009	5/19/2009	Communication problem	Manual Collect	1300006816	
	5/13/2009	5/14/2009	Communication problem	Manual Collect	1300006799	
	5/11/2009	5/12/2009	Communication problem	Manual Collect	1300006706	
	5/6/2009	5/7/2009	Communication problem	Manual Collect	1300006679	
	5/4/2009	5/5/2009	Communication problem	Manual Collect	1300006645	
	4/29/2009	4/30/2009	Communication problem	Manual Collect	1300006618	
	4/27/2009	4/28/2009	Communication problem	Replaced Battery - Monitor	1300006583	
	4/27/2009	4/28/2009	Communication problem	Manual Collect	1300006583	
	4/22/2009	4/23/2009	Communication problem	Manual Collect	1300006560	
	4/21/2009	4/21/2009	Communication problem	Manual Collect	1300006527	
	4/16/2009	4/16/2009	Communication problem	Manual Collect	1300006480	
	4/13/2009	4/14/2009	Communication problem	Manual Collect	1300006429	
	4/8/2009	4/9/2009	Communication problem	Manual Collect	1300006387	
	4/6/2009	4/7/2009	Communication problem	Manual Collect	1300006334	
	4/1/2009	4/2/2009	Communication problem	Manual Collect	1300006309	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059409	3/30/2009	3/31/2009	Communication problem	Manual Collect	1300006252	
	3/25/2009	3/26/2009	Communication problem	Manual Collect	1300006215	
	3/18/2009	3/19/2009	Communication problem	Manual Collect	1300006138	
	3/16/2009	3/17/2009	Communication problem	Manual Collect	1300006107	
	3/11/2009	3/12/2009	Communication problem	Manual Collect	1300006062	
	3/9/2009	3/10/2009	Communication problem	Manual Collect	1300006029	
	3/4/2009	3/5/2009	Communication problem	Manual Collect	1300005979	
	3/3/2009	3/3/2009	Communication problem	Manual Collect	1300005917	
	2/25/2009	2/26/2009	Communication problem	Replaced Battery - Monitor	1300005847	
	2/25/2009	2/26/2009	Communication problem	Manual Collect	1300005847	
	2/23/2009	2/24/2009	Communication problem	Manual Collect	1300005827	
	2/18/2009	2/19/2009	Communication problem	Manual Collect	1300005806	
	2/16/2009	2/17/2009	Communication problem	Manual Collect	1300005777	
	2/11/2009	2/12/2009	Communication problem	Manual Collect	1300005735	
	2/9/2009	2/10/2009	Communication problem	Manual Collect	1300005708	
	2/4/2009	2/5/2009	Communication problem	Manual Collect	1300005664	
	2/4/2009	2/5/2009	Velocity - spikes/drop out	No problem	1300005664	
	2/3/2009	2/3/2009	Communication problem	Manual Collect	1300005596	
	1/28/2009	1/29/2009	Communication problem	Manual Collect	1300005533	
	1/26/2009	1/27/2009	Communication problem	Manual Collect	1300005506	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059409	1/22/2009	1/22/2009	Communication problem	Manual Collect	1300005442	
	1/20/2009	1/20/2009	Communication problem	No problem	1300005406	
	1/14/2009	1/15/2009	Communication problem	Manual Collect	1300005386	
	1/13/2009	1/13/2009	Communication problem	Manual Collect	1300005355	
	1/13/2009	1/13/2009	Velocity - spikes/drop out	Replaced Velocity Sensor	1300005355	
	1/7/2009	1/8/2009	Communication problem	Manual Collect	1300005293	
	12/30/2008	1/6/2009	Communication problem	Manual Collect	1300005143	
	12/22/2008	12/22/2008	Communication problem	No problem	1300005084	
	12/18/2008	12/18/2008	Communication problem	Manual Collect	1300005047	
	12/16/2008	12/16/2008	Communication problem	Manual Collect	1300004995	
	12/11/2008	12/11/2008	Communication problem	Manual Collect	1300004931	
	12/9/2008	12/9/2008	Communication problem	Manual Collect	1300004912	
	12/4/2008	12/4/2008	Communication problem	No problem	1300004822	
	12/2/2008	12/2/2008	Communication problem	No problem	1300004802	
	11/26/2008	11/26/2008	Communication problem	Reset Monitor/Board	1300004749	
	11/25/2008	11/25/2008	Communication problem	Adjusted Other	1300004720	
	11/19/2008	11/20/2008	Communication problem	Reset Monitor/Board	1300004681	
	11/17/2008	11/18/2008	Communication problem	Reset Monitor/Board	1300004634	
	11/17/2008	11/18/2008	Communication problem	Reset Monitor/Board	1300004633	
	11/12/2008	11/13/2008	Communication problem	Reset Monitor/Board	1300004598	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059409	11/10/2008	11/11/2008	Communication problem	Reset Monitor/Board	1300004570	
	11/5/2008	11/6/2008	Communication problem	Manual Collect	1300004544	
	10/30/2008	10/30/2008	Communication problem	Reset Monitor/Board	1300004487	
	10/27/2008	10/28/2008	Communication problem	Hook-up - Other	1300004449	
	10/23/2008	10/23/2008	Communication problem	Adjusted Other	1300004425	
	10/20/2008	10/21/2008	Communication problem	Manual Collect	1300004403	
	10/15/2008	10/16/2008	Communication problem	Adjusted Other	1300004368	
	10/13/2008	10/14/2008	Communication problem	Adjusted Other	1300004343	
	10/8/2008	10/9/2008	Communication problem	Reset Monitor/Board	1300004301	
	10/8/2008	10/9/2008	Communication problem		1300004301	
	10/6/2008	10/7/2008	Communication problem	Hook-up - Other	1300004271	
	10/1/2008	10/1/2008	Communication problem	No problem	1300004233	
	9/29/2008	9/30/2008	Communication problem	Manual Collect	1300004206	
	9/24/2008	9/24/2008	Communication problem	No problem	1300004166	
	9/22/2008	9/22/2008	Communication problem	No problem	1300004133	
	9/17/2008	9/18/2008	Communication problem	Collected Data	1300004100	
	9/15/2008	9/16/2008	Communication problem	Collected Data	1300004077	
	9/10/2008	9/11/2008	Communication problem	Collected Data	1300004043	
	9/8/2008	9/9/2008	Communication problem	Collected Data	1300004005	
	9/8/2008	9/9/2008	Communication problem	Collected Data	1300004013	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059409	9/3/2008	9/4/2008	Communication problem	Collected Data	1300003953	
	9/1/2008	9/2/2008	Communication problem	Collected Data	1300003928	
	8/28/2008	8/28/2008	Communication problem	Collected Data	1300003905	
	8/26/2008	8/26/2008	Communication problem	Collected Data	1300003843	
	8/20/2008	8/21/2008	Communication problem	Collected Data	1300003805	
	8/18/2008	8/19/2008	Communication problem	Manual Collect	1300003752	
	8/13/2008	8/14/2008	Communication problem	Collected Data	1300003718	
	8/11/2008	8/12/2008	Communication problem	Collected Data	1300003691	
	8/6/2008	8/7/2008	Communication problem	Manual Collect	1300003635	
	8/4/2008	8/5/2008	Communication problem	Manual Collect	1300003596	
	7/31/2008	7/31/2008	Communication problem	Collected Data	1300003565	
	7/28/2008	7/29/2008	Communication problem	Collected Data	1300003540	
	7/24/2008	7/24/2008	Communication problem	Collected Data	1300003494	
	7/22/2008	7/22/2008	Communication problem	Collected Data	1300003461	
	7/17/2008	7/17/2008	Communication problem	Collected Data	1300003424	
	7/15/2008	7/15/2008	Communication problem	Collected Data	1300003396	
	7/10/2008	7/10/2008	Communication problem	Collected Data	1300003345	
	7/8/2008	7/8/2008	Communication problem	Collected Data	1300003312	
	7/3/2008	7/3/2008	Communication problem	Collected Data	1300003254	
	7/1/2008	7/1/2008	Communication problem	Collected Data	1300003223	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059409	6/26/2008	6/26/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003195	
	6/5/2008	6/5/2008	Battery low - Monitor	Replaced Battery - Monitor	1300002952	
	5/29/2008	5/29/2008	Communication problem	Manual Collect	1300002852	
	5/27/2008	5/27/2008	Communication problem	Manual Collect	1300002804	
	5/22/2008	5/22/2008	Communication problem	Manual Collect	1300002774	
	5/20/2008	5/20/2008	Communication problem	Collected Data	1300002740	
	5/15/2008	5/15/2008	Communication problem	Collected Data	1300002669	
	5/13/2008	5/13/2008	Communication problem	Manual Collect	1300002642	
	5/8/2008	5/8/2008	Communication problem	Manual Collect	1300002568	
	5/6/2008	5/6/2008	Communication problem	Manual Collect	1300002527	
	5/1/2008	5/1/2008	Communication problem	Collected Data	1300002460	
	4/29/2008	4/29/2008	Communication problem	Manual Collect	1300002415	
	4/24/2008	4/24/2008	Communication problem	Manual Collect	1300002349	
	4/21/2008	4/24/2008	Communication problem	Collected Data	1300002309	
	4/17/2008	4/17/2008	Communication problem	Manual Collect	1300002247	
	4/15/2008	4/15/2008	Communication problem	Manual Collect	1300002222	
	4/11/2008	4/11/2008	Communication problem	Manual Collect	1300002170	
	4/8/2008	4/8/2008	Communication problem	Manual Collect	1300002128	
	4/3/2008	4/4/2008	Communication problem	Manual Collect	1300002090	
	3/31/2008	4/2/2008	Communication problem	Manual Collect	1300002041	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059409	3/27/2008	3/31/2008	Communication problem	Manual Collect	1300001999	
	3/24/2008	3/25/2008	Communication problem	Manual Collect	1300001946	
	3/19/2008	3/20/2008	Communication problem	Manual Collect	1300001908	
	3/17/2008	3/17/2008	Communication problem	Manual Collect	1300001849	
	3/12/2008	3/14/2008	Communication problem	Manual Collect	1300001818	
	3/7/2008	3/10/2008	Communication problem	Manual Collect	1300001754	
	3/3/2008	3/4/2008	Communication problem	Manual Collect	1300001692	
	2/25/2008	2/26/2008	Communication problem	Manual Collect	1300001612	

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Customer *Seattle Public Utility (SPU)*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES041A_MH059434	5/12/2009	5/14/2009	Battery low - Monitor	Replaced Battery - Monitor	1300006720	
	5/12/2009	5/14/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300006720	
	3/27/2009	3/27/2009	Communication problem	Manual Collect	1300006239	
	3/9/2009	3/11/2009	Confirmation(Profile)	Confirmation(Profile/Weir)	1300006038	
	3/9/2009	3/11/2009	Other	Other	1300006038	
	12/29/2008	1/14/2009	Pressure problem	No problem	1300005128	
	11/24/2008	11/25/2008	Pressure problem	Replaced Pressure Sensor	1300004708	
	6/16/2008	6/16/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003076	
	5/27/2008	5/28/2008	Velocity problem	Replaced Velocity Sensor	1300002825	
	5/16/2008	5/21/2008	Confirmation(PVD)	Confirmation(PVD)	1300002702	
	2/5/2008	2/6/2008	Velocity - spikes/drop out	No problem	1300001487	
	1/28/2008	1/29/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300001434	
	12/10/2007	12/12/2007	Velocity - spikes/drop out	Scrub/Clean Sensors	1300000917	
	9/11/2007	9/19/2007	Other	Other	1300000421	
	8/27/2007	9/4/2007	Communication problem	No problem	1300000351	
	8/27/2007	9/4/2007	Manual Data collect	No problem	1300000351	
	8/21/2007	8/27/2007	Ultrasonic problem	Scrub/Clean Sensors	1300000334	
	8/13/2007	8/14/2007	Battery Low - Wireless	Replaced Monitor	1300000281	

Customer *Seattle Public Utility (SPU)*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES041A_MH059434	8/9/2007	8/14/2007	Communication problem	Reset Monitor/Board	1300000278	
	8/9/2007	8/14/2007	Other	Other	1300000278	
	8/7/2007	8/14/2007	Manual Data collect	Manual Collect	1300000261	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059436	5/27/2009	5/27/2009	Communication problem	Manual Collect	1300006868	
	5/26/2009	5/26/2009	Communication problem	Manual Collect	1300006849	
	5/21/2009	5/21/2009	Communication problem	Manual Collect	1300006835	
	5/19/2009	5/19/2009	Communication problem	Manual Collect	1300006817	
	5/13/2009	5/14/2009	Communication problem	Manual Collect	1300006800	
	5/13/2009	5/14/2009	Velocity - spikes/drop out	No problem	1300006800	
	5/11/2009	5/12/2009	Communication problem	Manual Collect	1300006707	
	5/6/2009	5/7/2009	Communication problem	Manual Collect	1300006680	
	5/4/2009	5/5/2009	Communication problem	Manual Collect	1300006646	
	4/29/2009	5/6/2009	Communication problem	Manual Collect	1300006619	
	4/27/2009	4/28/2009	Communication problem	Manual Collect	1300006584	
	4/22/2009	4/23/2009	Communication problem	Manual Collect	1300006561	
	4/21/2009	4/21/2009	Communication problem	Manual Collect	1300006528	
	4/16/2009	4/17/2009	Communication problem	Manual Collect	1300006481	
	4/13/2009	4/14/2009	Communication problem	Hook-up - Other	1300006430	
	4/13/2009	4/14/2009	Velocity - Erratic data	Scrub/Clean Sensors	1300006430	
	4/8/2009	4/9/2009	Communication problem	Manual Collect	1300006388	
	4/6/2009	4/7/2009	Communication problem	Manual Collect	1300006335	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059436	4/1/2009	4/2/2009	Communication problem	Manual Collect	1300006310	
	3/30/2009	3/31/2009	Communication problem	Manual Collect	1300006253	
	3/30/2009	3/31/2009	Velocity - spikes/drop out in mins	Scrub/Clean Sensors	1300006253	
	3/25/2009	3/26/2009	Communication problem	Manual Collect	1300006216	
	3/18/2009	3/19/2009	Communication problem	Manual Collect	1300006139	
	3/16/2009	3/17/2009	Communication problem	Manual Collect	1300006108	
	3/11/2009	3/12/2009	Communication problem	Manual Collect	1300006063	
	3/9/2009	3/10/2009	Communication problem	Manual Collect	1300006030	
	3/4/2009	3/5/2009	Communication problem	Manual Collect	1300005980	
	3/3/2009	3/3/2009	Communication problem	Manual Collect	1300005918	
	2/25/2009	2/26/2009	Communication problem	Manual Collect	1300005848	
	2/23/2009	2/24/2009	Communication problem	Manual Collect	1300005828	
	2/18/2009	2/19/2009	Communication problem	Manual Collect	1300005807	
	2/16/2009	2/17/2009	Communication problem	Manual Collect	1300005778	
	2/11/2009	2/12/2009	Communication problem	Manual Collect	1300005736	
	2/9/2009	2/10/2009	Communication problem	Manual Collect	1300005709	
	2/4/2009	2/5/2009	Communication problem	Manual Collect	1300005665	
	2/4/2009	2/5/2009	Ultrasonic - Erratic data	No problem	1300005665	
	2/3/2009	2/3/2009	Communication problem	Manual Collect	1300005597	
	2/3/2009	2/3/2009	Ultrasonic - spikes	Scrub/Clean Sensors	1300005597	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059436	2/3/2009	2/3/2009	Velocity - Erratic data	Scrub/Clean Sensors	1300005597	
	1/28/2009	1/29/2009	Communication problem	Manual Collect	1300005534	
	1/26/2009	1/27/2009	Communication problem	Manual Collect	1300005507	
	1/22/2009	1/22/2009	Communication problem	Manual Collect	1300005443	
	1/20/2009	1/20/2009	Communication problem	No problem	1300005407	
	1/14/2009	1/15/2009	Communication problem	Manual Collect	1300005387	
	1/13/2009	1/13/2009	Communication problem	Manual Collect	1300005356	
	1/7/2009	1/8/2009	Communication problem	Manual Collect	1300005294	
	12/30/2008	1/6/2009	Communication problem	Manual Collect	1300005144	
	12/22/2008	12/22/2008	Communication problem	No problem	1300005085	
	12/18/2008	12/18/2008	Communication problem	No problem	1300005048	
	12/16/2008	12/16/2008	Communication problem	Manual Collect	1300004996	
	12/11/2008	12/11/2008	Communication problem	No problem	1300004932	
	12/9/2008	12/9/2008	Communication problem	Manual Collect	1300004913	
	12/4/2008	12/4/2008	Communication problem	No problem	1300004823	
	12/2/2008	12/2/2008	Communication problem	No problem	1300004803	
	11/25/2008	11/25/2008	Communication problem	Adjusted Other	1300004721	
	11/19/2008	11/20/2008	Communication problem	Adjusted Other	1300004673	
	11/17/2008	11/18/2008	Communication problem	Manual Collect	1300004635	
	11/12/2008	11/13/2008	Communication problem	Reset Monitor/Board	1300004599	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059436	11/10/2008	11/11/2008	Communication problem	Reset Monitor/Board	1300004571	
	11/10/2008	11/11/2008	Confirmation(Profile)	Confirmation(Profile/Weir)	1300004571	
	11/5/2008	11/6/2008	Communication problem	Hook-up - Other	1300004545	
	10/30/2008	10/30/2008	Communication problem	Reset Monitor/Board	1300004488	
	10/27/2008	10/28/2008	Communication problem	Hook-up - Other	1300004450	
	10/23/2008	10/23/2008	Communication problem	Adjusted Other	1300004426	
	10/20/2008	10/21/2008	Communication problem	Adjusted Other	1300004404	
	10/15/2008	10/16/2008	Communication problem	Adjusted Other	1300004369	
	10/13/2008	10/14/2008	Communication problem	Reset Monitor/Board	1300004344	
	10/8/2008	10/9/2008	Communication problem	Adjusted Other	1300004302	
	10/8/2008	10/9/2008	Communication problem	Hook-up - Other	1300004302	
	10/6/2008	10/7/2008	Communication problem	Hook-up - Other	1300004272	
	10/1/2008	10/1/2008	Communication problem	No problem	1300004234	
	9/29/2008	9/30/2008	Communication problem	Manual Collect	1300004207	
	9/24/2008	9/25/2008	Communication problem	Collected Data	1300004167	
	9/22/2008	9/23/2008	Communication problem	Collected Data	1300004134	
	9/17/2008	9/18/2008	Communication problem	Collected Data	1300004101	
	9/15/2008	9/16/2008	Communication problem	Collected Data	1300004078	
	9/10/2008	9/11/2008	Communication problem	Collected Data	1300004044	
	9/8/2008	9/9/2008	Communication problem	Collected Data	1300004014	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059436	9/8/2008	9/9/2008	Communication problem	Collected Data	1300004006	
	9/3/2008	9/4/2008	Communication problem	Collected Data	1300003954	
	9/1/2008	9/2/2008	Communication problem	Collected Data	1300003929	
	8/28/2008	8/28/2008	Communication problem	Collected Data	1300003906	
	8/26/2008	8/26/2008	Communication problem	Collected Data	1300003844	
	8/20/2008	8/21/2008	Communication problem	Manual Collect	1300003806	
	8/18/2008	8/19/2008	Communication problem	Collected Data	1300003753	
	8/13/2008	8/14/2008	Communication problem	Collected Data	1300003719	
	8/11/2008	8/12/2008	Communication problem	Collected Data	1300003692	
	8/6/2008	8/7/2008		Scrub/Clean Sensors	1300003636	
	8/6/2008	8/7/2008	Communication problem	Collected Data	1300003636	
	8/6/2008	8/6/2008		Rework - other	1300003636	
	8/6/2008	8/6/2008	Communication problem	Collected Data	1300003636	
	8/4/2008	8/6/2008	Communication problem	Collected Data	1300003597	
	7/31/2008	7/31/2008	Communication problem	Collected Data	1300003566	
	7/28/2008	7/29/2008	Communication problem	Collected Data	1300003541	
	7/24/2008	7/24/2008	Communication problem	Collected Data	1300003495	
	7/22/2008	7/22/2008	Communication problem	Collected Data	1300003462	
	7/22/2008	7/22/2008	Ultrasonic - Erratic data	No problem	1300003462	
	7/22/2008	7/22/2008	Velocity - spikes/drop out	No problem	1300003462	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059436	7/17/2008	7/17/2008	Communication problem	Collected Data	1300003425	
	7/15/2008	7/15/2008	Communication problem	Collected Data	1300003397	
	7/10/2008	7/10/2008	Communication problem	Collected Data	1300003346	
	7/8/2008	7/8/2008	Communication problem	Collected Data	1300003313	
	7/3/2008	7/3/2008	Communication problem	Collected Data	1300003255	
	7/1/2008	7/1/2008	Communication problem	Collected Data	1300003224	
	6/26/2008	6/26/2008	Communication problem	Collected Data	1300003193	
	6/23/2008	6/24/2008	Communication problem	Collected Data	1300003164	
	6/19/2008	6/20/2008	Communication problem	Collected Data	1300003127	
	6/17/2008	6/17/2008	Communication problem	Collected Data	1300003099	
	6/12/2008	6/12/2008	Communication problem	Collected Data	1300003043	
	6/10/2008	6/10/2008	Communication problem	Collected Data	1300003013	
	6/5/2008	6/6/2008	Communication problem	Collected Data	1300002946	
	6/3/2008	6/3/2008	Communication problem	Collected Data	1300002919	
	5/29/2008	5/29/2008	Communication problem	Collected Data	1300002853	
	5/27/2008	5/27/2008	Communication problem	Collected Data	1300002805	
	5/22/2008	5/22/2008	Communication problem	Collected Data	1300002775	
	5/20/2008	5/20/2008	Communication problem	Collected Data	1300002741	
	5/15/2008	5/15/2008	Communication problem	Collected Data	1300002670	
	5/13/2008	5/13/2008	Communication problem	Collected Data	1300002643	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059436	5/8/2008	5/8/2008	Communication problem	Collected Data	1300002569	
	5/6/2008	5/6/2008	Communication problem	Manual Collect	1300002528	
	5/1/2008	5/1/2008	Communication problem	Collected Data	1300002461	
	4/29/2008	4/30/2008	Communication problem	Collected Data	1300002416	
	4/24/2008	4/24/2008	Communication problem	Manual Collect	1300002350	
	4/21/2008	4/22/2008	Communication problem	Collected Data	1300002310	
	4/17/2008	4/18/2008	Communication problem	Collected Data	1300002248	
	4/15/2008	4/15/2008	Communication problem	Collected Data	1300002223	
	4/11/2008	4/11/2008	Communication problem	Manual Collect	1300002171	
	4/8/2008	4/8/2008	Communication problem	Replaced Monitor	1300002129	
	4/3/2008	4/4/2008	Communication problem	Manual Collect	1300002091	
	3/31/2008	4/2/2008	Communication problem	Manual Collect	1300002042	
	3/27/2008	3/31/2008	Communication problem	Manual Collect	1300002000	
	3/24/2008	3/25/2008	Communication problem	Manual Collect	1300001947	
	3/19/2008	3/20/2008	Communication problem	Manual Collect	1300001909	
	3/17/2008	3/17/2008	Communication problem	Manual Collect	1300001850	
	3/12/2008	3/14/2008	Communication problem	Manual Collect	1300001819	
	3/7/2008	3/10/2008	Communication problem	Manual Collect	1300001755	
	3/3/2008	3/4/2008	Communication problem	Manual Collect	1300001690	
	2/25/2008	2/26/2008	Communication problem	Manual Collect	1300001613	

059-443 is owned and operated by King County. Service reports are not available for this site.

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Customer *Genesee*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059451	4/16/2009	4/16/2009	Communication problem	Manual Collect	1300006478	
	4/13/2009	4/14/2009	Communication problem	Manual Collect	1300006427	
	3/25/2009	3/26/2009	Communication problem	Manual Collect	1300006212	
	3/18/2009	3/19/2009	Communication problem	Manual Collect	1300006135	
	3/16/2009	3/17/2009	Communication problem	Manual Collect	1300006104	
	2/11/2009	2/11/2009	Ultrasonic - spikes	No problem	1300005733	
	1/7/2009	1/8/2009	Ultrasonic - Erratic data	No problem	1300005289	
	1/7/2009	1/8/2009	Velocity - Erratic data	Other	1300005289	
	12/16/2008	12/16/2008	Communication problem	No problem	1300004991	
	12/11/2008	12/11/2008	Communication problem	Replaced Battery - Monitor	1300004928	
	12/11/2008	12/11/2008	Communication problem	Manual Collect	1300004928	
	12/9/2008	12/9/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300004909	
	12/9/2008	12/9/2008	Communication problem	Adjusted Other	1300004909	
	11/12/2008	11/13/2008	Pressure problem	Replaced Pressure Sensor	1300004595	
	10/14/2008	10/15/2008	Pressure problem	Replaced Pressure Sensor	1300004348	
	10/13/2008	10/14/2008	Communication problem	Replaced Battery - Monitor	1300004340	
	9/17/2008	9/18/2008	Communication problem	Collected Data	1300004098	
	8/25/2008	8/26/2008	Velocity - spikes/drop out	Replaced Velocity Sensor	1300003845	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059451	8/13/2008	8/14/2008	Communication problem	No problem	1300003716	
	7/15/2008	7/15/2008	Communication problem	Other	1300003395	
	7/10/2008	7/10/2008	Communication problem	Replaced Battery - Monitor	1300003343	
	7/10/2008	7/10/2008	Communication problem	Collected Data	1300003343	
	7/8/2008	7/9/2008	Communication problem	Collected Data	1300003310	
	7/3/2008	7/3/2008	Pressure problem	Scrub/Clean Sensors	1300003258	
	7/1/2008	7/1/2008	Communication problem	Collected Data	1300003221	
	6/23/2008	6/24/2008	Communication problem	Collected Data	1300003161	
	6/17/2008	6/17/2008	Pressure problem	Scrub/Clean Sensors	1300003090	
	6/10/2008	6/10/2008	Communication problem	Collected Data	1300003012	
	6/3/2008	6/3/2008	Communication problem	Collected Data	1300002917	
	5/22/2008	5/22/2008	Communication problem	Collected Data	1300002773	
	5/20/2008	5/20/2008	Communication problem	Collected Data	1300002739	
	4/17/2008	4/18/2008	Communication problem	Collected Data	1300002246	
	4/11/2008	4/11/2008	Communication problem	Collected Data	1300002168	
	4/8/2008	4/8/2008	Velocity problem	Scrub/Clean Sensors	1300002131	
	3/24/2008	3/25/2008	Communication problem	Collected Data	1300001944	
	3/17/2008	3/18/2008	Confirmation(Profile)	Confirmation(Profile/Weir)	1300001853	
	3/12/2008	3/12/2008	Communication problem	Collected Data	1300001821	
	2/1/2008	2/4/2008	Pressure problem	Scrub/Clean Sensors	1300001458	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059451	2/1/2008	2/4/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300001458	
	1/16/2008	1/28/2008	Communication problem	Replaced Monitor	1300001267	
	12/31/2007	1/2/2008	Communication problem	Collected Data	1300001094	
	12/26/2007	12/28/2007	Battery low - Monitor	Replaced Battery - Monitor	1300001037	

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Customer *Seattle Public Utility (SPU)*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES038_MH059451	3/30/2009	4/13/2009	Pressure problem	Replaced Pressure Sensor	1300006280	
	3/24/2009	3/27/2009	Pressure problem	Other	1300006201	
	3/4/2009	3/13/2009	Communication problem	No problem	1300005965	
	2/17/2009	2/18/2009	Communication problem	Manual Collect	1300005798	
	2/13/2009	2/13/2009	Communication problem	Manual Collect	1300005751	
	1/30/2009	1/30/2009	Monitor problem	Replaced Monitor	1300005636	
	1/12/2009	1/22/2009	Pressure problem	Replaced Pressure Sensor	1300005337	
	12/30/2008	12/31/2008	Communication problem	Manual Collect	1300005169	
	12/29/2008	12/29/2008	Communication problem	Manual Collect	1300005177	
	12/26/2008	12/26/2008	Communication problem	Manual Collect	1300005213	
	12/3/2008	12/3/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300004814	
	12/1/2008	12/1/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004760	
	12/1/2008	12/1/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300004760	
	5/16/2008	5/22/2008	Confirmation(PVD)	Confirmation(Profile/Weir)	1300002699	
	5/14/2008	5/15/2008	Pressure problem	Replaced Pressure Sensor	1300002667	
	5/2/2008	5/2/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300002557	
	5/1/2008	5/6/2008	Ultrasonic - spikes	No problem	1300002468	
	4/23/2008	4/24/2008	Communication problem	Manual Collect	1300002336	

Note: NPDES_38 MH059451 was incorrectly labeled. This site is at MH 059-574, not MH 059-451. Continued monitoring at this site can be found under the label "NPDES038_MH059574." This site is also known as "Structure A". Please see Section 3.2 *059-451 "A" (Monitoring ID NPDES38_059-451 , Structure "A")* in the report for more details.

Customer *Seattle Public Utility (SPU)* Note: NPDES_38 MH059451 was incorrectly labeled. See note on previous page.

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES038_MH059451	3/31/2008	4/1/2008	Ultrasonic - spikes	Other	1300002047	
	3/17/2008	3/17/2008	Ultrasonic - Low number of good pairs	Scrub/Clean Sensors	1300001883	
	2/25/2008	2/25/2008	Ultrasonic - Erratic data	Other	1300001605	
	2/19/2008	2/20/2008	Battery low - Monitor	Replaced Battery - Monitor	1300001574	
	1/8/2008	1/23/2008	Other	Other	1300001197	
	1/2/2008	1/2/2008	Other	Other	1300001117	
	12/13/2007	12/18/2007	Ultrasonic - spikes	Scrub/Clean Sensors	1300000949	
	12/13/2007	12/18/2007	Ultrasonic - spikes	Activated Monitor	1300000949	
	12/10/2007	12/12/2007	Battery low - Monitor	Replaced Battery - Monitor	1300000929	
	10/19/2007	10/22/2007	Ultrasonic 2 problem	Other	1300000629	
	9/2/2007	9/7/2007	Ultrasonic problem	Re-Install	1300000372	

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Customer *Seattle Public Utility (SPU)*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES037_MH059489	5/19/2009	5/20/2009	Pressure problem	Replaced Pressure Sensor	1300007078	
	5/7/2009	5/7/2009	Pressure problem	Replaced Pressure Sensor	1300006763	
	5/6/2009	5/6/2009	Ultrasonic - spikes	Scrub/Clean Sensors	1300006670	
	3/31/2009	4/1/2009	Battery low - Monitor	Replaced Battery - Monitor	1300006292	
	3/31/2009	4/1/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300006292	
	3/31/2009	4/1/2009	Pressure problem	Replaced Pressure Sensor	1300006292	
	3/24/2009	3/25/2009	Velocity - spikes/drop out	Scrub/Clean Sensors	1300006199	
	3/9/2009	3/10/2009	Velocity problem	Scrub/Clean Sensors	1300006021	
	2/12/2009	2/12/2009	Flow change	Confirmation(Profile/Weir)	1300005740	
	1/23/2009	1/23/2009	Velocity - Zeros	Scrub/Clean Sensors	1300005609	
	1/16/2009	1/16/2009	Velocity - Zeros	Scrub/Clean Sensors	1300005468	
	1/6/2009	1/7/2009	Communication problem	Activated Monitor	1300005263	
	1/6/2009	1/7/2009	Communication problem	Manual Collect	1300005263	
	1/5/2009	1/5/2009	Communication problem	Manual Collect	1300005242	
	1/2/2009	1/2/2009	Communication problem	Manual Collect	1300005228	
	12/30/2008	12/31/2008	Communication problem	Manual Collect	1300005166	
	12/29/2008	12/29/2008	Communication problem	Manual Collect	1300005111	
	12/26/2008	12/26/2008	Communication problem	Manual Collect	1300005215	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES037_MH059489	12/22/2008	12/22/2008	Battery low - Monitor	Replaced Battery - Monitor	1300005060	
	12/19/2008	12/19/2008	Communication problem	Manual Collect	1300005186	
	12/16/2008	12/17/2008	Velocity - Zeros	Scrub/Clean Sensors	1300005033	
	12/8/2008	12/8/2008	Communication problem	Activated Monitor	1300004866	
	12/8/2008	12/8/2008	Communication problem	Manual Collect	1300004866	
	12/5/2008	12/5/2008	Communication problem	Scrub/Clean Sensors	1300004852	
	12/5/2008	12/5/2008	Communication problem	Manual Collect	1300004852	
	12/1/2008	12/1/2008	Communication problem	Manual Collect	1300004759	
	11/24/2008	11/24/2008	Velocity - Zeros	Scrub/Clean Sensors	1300004706	
	11/19/2008	11/19/2008	Velocity - Zeros	Scrub/Clean Sensors	1300004653	
	11/17/2008	11/17/2008	Velocity - Zeros	Scrub/Clean Sensors	1300004660	
	11/7/2008	11/10/2008	Flow change	Confirmation(Profile/Weir)	1300004549	
	11/7/2008	11/10/2008	Flow change	Scrub/Clean Sensors	1300004549	
	10/27/2008	10/28/2008	Velocity - Zeros	Scrub/Clean Sensors	1300004442	
	10/20/2008	10/21/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300004394	
	10/13/2008	10/14/2008	Velocity - Zeros	Scrub/Clean Sensors	1300004330	
	10/2/2008	10/3/2008	Velocity - Zeros	Scrub/Clean Sensors	1300004239	
	10/1/2008	10/1/2008	Velocity - Zeros	Scrub/Clean Sensors	1300004216	
	9/29/2008	9/29/2008	Velocity - Zeros	Scrub/Clean Sensors	1300004197	
	9/22/2008	9/23/2008	Velocity - Zeros	Scrub/Clean Sensors	1300004139	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES037_MH059489	9/18/2008	9/23/2008	Velocity - Zeros	No problem	1300004111	
	9/18/2008	9/19/2008	Velocity - Zeros	Scrub/Clean Sensors	1300004112	
	9/15/2008	9/15/2008	Velocity - Zeros	Scrub/Clean Sensors	1300004065	
	9/10/2008	9/10/2008	Velocity - Zeros	Scrub/Clean Sensors	1300004027	
	9/5/2008	9/5/2008	Velocity - Zeros	Scrub/Clean Sensors	1300003978	
	9/2/2008	9/2/2008	Velocity - Zeros	Scrub/Clean Sensors	1300003944	
	8/27/2008	8/27/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003887	
	8/18/2008	8/19/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003750	
	8/4/2008	8/4/2008	Communication problem	Reset Monitor/Board	1300003585	
	8/4/2008	8/4/2008	Communication problem	Other	1300003585	
	8/1/2008	8/1/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003770	
	8/1/2008	8/1/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300003770	
	6/24/2008	6/25/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003179	
	6/23/2008	6/23/2008	Communication problem	Reset Monitor/Board	1300003149	
	6/20/2008	6/20/2008	Communication problem	Reset Monitor/Board	1300003142	
	6/17/2008	6/18/2008	Missing data	Manual Collect	1300003109	
	5/28/2008	6/11/2008	Velocity - spikes/drop out	No problem	1300002846	
	5/27/2008	5/27/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002823	
	4/30/2008	5/1/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300002438	
	4/28/2008	4/28/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300002397	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES037_MH059489	4/11/2008	4/11/2008	Other	Other	1300002192	
	3/20/2008	3/20/2008	Other	Other	1300001930	
	2/25/2008	2/26/2008	Confirmation(PVD)	Confirmation(Profile/Weir)	1300001607	
	2/18/2008	2/18/2008	Communication problem	Reset Monitor/Board	1300001562	
	2/12/2008	2/13/2008	Battery low - Monitor	Replaced Battery - Monitor	1300001271	
	1/24/2008	1/24/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300001375	
	12/28/2007	12/28/2007	Communication problem	Replaced Antenna	1300001078	
	12/26/2007	12/27/2007	Ultrasonic - spikes	Scrub/Clean Sensors	1300001043	
	12/20/2007	12/21/2007	Ultrasonic - spikes	Scrub/Clean Sensors	1300001009	
	12/19/2007	12/20/2007	Battery low - Monitor	Replaced Battery - Monitor	1300000997	
	11/13/2007	11/13/2007	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300000736	
	11/13/2007	11/13/2007	Velocity - spikes/drop out	Scrub/Clean Sensors	1300000736	
	11/1/2007	11/2/2007	Velocity - spikes/drop out	Scrub/Clean Sensors	1300000681	
	10/22/2007	10/22/2007	Ultrasonic - spikes	Scrub/Clean Sensors	1300000633	
	10/3/2007	10/4/2007	Ultrasonic - spikes	Scrub/Clean Sensors	1300000527	
	9/26/2007	9/27/2007	Communication problem	Replaced Monitor	1300000490	
	9/26/2007	9/27/2007	Manual Data collect	Manual Collect	1300000490	
	9/20/2007	9/25/2007	Communication problem	Reset Monitor/Board	1300000458	
	9/20/2007	9/25/2007	Manual Data collect	Manual Collect	1300000458	
	9/14/2007	9/17/2007	Communication problem	Reset Monitor/Board	1300000433	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES037_MH059489	9/14/2007	9/17/2007	Manual Data collect	Manual Collect	1300000433	
	9/11/2007	9/13/2007	Communication problem	Reset Monitor/Board	1300000410	
	9/11/2007	9/13/2007	Manual Data collect	Manual Collect	1300000410	
	8/27/2007	9/5/2007	Communication problem	Other	1300000349	
	8/27/2007	9/5/2007	Manual Data collect	Manual Collect	1300000349	
	8/21/2007	8/27/2007	Velocity - Erratic data	Replaced Monitor	1300000333	

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Customer *Seattle Public Utility (SPU)*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES037_O_MH0594	6/26/2009	6/26/2009	Communication problem	Manual Collect	1300007215	
	3/31/2009	4/1/2009	Battery low - Monitor	Replaced Battery - Monitor	1300005059	
	3/31/2009	4/1/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300005059	
	1/19/2009	1/19/2009	Communication problem	Manual Collect	1300005395	
	12/30/2008	12/31/2008	Communication problem	Manual Collect	1300005171	
	12/26/2008	12/26/2008	Communication problem	Manual Collect	1300005214	
	12/22/2008	12/22/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003334	
	12/22/2008	12/22/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300003334	
	12/19/2008	12/19/2008	Communication problem	Manual Collect	1300005187	
	12/8/2008	12/8/2008	Communication problem	Manual Collect	1300004860	
	12/8/2008	12/8/2008	Communication problem	Activated Monitor	1300004860	
	6/17/2008	6/19/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003110	

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Customer *Genesee*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059490	5/27/2009	5/27/2009	Communication problem	Manual Collect	1300006869	
	5/26/2009	5/26/2009	Communication problem	Manual Collect	1300006850	
	5/21/2009	5/21/2009	Communication problem	Manual Collect	1300006836	
	5/19/2009	5/21/2009	Communication problem	Manual Collect	1300006818	
	5/13/2009	5/14/2009	Communication problem	Manual Collect	1300006801	
	5/11/2009	5/12/2009	Communication problem	Manual Collect	1300006708	
	5/6/2009	5/7/2009	Communication problem	Manual Collect	1300006681	
	5/6/2009	5/7/2009	Velocity - spikes/drop out	No problem	1300006681	
	5/4/2009	5/5/2009	Communication problem	Manual Collect	1300006647	
	4/29/2009	4/30/2009	Communication problem	Manual Collect	1300006620	
	4/27/2009	4/28/2009	Communication problem	Manual Collect	1300006585	
	4/22/2009	4/23/2009	Communication problem	Manual Collect	1300006562	
	4/21/2009	4/21/2009	Communication problem	Manual Collect	1300006529	
	4/16/2009	4/16/2009	Communication problem	Manual Collect	1300006482	
	4/13/2009	4/14/2009	Communication problem	Manual Collect	1300006431	
	4/6/2009	4/7/2009	Communication problem	Manual Collect	1300006336	
	3/18/2009	3/19/2009	Communication problem	Manual Collect	1300006148	
	3/4/2009	3/5/2009	Communication problem	Manual Collect	1300005981	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059490	3/3/2009	3/3/2009	Communication problem	Manual Collect	1300005919	
	2/25/2009	2/26/2009	Communication problem	Manual Collect	1300005849	
	2/23/2009	2/24/2009	Communication problem	Manual Collect	1300005829	
	2/16/2009	2/17/2009	Communication problem	Manual Collect	1300005779	
	2/11/2009	2/12/2009	Communication problem	Manual Collect	1300005737	
	2/9/2009	2/10/2009	Communication problem	Manual Collect	1300005710	
	2/4/2009	2/5/2009	Communication problem	Scrub/Clean Sensors	1300005666	
	2/4/2009	2/5/2009	Communication problem	Manual Collect	1300005666	
	2/3/2009	2/3/2009	Communication problem	Reset Monitor/Board	1300005598	
	1/28/2009	1/29/2009	Communication problem	Manual Collect	1300005535	
	1/28/2009	1/29/2009	Confirmation(PVD)	Confirmation(Profile/Weir)	1300005535	
	1/26/2009	1/27/2009	Communication problem	Manual Collect	1300005508	
	1/22/2009	1/22/2009	Communication problem	Manual Collect	1300005444	
	1/20/2009	1/20/2009	Communication problem	No problem	1300005408	
	1/14/2009	1/15/2009	Communication problem	Manual Collect	1300005388	
	1/13/2009	1/13/2009	Communication problem	Scrub/Clean Sensors	1300005357	
	1/13/2009	1/13/2009	Communication problem	Manual Collect	1300005357	
	1/7/2009	1/8/2009	Communication problem	Manual Collect	1300005295	
	12/30/2008	1/6/2009	Communication problem	Manual Collect	1300005145	
	12/22/2008	12/22/2008	Communication problem	No problem	1300005086	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059490	12/18/2008	12/18/2008	Communication problem	Manual Collect	1300005049	
	12/16/2008	12/16/2008	Communication problem	Manual Collect	1300004997	
	12/11/2008	12/12/2008	Communication problem	Reset Monitor/Board	1300004933	
	12/2/2008	12/2/2008	Communication problem	No problem	1300004800	
	11/19/2008	11/20/2008	Communication problem	Reset Monitor/Board	1300004674	
	11/19/2008	11/20/2008	Communication problem	Replaced Monitor	1300004674	
	11/17/2008	11/18/2008	Communication problem	Reset Monitor/Board	1300004636	
	11/12/2008	11/13/2008	Communication problem	Reset Monitor/Board	1300004600	
	11/10/2008	11/11/2008	Communication problem	Reset Monitor/Board	1300004572	
	10/30/2008	10/30/2008	Communication problem	Reset Monitor/Board	1300004489	
	9/3/2008	9/4/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003955	
	8/6/2008	8/7/2008	Flow change	Scrub/Clean Sensors	1300003639	
	7/15/2008	7/15/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003402	
	7/3/2008	7/3/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003259	
	7/3/2008	7/3/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300003259	
	5/6/2008	5/6/2008	Communication problem	Manual Collect	1300002530	
	4/29/2008	4/29/2008	Communication problem	Collected Data	1300002417	
	4/15/2008	4/15/2008	Communication problem	Collected Data	1300002224	
	4/3/2008	4/4/2008	Communication problem	Collected Data	1300002092	
	3/12/2008	3/14/2008	Communication problem	Collected Data	1300001820	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN40_059490	3/3/2008	3/4/2008	Communication problem	Collected Data	1300001691	
	1/28/2008	1/29/2008	Communication problem	Collected Data	1300001415	
	1/16/2008	1/23/2008	Communication problem	Collected Data	1300001328	
	1/10/2008	1/10/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300001222	
	1/7/2008	1/11/2008	Communication problem	Collected Data	1300001167	
	12/31/2007	1/2/2008	Other	Other	1300001097	

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Customer *Seattle Public Utility (SPU)*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES040_MH059491	6/29/2009	6/29/2009	Communication problem	Manual Collect	1300007222	
	6/26/2009	6/26/2009	Communication problem	Manual Collect	1300007005	
	6/24/2009	6/25/2009	Communication problem	Manual Collect	1300007137	
	6/22/2009	6/22/2009	Communication problem	Manual Collect	1300007105	
	6/11/2009	6/12/2009	Communication problem	Manual Collect	1300007022	
	6/9/2009	6/12/2009	Communication problem	Manual Collect	1300007006	
	6/8/2009	6/8/2009	Communication problem	Other	1300006978	
	6/5/2009	6/5/2009	Communication problem	Manual Collect	1300006956	
	6/5/2009	6/5/2009	Communication problem	Manual Collect	1300007191	
	6/2/2009	6/3/2009	Communication problem	Manual Collect	1300006897	
	6/1/2009	6/1/2009	Communication problem	Manual Collect	1300006879	
	5/29/2009	5/29/2009	Communication problem	Manual Collect	1300007174	
	5/25/2009	5/25/2009	Communication problem	Manual Collect	1300007147	
	5/22/2009	5/22/2009	Communication problem	Other	1300007097	
	5/19/2009	5/21/2009	Communication problem	Reset Monitor/Board	1300007088	
	5/19/2009	5/21/2009	Communication problem	Other	1300007088	
	5/18/2009	5/18/2009	Communication problem	Manual Collect	1300006935	
	5/15/2009	5/15/2009	Communication problem	Manual Collect	1300006924	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES040_MH059491	5/12/2009	5/13/2009	Communication problem	Manual Collect	1300006724	
	5/11/2009	5/11/2009	Communication problem	Manual Collect	1300006775	
	5/8/2009	5/8/2009	Communication problem	Manual Collect	1300006696	
	5/6/2009	5/6/2009	Communication problem	Manual Collect	1300006662	
	5/4/2009	5/4/2009	Communication problem	Manual Collect	1300006752	
	5/1/2009	5/1/2009	Communication problem	Manual Collect	1300006740	
	4/21/2009	4/22/2009	Communication problem	Manual Collect	1300006549	
	4/20/2009	4/20/2009	Communication problem	Manual Collect	1300006509	
	4/17/2009	4/17/2009	Communication problem	Manual Collect	1300006503	
	4/13/2009	4/13/2009	Communication problem	Manual Collect	1300006465	
	4/9/2009	4/10/2009	Communication problem	Manual Collect	1300006406	
	4/7/2009	4/8/2009	Communication problem	Manual Collect	1300006362	
	4/6/2009	4/6/2009	Communication problem	Manual Collect	1300006399	
	4/3/2009	4/3/2009	Communication problem	Manual Collect	1300006320	
	3/31/2009	4/1/2009	Communication problem	Manual Collect	1300006289	
	3/30/2009	3/30/2009	Communication problem	Manual Collect	1300006279	
	3/27/2009	3/27/2009	Communication problem	Manual Collect	1300006238	
	3/24/2009	3/25/2009	Communication problem	Manual Collect	1300006197	
	3/23/2009	3/23/2009	Communication problem	Manual Collect	1300006187	
	3/20/2009	3/20/2009	Communication problem	Manual Collect	1300006170	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES040_MH059491	3/17/2009	3/18/2009	Communication problem	Manual Collect	1300006132	
	3/17/2009	3/18/2009	Communication problem	Replaced Battery - Monitor	1300006132	
	3/17/2009	3/18/2009	Communication problem	Replaced Battery - Wireless	1300006132	
	3/16/2009	3/16/2009	Communication problem	Manual Collect	1300006096	
	3/13/2009	3/13/2009	Communication problem	Manual Collect	1300006085	
	3/10/2009	3/11/2009	Communication problem	Manual Collect	1300006054	
	3/9/2009	3/9/2009	Communication problem	Manual Collect	1300006002	
	3/6/2009	3/6/2009	Communication problem	Manual Collect	1300005992	
	3/3/2009	3/4/2009	Communication problem	Manual Collect	1300005957	
	3/2/2009	3/2/2009	Communication problem	Manual Collect	1300005904	
	2/27/2009	2/27/2009	Communication problem	Manual Collect	1300005890	
	2/25/2009	2/25/2009	Communication problem	Reset Monitor/Board	1300005858	
	2/23/2009	2/23/2009	Communication problem	Manual Collect	1300005869	
	2/20/2009	2/20/2009	Communication problem	Manual Collect	1300006076	
	2/17/2009	2/18/2009	Communication problem	Manual Collect	1300005793	
	2/16/2009	2/20/2009	Communication problem	Manual Collect	1300005938	
	2/13/2009	2/13/2009	Communication problem	Manual Collect	1300005755	
	2/10/2009	2/11/2009	Communication problem	Manual Collect	1300005718	
	2/4/2009	2/6/2009	Pressure problem	Activated Monitor	1300005650	
	1/27/2009	2/9/2009	Communication problem	No problem	1300005515	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES040_MH059491	1/27/2009	1/28/2009	Communication problem	Manual Collect	1300005513	
	1/26/2009	1/26/2009	Communication problem	Manual Collect	1300005489	
	1/13/2009	1/13/2009	Ultrasonic - spikes	Scrub/Clean Sensors	1300005368	
	1/13/2009	1/13/2009	Ultrasonic - spikes	Confirmation(Profile/Weir)	1300005368	
	1/12/2009	1/12/2009	Communication problem	Manual Collect	1300005313	
	1/9/2009	1/9/2009	Communication problem	Manual Collect	1300005330	
	1/6/2009	1/7/2009	Communication problem	Manual Collect	1300005260	
	1/5/2009	1/5/2009	Communication problem	Manual Collect	1300005239	
	1/2/2009	1/2/2009	Communication problem	Manual Collect	1300005224	
	12/30/2008	12/31/2008	Communication problem	Manual Collect	1300005162	
	12/29/2008	12/29/2008	Communication problem	Manual Collect	1300005105	
	12/26/2008	12/26/2008	Communication problem	Manual Collect	1300005211	
	12/24/2008	12/24/2008	Communication problem	Manual Collect	1300005198	
	12/22/2008	12/22/2008	Communication problem	Manual Collect	1300005068	
	12/19/2008	12/19/2008	Communication problem	Manual Collect	1300005183	
	12/16/2008	12/17/2008	Communication problem	Manual Collect	1300005028	
	12/15/2008	12/15/2008	Communication problem	Manual Collect	1300004974	
	12/15/2008	12/15/2008	Velocity - Zeros	Scrub/Clean Sensors	1300004974	
	12/12/2008	12/12/2008	Communication problem	Manual Collect	1300004960	
	12/10/2008	12/10/2008	Communication problem	Manual Collect	1300004942	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES040_MH059491	12/8/2008	12/8/2008	Communication problem	Manual Collect	1300004869	
	12/8/2008	12/8/2008	Communication problem	Activated Monitor	1300004869	
	12/5/2008	12/5/2008	Communication problem	Manual Collect	1300004851	
	11/7/2008	11/10/2008	Flow change	Confirmation(Profile/Weir)	1300004548	
	10/13/2008	10/14/2008	Communication problem	Manual Collect	1300004328	
	10/6/2008	10/8/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004256	
	10/6/2008	10/8/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300004256	
	9/22/2008	9/22/2008	Communication problem	Other	1300004124	
	9/22/2008	9/22/2008	Communication problem	Reset Monitor/Board	1300004124	
	9/3/2008	9/3/2008	Communication problem	Other	1300003936	
	8/25/2008	8/25/2008	Communication problem	Reset Monitor/Board	1300003833	
	8/19/2008	8/20/2008	Communication problem	Replaced Monitor	1300003783	
	8/19/2008	8/20/2008	Other	Other	1300003783	
	8/18/2008	8/18/2008	Communication problem	Manual Collect	1300003748	
	8/15/2008	8/18/2008	Communication problem	Manual Collect	1300003741	
	8/12/2008	8/13/2008	Communication problem	Manual Collect	1300003705	
	8/11/2008	8/11/2008	Communication problem	Manual Collect	1300003675	
	8/8/2008	8/8/2008	Monitor problem	Scrub/Clean Sensors	1300003667	
	8/8/2008	8/8/2008	Monitor problem	Replaced Monitor	1300003667	
	8/4/2008	8/19/2008	Communication problem	No problem	1300003588	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES040_MH059491	8/4/2008	8/4/2008	Communication problem	Reset Monitor/Board	1300003591	
	8/4/2008	8/4/2008	Communication problem	Other	1300003591	
	8/1/2008	8/1/2008	Communication problem	Other	1300003764	
	8/1/2008	8/1/2008	Communication problem	Reset Monitor/Board	1300003764	
	8/1/2008	8/1/2008	Communication problem	Manual Collect	1300003764	
	7/30/2008	7/31/2008	Communication problem	Manual Collect	1300003558	
	7/7/2008	7/7/2008	Communication problem	Reset Monitor/Board	1300003277	
	7/7/2008	7/7/2008	Communication problem	Other	1300003277	
	7/4/2008	7/4/2008	Communication problem	Manual Collect	1300003299	
	6/13/2008	6/13/2008	Communication problem	Reset Monitor/Board	1300003063	
	5/27/2008	5/27/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300002824	
	5/16/2008	5/20/2008	Confirmation(PVD)	Confirmation(Profile/Weir)	1300002700	
	5/12/2008	5/13/2008	Ultrasonic problem	Scrub/Clean Sensors	1300002619	
	5/5/2008	5/5/2008	Communication problem	Reset Monitor/Board	1300002497	
	5/5/2008	5/5/2008	Communication problem	Other	1300002497	
	5/1/2008	5/2/2008	Ultrasonic - spikes	Replaced Ultrasonic Board	1300002469	
	4/29/2008	4/30/2008	Ultrasonic - spikes	Other	1300002424	
	4/25/2008	4/25/2008	Communication problem	Reset Monitor/Board	1300002376	
	4/23/2008	4/25/2008	Communication problem	No problem	1300002337	
	4/15/2008	4/16/2008	Communication problem	Replaced Battery - Monitor	1300002235	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES040_MH059491	3/31/2008	3/31/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300002048	
	3/14/2008	3/14/2008	Communication problem	Reset Monitor/Board	1300001838	
	3/3/2008	3/3/2008	Communication problem	Reset Monitor/Board	1300001717	
	1/25/2008	1/25/2008	Communication problem	No problem	1300001402	
	1/25/2008	1/25/2008	Communication problem	Reset Monitor/Board	1300001533	
	1/22/2008	1/25/2008	Communication problem	No problem	1300001348	
	1/18/2008	1/18/2008	Communication problem	Reset Monitor/Board	1300001320	
	1/11/2008	1/11/2008	Communication problem	Reset Monitor/Board	1300001273	
	12/21/2007	2/19/2008	Communication problem	No problem	1300001016	
	12/17/2007	12/17/2007	Communication problem	Reset Monitor/Board	1300000977	
	12/6/2007	12/7/2007	Communication problem	Reset Monitor/Board	1300000895	
	12/6/2007	12/6/2007	Ultrasonic - spikes	Scrub/Clean Sensors	1300001303	
	12/6/2007	12/6/2007	Velocity - spikes/drop out	Scrub/Clean Sensors	1300001303	
	12/4/2007	12/4/2007	Velocity - Zeros	Other	1300000950	
	11/30/2007	11/30/2007	Communication problem	Other	1300000907	
	11/26/2007	11/26/2007	Battery low - Monitor	Replaced Battery - GSM/GPRS	1300000839	
	11/15/2007	11/19/2007	Ultrasonic - spikes	Scrub/Clean Sensors	1300000753	
	11/13/2007	11/14/2007	Communication problem	Reset Monitor/Board	1300000737	
	11/13/2007	11/14/2007	Manual Data collect	Manual Collect	1300000737	
	11/5/2007	11/5/2007	Can not connect	Reset Monitor/Board	1300000691	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES040_MH059491	10/30/2007	10/30/2007	Velocity - spikes/drop out	Scrub/Clean Sensors	1300000677	
	10/23/2007	10/23/2007	Ultrasonic - spikes	Scrub/Clean Sensors	1300000644	
	9/18/2007	8/13/2007	Communication problem	No problem	1300000451	
	9/18/2007	8/13/2007	Manual Data collect	No problem	1300000451	
	9/17/2007	10/1/2007	Ultrasonic - spikes	Scrub/Clean Sensors	1300000434	
	9/11/2007	9/19/2007	Other	Other	1300000416	
	9/11/2007	9/19/2007	Ultrasonic - spikes	No problem	1300000416	
	9/5/2007	9/10/2007	Missing data	Manual Collect	1300000378	
	9/5/2007	9/10/2007	Ultrasonic - spikes	Other	1300000378	
	8/14/2007	8/21/2007	Communication problem	Other	1300000300	
	8/14/2007	8/21/2007	Manual Data collect	Manual Collect	1300000300	
	8/9/2007	8/14/2007	Ultrasonic problem	No problem	1300000276	
	8/7/2007	8/8/2007	Communication problem	Reset Monitor/Board	1300000260	
	8/7/2007	8/8/2007	Manual Data collect	Manual Collect	1300000260	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059498A	6/8/2009	6/9/2009	Velocity - Erratic data	Scrub/Clean Sensors	1300006975	
	6/3/2009	6/4/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300006946	
	6/3/2009	6/4/2009	Velocity - spikes/drop out	Scrub/Clean Sensors	1300006946	
	5/27/2009	5/29/2009	Velocity - spikes/drop out	Scrub/Clean Sensors	1300006865	
	5/13/2009	5/14/2009	Velocity - spikes/drop out	Scrub/Clean Sensors	1300006797	
	5/11/2009	5/12/2009	Battery low - Monitor	Replaced Battery - Wireless	1300006704	
	4/22/2009	4/23/2009	Velocity - spikes/drop out	Manual Collect	1300006558	
	4/8/2009	4/9/2009	Velocity - Erratic data	Scrub/Clean Sensors	1300006384	
	3/3/2009	3/3/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300005921	
	2/3/2009	2/3/2009	Battery low - Monitor	Replaced Battery - Monitor	1300005602	
	12/16/2008	12/16/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004992	
	12/4/2008	12/4/2008	Battery Low - Wireless	No problem	1300004820	
	10/27/2008	10/28/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004454	
	9/24/2008	9/25/2008	Communication problem	Collected Data	1300004163	
	9/8/2008	9/9/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004020	
	9/3/2008	9/4/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300003949	
	9/1/2008	9/2/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003933	
	8/28/2008	8/28/2008	Pressure drifting	Scrub/Clean Sensors	1300003907	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059498A	8/6/2008	8/7/2008	Communication problem	Collected Data	1300003633	
	7/28/2008	7/29/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003537	
	7/24/2008	7/24/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003491	
	7/24/2008	7/24/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003491	
	7/24/2008	7/24/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003491	
	7/17/2008	7/17/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003427	
	7/15/2008	7/15/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003393	
	7/8/2008	7/9/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003319	
	7/3/2008	7/3/2008	Velocity - spikes/drop out	Rotate Velocity Sensor	1300003250	
	7/1/2008	7/1/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003228	
	6/26/2008	6/26/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003194	
	6/23/2008	6/24/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003158	
	6/19/2008	6/19/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003130	
	6/17/2008	6/17/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003100	
	6/12/2008	6/12/2008	Velocity problem	Scrub/Clean Sensors	1300003045	
	6/5/2008	6/5/2008	Battery low - Monitor	Replaced Battery - Monitor	1300002949	
	6/5/2008	6/5/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002949	
	6/3/2008	6/3/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002923	
	5/29/2008	5/29/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002855	
	5/27/2008	5/27/2008	Communication problem	Manual Collect	1300002803	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_059498A	4/29/2008	4/29/2008	Battery low - Monitor	Replaced Battery - Monitor	1300002421	
	4/29/2008	4/29/2008	Battery low - Monitor	Re-Install	1300002421	
	4/21/2008	4/22/2008	Velocity - spikes/drop out	Other	1300002312	
	4/3/2008	4/8/2008	Velocity - Erratic data	Scrub/Clean Sensors	1300002094	
	3/24/2008	3/25/2008	Confirmation(Profile)	Confirmation(Profile/Weir)	1300001948	
	3/19/2008	3/20/2008	Ultrasonic - Erratic data	Replaced Ultrasonic Sensor	1300001903	
	3/17/2008	3/18/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300001851	
	3/12/2008	3/12/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300001811	
	3/7/2008	3/10/2008	Battery low - Monitor	Replaced Battery - Monitor	1300001765	
	3/3/2008	3/4/2008	Communication problem	Collected Data	1300001688	
	2/25/2008	2/26/2008	Communication problem	Collected Data	1300001610	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_060W012	5/6/2009	5/7/2009	Ultrasonic - spikes	Scrub/Clean Sensors	1300006677	
	4/8/2009	4/9/2009	Communication problem	Manual Collect	1300006385	
	4/6/2009	4/8/2009	Communication problem	Manual Collect	1300006332	
	4/1/2009	4/2/2009	Communication problem	Manual Collect	1300006307	
	3/30/2009	3/31/2009	Communication problem	Manual Collect	1300006250	
	3/25/2009	3/26/2009	Communication problem	Manual Collect	1300006213	
	3/18/2009	3/19/2009	Communication problem	Manual Collect	1300006136	
	3/16/2009	3/17/2009	Communication problem	Manual Collect	1300006105	
	3/11/2009	3/10/2009	Communication problem	Manual Collect	1300006060	
	3/9/2009	3/10/2009	Communication problem	Manual Collect	1300006027	
	3/4/2009	3/5/2009	Communication problem	Manual Collect	1300005976	
	3/3/2009	3/3/2009	Communication problem	Manual Collect	1300005915	
	2/25/2009	2/26/2009	Communication problem	Manual Collect	1300005852	
	2/9/2009	2/10/2009	Communication problem	Manual Collect	1300005706	
	2/4/2009	2/5/2009	Communication problem	Manual Collect	1300005662	
	2/3/2009	2/3/2009	Communication problem	Replaced Battery - Wireless	1300005594	
	2/3/2009	2/3/2009	Communication problem	Manual Collect	1300005594	
	1/22/2009	1/22/2009	Communication problem	Manual Collect	1300005441	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_060W012	1/20/2009	1/20/2009	Communication problem	No problem	1300005405	
	1/14/2009	1/15/2009	Communication problem	Manual Collect	1300005383	
	1/13/2009	1/13/2009	Communication problem	Manual Collect	1300005353	
	1/7/2009	1/8/2009	Communication problem	Reset Monitor/Board	1300005290	
	1/7/2009	1/8/2009	Pressure drifting	Replaced Pressure Sensor	1300005290	
	12/30/2008	1/6/2009	Communication problem	Manual Collect	1300005140	
	12/30/2008	1/6/2009	Pressure drifting	Scrub/Clean Sensors	1300005140	
	12/22/2008	12/22/2008	Communication problem	No problem	1300005082	
	12/18/2008	12/18/2008	Communication problem	No problem	1300005045	
	12/16/2008	12/16/2008	Communication problem	Manual Collect	1300004993	
	12/11/2008	12/11/2008	Communication problem	Reset Monitor/Board	1300004929	
	12/11/2008	12/11/2008	Confirmation(Profile)	Confirmation(Profile/Weir)	1300004929	
	12/9/2008	12/9/2008	Communication problem	Manual Collect	1300004910	
	12/1/2008	12/1/2008	Flow change	No problem	1300004793	
	11/25/2008	11/25/2008	Communication problem	Reset Monitor/Board	1300004717	
	11/25/2008	11/25/2008	Communication problem	Replaced Monitor	1300004717	
	11/19/2008	11/20/2008	Communication problem	Reset Monitor/Board	1300004679	
	11/17/2008	11/18/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004629	
	11/17/2008	11/18/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300004629	
	11/12/2008	11/1/1308	Communication problem	Reset Monitor/Board	1300004596	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_060W012	11/10/2008	11/11/2008	Communication problem	Reset Monitor/Board	1300004568	
	11/5/2008	11/6/2008	Communication problem	Hook-up - Other	1300004542	
	11/3/2008	11/3/2008	Communication problem	Manual Collect	1300004518	
	10/30/2008	10/30/2008	Communication problem	Reset Monitor/Board	1300004485	
	10/27/2008	10/28/2008	Communication problem	Hook-up - Other	1300004447	
	10/23/2008	10/23/2008	Communication problem	Adjusted Other	1300004423	
	10/20/2008	10/21/2008	Communication problem	Adjusted Other	1300004401	
	10/15/2008	10/16/2008	Communication problem	Adjusted Other	1300004366	
	10/13/2008	10/14/2008	Communication problem	Reset Monitor/Board	1300004341	
	10/8/2008	10/9/2008	Communication problem		1300004299	
	10/8/2008	10/9/2008	Communication problem	Replaced Monitor	1300004299	
	10/6/2008	10/7/2008	Communication problem	Hook-up - Other	1300004269	
	9/29/2008	9/30/2008	Battery Low - Wireless	No problem	1300004202	
	9/24/2008	9/25/2008	Communication problem	Replaced Battery - Monitor	1300004164	
	9/22/2008	9/23/2008	Communication problem	Collected Data	1300004131	
	9/15/2008	9/16/2008	Communication problem	No problem	1300004075	
	9/8/2008	9/9/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300004003	
	9/8/2008	9/9/2008	Communication problem	Collected Data	1300004003	
	9/8/2008	9/9/2008	Communication problem	Collected Data	1300004011	
	9/3/2008	9/4/2008	Communication problem	Collected Data	1300003951	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_060W012	9/1/2008	9/2/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300003934	
	8/20/2008	8/21/2008	Pressure drifting	Replaced Pressure Desiccant (Dryer)	1300003810	
	6/3/2008	6/3/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300002925	
	5/20/2008	5/20/2008	Battery low - Monitor	Replaced Battery - Monitor	1300002746	
	4/11/2008	4/14/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002174	
	2/28/2008	2/29/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300001664	
	1/24/2008	1/30/2008	Pressure drifting	Scrub/Clean Sensors	1300001366	
	1/8/2008	1/15/2008	Battery low - Monitor	Replaced Battery - Monitor	1300001184	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN42_060W014	6/8/2009	6/9/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300006974	
	6/3/2009	6/4/2009	Velocity - spikes/drop out	Scrub/Clean Sensors	1300006948	
	5/27/2009	5/27/2009	Velocity - spikes/drop out	Scrub/Clean Sensors	1300006870	
	5/26/2009	5/26/2009	Battery low - Monitor	Replaced Battery - Wireless	1300006852	
	3/4/2009	3/6/2009	Communication problem	Manual Collect	1300005982	
	3/3/2009	3/3/2009	Communication problem	Manual Collect	1300005920	
	2/25/2009	2/26/2009	Communication problem	Manual Collect	1300005850	
	2/23/2009	2/24/2009	Communication problem	Other	1300005830	
	2/19/2009	2/19/2009	Communication problem	Manual Collect	1300005822	
	2/3/2009	2/3/2009	Velocity - spikes/drop out	Scrub/Clean Sensors	1300005603	
	1/20/2009	1/20/2009	Communication problem	No problem	1300005400	
	1/14/2009	1/15/2009	Velocity - Erratic data	Scrub/Clean Sensors	1300005389	
	1/7/2009	1/13/2009	Pressure drifting	Scrub/Clean Sensors	1300005296	
	1/7/2009	1/13/2009	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300005296	
	12/30/2008	1/6/2009	Battery Low - Wireless	No problem	1300005146	
	12/22/2008	12/22/2008	Battery Low - Wireless	No problem	1300005087	
	12/18/2008	12/18/2008	Battery Low - Wireless	No problem	1300005052	
	12/4/2008	12/4/2008	Communication problem	No problem	1300004824	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN42_060W014	12/1/2008	12/1/2008	Communication problem	No problem	1300004773	
	11/25/2008	11/25/2008	Communication problem	Adjusted Other	1300004723	
	11/10/2008	11/11/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300004575	
	10/30/2008	10/30/2008	Monitor problem	Replaced Monitor	1300004482	
	9/22/2008	9/23/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300004137	
	9/17/2008	9/18/2008	Communication problem	Collected Data	1300004102	
	9/8/2008	9/9/2008	Communication problem	Collected Data	1300004007	
	9/8/2008	9/9/2008	Communication problem	Collected Data	1300004015	
	9/3/2008	9/4/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003956	
	9/3/2008	9/4/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003956	
	8/18/2008	8/20/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003759	
	8/11/2008	8/12/2008	Velocity - spikes/drop out	Troubleshoot - Velocity sensor problem	1300003688	
	8/4/2008	8/5/2008		Rotate Velocity Sensor	1300003604	
	8/4/2008	8/5/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003604	
	8/4/2008	8/4/2008	Velocity - spikes/drop out	Weekly Scrub	1300003604	
	7/31/2008	7/31/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003562	
	7/31/2008	7/31/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300003562	
	7/28/2008	7/29/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003538	
	7/22/2008	7/22/2008	Pressure drifting	Scrub/Clean Sensors	1300003465	
	7/22/2008	7/22/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003465	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN42_060W014	7/10/2008	7/10/2008	Communication problem	Collected Data	1300003347	
	7/8/2008	7/9/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003320	
	7/3/2008	7/3/2008	Velocity - spikes/drop out	Rotate Velocity Sensor	1300003251	
	6/23/2008	6/24/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003159	
	6/12/2008	6/12/2008	Battery low - Monitor	Replaced Battery - Wireless	1300003046	
	6/3/2008	6/3/2008	Communication problem	Collected Data	1300002920	
	5/22/2008	5/22/2008	Communication problem	Collected Data	1300002776	
	5/8/2008	5/8/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300002573	
	4/21/2008	4/22/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300002313	
	4/15/2008	4/15/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300002225	
	4/11/2008	4/11/2008	Battery low - Monitor	No problem	1300002176	
	4/3/2008	4/8/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300002095	
	4/1/2008	4/3/2008			1300002064	
	3/17/2008	3/18/2008	Confirmation(Profile)	Confirmation(Profile/Weir)	1300001854	
	1/16/2008	1/11/2008	Ultrasonic - Erratic data		1300001223	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN42_060W019	5/21/2009	5/21/2009	Battery low - Monitor	Replaced Battery - Monitor	1300006838	
	5/4/2009	5/5/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300006648	
	4/27/2009	4/28/2009	Pressure problem	Confirmation(PVD)	1300006586	
	4/22/2009	4/23/2009	Communication problem	Manual Collect	1300006563	
	4/8/2009	4/10/2009	Communication problem	Manual Collect	1300006389	
	4/6/2009	4/7/2009	Communication problem	Manual Collect	1300006337	
	3/30/2009	3/31/2009	Communication problem	Manual Collect	1300006254	
	2/18/2009	2/18/2009	Velocity - Zeros	No problem	1300005815	
	2/11/2009	2/12/2009	Pressure drifting	No problem	1300005738	
	2/3/2009	2/3/2009	Communication problem	Replaced Monitor	1300005599	
	2/3/2009	2/3/2009	Communication problem	Manual Collect	1300005599	
	2/3/2009	2/3/2009	Velocity - spikes/drop out	Scrub/Clean Sensors	1300005599	
	1/28/2009	1/29/2009	Communication problem	Manual Collect	1300005536	
	1/26/2009	1/27/2009	Communication problem	Manual Collect	1300005509	
	1/22/2009	1/22/2009	Communication problem	Manual Collect	1300005445	
	1/20/2009	1/20/2009	Communication problem	No problem	1300005409	
	1/14/2009	1/15/2009	Communication problem	Manual Collect	1300005390	
	1/13/2009	1/13/2009	Communication problem	Manual Collect	1300005358	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN42_060W019	1/7/2009	1/8/2009	Communication problem	Manual Collect	1300005297	
	12/30/2008	1/6/2009	Communication problem	Manual Collect	1300005147	
	12/22/2008	12/29/2008	Communication problem	Manual Collect	1300005088	
	12/22/2008	12/29/2008	Ultrasonic - spikes	No problem	1300005088	
	12/18/2008	12/18/2008	Communication problem	No problem	1300005050	
	12/16/2008	12/16/2008	Communication problem	Manual Collect	1300004998	
	12/11/2008	12/11/2008	Velocity - spikes/drop out	Replaced Velocity Sensor	1300004934	
	12/9/2008	12/9/2008	Communication problem	Manual Collect	1300004914	
	12/4/2008	1/5/2009	Battery low - Monitor	Replaced Battery - Monitor	1300004825	
	12/1/2008	12/1/2008	Communication problem	No problem	1300004772	
	11/10/2008	11/11/2008	Confirmation(Profile)	Confirmation(Profile/Weir)	1300004573	
	11/5/2008	11/6/2008	Communication problem	Re-Install - Other	1300004546	
	10/30/2008	10/30/2008	Monitor problem	Replaced Monitor	1300004483	
	9/24/2008	9/25/2008	Communication problem	Manual Collect	1300004168	
	9/1/2008	9/2/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003930	
	7/31/2008	7/31/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300003563	
	7/8/2008	7/8/2008	Communication problem	Collected Data	1300003314	
	7/3/2008	7/3/2008	Confirmation(Profile)	Confirmation(Profile/Weir)	1300003256	
	7/1/2008	7/1/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003229	
	7/1/2008	7/1/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300003229	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN42_060W019	6/19/2008	6/19/2008	Communication problem	Collected Data	1300003128	
	4/29/2008	4/29/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300002419	
	4/11/2008	4/11/2008	Battery low - Monitor	No problem	1300002177	
	2/28/2008	2/29/2008	Battery low - Monitor	Replaced Battery - Monitor	1300001665	
	2/1/2008	2/4/2008	Pressure problem	Troubleshoot - Pressure sensor problem	1300001460	
	1/28/2008	1/30/2008	Pressure problem	Scrub/Clean Sensors	1300001417	
	1/8/2008	1/8/2008	Battery low - Monitor	Replaced Battery - Monitor	1300001185	
	1/8/2008	1/8/2008	Battery low - Monitor		1300001185	
	1/7/2008	1/11/2008	Battery low - Monitor	Replaced Battery - Monitor	1300001181	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN43_060W025	1/16/2008	1/23/2008	Communication problem	Collected Data	1300001329	
	1/7/2008	1/15/2008	Communication problem	Manual Collect	1300001168	
	1/3/2008	1/4/2008	Communication problem	Collected Data	1300001134	
	12/26/2007	12/28/2007	Communication problem	Collected Data	1300001036	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN42_060W047	5/27/2009	5/27/2009	Ultrasonic - spikes	Manual Collect	1300006871	
	5/21/2009	5/21/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300006839	
	5/13/2009	5/14/2009	Velocity - spikes/drop out	Replaced Velocity Sensor	1300006802	
	5/11/2009	5/12/2009	Communication problem	Manual Collect	1300006710	
	4/13/2009	4/14/2009	Battery low - Monitor	Replaced Battery - Monitor	1300006424	
	4/13/2009	4/14/2009	Pressure problem	Replaced Pressure Sensor	1300006424	
	4/1/2009	4/9/2009	Pressure problem	Replaced Pressure Sensor	1300006311	
	4/1/2009	4/9/2009	Ultrasonic problem	Replaced Velocity Sensor	1300006311	
	3/16/2009	3/18/2009	Pressure drifting	Replaced Pressure Sensor	1300006109	
	3/9/2009	3/9/2009	Communication problem	No problem	1300006043	
	3/4/2009	3/10/2009	Pressure problem	Replaced Pressure Sensor	1300005983	
	3/4/2009	3/10/2009	Velocity - spikes/drop out	Replaced Velocity Sensor	1300005983	
	3/3/2009	3/3/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300005922	
	2/23/2009	3/4/2009	Ultrasonic - spikes	No problem	1300005831	
	2/18/2009	2/19/2009	Pressure problem	Hook-up - Other	1300005808	
	2/18/2009	2/19/2009	Ultrasonic - spikes	Hook-up - Other	1300005808	
	2/18/2009	2/19/2009	Velocity - Zeros	Hook-up - Other	1300005808	
	2/16/2009	2/17/2009	Pressure drifting	Replaced Velocity Sensor	1300005780	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN42_060W047	2/16/2009	2/17/2009	Pressure drifting	Replaced Pressure Sensor	1300005780	
	2/11/2009	2/12/2009	Battery low - Monitor	Replaced Battery - Monitor	1300005739	
	2/3/2009	2/3/2009	Communication problem	Replaced Antenna	1300005600	
	1/28/2009	1/29/2009	Communication problem	Reset Monitor/Board	1300005538	
	1/28/2009	1/29/2009	Confirmation(PVD)	Confirmation(Profile/Weir)	1300005538	
	1/22/2009	1/22/2009	Communication problem	Manual Collect	1300005447	
	1/20/2009	1/20/2009	Communication problem	No problem	1300005410	
	1/13/2009	1/13/2009	Communication problem	Manual Collect	1300005359	
	1/7/2009	1/8/2009	Communication problem	Manual Collect	1300005298	
	12/30/2008	12/30/2008	Communication problem	No problem	1300005148	
	12/22/2008	12/29/2008	Communication problem	Manual Collect	1300005089	
	12/22/2008	12/29/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300005089	
	12/18/2008	12/18/2008	Communication problem	No problem	1300005051	
	12/16/2008	12/16/2008	Communication problem	Manual Collect	1300004999	
	12/11/2008	12/11/2008	Communication problem	Reset Monitor/Board	1300004935	
	12/9/2008	12/9/2008	Communication problem	Manual Collect	1300004915	
	12/4/2008	12/4/2008	Communication problem	No problem	1300004826	
	12/2/2008	12/2/2008	Communication problem	No problem	1300004804	
	11/25/2008	11/25/2008	Communication problem	Reset Monitor/Board	1300004722	
	11/25/2008	11/25/2008	Communication problem	No problem	1300004718	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN42_060W047	11/19/2008	11/20/2008	Communication problem	Reset Monitor/Board	1300004675	
	11/17/2008	11/18/2008	Communication problem	Reset Monitor/Board	1300004637	
	11/10/2008	11/11/2008	Confirmation(Profile)	Confirmation(Profile/Weir)	1300004574	
	11/5/2008	11/6/2008	Communication problem	Replaced Monitor	1300004547	
	10/27/2008	10/28/2008	Communication problem	Manual Collect	1300004451	
	10/23/2008	10/23/2008	Communication problem	Adjusted Other	1300004427	
	10/20/2008	10/21/2008	Communication problem	Replaced Monitor	1300004405	
	10/15/2008	10/16/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004364	
	10/15/2008	10/16/2008	Confirmation(Profile)	Profile - Velocity	1300004364	
	10/1/2008	10/2/2008	Communication problem	No problem	1300004235	
	9/24/2008	9/24/2008	Communication problem	No problem	1300004169	
	9/22/2008	9/23/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300004138	
	9/15/2008	9/16/2008	Communication problem	Collected Data	1300004079	
	9/10/2008	9/11/2008	Communication problem	Scrub/Clean Sensors	1300004045	
	9/8/2008	9/9/2008	Communication problem	Collected Data	1300004016	
	9/8/2008	9/9/2008	Communication problem	Collected Data	1300004008	
	9/3/2008	9/4/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003957	
	9/3/2008	9/4/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003957	
	9/1/2008	9/2/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003931	
	8/26/2008	8/26/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003846	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN42_060W047	8/18/2008	8/20/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003760	
	8/18/2008	8/20/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003760	
	8/13/2008	8/14/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003722	
	8/6/2008	8/7/2008	Communication problem	Collected Data	1300003637	
	8/4/2008	8/5/2008	Ultrasonic - Erratic data	Troubleshoot - Ultrasonic sensor probler	1300003599	
	7/31/2008	7/31/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003569	
	7/28/2008	7/29/2008	Communication problem	Collected Data	1300003542	
	7/24/2008	7/24/2008	Communication problem	Collected Data	1300003492	
	7/24/2008	7/24/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003492	
	7/24/2008	7/24/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003492	
	7/17/2008	7/17/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003428	
	7/17/2008	7/17/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003428	
	7/10/2008	7/9/2008	Communication problem	Collected Data	1300003348	
	7/8/2008	7/9/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003321	
	7/3/2008	7/3/2008	Communication problem	Collected Data	1300003252	
	7/3/2008	7/3/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003252	
	7/1/2008	7/1/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003230	
	7/1/2008	7/1/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003230	
	6/26/2008	6/26/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003196	
	6/23/2008	6/24/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003160	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN42_060W047	6/19/2008	6/19/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003131	
	6/17/2008	6/17/2008	Communication problem	Collected Data	1300003088	
	6/12/2008	6/12/2008	Ultrasonic problem	Scrub/Clean Sensors	1300003047	
	6/10/2008	6/10/2008	Communication problem	Collected Data	1300003014	
	6/5/2008	6/5/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002950	
	6/3/2008	6/3/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300002924	
	6/3/2008	6/3/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002924	
	5/29/2008	5/29/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002856	
	5/27/2008	5/27/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300002808	
	5/22/2008	5/22/2008	Communication problem	Collected Data	1300002777	
	5/20/2008	5/20/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002745	
	5/15/2008	5/15/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300002671	
	5/15/2008	5/15/2008	Velocity - Erratic data	Scrub/Clean Sensors	1300002671	
	5/13/2008	5/13/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002645	
	5/6/2008	5/6/2008	Communication problem	Manual Collect	1300002529	
	4/29/2008	4/29/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300002420	
	4/22/2008	4/24/2008	Ultrasonic problem	Troubleshoot - Ultrasonic sensor probler	1300002251	
	4/15/2008	4/15/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300002226	
	4/11/2008	4/14/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002175	
	4/3/2008	4/4/2008	Communication problem	Collected Data	1300002093	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN42_060W047	4/1/2008	4/2/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002065	
	3/24/2008	3/27/2008	Confirmation(Profile)	Confirmation(Profile/Weir)	1300001950	
	3/17/2008	3/18/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300001852	
	3/12/2008	3/12/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300001812	
	2/1/2008	2/4/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300001459	
	1/28/2008	2/4/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300001418	
	1/10/2008	1/15/2008	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300001224	
	1/4/2008	1/7/2008	Battery low - Monitor	Replaced Battery - Monitor	1300001137	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES043_MH060W04	6/26/2009	6/26/2009	Communication problem	Manual Collect	1300007214	
	6/22/2009	6/22/2009	Communication problem	Manual Collect	1300007104	
	6/12/2009	6/12/2009	Battery low - Monitor	Replaced Battery - Monitor	1300007028	
	6/12/2009	6/12/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300007028	
	6/11/2009	6/12/2009	Communication problem	Manual Collect	1300007024	
	5/27/2009	5/27/2009	Ultrasonic - spikes	Other	1300007164	
	5/22/2009	5/22/2009	Ultrasonic - spikes	Other	1300007100	
	5/19/2009	5/21/2009	Communication problem	Manual Collect	1300007089	
	5/18/2009	5/18/2009	Communication problem	Manual Collect	1300006937	
	5/15/2009	5/15/2009	Communication problem	Manual Collect	1300006925	
	5/12/2009	5/13/2009	Confirmation(Profile)	Confirmation(Profile/Weir)	1300006731	
	5/12/2009	5/13/2009	Velocity - Zeros	Replaced Velocity Sensor	1300006731	
	4/13/2009	4/13/2009	Communication problem	Manual Collect	1300006462	
	4/10/2009	4/10/2009	Communication problem	Manual Collect	1300006441	
	2/25/2009	2/26/2009	Pressure problem	Replaced Pressure Sensor	1300004848	
	2/24/2009	2/25/2009	Communication problem	Manual Collect	1300005876	
	2/20/2009	3/12/2009	Communication problem	Manual Collect	1300005939	
	2/17/2009	2/18/2009	Communication problem	Manual Collect	1300005794	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES043_MH060W04	2/16/2009	2/20/2009	Communication problem	No problem	1300005941	
	2/16/2009	2/20/2009	Other	Other	1300005940	
	2/10/2009	2/11/2009	Communication problem	Re-Install	1300005720	
	2/9/2009	2/9/2009	Communication problem	Manual Collect	1300005641	
	1/23/2009	1/23/2009	Communication problem	Manual Collect	1300005614	
	1/16/2009	1/16/2009	Communication problem	Manual Collect	1300005466	
	1/13/2009	1/13/2009	Other	Other	1300005369	
	12/29/2008	12/31/2008	Other	Other	1300005132	
	12/3/2008	12/5/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004813	
	12/3/2008	12/5/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300004813	
	11/21/2008	11/21/2008	Communication problem	Other	1300004699	
	11/14/2008	11/14/2008	Communication problem	Manual Collect	1300004617	
	10/10/2008	10/10/2008	Communication problem	Reset Monitor/Board	1300004312	
	10/8/2008	10/8/2008	Communication problem	Other	1300004282	
	10/6/2008	10/6/2008	Communication problem	Other	1300004265	
	8/29/2008	8/29/2008	Communication problem	Reset Monitor/Board	1300003913	
	8/27/2008	8/28/2008	Communication problem	Reset Monitor/Board	1300003893	
	8/8/2008	8/8/2008	Communication problem	Reset Monitor/Board	1300003666	
	8/1/2008	8/1/2008	Communication problem	Reset Monitor/Board	1300003771	
	7/25/2008	7/25/2008	Communication problem	Manual Collect	1300003553	

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Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES043_MH060W04	7/15/2008	7/16/2008	Communication problem	No problem	1300003406	
	5/20/2008	5/20/2008	Communication problem	Reset Monitor/Board	1300002872	
	4/30/2008	5/2/2008	Battery low - Monitor	Replaced Battery - Monitor	1300002442	
	4/1/2008	4/25/2008	Communication problem	No problem	1300002072	
	2/22/2008	2/22/2008	Communication problem	Reset Monitor/Board	1300001588	
	1/8/2008	1/9/2008	Other	Other	1300001196	
	12/26/2007	12/26/2007	Communication problem	Reset Monitor/Board	1300001052	
	11/12/2007	11/13/2007	Battery low - Monitor	Replaced Battery - Monitor	1300000728	
	10/29/2007	10/30/2007	Communication problem	Other	1300000671	
	10/25/2007	10/26/2007	Communication problem	Other	1300000657	
	10/25/2007	10/26/2007	Manual Data collect	Manual Collect	1300000657	
	10/17/2007	10/23/2007	Communication problem	No problem	1300000619	
	10/4/2007	10/5/2007	Communication problem	Other	1300000532	
	9/28/2007	10/2/2007	Communication problem	Reset Monitor/Board	1300000505	
	9/28/2007	10/2/2007	Manual Data collect	Manual Collect	1300000505	
	9/11/2007	9/14/2007	Communication problem	Replaced Monitor	1300000411	
	9/11/2007	9/14/2007	Manual Data collect	Manual Collect	1300000411	
	9/11/2007	9/14/2007	Pressure problem	Scrub/Clean Sensors	1300000411	
	9/11/2007	9/14/2007	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300000411	
	8/22/2007	9/4/2007	Communication problem	No problem	1300000341	

Customer *Seattle Public Utility (SPU)*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES043_MH060W04	8/22/2007	9/4/2007	Manual Data collect	Manual Collect	1300000341	
	8/14/2007	8/14/2007	Communication problem	Replaced Monitor	1300000292	
	8/14/2007	8/14/2007	Manual Data collect	Manual Collect	1300000292	
	8/7/2007	8/14/2007	Communication problem	Reset Monitor/Board	1300000254	
	8/7/2007	8/14/2007	Manual Data collect	Manual Collect	1300000254	

Service History Report

Customer *Seattle Public Utility (SPU)*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES042_MH060W05	6/25/2009	6/26/2009	Velocity - Zeros	Scrub/Clean Sensors	1300007203	
	6/16/2009	6/18/2009	Velocity - Zeros	Scrub/Clean Sensors	1300007051	
	6/11/2009	6/12/2009	Communication problem	Manual Collect	1300007023	
	5/18/2009	5/18/2009	Communication problem	Manual Collect	1300006936	
	5/8/2009	5/8/2009	Communication problem	Manual Collect	1300006691	
	4/22/2009	4/23/2009	Velocity problem	Scrub/Clean Sensors	1300006574	
	4/22/2009	4/23/2009	Velocity problem	Confirmation(Profile/Weir)	1300006574	
	3/27/2009	3/27/2009	Communication problem	Manual Collect	1300006240	
	3/6/2009	3/6/2009	Communication problem	Manual Collect	1300005986	
	3/2/2009	3/2/2009	Battery low - Monitor	Replaced Battery - Monitor	1300005903	
	3/2/2009	3/2/2009	Battery Low - Wireless	Replaced Battery - Wireless	1300005903	
	2/27/2009	2/27/2009	Communication problem	Manual Collect	1300005885	
	2/27/2009	2/20/2009	Communication problem	No problem	1300005883	
	2/20/2009	2/20/2009	Communication problem	Manual Collect	1300006001	
	1/28/2009	1/29/2009	Ultrasonic - spikes	Scrub/Clean Sensors	1300005547	
	1/20/2009	1/22/2009	Communication problem	No problem	1300005433	
	11/10/2008	11/10/2008	Flow change	Confirmation(Profile/Weir)	1300004608	
	11/5/2008	11/5/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004520	

Customer *Seattle Public Utility (SPU)*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES042_MH060W05	11/5/2008	11/5/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300004520	
	11/5/2008	11/5/2008	Velocity - Zeros	Scrub/Clean Sensors	1300004520	
	11/3/2008	11/4/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004513	
	10/27/2008	10/27/2008	Communication problem	Manual Collect	1300004466	
	10/21/2008	10/24/2008	Communication problem	No problem	1300004413	
	10/8/2008	10/8/2008	Communication problem	Other	1300004283	
	10/6/2008	10/6/2008	Communication problem	Other	1300004264	
	10/3/2008	10/3/2008	Communication problem	Other	1300004246	
	9/26/2008	9/26/2008	Communication problem	Manual Collect	1300004189	
	8/11/2008	8/11/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300003680	
	7/31/2008	7/31/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003657	
	7/21/2008	7/22/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300003459	
	7/18/2008	7/18/2008	Communication problem	Reset Monitor/Board	1300003477	
	7/18/2008	7/18/2008	Communication problem	Other	1300003477	
	7/18/2008	7/18/2008	Communication problem	Manual Collect	1300003477	
	6/12/2008	6/13/2008	Confirmation(PVD)	Confirmation(Profile/Weir)	1300003059	
	5/29/2008	5/30/2008	Ultrasonic - spikes	Scrub/Clean Sensors	1300002880	
	5/16/2008	5/20/2008	Confirmation(PVD)	Confirmation(Profile/Weir)	1300002701	
	5/16/2008	5/20/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002701	
	4/17/2008	4/18/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300002266	

Customer *Seattle Public Utility (SPU)*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
NPDES042_MH060W05	3/28/2008	3/28/2008	Communication problem	Replaced Antenna	1300002002	
	3/25/2008	3/26/2008	Communication problem	Replaced Antenna	1300001974	
	3/10/2008	3/10/2008	Velocity - spikes/drop out	Scrub/Clean Sensors	1300001781	
	1/8/2008	1/9/2008	Other	Other	1300001195	
	12/26/2007	12/27/2007	Velocity - Zeros	Scrub/Clean Sensors	1300001044	
	12/19/2007	12/26/2007	Battery low - Monitor	Replaced Battery - Monitor	1300000998	
	10/29/2007	10/29/2007	Ultrasonic - spikes	Scrub/Clean Sensors	1300000664	
	10/22/2007	10/22/2007	Ultrasonic - spikes	Scrub/Clean Sensors	1300000632	
	10/12/2007	10/16/2007	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300000581	
	9/26/2007	9/27/2007	Ultrasonic - Erratic data	Scrub/Clean Sensors	1300000491	
	9/26/2007	9/27/2007	Velocity - Zeros	Scrub/Clean Sensors	1300000491	
	9/5/2007	9/14/2007	Velocity - spikes/drop out	Scrub/Clean Sensors	1300000383	
	8/21/2007	8/27/2007	Communication problem	Replaced Monitor	1300000335	
	8/21/2007	8/27/2007	Manual Data collect	Manual Collect	1300000335	
	8/7/2007	8/14/2007	Communication problem	No problem	1300000263	
	8/7/2007	8/14/2007	Manual Data collect	No problem	1300000263	

067-014 is operated through the RainCatchers data collection program. Service reports are not available for this site.

067-024 is operated through the RainCatchers data collection program. Service reports are not available for this site.

067-029 is operated through the RainCatchers data collection program. Service reports are not available for this site.

Service History Report

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Customer *Genesee*

Site Name	Reported	Site Visit	Problem	Resolution	WorkOrderID	RefNo:
GEN38_D059191	3/4/2009	3/12/2009	Pressure problem	Confirmation(PVD)	1300005977	
	1/26/2009	1/27/2009	Communication problem	Manual Collect	1300005505	
	1/14/2009	1/13/2009	Communication problem	Manual Collect	1300005384	
	1/7/2009	1/8/2009	Communication problem	Manual Collect	1300005291	
	11/3/2008	11/4/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004519	
	9/8/2008	9/11/2008	Battery low - Monitor	Replaced Battery - Monitor	1300004021	
	9/3/2008	9/4/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003950	
	7/31/2008	7/31/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003561	
	7/15/2008	7/16/2008	Battery low - Monitor	Replaced Battery - Monitor	1300003400	
	7/10/2008	7/10/2008	Battery Low - Wireless	No problem	1300003349	
	5/20/2008	5/20/2008	Battery low - Monitor	Replaced Battery - Monitor	1300002747	
	4/17/2008	4/17/2008	Battery Low - Wireless	Replaced Battery - Wireless	1300002250	
	3/31/2008	3/31/2008	Communication problem	Collected Data	1300002039	
	3/24/2008	3/25/2008	Communication problem	Collected Data	1300001945	
	3/19/2008	3/20/2008	Communication problem	Collected Data	1300001906	
	3/17/2008	3/17/2008	Communication problem	Collected Data	1300001847	
	3/12/2008	3/13/2008	Communication problem	Collected Data	1300001817	
	3/7/2008	3/10/2008	Communication problem	Collected Data	1300001752	

Customer *Genesee*

Site Name	***Reported***	***Site Visit***	***Problem***	***Resolution***	***WorkOrderID***	***RefNo:***
GEN38_D059191	3/5/2008	3/5/2008	Communication problem	Manual Collect	1300001734	
	2/25/2008	2/26/2008	Communication problem	Manual Collect	1300001611	

Pump Station #5 is operated by Seattle Public Utilities. Service reports are not available for this site.

Pump Station #6 is operated by Seattle Public Utilities. Service reports are not available for this site.

Rainier Avenue Lift Station is operated by King County Service reports are not available for this site.

Appendix G: ADS Calibration Matrix

South Genesee CSO Basin Master Site Summary Matrix
Phase I (Jan to June 08)

SITE LISTING	DATE INSTALLED	TYPE	DATA START	DATA END	FINAL DATA TYPE	PIPE H	PIPE W	Shape	PO	GAIN	FINAL GAIN if changed after balance	A/P	Depth Ajd	FINAL DEPTH Ajd if changed after balance	Silt	FINAL SILT if changed after balance	Confirmation on Weir?	Final D	Final Q	Balance US & DS	Reconstitution	Back-water	Surcharge	Final Comment	Final Check
GEN38_059121	12/19/2007	CSO	12/21/2007	6/10/2008	Flow	22.88	25.25	Elliptical	1.38	0.84		0.90	0.00		0.00			Unidepth	Continuity	N/A	None	No	No		complete
GEN38_059131	1/4/2008	CSO	1/5/2008	6/10/2008	Flow	41.75	42.25	Elliptical	1.38	0.90		0.90	0.00		4.00		NA	Unidepth	Continuity	Yes	Velocity data reconstituted throughout entire monitoring period	No	No	Hydraulics rarely reach above 2.0 fps	complete
GEN38_059320	12/12/2007	CSO	12/21/2007	6/10/2008	Flow	23.00	23.25	Elliptical	1.50	0.63		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	Velocity data reconstituted throughout entire monitoring period	No	No	Hydraulics rarely reach above1.75 fps	complete
GEN38_059332	12/20/2007	CSO	12/21/2007	6/10/2008	Flow	38.63	40.00	Elliptical	1.38	0.56		0.55	0.00		0.00		NA	Unidepth	Continuity	Yes	Minimum data frequently reconstituted (drops to zero)	No	No	Hydraulics rarely reach above1.25 fps	complete
GEN38_059371	1/3/2008	CSO	1/5/2008	6/10/2008	Flow	15.25	15.00	Elliptical	1.50	0.69		0.90	0.00		0.25	0.00	NA	Unidepth	Continuity	N/A	Reconstitution performed for drops to zero and outlyers using best fit curve for entire data set	No	No	Hydraulics rarely reach above 0.70fps	complete
GEN38_059373	12/12/2007	CSO	12/21/2007	6/10/2008	Flow	29.63	30.00	Elliptical	1.50	0.65		0.90	0.00		0.13		NA	Unidepth	Continuity	N/A	Minimal velocity data reconstituted in May and June	No	No		complete
GEN38_059398	12/13/2007	CSO	12/21/2007	6/10/2008	Flow	21.00	21.13	Elliptical	1.50	0.78		0.83	0.00		0.13		NA	Unidepth	Continuity	No, see final comments for NPDES041B	Data frequently reconstituted due to silt conditions at site	Yes, 4/22/08; 5/21/08	No	Site gets continuous silt built up in the line and blocking sensor, ring has been rotated as far as possible to still catch mins	complete
GEN38_059404	12/19/2007	CSO	12/21/2007	6/10/2008	Flow	15.00	14.63	Elliptical	1.38	0.92		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes	Minimum data reconstituted from 5/1-6/10	No	No		complete
GEN38_059451	12/19/2007	CSO	12/21/2007	6/10/2008	Flow	71.88	72.13	Elliptical	1.25	1.08		0.90	0.00		0.00		NA	Unidepth	Continuity	Balances most day, slightly out of balance a few days here and there.	No	Yes, at depths > 5"	No		complete
GEN38_059498A	12/18/2007	CSO	12/21/2007	6/10/2008	Flow	72.38	72.38	Circular	1.50	0.88	0.88	0.90	0.00	0.00	2.75		NA	Unidepth	Continuity	Yes	Minimum data, and few outlyers, frequently reconstituted (drops to zero) throughout period	Yes, typically at depths > 15"	No		complete
GEN38_060W012	12/12/2007	CSO	12/21/2007	6/10/2008	Flow	14.75	14.88	Circular	1.25	0.98		0.90	0.00		0.00		NA	Unidepth	Continuity	No, see final comments for NPDES165	Minimum data in February and March reconstituted to fit the appropriate curve	No	No		complete
GEN38_D059191	1/31/2008	CSO	2/1/2008	6/10/2008	Flow	96.00	96.00	Circular	1.38	0.90		0.90	0.00		0.25		NA	Unidepth	Continuity	N/A	No data reconstituted due to flow conditions	*No	No	stagnant pool	complete
GEN40_059407	12/19/2007	CSO	12/21/2007	6/10/2008	Flow	10.13	10.13	Circular	1.75	1.03		0.90	0.00		0.00		NA	Unidepth	Continuity	Balancing very tight with us/ site 490	Data frequently reconstituted from mid Dec - January and again in March. Proceeded by very minimal reconstitution to outlyers	No	No		complete
GEN40_059409	1/24/2008	CSO	1/25/2008	6/10/2008	Flow	10.00	10.00	Circular	1.25	0.87		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	Minimal reconstitution to drops to zeros in March and April	No	No		complete
GEN40_059436	1/24/2008	CSO	1/25/2008	6/10/2008	Flow	14.00	14.00	Circular	1.38	0.90		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	Minimal data reconstituted 3/1 - 6/10	No	No		complete
GEN40_059490	12/19/2007	CSO	12/21/2007	6/10/2008	Flow	12.13	12.00	Elliptical	1.38	0.66		0.90	0.00		0.00		NA	Unidepth	Continuity	No, see comments for NPDES040	February and April data frequently reconstituted	Yes at depths >3"	Yes frequently		complete
GEN40_059490 Mpt 2	2/7/2008	CSO	2/8/2007	6/10/2008	*Depth Only*	148.50	71.50	Elliptical	123.00	0.90		0.90			1.75			Unidepth	Manning	N/A	None	No	No		complete
GEN42_060W014	12/20/2007	CSO	12/21/2007	6/10/2008	Flow	12.00	11.25	Elliptical	1.50	0.90		0.90	0.00		2.50		NA	Unidepth	Continuity	No, see final comments for NPDES042	Significant velocity reconstitution throughout study period due to hydraulic conditions	Yes at depths > 5"	Yes frequently	Site hydraulics are very slow causing silt build up	complete
GEN42_060W019	12/20/2007	CSO	12/21/2007	6/10/2008	Flow	12.25	11.75	Elliptical	1.63	1.02		0.90	0.00		0.00		NA	Unidepth	Continuity	Still imbalances on rain event, very tight to slightly out of balance on some dry days	12/21 - 1/31 and 3/1-3/31 velocity minimum and drops to zeros reconstituted due to site conditions (very low flow)	Yes at depths >2"	Yes frequently		complete
GEN42_060W047	12/20/2007	CSO	12/21/2007	6/10/2008	Flow	140.50	143.00	Elliptical	1.63	0.73		0.90	0.00		3.00		Pass	Unidepth	Continuity	Yes	Minimal reconstitution throughout study period	Yes at depths > 5"	No	The ultra fires from 12ft above the deck into a 12" cunette. Site conditions contribute to low percentage of U-pair firings	complete
GEN43_060W025	12/13/2007	CSO	12/21/2007	2/7/2008	Flow	8.00	7.88	Elliptical	2.00	0.90		0.90	0.00		0.00		Not performed	Pdepth not used during this data set	Continuity	NA	None	No	No	monitor removed on 2/7/08	complete
NPDES037_MH059489	12/21/2007	CSO NPDES	12/21/2007	6/10/2008	Flow	18.63	18.38	Elliptical		0.90		0.90	0.00	0.00	0.75		Check if possible	Pdepth OK when used	Continuity	N/A	Minimum flows frequently drop to zero due to low velocity. Set all zero velocity during dry weather to 0.75ft/s (minimum observed data value).	No	No	Slow low flow, vertical scattergraph is an indication to use data with caution.	Complete
NPDES038_MH059451	12/21/2007	CSO NPDES	12/21/2007	6/10/2008	Flow	72.75	72.5	Elliptical	1.25	0.90		0.90	0.00		0.00		no, too large	Pdepth ok when used	Site not recommended for DWF calculation (not even Mannings)	no, see final comments	None	Stagnant except for events		Site appears to be mostly stagnant except during rain events. Not recommended for DWF calculation.	DATA NOT SUITABLE FOR DWF
NPDES040_MH059491	12/21/2007	CSO NPDES	12/21/2007	6/10/2008	Flow	80.50	80.50	Circular		0.90		0.90	0.00		0.13	Need another silt measurement	No (site too large)	Pdepth OK when used	Continuity	no	Zero velocity data at less than 4" deep unable to be reconstituted (no good curve fit, no good single value estimate)	Severe backwater at depths greater than 5".	Yes Dec 2/3.	Data set very repeatable.	Complete
NPDES041A_MH059434	12/21/2007	CSO NPDES	12/21/2007	6/10/2008	Flow	14.50	14.13	Elliptical		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Pdepth OK when used	Continuity	Not checked	Zero velocity data at less than 2.5" deep unable to be reconstituted (no good curve fit, no good single value estimate)	Severe backwater at depths greater than 2.5".	No	Slow low flow, vertical scattergraph is an indication to use data with caution. Zero velocity data at less than 2.5" deep unable to be reconstituted (no good curve fit, no good single value estimate) so all data was flagged. Mannings not an appropriate flow estimate.	Complete
NPDES041B_MH059406	12/21/2007	CSO NPDES	12/21/2007	6/10/2008	Flow	12.00	12.00	Circular		0.61		0.90	0.00	Unaccounted for drop in depth 12/15/2007	1.00	Need another silt measurement	Check if possible	Pdepth OK when used	Continuity	No, see final comments	SIGNIFICANT DATA RECONSTITUTION. Used best fit curve for 9/26/2007 - 10/02/2007 for data set to reconstitute erroneous velocity pops and drops from 8/29/2007 - 10/02/2007. Used best fit curve for 10/16/2007 - 11/20/2007 for data set to reconstitute erroneous velocity pops and drops in the <8.5" depth range from 10/03/2007 - 11/20/2007 and flagged remainder. Used best fit curve for 12/12/2007 - 12/18/2007 for data set to reconstitute erroneous velocity pops and drops from 12/12/2007 - 1/8/2008. Used best fit curve for 1/8/2008 - 2/12/2008 for data set to reconstitute erroneous velocity pops and drops from 1/9/2008 - 2/12/2008. Signficant data loss (velocity zero) so used best fit curve estimate for 2/13/2008 - 5/31/2008 for data set to reconstitute majority zero velocity drops from 2/13/2008 - 5/31/2008.	No	No	Presence of silt a problem. Silt most likely comes and goes (measured between 0 - 1.75 inches) causing sharp decreases and increases in depth data set for no apparent reason. Set to 1" due to instability of silt presence.	DATA EXTREMELY MARGINAL FOR DWF
NPDES042_MH060W052	12/21/2007	CSO NPDES	12/21/2007	6/10/2008	Flow	9.50	9.94	Non-Standard		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Pdepth OK when used	Continuity	Not checked	Velocity frequently drop to zero due to low velocity/silt. Set all zero velocity to 1ft/s (average observed velocity data value, rounding of velocity data by sensor may be an issue).	Severe backwater at depths greater than 5".	Yes frequently surcharges (every rain event).	Slow low flow, vertical scattergraph is an indication to use data with caution.	DATA MARGINAL FOR DWF

South Genesee CSO Basin Master Site Summary Matrix
Phase I (Jan to June 08)

SITE LISTING	DATE INSTALLED	TYPE	DATA START	DATA END	FINAL DATA TYPE	PIPE H	PIPE W	Shape	PO	GAIN	FINAL GAIN if changed after balance	A/P	Depth Ajd	FINAL DEPTH Ajd if changed after balance	Silt	FINAL SILT if changed after balance	Confirmation on Weir?	Final D	Final Q	Balance US & DS	Reconstitution	Back-water	Surcharge	Final Comment	Final Check
NPDES043_MH060 W049	12/21/2007	CSO NPDES	12/21/2007	6/10/2008	Flow	24.38	24.13	Elliptical		0.90		0.90	0.00		0.00		No (site too large)	Pdepth OK when used	Continuity	Not checked	None	Severe backwater at depths greater than 5".	Yes 11/16 and 12 2/3/4.	Data fairly repeatable.	Complete
NPDES165_MH067 078	12/21/2007	CSO NPDES	12/21/2007	6/10/2008	Flow	10	10.13	Elliptical		0.90		0.90	0.00		0.25		Check if possible	Pdepth OK when used	Continuity	Not checked	SIGNIFICANT DATA RECONSTITUTION. Used best fit curve for 9/26/2007 - 10/01/2007 for data set to reconstitute erroneous velocity drops from 8/29/2007 - 11/27/2007 in the <2" depth range. Used best fit curve for 1/9/2008 - 1/15/2008 for data set to reconstitute erroneous velocity drops from 11/30/2007 - 1/28/2008. Used best fit curve for 3/12/2008 - 3/18/2008 for data set to reconstitute erroneous velocity drops from 3/2/2008 - 3/18/2008. Used curve where possible, flagged remainder.	No	Yes 12/3 & 3/1	Significant velocity data reconstitution, low slow flows, mutiple hydraulic shifts. Silt level most likely fluctuates. Orifce effect at depths > 9".	DATA MARGINAL FOR DWF

SITE LISTING	DATE INSTALLED	TYPE	DATA START	DATA END	FINAL DATA TYPE	PIPE H	PIPE W	Shape	PO	GAIN	FINAL GAIN if changed after balance	A/P	Depth Ajd	FINAL DEPTH Ajd if changed after balance	Silt	FINAL SILT if changed after balance	Confirmation Weir?	Final D	Final Q	Balance US & DS	Reconstitution	Backwater	Surcharge	Final Comment	Final Check
GEN38_059121	12/19/2007	CSO	6/11/2008	8/31/2008	Flow	22.88	25.25	Elliptical	1.38	0.84		0.90	0.00		0.00			Unidepth	Continuity	N/A	None	No	No	some depth and velocity outlyers were manually edited	complete
GEN38_059131	1/4/2008	CSO	6/11/2008	8/31/2008	Flow	41.75	42.25	Elliptical	1.38	0.90		0.90	0.00		4.00		NA	Unidepth	Continuity	Yes	Velocity data reconstituted throughout entire monitoring period, during minimum flow levels	No	No	Hydraulics rarely reach above 2.0 fps	complete
GEN38_059320	12/12/2007	CSO	6/11/2008	8/31/2008	Flow	23.00	23.25	Elliptical	1.50	0.63		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	Velocity data reconstituted throughout entire monitoring period	No	No	Hydraulics rarely reach above1.75 fps	complete
GEN38_059332	12/20/2007	CSO	6/11/2008	8/31/2008	Flow	38.63	40.00	Elliptical	1.38	0.56		0.55	0.00		0.00		NA	Unidepth	Continuity	Yes	Minimum data frequently reconstituted (drops to zero)	No	No	Hydraulics rarely reach above1.25 fps	complete
GEN38_059371	1/3/2008	CSO	6/11/2008	8/31/2008	Flow	15.25	15.00	Elliptical	1.50	0.69		0.90	0.00		0.25	0.00	NA	Unidepth	Continuity	N/A	Reconstitution performed for drops to zero and outlyers using best fit curve for entire data set	No	No	Hydraulics rarely reach above 0.70fps	complete
GEN38_059373	12/12/2007	CSO	6/11/2008	8/31/2008	Flow	29.63	30.00	Elliptical	1.50	0.65		0.90	0.00		0.13		NA	Unidepth	Continuity	N/A	Minimum velocity reconstituted throughout the monitoring period using a few bestfit curves	No	No		complete
GEN38_059398	12/13/2007	CSO	6/11/2008	8/31/2008	Flow	21.00	21.13	Elliptical	1.50	0.90		0.90	-0.50		0.13		NA	Unidepth	Continuity	No, see final comments for NPDES041B	Data frequently reconstituted due to silt conditions at site	No	No	Site gets continuous silt built up in the line and blocking sensor, ring has been rotated as far as possible to still catch mins	complete
GEN38_059404	12/19/2007	CSO	6/11/2008	8/31/2008	Flow	15.00	14.63	Elliptical	1.38	0.92		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, to slightly out	Minimum data reconstituted throughout the monitoring period	No	No		complete
GEN38_059451	12/19/2007	CSO	6/11/2008	8/31/2008	Flow	71.88	72.13	Elliptical	1.25	1.08		0.90	0.00		0.00		NA	Unidepth	Continuity	Balances most day, slightly out of balance most days.	Zero and outlying velocity data reconstituted in August	Yes, at depths > 5.5"	No		complete
GEN38_059498A	12/18/2007	CSO	6/11/2008	8/31/2008	Flow	72.38	72.38	Circular	1.50	0.88	0.88	0.90	0.00	0.00	2.75		NA	Unidepth	Continuity	Yes	Minimum data, and few outlyers, frequently reconstituted (drops to zero) throughout period	Yes, at depths > 13"	No		complete
GEN38_060W012	12/12/2007	CSO	6/11/2008	8/31/2008	Flow	14.75	14.88	Circular	1.25	0.98		0.90	0.00		0.00		NA	Unidepth	Continuity	No, see final comments for NPDES165	Minimum data in August reconstituted to fit the appropriate curve	No	No		complete
GEN38_D059191	1/31/2008	CSO	6/11/2008	8/31/2008	Flow	96.00	96.00	Circular	1.38	0.90		0.90	0.00		0.25		NA	Unidepth	Continuity	N/A	No data reconstituted due to flow conditions	"No	No	usually stagnant pool with response from velocity during most storm events	complete
GEN40_059407	12/19/2007	CSO	6/11/2008	8/31/2008	Flow	10.13	10.13	Circular	1.75	0.90	0.90	0.90	0.50		0.00		NA	Unidepth	Continuity	Yes	None	No	No		complete
GEN40_059409	1/24/2008	CSO	6/11/2008	8/31/2008	Flow	10.00	10.00	Circular	1.25	0.87		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes	Minimal reconstitution to drops to zeros throughout the monitoring period	No	No		complete
GEN40_059436	1/24/2008	CSO	6/11/2008	8/31/2008	Flow	14.00	14.00	Circular	1.38	0.90		0.90	0.25		0.00		NA	Unidepth	Continuity	N/A	Data reconstituted throughout the monitoring period	No	No		complete
GEN40_059490	12/19/2007	CSO	6/11/2008	8/31/2008	Flow	12.13	12.00	Elliptical	1.38	0.66		0.90	0.00		0.00		NA	Unidepth	Continuity	No, see comments for NPDES040	Velocity zeros and outlyers reconstituted in August	Yes frequently at depths >3"	Yes frequently		complete
GEN40_059490 Mpt 2	2/7/2008	CSO	6/11/2008	8/31/2008	*Depth Only*	148.50	71.50	Elliptical	123.00	0.90		0.90			1.75			Unidepth	Manning	N/A	None	No	No		complete
GEN42_060W014	12/20/2007	CSO	6/11/2008	8/31/2008	Flow	12.00	11.25	Elliptical	1.50	0.90		0.90	0.00		2.75		NA	Unidepth	Continuity	No, see final comments for NPDES042	Significant velocity reconstitution throughout study period due to hydraulic conditions	Yes at depths > 5"	Yes frequently	Site hydraulics are very slow causing silt build up	complete
GEN42_060W019	12/20/2007	CSO	6/11/2008	8/31/2008	Flow	12.25	11.75	Elliptical	1.63	1.02		0.90	0.38	0.00	0.00		NA	Unidepth	Continuity	Still imbalances, but close in June and July	velocity minimum and drops to zeros reconstituted due to site conditions (very low flow) throughout the monitoring period	Yes at depths >2"	Yes frequently	Depth adjustment of -0.38" only for 7/29-8/19 period, not needed any other time	complete
GEN42_060W047	12/20/2007	CSO	6/11/2008	8/31/2008	Flow	140.50	143.00	Elliptical	1.63	0.73		0.90	0.00		3.00		Pass	Avgudepth(U3 and U5) 6/11-7/3, then Unidepth	Continuity	No,came into balance late in August	reconstitution (mostly at minimum flow depths) throughout study period with several diffent bestfit curves	Yes at depths > 5"	No	The ultra fires from 12ft above the deck into a 12" cunette. Site conditions contribute to low percentage of U-pair firings; velocity zeros at higher depths were not reconstituted	complete
NPDES037_MH059 489	12/21/2007	CSO NPDES	6/11/2008	8/31/2008	Flow	18.63	18.38	Elliptical		0.90		0.90	0.00	0.00	0.75		N/A	Pdepth OK when used	Continuity	N/A	Minimum flows frequently drop to zero due to low velocity. Set all zero velocity during dry weather to 0.75ft/s (minimum observed data value).	No	No	Slow low flow, vertical scattergraph is an indication to use data with caution	Complete
NPDES038_MH059 451	12/21/2007	CSO NPDES	6/11/2008	8/31/2008	Flow	72.75	72.5	Elliptical	1.25	0.90		0.90	0.00		0.00		no, too large	Pdepth ok when used	Site not recommended for DWF calculation (not even Mannings)	no, see final comments	None	Stagnant except for events		Site appears to be mostly stagnant except during rain events. Not recommended for DWF calculation.	DATA NOT SUITABLE FOR DWF
NPDES040_MH059 491	12/21/2007	CSO NPDES	6/11/2008	8/31/2008	Flow	80.50	80.50	Circular		0.90		0.90	0.00		0.00		No (site too large)	Pdepth OK when used	Continuity	Not checked	Reconstituted miniml velocity throughout the monitoring period	Severe backwater at depths greater than 5".	No	Data set very repeatable.	Complete
NPDES041A_MH0 59434	12/21/2007	CSO NPDES	6/11/2008	8/31/2008	Flow	14.50	14.13	Elliptical		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Pdepth OK when used	Continuity	Not checked	Reconstituted miniml velocity throughout the monitoring period	Severe backwater at depths greater than 2.5".	No	Slow low flow, vertical scattergraph is an indication to use data with caution. Mannings not an appropriate flow estimate.	Complete
NPDES041B_MH0 59406	12/21/2007	CSO NPDES	6/11/2008	8/31/2008	Flow	12.00	12.00	Circular		0.61		0.90	0.00		1.00		Check if possible	Pdepth OK when used	Continuity	No, see final comments	Minimal velocity reconsistution.	No	No	Presence of silt a problem. Silt most likely comes and goes (measured between 0 - 1.75 inches) causing sharp decreases and increases in depth data set for no apparent reason. Set to 1" due to instability of silt presence.	Complete
NPDES042_MH060 W052	12/21/2007	CSO NPDES	6/11/2008	8/31/2008	Flow	11.88	16.50	Standard Horseshoe		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Pdepth OK when used	Continuity		Velocity frequently drop to zero due to low velocity/silt. Set all zero velocity to 1ft/s (average observed velocity data value, rounding of velocity data by sensor may be an issue).	Severe backwater at depths greater than 3".	No	Slow low flow, vertical scattergraph is an indication to use data with caution.	DATA MARGINAL FOR DWF
NPDES043_MH060 W049	12/21/2007	CSO NPDES	6/11/2008	8/31/2008	Flow	24.38	24.13	Elliptical		0.90		0.90	0.00		0.00		No (site too large)	Pdepth OK when used	Continuity		Minimal	Severe backwater at depths greater than 5".	No	Data fairly repeatable.	Complete
NPDES165_MH067 078	12/21/2007	CSO NPDES	6/11/2008	8/31/2008	Flow	10	10.13	Elliptical		0.90		0.90	0.00		0.25		N/A	Pdepth OK when used	Continuity		SIGNIFICANT DATA RECONSTITUTION.	No	No	Significant velocity data reconstitution, low slow flows, mutiple hydraulic shifts. Silt level most likely fluctuates. Orifce effect at depths > 9".	DATA MARGINAL FOR DWF

SITE LISTING	DATE INSTALLED	TYPE	DATA START	DATA END	FINAL DATA TYPE	PIPE H	PIPE W	Shape	PO	GAIN	FINAL GAIN if changed after balance	A/P	Depth Ajd	FINAL DEPTH Ajd if changed after balance	Silt	FINAL SILT if changed after balance	Confirmation Weir?	Final D	Final Q	Balance US & DS	Reconstitution	Backwater	Surcharge	Final Comment	Final Check
GEN38_059121	12/19/2007	CSO	9/1/2008	9/30/2008	Flow	22.88	25.25	Elliptical	1.38	0.84		0.90	0.00		0.00			Unidepth	Continuity	N/A	None	No	No	No editing was done.	complete
GEN38_059131	1/4/2008	CSO	9/1/2008	9/30/2008	Flow	41.75	42.25	Elliptical	1.38	0.90		0.90	0.00		4.00		NA	Unidepth	Continuity	No, imbalance with D/S site 332	Velocity data reconstituted throughout entire monitoring period, during minimum flow levels	No	No	Hydraulics rarely reach above 2.0 fps	complete
GEN38_059320	12/12/2007	CSO	9/1/2008	9/30/2008	Flow	23.00	23.25	Elliptical	1.50	0.63		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	Velocity data reconstituted throughout entire monitoring period to BF curve derived from the month	No	No	Hydraulics rarely reach above1.75 fps. There were intermittent sampe rate issues this month. Data gaps experienced 9/24-9/25 due to monitor malfunction. The monitor was replaced on 9/25. No sample rate issues since the monitor was replaced.	complete
GEN38_059332	12/20/2007	CSO	9/1/2008	9/30/2008	Flow	38.63	40.00	Elliptical	1.38	0.56		0.55	0.00		0.00		NA	Unidepth	Continuity	No	Minimum data frequently reconstituted (drops to zero)9/1-9/17 zeros reconstituted to BF curve derived from 8/12-9/17. Velocity zeros 9/18-10/8 reconsistuted to BF curve derived from 9/1-10/8	No	No	Hydraulics rarely reach above1.50 fps	complete
GEN38_059346	7/9/2008	OverFlow	9/1/2008	9/30/2008	Flow	72.00	72.88	Elliptical	1.25	0.90		0.90			0.00		N/A	Unidepth	Continuity	N/A	None	No	No	Site is an overflow location. All depth zero and no response in velocity during this period	complete
GEN38_059371	1/3/2008	CSO	9/1/2008	9/30/2008	Flow	15.25	15.00	Elliptical	1.50	0.90		0.90	0.00		0.25	0.00	NA	Unidepth	Continuity	N/A	Reconstitution performed for drops to zero and outlyers using best fit curve for the month	No	No	Hydraulics rarely reach above 0.70fps. The gain was changed to 0.90 for the entire data set. Because of low, slow flow hydraulics and silt, a crew will not be able to get a really accurate confirmation.Data from installation through 8/31 will be re-submitted.	complete
GEN38_059373	12/12/2007	CSO	9/1/2008	9/30/2008	Flow	29.63	30.00	Elliptical	1.50	0.90		0.90	0.00		0.13		NA	Unidepth	Continuity	N/A	Minimum velocity reconstituted throughout the monitoring period using a few bestfit curves derived from 9/1-9/7, 9/8-9/10, 9/11-9/14, 9/17-9/20, 9/19-9/21, and 9/22-10/6.	No	No	Hydraulics rarely reach above 2.0 fps. The gain was changed to 0.90 for the entire data set. Because of low flow hydraulics gains calculated from confirmations are not trusted.Data from installation through 8/31 will be re-submitted.	complete
GEN38_059398	12/13/2007	CSO	9/1/2008	9/30/2008	Flow	21.00	21.13	Elliptical	1.50	0.90		0.90	0.50		0.13		NA	Unidepth	Continuity	No, see final comments for NPDES041B	Data frequently reconstituted due to silt conditions at site to several different curves	No	No	Site gets continuous silt built up in the line and blocking sensor, ring has been rotated as far as possible to still catch mins	complete
GEN38_059404	12/19/2007	CSO	9/1/2008	9/30/2008	Flow	15.00	14.63	Elliptical	1.38	0.92		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, but tight	Minimum data reconstituted throughout the monitoring period to Bestfit curve derived from the month	No	No		complete
GEN38_059451	12/19/2007	CSO	9/1/2008	9/30/2008	Flow	71.88	72.13	Elliptical	1.25	1.08		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes	None	No	No		complete
GEN38_059498A	12/18/2007	CSO	9/1/2008	9/30/2008	Flow	72.38	72.38	Circular	1.50	0.88	0.88	0.90	0.00	0.00	2.75		NA	Unidepth	Continuity	Yes, most days; imbalance seen may be due to storage tank	Minimum data, and few outlyers, frequently reconstituted (drops to zero) throughout period	No	No		complete
GEN38_060W012	12/12/2007	CSO	9/1/2008	9/30/2008	Flow	14.75	14.88	Circular	1.25	0.98		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, most days, see also final comments for NPDES165	Minimum data in reconstituted toBestfit curve derived for the month	No	No		complete
GEN38_D059191	1/31/2008	CSO	9/1/2008	9/30/2008	Flow	96.00	96.00	Circular	1.38	0.90		0.90	0.00		0.25		NA	Unidepth	Continuity	N/A	No data reconstituted due to flow conditions	*No	No	usually stagnant pool with response from velocity during most storm events	complete
GEN40_059407	12/19/2007	CSO	9/1/2008	9/30/2008	Flow	10.13	10.13	Circular	1.75	0.90	0.90	0.90	0.50		0.00		NA	Unidepth	Continuity	Yes, very tight	None	No	No		complete
GEN40_059409	1/24/2008	CSO	9/1/2008	9/30/2008	Flow	10.00	10.00	Circular	1.25	0.87		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	Minimal reconstitution to drops to zeros throughout the monitoring period	No	No		complete
GEN40_059436	1/24/2008	CSO	9/1/2008	9/30/2008	Flow	14.00	14.00	Circular	1.38	0.90		0.90	0.25		0.00		N/A	Unidepth	Continuity	Yes	Data reconstituted throughout the monitoring period	No	No		complete
GEN40_059490	12/19/2007	CSO	9/1/2008	9/30/2008	Flow	12.13	12.00	Elliptical	1.38	0.90		0.90	0.00		0.00		NA	Unidepth	Continuity	No, see comments for NPDES040	None	Yes, on 9/25	Yes, on 9/25	Historical data may have been submitted with incorrect gain value. Recalcualted with 0.90 gain and re-sibmitted all historical data.	complete
GEN40_059490 Mpt 2	2/7/2008	CSO	9/1/2008	9/30/2008	*Depth Only*	148.50	71.50	Elliptical	123.00	0.90		0.90			1.75			Unidepth	Manning	N/A	None	No	No		complete
GEN42_060W014	12/20/2007	CSO	9/1/2008	9/30/2008	Flow	12.00	11.25	Elliptical	1.50	0.90		0.90	0.00		2.75		NA	Unidepth	Continuity	No, see final comments for NPDES042; in and out of balance	Significant velocity reconstitution throughout study period due to hydraulic conditions	Yes at depths > 5"	yes, briefly on 9/20 and 9/25	Site hydraulics are very slow causing silt build up	complete
GEN42_060W019	12/20/2007	CSO	9/1/2008	9/30/2008	Flow	12.25	11.75	Elliptical	1.63	1.02		0.90	0.38	0.00	0.00		NA	Unidepth	Continuity	No	velocity minimum and drops to zeros reconstituted due to site conditions (very low flow) throughout the monitoring period	No	No		complete
GEN42_060W047	12/20/2007	CSO	9/1/2008	9/30/2008	Flow	140.50	143.00	Elliptical	1.63	0.73		0.90	0.00		3.00		Pass	Unidepth	Continuity	No	reconstitution (mostly at minimum flow depths) throughout study period with several diffent bestfit curves	Yes, on 9/20, 9/24, and 9/25		The ultra fires from 12ft above the deck into a 12" cunette. Site conditions contribute to low percentage of U-pair firings; velocity zeros at higher depths were not reconstituted	complete
NPDES037_MH059489	12/21/2007	CSO NPDES	9/1/2008	9/30/2008	Flow	18.63	18.38	Elliptical		0.90		0.90	0.00	0.00	0.75		N/A	Unidepth	Continuity	N/A	Minimum flows frequently drop to zero due to low velocity. Set all zero velocity during dry weather to 0.75ft/s (minimum observed data value).	No	No	Slow low flow, vertical scattergraph is an indication to use data with caution	Complete
NPDES038_MH059451	12/21/2007	CSO NPDES	9/1/2008	9/30/2008	Flow	72.75	72.5	Elliptical	1.25	0.90		0.90	0.00		0.00		no, too large	Unidepth	Site not recommended for DWF calculation (not even Mannings)	no, see final comments	None	Stagnant except for events		Site appears to be mostly stagnant except during rain events. Not recommended for DWF calculation.	DATA NOT SUITABLE FOR DWF
NPDES040_MH059491	12/21/2007	CSO NPDES	9/1/2008	9/30/2008	Flow	80.50	80.50	Circular		0.90		0.90	0.00		0.00		No (site too large)	Unidepth	Continuity	Yes	Reconstituted miniml velocity throughout the monitoring period	Yes, briefly on 9/25	No	Data set very repeatable.	Complete
NPDES041A_MH059434	12/21/2007	CSO NPDES	9/1/2008	9/30/2008	Flow	14.50	14.13	Elliptical		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity	N/A	Reconstituted miniml velocity throughout the monitoring period	No	No	Slow low flow, vertical scattergraph is an indication to use data with caution. Mannings not an appropriate flow estimate.	Complete
NPDES041B_MH059406	12/21/2007	CSO NPDES	9/1/2008	9/30/2008	Flow	12.00	12.00	Circular		0.61		0.90	0.00		1.00			Unidepth	Continuity	Yes	Minimal velocity reconsistution.	No	No	Presence of silt a problem. Silt most likely comes and goes (measured between 0 - 1.75 inches) causing sharp decreases and increases in depth data set for no apparent reason. Set to 1" due to instability of silt presence.	Complete
NPDES042_MH060W052	12/21/2007	CSO NPDES	9/1/2008	9/30/2008	Flow	11.88	16.50	Standard Horseshoe		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity		Velocity frequently drop to zero due to low velocity/silt.	Yes, 9/20 and 9/25	No	Slow low flow, vertical scattergraph is an indication to use data with caution.	DATA MARGINAL FOR DWF
NPDES043_MH060W049	12/21/2007	CSO NPDES	9/1/2008	9/30/2008	Flow	24.38	24.13	Elliptical		0.90		0.90	0.00		0.00		No (site too large)	Unidepth	Continuity		Minimal	No	No	Data fairly repeatable.	Complete
NPDES165_MH067078	12/21/2007	CSO NPDES	9/1/2008	9/30/2008	Flow	10	10.13	Elliptical		0.90		0.90	0.00		0.25		N/A	Unidepth	Continuity		SIGNIFICANT DATA RECONSTITUTION.	No	No	Significant velocity data reconstitution, low slow flows, mutiple hydraulic shifts. Silt level most likely fluctuates. Orifce effect at depths > 9".	DATA MARGINAL FOR DWF

SITE LISTING	DATE INSTALLED	TYPE	DATA START	DATA END	FINAL DATA TYPE	PIPE H	PIPE W	Shape	PO	GAIN	FINAL GAIN if changed after balance	A/P	Depth Ajd	FINAL DEPTH Ajd if changed after balance	Silt	FINAL SILT if changed after balance	Confirmation Weir?	Final D	Final Q	Balance US & DS	Reconstitution	Backwater	Surcharge	Final Comment	Final Check
GEN38_059121	12/19/2007	CSO	10/1/2008	10/31/2008	Flow	22.88	25.25	Elliptical	1.38	0.84		0.90	0.00		0.00			Unidepth	Continuity	N/A	None	No	No	No editing was done.	complete
GEN38_059131	1/4/2008	CSO	10/1/2008	10/31/2008	Flow	41.75	42.25	Elliptical	1.38	0.90		0.90	0.00		4.00		NA	Unidepth	Continuity	No, imbalance with D/S site 332	Velocity data reconstituted throughout entire monitoring period, during minimum flow levels	No	No	Hydraulics rarely reach above 2.0 fps	complete
GEN38_059320	12/12/2007	CSO	10/1/2008	10/31/2008	Flow	23.00	23.25	Elliptical	1.50	0.63		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	Velocity data reconstituted throughout entire monitoring period to BF curve derived from the month	No	No	Hydraulics rarely reach above1.75 fps.	complete
GEN38_059332	12/20/2007	CSO	10/1/2008	10/31/2008	Flow	38.63	40.00	Elliptical	1.38	0.56		0.55	0.00		0.00		NA	Unidepth	Continuity	No	Minimum data frequently reconstituted (drops to zero) to BF curve for the month	No	No	Hydraulics rarely reach above1.50 fps	complete
GEN38_059346	7/9/2008	OverFlow	10/1/2008	10/31/2008	Flow	72.00	72.88	Elliptical	1.25	0.90		0.90			0.00		N/A	Unidepth	Continuity	N/A	None	No	No	Site is an overflow location. All depth zero and no response in velocity during this period	complete
GEN38_059371	1/3/2008	CSO	10/1/2008	10/31/2008	Flow	15.25	15.00	Elliptical	1.50	0.90		0.90	0.00		0.25	0.00	NA	Unidepth	Continuity	N/A	Reconstitution performed for drops to zero and outlyers using best fit curve for the month	No	No	Hydraulics rarely reach above 0.70fps.	complete
GEN38_059373	12/12/2007	CSO	10/1/2008	10/31/2008	Flow	29.63	30.00	Elliptical	1.50	0.90		0.90	0.00		0.13		NA	Unidepth	Continuity	N/A	Minimum velocity reconstituted throughout the monitoring period using several different BF curves.	No	No	Hydraulics rarely reach above 2.0 fps. .	complete
GEN38_059398	12/13/2007	CSO	10/1/2008	10/31/2008	Flow	21.00	21.13	Elliptical	1.50	0.90		0.90	0.50		0.13		NA	Unidepth	Continuity	Yes	Data frequently reconstituted to curve for the month	No	No	Site gets continuous silt built up in the line and blocking sensor, ring has been rotated as far as possible to still catch mins	complete
GEN38_059404	12/19/2007	CSO	10/1/2008	10/31/2008	Flow	15.00	14.63	Elliptical	1.38	0.92		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, but tight	Minimum data reconstituted throughout the monitoring period to Bestfit curve derived from the month	No	No	Bad depth data was flagged 10/17-10/20, 10/27	complete
GEN38_059451	12/19/2007	CSO	10/1/2008	10/31/2008	Flow	71.88	72.13	Elliptical	1.25	1.08		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes	None	No	No		complete
GEN38_059498A	12/18/2007	CSO	10/1/2008	10/31/2008	Flow	72.38	72.38	Circular	1.50	0.88	0.88	0.90	0.00	0.00	2.75		NA	Unidepth	Continuity	No, imbalance seen may be due to storage tank	Minimum data, and few outlyers, frequently reconstituted (drops to zero) throughout period to BF curve derived for the month	No	No		complete
GEN38_060W012	12/12/2007	CSO	10/1/2008	10/31/2008	Flow	14.75	14.88	Circular	1.25	0.98		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, most days, see also final comments for NPDES165	Minimum data in reconstituted toBestfit curve derived for the month	No	No		complete
GEN38_D059191	1/31/2008	CSO	10/1/2008	10/31/2008	Flow	96.00	96.00	Circular	1.38	0.90		0.90	0.00		0.25		NA	Unidepth	Continuity	N/A	No data reconstituted due to flow conditions	Yes, briefly on 10/13	No	usually stagnant pool with response from velocity during most storm events	complete
GEN40_059407	12/19/2007	CSO	10/1/2008	10/31/2008	Flow	10.13	10.13	Circular	1.75	0.90	0.90	0.90	0.50		0.00		NA	Unidepth	Continuity	Yes, very tight	Velocity reconstitution throughout the monitoring periof to BF curved derived for the month.	No	No		complete
GEN40_059409	1/24/2008	CSO	10/1/2008	10/31/2008	Flow	10.00	10.00	Circular	1.25	0.87		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	None	No	No		complete
GEN40_059436	1/24/2008	CSO	10/1/2008	10/31/2008	Flow	14.00	14.00	Circular	1.38	0.90		0.90	0.25		0.00		N/A	Unidepth	Continuity	Yes	Data reconstituted throughout the monitoring period	No	No		complete
GEN40_059490	12/19/2007	CSO	10/1/2008	10/31/2008	Flow	12.13	12.00	Elliptical	1.38	0.90		0.90	0.00		0.00		NA	Unidepth	Continuity	No, see comments for NPDES040	Velocity zeros where valid curve were reconstituted. Left those zeros during events where could not get a valid curve.	Yes, frquently at depths greater than 5.0"	Yes, frequently		complete
GEN40_059490 Mpt 2	2/7/2008	CSO	10/1/2008	10/31/2008	*Depth Only*	148.50	71.50	Elliptical	123.00	0.90		0.90			1.75			Unidepth	Manning	N/A	None	No	No		complete
GEN42_060W014	12/20/2007	CSO	10/1/2008	10/31/2008	Flow	12.00	11.25	Elliptical	1.50	0.90		0.90	0.00		2.75		NA	Unidepth	Continuity	No, see final comments for NPDES042; in and out of balance	Significant velocity reconstitution throughout study period due to hydraulic conditions	Yes at depths > 5"	yes, frequently	Site hydraulics are very slow causing silt build up	complete
GEN42_060W019	12/20/2007	CSO	10/1/2008	10/31/2008	Flow	12.25	11.75	Elliptical	1.63	1.02		0.90	0.38	0.00	0.00		NA	Unidepth	Continuity	No	velocity minimum and drops to zeros reconstituted due to site conditions (very low flow) throughout the monitoring period	Yes, at various depths	Yes, 10/13		complete
GEN42_060W047	12/20/2007	CSO	10/1/2008	10/31/2008	Flow	140.50	143.00	Elliptical	1.63	0.73		0.90	0.00		3.00		Pass	Unidepth	Continuity	No	reconstitution (mostly at minimum flow depths) throughout study period to bestfit curves derived from 10/1-10/16 and 1021-10/30.	Yes, frequently at depths greater than 7.0".	No	The ultra fires from 12ft above the deck into a 12" cunette. Site conditions contribute to low percentage of U-pair firings; velocity zeros at higher depths were not reconstituted. Data gaps 10/16-10/21 was due to a monitor malfucntion. The data rescue failed to retrieve any usable data.	complete
NPDES037_MH059 489	12/21/2007	CSO NPDES	10/1/2008	10/31/2008	Flow	18.63	18.38	Elliptical		0.90		0.90	0.00	0.00	0.75		N/A	Unidepth	Continuity	N/A		No	No	MP1 has ultra sensor only.	Complete
NPDES037_MH059 489 MP2		CSO NPDES	10/1/2008	10/31/2008	Flow	18.63	18.38	Elliptical		0.90		0.90			0.38		N/A	Unidepth	Continuity	N/A	Minimum flows frequently drop to zero due to low velocity.	No	No	MP2 has velocity sensor, ultra and pressure. Slow low flow, vertical scattergraph is an indication to use data with caution	Complete
NPDES038_MH059 451	12/21/2007	CSO NPDES	10/1/200/	10/31/2008	Flow	72.75	72.5	Elliptical	1.25	0.90		0.90	0.00		0.00		no, too large	Unidepth	Site not recommended for DWF calcualtion (not even Mannings)	no, see final comments	None	Stagnant except for events		Site appears to be mostly stagnant except during rain events. Not recommended for DWF calculation.	DATA NOT SUITABLE FOR DWF
NPDES040_MH059 491	12/21/2007	CSO NPDES	10/1/2008	10/31/2008	Flow	80.50	80.50	Circular		0.90		0.90	0.00		0.00		No (site too large)	Unidepth	Continuity	Yes	Reconstituted velocity throughout the monitoring period where a valid curve was generated	Yes, frequently	No	Data set very repeatable.	Complete
NPDES041A_MH0 59434	12/21/2007	CSO NPDES	10/1/2008	10/31/2008	Flow	14.50	14.13	Elliptical		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity	N/A	Reconstituted miniml velocity throughout the monitoring period	No	No	Slow low flow, vertical scattergraph is an indication to use data with caution. Mannings not an appropriate flow estimate.	Complete
NPDES041B_MH0 59406	12/21/2007	CSO NPDES	10/1/2008	10/31/2008	Flow	12.00	12.00	Circular		0.61		0.90	0.00		1.00			Unidepth	Continuity	Yes	Minimal velocity reconsistution.	No	No	Presence of silt a problem. Silt most likely comes and goes (measured between 0 - 1.75 inches) causing sharp decreases and increases in depth data set for no apparent reason. Set to 1" due to instability of silt presence.	Complete
NPDES042_MH060 W052	12/21/2007	CSO NPDES	10/1/200/	10/31/2008	Flow	11.88	16.50	Standard Horseshoe		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity		Velocity frequently drop to zero due to low velocity/silt. Negative velocities were flagged. Left velocity zeros during backwater.	Yes, frequently	No	Slow low flow, vertical scattergraph is an indication to use data with caution.	DATA MARGINAL FOR DWF
NPDES043_MH060 W049	12/21/2007	CSO NPDES	10/1/2008	10/31/2008	Flow	24.38	24.13	Elliptical		0.90		0.90	0.00		0.00		No (site too large)	Unidepth	Continuity	N/A	Minimal	No	No	Data repeatable.	Complete
NPDES165_MH067 078	12/21/2007	CSO NPDES	10/1/200/	10/31/2008	Flow	10	10.13	Elliptical		0.90		0.90	0.00		0.25		N/A	Unidepth	Continuity		SIGNIFICANT DATA RECONSTITUTION.	No	No	Significant velocity data reconstitution, low slow flows, mutiple hydraulic shifts. Silt level most likely fluctuates. Orifce effect at depths > 9".	DATA MARGINAL FOR DWF

SITE LISTING	DATE INSTALLED	TYPE	DATA START	DATA END	FINAL DATA TYPE	PIPE H	PIPE W	Shape	PO	GAIN	FINAL GAIN if changed after balance	A/P	Depth Ajd	FINAL DEPTH Ajd if changed after balance	Silt	FINAL SILT if changed after balance	Confirmation Weir?	Final D	Final Q	Balance US & DS	Reconstitution	Backwater	Surcharge	Final Comment	Final Check
GEN38_059121	12/19/2007	CSO	11/1/2008	11/30/2008	Flow	22.88	25.25	Elliptical	1.38	0.84		0.90	0.00		0.00			Unidepth	Continuity	N/A	None	No	No	No editing was done.	complete
GEN38_059131	1/4/2008	CSO	11/1/2008	11/30/2008	Flow	41.75	42.25	Elliptical	1.38	0.90		0.90	0.00		4.00		NA	Unidepth	Continuity	yes	Velocity data reconstituted throughout entire monitoring period, during minimum flow levels	No	No	Hydraulics rarely reach above 2.0 fps	complete
GEN38_059320	12/12/2007	CSO	11/1/2008	11/30/2008	Flow	23.00	23.25	Elliptical	1.50	0.63		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	Minimal velocity reconstituted this month.	No	No	Hydraulics rarely reach above1.75 fps. Data gaps 11/13-11/18 due to monitor malfunction. Data rescue failed.	complete
GEN38_059332	12/20/2007	CSO	11/1/2008	11/30/2008	Flow	38.63	40.00	Elliptical	1.38	0.56		0.55	2.70		0.00		NA	Unidepth	Continuity	No	Minimum data frequently reconstituted (drops to zero) to BF curve for the month	Yes, at depth greater than 12"	No	Hydraulics rarely reach above1.50 fps. Crew moved the velocity sensor about 8 feet up the pipe to avoid interference and get better data. Depth adjustment made 11/14 on to correct depth data that was collected with incorrect lif parameters after the velocity sensor was moved up the pipe. Confirmation validated the depth adjustment. Flagged velocity data before the velocity was moved.	complete
GEN38_059346	7/9/2008	OverFlow	11/1/2008	11/30/2008	Flow	72.00	72.88	Elliptical	1.25	0.90		0.90			0.00		N/A	Unidepth	Continuity	N/A	None	No	No	Site is an overflow location. All depth zero and no response in velocity during this period	complete
GEN38_059371	1/3/2008	CSO	11/1/2008	11/30/2008	Flow	15.25	15.00	Elliptical	1.50	0.90		0.90	0.00		0.25	0.00	NA	Unidepth	Continuity	N/A	Reconstitution performed for drops to zero and outlyers using best fit curve for the month	No	No	Hydraulics rarely reach above 0.70fps.	complete
GEN38_059373	12/12/2007	CSO	11/1/2008	11/30/2008	Flow	29.63	30.00	Elliptical	1.50	0.90		0.90	0.00		0.13		NA	Unidepth	Continuity	N/A	Minimum velocity reconstituted a few days this month manually	No	No	Hydraulics rarely reach above 2.0 fps. .	complete
GEN38_059398	12/13/2007	CSO	11/1/2008	11/30/2008	Flow	21.00	21.13	Elliptical	1.50	0.90		0.90	0.50		0.13		NA	Unidepth	Continuity	Yes	Data frequently reconstituted to curve for the month	No	No	Site gets continuous silt built up in the line and blocking sensor, ring has been rotated as far as possible to still catch mins	complete
GEN38_059404	12/19/2007	CSO	11/1/2008	11/30/2008	Flow	15.00	14.63	Elliptical	1.38	0.92		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, very tight to slightly out of balance	Minimum data reconstituted throughout the monitoring period to Bestfit curve derived from the month	No	No		complete
GEN38_059451	12/19/2007	CSO	11/1/2008	11/30/2008	Flow	71.88	72.13	Elliptical	1.25	1.08		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes	None	No	No		complete
GEN38_059498A	12/18/2007	CSO	11/1/2008	11/30/2008	Flow	72.38	72.38	Circular	1.50	0.88	0.88	0.90	0.00	0.00	2.75		NA	Unidepth	Continuity	No, imbalance seen may be due to storage tank	frequently reconstituted (drops to zero) throughout period to BF curve derived for the month	No	No		complete
GEN38_060W012	12/12/2007	CSO	11/1/2008	11/30/2008	Flow	14.75	14.88	Circular	1.25	0.98		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, see also final comments for NPDES165	None	No	No	Data gap 11/25- end of the month, data retrieval failed.	complete
GEN38_D059191	1/31/2008	CSO	11/1/2008	11/30/2008	Flow	96.00	96.00	Circular	1.38	0.90		0.90	0.00		0.25		NA	Unidepth	Continuity	N/A	No data reconstituted due to flow conditions	No	No	usually stagnant pool with response from velocity during most storm events	complete
GEN40_059407	12/19/2007	CSO	11/1/2008	11/30/2008	Flow	10.13	10.13	Circular	1.75	0.90	0.90	0.90	0.50		0.00		NA	Unidepth	Continuity	Yes, very tight	None	No	No	Small data gap on 1/26 when the monitor was being replaced	complete
GEN40_059409	1/24/2008	CSO	11/1/2008	11/30/2008	Flow	10.00	10.00	Circular	1.25	0.87		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	None	No	No		complete
GEN40_059436	1/24/2008	CSO	11/1/2008	11/30/2008	Flow	14.00	14.00	Circular	1.38	0.90		0.90	0.25		0.00		N/A	Unidepth	Continuity	Yes	Data reconstituted throughout the monitoring period	No	No		complete
GEN40_059490	12/19/2007	CSO	11/1/2008	11/30/2008	Flow	12.13	12.00	Elliptical	1.38	0.90		0.90	0.00		0.00		NA	Unidepth	Continuity	No, see comments for NPDES040	None, Left those zeros during events where could not get a valid curve.	Yes, frquently at depths greater than 5.0"	Yes, frequently	Data gap 11/20- end of the month, data retrieval failed. Gap 11/7-11/11 malfunctioning ultrasonic sensor	complete
GEN40_059490 Mpt 2	2/7/2008	CSO	11/1/2008	11/30/2008	*Depth Only*	148.50	71.50	Elliptical	123.00	0.90		0.90			1.75			Unidepth	Manning	N/A	None	No	No	Data gap 11/20-11/25, data retrieval failed after monitor swap	complete
GEN42_060W014	12/20/2007	CSO	11/1/2008	11/30/2008	Flow	12.00	11.25	Elliptical	1.50	0.90		0.90	0.00		2.75		NA	Unidepth/Pdepth	Continuity	No, see final comments for NPDES042; in and out of balance	None	Yes at depths > 5"	yes, frequently	Site hydraulics are very slow causing silt build up; Re-imported all negative velocity that has previously been edited and left as reported from the meter	complete
GEN42_060W019	12/20/2007	CSO	11/1/2008	11/30/2008	Flow	12.25	11.75	Elliptical	1.63	1.02		0.90	0.38	0.00	0.00		NA	Unidepth/Pdepth	Continuity	No	None	Yes, at various depths	Yes, frequently	Re-imported all negative velocity that has previously been edited and left as reported from the meter	complete
GEN42_060W047	12/20/2007	CSO	11/1/2008	11/30/2008	Flow	140.50	143.00	Elliptical	1.63	0.73		0.90	0.00		3.00		Pass	Unidepth	Continuity	No	None	Yes, frequently at depths greater than 7.0".	No	The ultra fires from 12ft above the deck into a 12" cunette. Site conditions contribute to low percentage of U-pair firings; velocity zeros at higher depths were not reconstituted. Re-imported all negative velocity that has previously been edited and left as reported from the meter; Gap in depth 11/3-11/6 due to malfunction. Monitor was replaced on 11/6.	complete
NPDES037_MH059489	12/21/2007	CSO NPDES	11/1/2008	11/30/2008	Flow	18.63	18.38	Elliptical		0.90		0.90	0.00	0.00	0.75		N/A	Unidepth	Continuity	N/A		No	No	MP1 has ultra sensor only,	Complete
NPDES037_MH059489 MP2		CSO NPDES	11/1/2008	11/30/2008	Flow	18.63	18.38	Elliptical		0.90		0.90			0.38		N/A	Unidepth	Continuity	N/A	Minimum flows frequently drop to zero due to low velocity.	No	No	MP2 has velocity sensor, ultra and pressure. Slow low flow, vertical scattergraph is an indication to use data with caution	Complete
NPDES038_MH059451	12/21/2007	CSO NPDES	11/1/2008	11/30/2008	Flow	72.75	72.5	Elliptical	1.25	0.90		0.90	0.00		0.00		no, too large	Unidepth	Site not recommended for DWF calculation (not even Mannings)	no, see final comments	None	Stagnant except for events		Site appears to be mostly stagnant except during rain events. Not recommended for DWF calculation.	DATA NOT SUITABLE FOR DWF
NPDES040_MH059491	12/21/2007	CSO NPDES	11/1/2008	11/30/2008	Flow	80.50	80.50	Circular		0.90		0.90	0.00		0.00		No (site too large)	Unidepth	Continuity	Yes	Reconstituted velocity throughout the monitoring period where a valid curve was generated	Yes, frequently	No	Data set very repeatable.	Complete
NPDES041A_MH059434	12/21/2007	CSO NPDES	11/1/2008	11/30/2008	Flow	14.50	14.13	Elliptical		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity	N/A	Reconstituted minimi velocity throughout the monitoring period	No	No	Slow low flow, vertical scattergraph is an indication to use data with caution. Mannings not an appropriate flow estimate.	Complete
NPDES041B_MH059406	12/21/2007	CSO NPDES	11/1/2008	11/30/2008	Flow	12.00	12.00	Circular		0.84		0.90	0.00		1.00			Unidepth	Continuity	No, very tight to slightly out of balance	Minimal velocity reconsistution.	No	Yes	Presence of silt a problem. Silt most likely comes and goes (measured between 0 - 1.75 inches) causing sharp decreases and increases in depth data set for no apparent reason. Set to 1" due to instability of silt presence.	Complete
NPDES042_MH060W052	12/21/2007	CSO NPDES	11/1/2008	11/30/2008	Flow	11.88	16.50	Standard Horseshoe		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity		Velocity frequently drop to zero due to low velocity/silt. Negative velocities were left. Left velocity zeros during backwater.	Yes, frequently	No	Slow low flow, vertical scattergraph is an indication to use data with caution.	DATA MARGINAL FOR DWF
NPDES043_MH060W049	12/21/2007	CSO NPDES	11/1/2008	11/30/2008	Flow	24.38	24.13	Elliptical		0.90		0.90	0.00		0.00		No (site too large)	Unidepth	Continuity	N/A	Minimal	yes	yes	Data repeatable.	Complete
NPDES165_MH067078	12/21/2007	CSO NPDES	11/1/2008	11/30/2008	Flow	10	10.13	Elliptical		0.90		0.90	0.00		0.25		N/A	Unidepth	Continuity		SIGNIFICANT DATA RECONSTITUTION.	No	No	Significant velocity data reconstitution, low slow flows, mutiple hydraulic shifts. Silt level most likely fluctuates. Orifice effect at depths > 9".	DATA MARGINAL FOR DWF

SITE LISTING	DATE INSTALLED	TYPE	DATA START	DATA END	FINAL DATA TYPE	PIPE H	PIPE W	Shape	PO	GAIN	FINAL GAIN if changed after balance	A/P	Depth Ajd	FINAL DEPTH Ajd if changed after balance	Silt	FINAL SILT if changed after balance	Confirmation Weir?	Final D	Final Q	Balance US & DS	Reconstitution	Backwater	Surcharge	Final Comment	Final Check
GEN38_059121	12/19/2007	CSO	12/1/2008	12/31/2008	Flow	22.88	25.25	Elliptical	1.38	0.84		0.90	0.00		0.00			Unidepth	Continuity	N/A	None	No	No		complete
GEN38_059131	1/4/2008	CSO	12/1/2008	12/31/2008	Flow	41.75	42.25	Elliptical	1.38	0.90		0.90	0.00		4.00		NA	Unidepth	Continuity	yes	Velocity data reconstituted to stored Bestfit curve for phasee ii	No	No	Hydraulics rarely reach above 2.0 fps	complete
GEN38_059320	12/12/2007	CSO	12/1/2008	12/31/2008	Flow	23.00	23.25	Elliptical	1.50	0.63		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	Minimal velocity reconstituted this month.	No	No	Hydraulics rarely reach above1.75 fps. Data gaps 11/13-11/18 due to monitor malfunction. Data rescue failed.	complete
GEN38_059332	12/20/2007	CSO	12/1/2008	12/31/2008	Flow	40.38	38.25	Elliptical	1.38	0.56		0.55	2.70		0.00		NA	Unidepth	Continuity	No	Minimum data frequently reconstituted (drops to zero) to BF curve for the month	No	No	Hydraulics rarely reach above1.50 fps. Crew moved the velocity sensor about 8 feet up the pipe to avoid interference and get better data. Depth adjustment made 11/14 on to correct depth data that was collected with incorrect lif parameters after the velocity sensor was moved up the pipe. Confirmation validated the depth adjustment. Flagged velocity data before the velocity was moved.	complete
GEN38_059346	7/9/2008	OverFlow	12/1/2008	12/31/2008	Flow	72.00	72.88	Elliptical	1.25	0.90		0.90			0.00		N/A	Unidepth	Continuity	N/A	None	No	No	Site is an overflow location. All depth zero and no response in velocity during this period	complete
GEN38_059371	1/3/2008	CSO	12/1/2008	12/31/2008	Flow	15.25	15.00	Elliptical	1.50	0.90		0.90	0.00		0.25	0.00	NA	Unidepth	Continuity	N/A	Reconstitution performed for drops to zero and outlyers using best fit curve for the month	No	No		complete
GEN38_059373	12/12/2007	CSO	12/1/2008	12/31/2008	Flow	29.63	30.00	Elliptical	1.50	0.90		0.90	0.00		0.13		NA	Unidepth	Continuity	N/A	No, flagged bad velocity points.	No	No	Hydraulics rarely reach above 2.0 fps. .	complete
GEN38_059398	12/13/2007	CSO	12/1/2008	12/31/2008	Flow	21.00	21.13	Elliptical	1.50	0.90		0.90	0.50		0.13		NA	Unidepth	Continuity	Yes	Velocity reconstituted to stored curve for phase ii	No	No	Site gets continuous silt built up in the line and blocking sensor, ring has been rotated as far as possible to still catch mins; Data gaps 12/28-12/29.	complete
GEN38_059404	12/19/2007	CSO	12/1/2008	12/31/2008	Flow	15.00	14.63	Elliptical	1.38	0.92		0.90	0.00		0.00		NA	Unidepth	Continuity	No, very tight to slightly out of balance	Minimum data reconstituted to Bestfit curve derived from the month	No	No		complete
GEN38_059451	12/19/2007	CSO	12/1/2008	12/31/2008	Flow	71.88	72.13	Elliptical	1.25	1.08		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes	None	No	No		complete
GEN38_059498A	12/18/2007	CSO	12/1/2008	12/31/2008	Flow	72.38	72.38	Circular	1.50	0.88	0.88	0.90	0.00	0.00	2.75		NA	Unidepth	Continuity	No, imbalance seen may be due to storage tank	frequently reconstituted (drops to zero) throughout period to BF curve derived for the month	Yes	No		complete
GEN38_060W012	12/12/2007	CSO	12/1/2008	12/31/2008	Flow	14.75	14.88	Circular	1.25	0.98		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, see also final comments for NPDES165	None	No	No	Data gap 12/1-12/4, data retrieval failed.	complete
GEN38_D059191	1/31/2008	CSO	12/1/2008	12/31/2008	Flow	96.00	96.00	Circular	1.38	0.90		0.90	0.00		0.25		NA	Unidepth	Continuity	N/A	No data reconstituted due to flow conditions	No	No	Swapped to pulse meter on 12/12/08. due to software limitations, all velocity readings could not be imported. Please see the Excel spreadsheets for additional velocity readings. Two excel files uploaded, data in one file was beyond software limits to upload as one document to Intelliserve account.	complete
GEN40_059407	12/19/2007	CSO	12/1/2008	12/31/2008	Flow	10.13	10.13	Circular	1.75	0.90	0.90	0.90	0.50		0.00		NA	Unidepth	Continuity	Yes, very tight	None	No	No		complete
GEN40_059409	1/24/2008	CSO	12/1/2008	12/31/2008	Flow	10.00	10.00	Circular	1.25	0.87		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	None	No, flagged bad velocity data	No	Data gap 12/11, unable to back collect	complete
GEN40_059436	1/24/2008	CSO	12/1/2008	12/31/2008	Flow	14.00	14.00	Circular	1.38	0.90		0.90	0.25		0.00		N/A	Unidepth	Continuity	Yes	Data reconstituted throughout the monitoring period	No	No	Data gap 12/11, unable to back collect	complete
GEN40_059490	12/19/2007	CSO	12/1/2008	12/31/2008	Flow	12.13	12.00	Elliptical	1.38	0.90		0.90	0.00		0.00		NA	Unidepth	Continuity	No, see comments for NPDES040	None, Left those zeros during events where could not get a valid curve.	Yes, frquently at depths greater than 5.0"	Yes, frequently		complete
GEN40_059490 Mpt 2	2/7/2008	CSO	12/1/2008	12/31/2008	*Depth Only*	148.50	71.50	Elliptical	123.00	0.90		0.90			1.75			Unidepth	Manning	N/A	None	No	No		complete
GEN42_060W014	12/20/2007	CSO	12/1/2008	12/31/2008	Flow	12.00	11.25	Elliptical	1.50	0.90		0.90	0.00		2.75		NA	Unidepth/P depth	Continuity	No, see final comments for NPDES042; in and out of balance	None	Yes at depths > 5"	yes, frequently	Site hydraulics are very slow causing silt build up; left velocity as reported from the meter	complete
GEN42_060W019	12/20/2007	CSO	12/1/2008	12/31/2008	Flow	12.25	11.75	Elliptical	1.63	1.02		0.90	0.38	0.00	0.00		NA	Unidepth/P depth	Continuity	No	None	Yes, at various depths	Yes, frequently	all negative velocity that reading that were obviously wron(per Jackie) were flagged	complete
GEN42_060W047	12/20/2007	CSO	12/1/2008	12/31/2008	Flow	140.50	143.00	Elliptical	1.63	0.73		0.90	0.00		3.00		Pass	Unidepth/U 3	Continuity	No	None	Yes, frequently at depths greater than 7.0".	No	The ultra fires from 12ft above the deck into a 12" cunette. Site conditions contribute to low percentage of U-pair firings; velocity zeros at higher depths were not reconstituted. all negative velocity that has previously been edited and left as reported from the meter; Flagged bad depth.	complete

SITE LISTING	DATE INSTALLED	TYPE	DATA START	DATA END	FINAL DATA TYPE	PIPE H	PIPE W	Shape	PO	GAIN	FINAL GAIN if changed after balance	A/P	Depth Ajd	FINAL DEPTH Ajd if changed after balance	Silt	FINAL SILT if changed after balance	Confirmation Weir?	Final D	Final Q	Balance US & DS	Reconstitution	Backwater	Surcharge	Final Comment	Final Check
NPDES037_MH059489	12/21/2007	CSO NPDES	12/1/2008	12/31/2008	Flow	18.63	18.38	Elliptical		0.90		0.90	0.00	0.00	0.75		N/A	Unidepth	Continuity	N/A		No	No	MP1 has ultra sensor only,	Complete
NPDES037_MH059489 MP2		CSO NPDES	12/1/2008	12/31/2008	Flow	18.63	18.38	Elliptical		0.90		0.90			0.38		N/A	Unidepth	Continuity	N/A	Minimum flows frequently drop to zero due to low velocity.	No	No	MP2 has velocity sensor, ultra and pressure.	Complete
NPDES038_MH059451	12/21/2007	CSO NPDES	12/1/2008	12/31/2008	Flow	72.75	72.5	Elliptical	1.25	0.90		0.90	0.00		0.00		no, too large	Unidepth	Site not recommended for DWF calculation (not even Mannings)	no, see final comments	None	Stagnant except for events		Site appears to be mostly stagnant except during rain events. Not recommended for DWF calculation.	DATA NOT SUITABLE FOR DWF
NPDES040_MH059491	12/21/2007	CSO NPDES	12/1/2008	12/31/2008	Flow	80.50	80.50	Circular		0.90		0.90	0.00		0.00		No (site too large)	Unidepth	Continuity	Yes	Reconstituted velocity throughout the monitoring period where a valid curve was generated	Yes, frequently	No	Data set very repeatable.	Complete
NPDES041A_MH059434	12/21/2007	CSO NPDES	12/1/2008	12/31/2008	Flow	14.50	14.13	Elliptical		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity	N/A	Reconstituted miniml velocity throughout the monitoring period	No	No	Slow low flow, vertical scattergraph is an indication to use data with caution. Mannings not an appropriate flow estimate.	Complete
NPDES041B_MH059406	12/21/2007	CSO NPDES	12/1/2008	12/31/2008	Flow	12.00	12.00	Circular		0.84		0.90	0.00		1.00			Unidepth	Continuity	No, very tight to slightly out of balance	Minimal velocity reconsistution.	No	Yes	Presence of silt a problem. Silt most likely comes and goes (measured between 0 - 1.75 inches) causing sharp decreases and increases in depth data set for no apparent reason. Set to 1" due to instability of silt presence.	Complete
NPDES042_MH060W052	12/21/2007	CSO NPDES	12/1/2008	12/31/2008	Flow	11.88	16.50	Standard Horseshoe		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity		Velocity frequently drop to zero due to low velocity/silt. Left velocity zeros during backwater.	Yes, frequently	Yes, 12/27,12/28	Slow low flow, vertical scattergraph is an indication to use data with caution.	DATA MARGINAL FOR DWF
NPDES043_MH060W049	12/21/2007	CSO NPDES	12/1/2008	12/31/2008	Flow	24.38	24.13	Elliptical		0.90		0.90	0.00		0.00		No (site too large)	Unidepth	Continuity	N/A	Minimal	yes, frequently	Yes, frequently	Data repeatable.	Complete
NPDES165_MH067078	12/21/2007	CSO NPDES	12/1/2008	12/31/2008	Flow	10	10.13	Elliptical		0.90		0.90	0.00		0.25		N/A	Unidepth	Continuity		Minimal reconstitution.	No	No	low slow flows, mutiple hydraulic shifts. Silt level most likely fluctuates. Orifice effect at depths > 9".	DATA MARGINAL FOR DWF

SITE LISTING	DATE INSTALLED	TYPE	DATA START	DATA END	FINAL DATA TYPE	PIPE H	PIPE W	Shape	PO	GAIN	FINAL GAIN if changed after balance	A/P	Depth Ajd	FINAL DEPTH Ajd if changed after balance	Silt	FINAL SILT if changed after balance	Confirmation Weir?	Final D	Final Q	Balance US & DS	Reconstitution	Backwater	Surcharge	Final Comment	Final Check
GEN38_059121	12/19/2007	CSO	1/1/2009	1/31/2009	Flow	22.88	25.25	Elliptical	1.38	0.84		0.90	0.00		0.00			Unidepth	Continuity	N/A	None	No	No	data gap 1/3-1/6 due to monitor malfunction	complete
GEN38_059131	1/4/2008	CSO	1/1/2009	1/31/2009	Flow	41.75	42.25	Elliptical	1.38	0.90		0.90	0.00		4.00		NA	Unidepth	Continuity	yes	Velocity data reconstituted to stored Bestfit curve for phasee ii	No	No	Hydraulics rarely reach above 2.0 fps	complete
GEN38_059320	12/12/2007	CSO	1/1/2009	1/31/2009	Flow	23.00	23.25	Elliptical	1.50	0.63		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	velocity reconstituted to stored phase ii curve.	No	No	Hydraulics rarely reach above1.75 fps. Data gaps 11/13-11/18 due to monitor malfunction. Data rescue failed.	complete
GEN38_059332	12/20/2007	CSO	1/1/2009	1/31/2009	Flow	40.38	38.25	Elliptical	1.38	0.56		0.55	2.70		0.00		NA	Unidepth	Continuity	No	Minimum data frequently reconstituted (drops to zero) to BF curve for the month	No	No	Hydraulics rarely reach above1.50 fps. Crew moved the velocity sensor about 8 feet up the pipe to avoid interference and get better data. Depth adjustment made 11/14 on to correct depth data that was collected with incorrect lif parameters after the velocity sensor was moved up the pipe. Confirmation validated the depth adjustment. Flagged velocity data before the velocity was moved.	complete
GEN38_059346	7/9/2008	OverFlow	1/1/2009	1/31/2009	Flow	72.00	72.88	Elliptical	1.25	0.90		0.90			0.00		N/A	Unidepth	Continuity	N/A	None	No	No	Site is an overflow location. All depth zero and no response in velocity during this period. A field crew visited GEN38_059346 and confirmed that the odd depth readings were caused by debris. There were large chunks of greasy debris and silt backing up the line. This is the overflow chamber from 451 and 498A. The crew mentioned that after a storm all the grease and debris was washed down into the chamber and clumped on the ultrasonic sensor. The debris was cleared and everything should return to normal. The abnormal readings were flagged.	complete
GEN38_059371	1/3/2008	CSO	1/1/2009	1/31/2009	Flow	15.25	15.00	Elliptical	1.50	0.90		0.90	0.00		0.25	0.00	NA	Unidepth	Continuity	N/A	Reconstitution performed for drops to zero and outlyers using best fit curve for the month	No	No		complete
GEN38_059373	12/12/2007	CSO	1/1/2009	1/31/2009	Flow	29.63	30.00	Elliptical	1.50	0.90		0.90	0.00		0.13		NA	Unidepth	Continuity	N/A	No, manually edited velocity drops.	No	No	Hydraulics rarely reach above 2.0 fps. Blockage observed from 1/13-1/20.	complete
GEN38_059398	12/13/2007	CSO	1/1/2009	1/31/2009	Flow	21.00	21.13	Elliptical	1.50	0.90		0.90	0.50		0.13		NA	Unidepth	Continuity	Yes	Velocity reconstituted to BF curve for the month; the stored curve for phase ii did not work for this data set	Yes, 1/7-1/8	Yes, 1/7-1/8	Site gets continuous silt built up in the line and blocking sensor, ring has been rotated as far as possible to still catch mins	complete
GEN38_059404	12/19/2007	CSO	1/1/2009	1/31/2009	Flow	15.00	14.63	Elliptical	1.38	0.92		0.90	0.00		0.00		NA	Unidepth	Continuity	No, very tight	None	Yes, 1/7-1/8 at depth greater than 10.0"	Yes, 1/7-1/8		complete
GEN38_059451	12/19/2007	CSO	1/1/2009	1/31/2009	Flow	71.88	72.13	Elliptical	1.25	1.08		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes	None	Yes, 1/7-1/8 at depth greater than 5.0"	No		complete
GEN38_059498A	12/18/2007	CSO	1/1/2009	1/31/2009	Flow	72.38	72.38	Circular	1.50	0.88	0.88	0.90	0.00	0.00	2.75		NA	Unidepth	Continuity	No, imbalance seen may be due to storage tank	frequently reconstituted (drops to zero) throughout period to BF curve derived for the month	Yes	No		complete
GEN38_060W012	12/12/2007	CSO	1/1/2009	1/31/2009	Flow	14.75	14.88	Circular	1.25	0.98		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, see also final comments for NPDES165	None	Yes, 1/7-1/8 at depth greater than 8.0"	Yes, 1/7-1/8	Data gap 12/1-12/4, data retrieval failed.	complete
GEN38_D059191	1/31/2008	CSO	1/1/2009	1/31/2009	Flow	96.00	96.00	Circular	1.38	0.90		0.90	0.00		0.25		NA	Unidepth	Continuity	N/A	No data reconstituted due to flow conditions	No	No	Swapped to pulse meter on 12/12/08. due to software limitations, all velocity readings could not be imported. Please see the Excel spreadsheets for additional velocity readings. Two excel files uploaded, data in one file was beyond software limits to upload as one document to Intelliserve account.	complete
GEN40_059407	12/19/2007	CSO	1/1/2009	1/31/2009	Flow	10.13	10.13	Circular	1.75	0.90	0.90	0.90	0.50		0.00		NA	Unidepth/pdepth(1/7-1/8)	Continuity	Yes, very tight, slightly out of balance on dry days.	None	No	No		complete
GEN40_059409	1/24/2008	CSO	1/1/2009	1/31/2009	Flow	10.00	10.00	Circular	1.25	0.87		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	Yes, reconstituted velocity to BF curve for the month.	No	No		complete
GEN40_059436	1/24/2008	CSO	1/1/2009	1/31/2009	Flow	14.00	14.00	Circular	1.38	0.90		0.90	0.25		0.00		N/A	Unidepth	Continuity	Yes	Data reconstituted to BF curve derived from 1/23-1/31.	No	No	Data gap 1/22, unable to back collect	complete
GEN40_059490	12/19/2007	CSO	1/1/2009	1/31/2009	Flow	12.13	12.00	Elliptical	1.38	0.90		0.90	0.00		0.00		NA	Unidepth	Continuity	No, see comments for NPDES040	Yes, Left those zeros during events where could not get a valid curve.	Yes, frquently at depths greater than 5.0"	Yes, frequently		complete
GEN40_059490 Mpt 2	2/7/2008	CSO	1/1/2009	1/31/2009	*Depth Only*	148.50	71.50	Elliptical	123.00	0.90		0.90			1.75			Unidepth	Manning	N/A	None	No	No		complete
GEN42_060W014	12/20/2007	CSO	1/1/2009	1/31/2009	Flow	12.00	11.25	Elliptical	1.50	0.90		0.90	0.00		2.75		NA	Unidepth/Pdepth	Continuity	No, see final comments for NPDES042; in and out of balance	None	Yes at depths > 5"	yes, frequently	Site hydraulics are very slow causing silt build up; left velocity as reported from the meter	complete
GEN42_060W019	12/20/2007	CSO	1/1/2009	1/31/2009	Flow	12.25	11.75	Elliptical	1.63	1.02		0.90	0.38	0.00	0.00		NA	Unidepth/Pdepth	Continuity	No	None	Yes, at various depths	Yes, frequently	all negative velocity that reading that were obviously wron(per Jackie) were flagged	complete
GEN42_060W047	12/20/2007	CSO	1/1/2009	1/31/2009	Flow	140.50	143.00	Elliptical	1.63	0.73		0.90	0.00		3.00		Pass	Unidepth	Continuity	No	None	Yes, frequently at depths greater than 7.0".	No	The ultra fires from 12ft above the deck into a 12" cunette. Site conditions contribute to low percentage of U-pair firings; velocity zeros at higher depths were not reconstituted. all negative velocity that has previously been edited and left as reported from the meter; Flagged bad depth.	complete
NPDES037_MH059489	12/21/2007	CSO NPDES	1/1/2009	1/31/2009	Flow	18.63	18.38	Elliptical		0.90		0.90	0.00	0.00	0.75		N/A	Unidepth	Continuity	N/A		Yes, 1/7-1/8	Yes, 1/7-1/8	MP1 has ultra sensor only,	Complete
NPDES037_MH059489 MP2		CSO NPDES	1/1/2009	1/31/2009	Flow	18.63	18.38	Elliptical		0.90		0.90			0.38		N/A	Unidepth	Continuity	N/A	Minimum flows frequently drop to zero due to low velocity.	No	No	MP2 has velocity sensor, ultra and pressure.	Complete
NPDES038_MH059451	12/21/2007	CSO NPDES	1/1/2009	1/31/2009	Flow	72.75	72.5	Elliptical	1.25	0.90		0.90	0.00		0.00		no, too large	Unidepth	Site not recommended for DWF calculation (not even Mannings)	no, see final comments	None	Stagnant except for events		Site appears to be mostly stagnant except during rain events. Not recommended for DWF calculation.	DATA NOT SUITABLE FOR DWF
NPDES040_MH059491	12/21/2007	CSO NPDES	1/1/2009	1/31/2009	Flow	80.50	80.50	Circular		0.90		0.90	0.00		0.00		No (site too large)	Unidepth	Continuity	Yes	Reconstituted velocity throughout the monitoring period where a valid curve was generated	Yes, frequently	Yes	Data set very repeatable.	Complete
NPDES041A_MH059434	12/21/2007	CSO NPDES	1/1/2009	1/31/2009	Flow	14.50	14.13	Elliptical		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity	N/A	Reconstituted miniml velocity throughout the monitoring period	Yes	No	Slow low flow, vertical scattergraph is an indication to use data with caution. Mannings not an appropriate flow estimate.	Complete
NPDES041B_MH059406	12/21/2007	CSO NPDES	1/1/2009	1/31/2009	Flow	12.00	12.00	Circular		0.84		0.90	0.00		1.00			Unidepth	Continuity	No, very tight to slightly out of balance	Minimal velocity reconsistution.	No	Yes	Presence of silt a problem. Silt most likely comes and goes (measured between 0 - 1.75 inches) causing sharp decreases and increases in depth data set for no apparent reason. Set to 1" due to instablility of silt presence.	Complete
NPDES042_MH060W052	12/21/2007	CSO NPDES	1/1/2009	1/31/2009	Flow	11.88	16.50	Standard Horseshoe		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity		Velocity frequently drop to zero due to low velocity/silt. Left velocity zeros during backwater.	Yes, frequently	Yes	Slow low flow, vertical scattergraph is an indication to use data with caution.	DATA MARGINAL FOR DWF
NPDES043_MH060W049	12/21/2007	CSO NPDES	1/1/2009	1/31/2009	Flow	24.38	24.13	Elliptical		0.90		0.90	0.00		0.00		No (site too large)	Unidepth	Continuity	N/A	Minimal	yes, frequently	Yes, frequently	Data repeatable.	Complete
NPDES165_MH067078	12/21/2007	CSO NPDES	1/1/2009	1/31/2009	Flow	10	10.13	Elliptical		0.90		0.90	0.00		0.25		N/A	Unidepth	Continuity		Minimal reconstitution.	No	No	low slow flows, mutiple hydraulic shifts. Silt level most likely fluctuates. Orifce effect at depths > 9".	DATA MARGINAL FOR DWF

SITE LISTING	DATE INSTALLED	TYPE	DATA START	DATA END	FINAL DATA TYPE	PIPE H	PIPE W	Shape	PO	GAIN	FINAL GAIN if changed after balance	A/P	Depth Ajd	FINAL DEPTH Ajd if changed after balance	Silt	FINAL SILT if changed after balance	Confirmation Weir?	Final D	Final Q	Balance US & DS	Reconstitution	Backwater	Surcharge	Final Comment	Final Check
GEN38_059121	12/19/2007	CSO	2/1/2009	2/28/2009	Flow	22.88	25.25	Elliptical	1.38	0.84		0.90	0.00		0.00			Unidepth	Continuity	N/A	None	No	No		complete
GEN38_059131	1/4/2008	CSO	2/1/2009	2/28/2009	Flow	41.75	42.25	Elliptical	1.38	0.90		0.90	0.00		4.00		NA	Unidepth	Continuity	yes	Velocity data reconstituted to stored Bestfit curve for phasee ii	No	No	Hydraulics rarely reach above 2.0 fps	complete
GEN38_059320	12/12/2007	CSO	2/1/2009	2/28/2009	Flow	23.00	23.25	Elliptical	1.50	0.63		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	velocity reconstituted to stored phase ii curve.	No	No	Hydraulics rarely reach above1.75 fps.	complete
GEN38_059332	12/20/2007	CSO	2/1/2009	2/28/2009	Flow	40.38	38.25	Elliptical	1.38	0.56		0.55	2.70		0.00		NA	Unidepth	Continuity	No	Minimum data frequently reconstituted (drops to zero) to BF curve for the month	No	No	Hydraulics rarely reach above1.50 fps. Crew moved the velocity sensor about 8 feet up the pipe to avoid interference and get better data.	complete
GEN38_059346	7/9/2008	OverFlow	2/1/2009	2/28/2009	Flow	72.00	72.88	Elliptical	1.25	0.90		0.90			0.00		N/A	Unidepth	Continuity	N/A	None	No	No	Site is an overflow location. Board test on 2/24 confirmed ultrasonic sensor is working properly	complete
GEN38_059371	1/3/2008	CSO	2/1/2009	2/28/2009	Flow	15.25	15.00	Elliptical	1.50	0.90		0.90	0.00		0.25	0.00	NA	Unidepth	Continuity	N/A	Reconstitution performed for drops to zero and outlyers using best fit curve for the month	No	No		complete
GEN38_059373	12/12/2007	CSO	2/1/2009	2/28/2009	Flow	29.63	30.00	Elliptical	1.50	0.90		0.90	0.00		0.13		NA	Unidepth	Continuity	N/A	Yes, flagged some velocity drops where BF curve was not valid.	No	No	Hydraulics rarely reach above 2.0 fps.	complete
GEN38_059398	12/13/2007	CSO	2/1/2009	2/28/2009	Flow	21.00	21.13	Elliptical	1.50	0.90		0.90	0.50		0.13		NA	Unidepth	Continuity	Yes	Velocity reconstituted to BF curve for the month; the stored curve for phase ii did not work for this data set	No	No	Site gets continuous silt built up in the line and blocking sensor, ring has been rotated as far as possible to still catch mins	complete
GEN38_059404	12/19/2007	CSO	2/1/2009	2/28/2009	Flow	15.00	14.63	Elliptical	1.38	0.92		0.90	0.00		0.00		NA	Unidepth	Continuity	No, very tight	None	No	No		complete
GEN38_059451	12/19/2007	CSO	2/1/2009	2/28/2009	Flow	71.88	72.13	Elliptical	1.25	1.08		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, most days very tight	None	Yes, 2/10, 2/23 at depth greater than 4.0"	No		complete
GEN38_059498A	12/18/2007	CSO	2/1/2009	2/28/2009	Flow	72.38	72.38	Circular	1.50	0.88	0.88	0.90	0.00	0.00	2.75		NA	Unidepth	Continuity	No, imbalance seen may be due to storage tank	frequently reconstituted (drops to zero) throughout period to BF curve derived for the month	No	No		complete
GEN38_060W01 2	12/12/2007	CSO	2/1/2009	2/28/2009	Flow	14.75	14.88	Circular	1.25	0.98		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, see also final comments for NPDES165	None	No	No		complete
GEN38_D059191	1/31/2008	CSO	2/1/2009	2/28/2009	Flow	96.00	96.00	Circular	1.38	0.90		0.90	0.00		0.25		NA	Unidepth	Continuity	N/A	No data reconstituted due to flow conditions	No	No	Swapped to pulse meter on 12/12/08.	complete
GEN40_059407	12/19/2007	CSO	2/1/2009	2/28/2009	Flow	10.13	10.13	Circular	1.75	0.90	0.90	0.90	0.50		0.00		NA	Unidepth	Continuity	No, very tight, slightly out of balance on most days.	None	Yes, 2/11, 2/12	No		complete
GEN40_059409	1/24/2008	CSO	2/1/2009	2/28/2009	Flow	10.00	10.00	Circular	1.25	0.87		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	Yes, reconstituted velocity to BF curve for the month.	No	No		complete
GEN40_059436	1/24/2008	CSO	2/1/2009	2/28/2009	Flow	14.00	14.00	Circular	1.38	0.90		0.90	0.25		0.00		N/A	Unidepth	Continuity	Yes		No	No	Flagged bad data 2/1-2/3.	complete
GEN40_059490	12/19/2007	CSO	2/1/2009	2/28/2009	Flow	12.13	12.00	Elliptical	1.38	0.90		0.90	0.00		0.00		NA	Unidepth	Continuity	No, see comments for NPDES040	None	Yes, frquently at depths greater than 5.0"	Yes, frequently		complete
GEN40_059490 Mpt 2	2/7/2008	CSO	2/1/2009	2/28/2009	*Depth Only*	148.50	71.50	Elliptical	123.00	0.90		0.90			1.75			Unidepth	Manning	N/A	None	No	No		complete
GEN42_060W01 4	12/20/2007	CSO	2/1/2009	2/28/2009	Flow	12.00	11.25	Elliptical	1.50	0.90		0.90	0.00		2.75		NA	Unidepth	Continuity	No, see final comments for NPDES042; in and out of balance	None	Yes at depths > 5"	yes, frequently	Site hydraulics are very slow causing silt build up; left velocity as reported from the meter. Data gap 2/24-2/25 due to monitor malfunction.	complete
GEN42_060W01 9	12/20/2007	CSO	2/1/2009	2/28/2009	Flow	12.25	11.75	Elliptical	1.63	1.02		0.90	0.38	0.00	0.00		NA	Unidepth	Continuity	No	None	Yes, at various depths	Yes, frequently	all negative velocity that reading that were obviously wrong(per Jackie) were flagged	complete
GEN42_060W04 7	12/20/2007	CSO	2/1/2009	2/28/2009	Flow	140.50	143.00	Elliptical	1.63	0.73		0.90	0.00		3.00		Pass	Unidepth	Continuity	No	None	Yes, frequently at depths greater than 7.0".	No	The ultra fires from 12ft above the deck into a 12" cunette. Site conditions contribute to low percentage of U-pair firings; velocity zeros at higher depths were not reconstituted. all negative velocity that has previously been edited and left as reported from the meter.	complete
NPDES037_MH0 59489	12/21/2007	CSO NPDES	2/1/2009	2/28/2009	Flow	18.63	18.38	Elliptical		0.90		0.90	0.00	0.00	0.75		N/A	Unidepth	Continuity	N/A		No	No	MP1 has ultra sensor only,	Complete
NPDES037_MH0 59489 MP2		CSO NPDES	2/1/2009	2/28/2009	Flow	18.63	18.38	Elliptical		0.90		0.90			0.38		N/A	Unidepth	Continuity	N/A	Minimum flows frequently drop to zero due to low velocity.	No	No	MP2 has velocity sensor, ultra and pressure.	Complete
NPDES038_MH0 59451	12/21/2007	CSO NPDES	2/1/2009	2/28/2009	Flow	72.75	72.5	Elliptical	1.25	0.90		0.90	0.00		0.00		no, too large	Unidepth	Site not recommended for DWF calculation (not even Mannings)	no, see final comments	None	Stagnant		Site appears to be mostly stagnant except during rain events. Not recommended for DWF calculation.	DATA NOT SUITABLE FOR DWF
NPDES040_MH0 59491	12/21/2007	CSO NPDES	2/1/2009	2/28/2009	Flow	80.50	80.50	Circular		0.90		0.90	0.00		0.00		No (site too large)	Unidepth	Continuity	Yes	Reconstituted velocity throughout the monitoring period where a valid curve was generated, left zeros during backwater conditions.	Yes, frequently	Yes	Data set very repeatable.	Complete

SITE LISTING	DATE INSTALLED	TYPE	DATA START	DATA END	FINAL DATA TYPE	PIPE H	PIPE W	Shape	PO	GAIN	FINAL GAIN if changed after balance	A/P	Depth Ajd	FINAL DEPTH Ajd if changed after balance	Silt	FINAL SILT if changed after balance	Confirmation Weir?	Final D	Final Q	Balance US & DS	Reconstitution	Backwater	Surcharge	Final Comment	Final Check
NPDES041A_MH 059434	12/21/2007	CSO NPDES	2/1/2009	2/28/2009	Flow	14.50	14.13	Elliptical		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity	N/A	Reconstituted miniml velocity throughout the monitoring period	No	No	Slow low flow, vertical scattergraph is an indication to use data with caution. Mannings not an appropriate flow estimate.	Complete
NPDES041B_MH 059406	12/21/2007	CSO NPDES	2/1/2009	2/28/2009	Flow	12.00	12.00	Circular		0.84		0.90	0.00		1.00			Unidepth	Continuity	Yes	Minimal velocity reconsistution.	No	Yes	Presence of silt a problem. Silt most likely comes and goes (measured between 0 - 1.75 inches) causing sharp decreases and increases in depth data set for no apparent reason. Set to 1" due to instability of silt presence. Pdepth questionable on 2/23 periods of high depth levels. Set unidepth to full pipe instead of pdepth	Complete
NPDES042_MH0 60W052	12/21/2007	CSO NPDES	2/1/2009	2/28/2009	Flow	11.88	16.50	Standard Horseshoe		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity		Velocity frequently drop to zero due to low velocity/silt. Negative and 0 velocity values at depth < approx. 10" were flagged.	Yes, frequently	No	Slow low flow, vertical scattergraph is an indication to use data with caution.	DATA MARGINAL FOR DWF
NPDES043_MH0 60W049	12/21/2007	CSO NPDES	2/1/2009	2/28/2009	Flow	24.38	24.13	Elliptical		0.90		0.90	0.00		0.00		No (site too large)	Unidepth	Continuity	N/A	No, flagged zero velocity	No	No	Data repeatable.	Complete
NPDES165_MH0 67078	12/21/2007	CSO NPDES	2/1/2009	2/28/2009	Flow	10	10.13	Elliptical		0.90		0.90	0.3-0.4		0.25		N/A	Unidepth	Continuity		Minimal reconstitution to BF curve derived from the February data set only (due to varying hydraulic conditions exhibited by this line)	No	No	low slow flows, mutiple hydraulic shifts. Silt level most likely fluctuates. Orifce effect at depths > 9".	DATA MARGINAL FOR DWF

SITE LISTING	DATE INSTALLED	TYPE	DATA START	DATA END	FINAL DATA TYPE	PIPE H	PIPE W	Shape	PO	GAIN	FINAL GAIN if changed after balance	A/P	Depth Ajd	FINAL DEPTH Ajd if changed after balance	Silt	FINAL SILT if changed after balance	Confirmation Weir?	Final D	Final Q	Balance US & DS	Reconstitution	Backwater	Surcharge	Final Comment	Final Check
GEN38_059121	12/19/2007	CSO	3/1/2009	4/3/2009	Flow	22.88	25.25	Elliptical	1.38	0.84		0.90	0.00		0.00			Unidepth	Continuity	N/A	None	No	No		complete
GEN38_059131	1/4/2008	CSO	3/1/2009	4/3/2009	Flow	41.75	42.25	Elliptical	1.38	0.90		0.90	0.00		4.00		NA	Unidepth	Continuity	yes	Velocity data reconstituted to stored Bestfit curve for phasee ii	No	No	Hydraulics rarely reach above 2.0 fps	complete
GEN38_059320	12/12/2007	CSO	3/1/2009	4/3/2009	Flow	23.00	23.25	Elliptical	1.50	0.63		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	velocity reconstituted to stored phase ii curve.	No	No	Data gaps 3/16-3/17 due to monitor malfunction. No data rescue.	complete
GEN38_059332	12/20/2007	CSO	3/1/2009	4/3/2009	Flow	40.38	38.25	Elliptical	1.38	0.56		0.55	2.70		0.00		NA	Unidepth	Continuity	Yes	none	No	No	Hydraulics rarely reach above 1.50 fps. Crew moved the velocity sensor about 8 feet up the pipe to avoid interference and get better data. Depth adjustment made 11/14 on to correct depth data that was collected with incorrect lif parameters after the velocity sensor was moved up the pipe. Confirmation validated the depth adjustment. Flagged velocity data before the velocity was moved.	complete
GEN38_059346	7/9/2008	OverFlow	3/1/2009	4/3/2009	Flow	72.00	72.88	Elliptical	1.25	0.90		0.90			0.00		N/A	Unidepth	Continuity	N/A	None	No	No	Site is an overflow location. Decrease in depth with little response from velocity this month	complete
GEN38_059371	1/3/2008	CSO	3/1/2009	4/3/2009	Flow	15.25	15.00	Elliptical	1.50	0.90		0.90	0.00		0.25	0.00	NA	Unidepth	Continuity	N/A	Reconstitution performed for drops to zero and outlyers using best fit curve for the month	No	No	Bad depth data flagged on 3/10	complete
GEN38_059373	12/12/2007	CSO	3/1/2009	4/3/2009	Flow	29.63	30.00	Elliptical	1.50	0.90		0.90	0.00		0.13		NA	Unidepth	Continuity	N/A	None	Yes, 3/1, 3/8-3/12	No	Hydraulics rarely reach above 2.0 fps.	complete
GEN38_059398	12/13/2007	CSO	3/1/2009	4/3/2009	Flow	21.00	21.13	Elliptical	1.50	0.90		0.90	0.50		0.13		NA	Unidepth	Continuity	Yes	None	No	No	Site gets continuous silt built up in the line and blocking sensor, ring has been rotated as far as possible to still catch mins. Flagged bad depth data 3/31-4/1.	complete
GEN38_059404	12/19/2007	CSO	3/1/2009	4/3/2009	Flow	15.00	14.63	Elliptical	1.38	0.92		0.90	0.00		0.00		NA	Unidepth	Continuity	No, very tight	None	No	No		complete
GEN38_059451	12/19/2007	CSO	3/1/2009	4/3/2009	Flow	71.88	72.13	Elliptical	1.25	1.08		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes	None	Yes, brief periods throughout the monitoring period, longer periods on 4/2, 4/3	No		complete
GEN38_059498A	12/18/2007	CSO	3/1/2009	4/3/2009	Flow	72.38	72.38	Circular	1.50	0.88	0.88	0.90	0.00	0.00	2.75		NA	Unidepth	Continuity	No, imbalance seen may be due to storage tank	Yes, to stored BF curve	Yes	No		complete
GEN38_060W012	12/12/2007	CSO	3/1/2009	4/3/2009	Flow	14.75	14.88	Circular	1.25	0.98		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, see also final comments for NPDES165	None	Yes, briefly on 4/3	No		complete
GEN38_D059191	1/31/2008	CSO	3/1/2009	4/3/2009	Flow	96.00	96.00	Circular	1.38	0.90		0.90	0.00		0.25		NA	Unidepth	Continuity	N/A	No data reconstituted due to flow conditions	No	No	Swapped to pulse meter on 12/12/08. Notable increase in depth this month.	complete
GEN40_059407	12/19/2007	CSO	3/1/2009	4/3/2009	Flow	10.13	10.13	Circular	1.75	0.90	0.90	0.90	0.50		0.00		NA	Unidepth	Continuity	Yes, very tight, slightly out of balance on dry days.	None	No	No		complete
GEN40_059409	1/24/2008	CSO	3/1/2009	4/3/2009	Flow	10.00	10.00	Circular	1.25	0.87		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	None	No	No		complete
GEN40_059436	1/24/2008	CSO	3/1/2009	4/3/2009	Flow	14.00	14.00	Circular	1.38	0.90		0.90	0.25		0.00		N/A	Unidepth	Continuity	Yes	Data reconstituted to BF curve derived from month.	No	No		complete
GEN40_059490	12/19/2007	CSO	3/1/2009	4/3/2009	Flow	12.13	12.00	Elliptical	1.38	0.90		0.90	0.00		0.00		NA	Unidepth	Continuity	No, see comments for NPDES040	Yes, Left those zeros during events where could not get a valid curve.	Yes, frquently at depths greater than 5.0"	Yes, frequently		complete
GEN40_059490 Mpt 2	2/7/2008	CSO	3/1/2009	4/3/2009	*Depth Only*	148.50	71.50	Elliptical	123.00	0.90		0.90			1.75			Unidepth	Manning	N/A	None	No	No		complete
GEN42_060W014	12/20/2007	CSO	3/1/2009	4/3/2009	Flow	12.00	11.25	Elliptical	1.50	0.90		0.90	0.00		2.75		NA	Unidepth/P depth	Continuity	No, see final comments for NPDES042; in and out of balance	None	Yes at depths > 5"	yes, frequently	Site hydraulics are very slow causing silt build up; left velocity as reported from the meter	complete
GEN42_060W019	12/20/2007	CSO	3/1/2009	4/3/2009	Flow	12.25	11.75	Elliptical	1.63	1.02		0.90	0.38	0.00	0.00		NA	Unidepth/P depth	Continuity	No	None	Yes, at various depths	Yes, frequently	all negative velocity that reading that were obviously wron(per Jackie) were flagged	complete
GEN42_060W047	12/20/2007	CSO	3/1/2009	4/3/2009	Flow	140.50	143.00	Elliptical	1.63	0.73		0.90	0.00		3.00		Pass	avgudepth	Continuity	No	None	Yes, frequently at depths greater than 7.0".	No	The ultra fires from 12ft above the deck into a 12" cunette. Site conditions contribute to low percentage of U-pair firings; velocity zeros at higher depths were not reconstituted. all negative velocity that has previously been edited and left as reported from the meter; Flagged bad depth.	complete
NPDES037_MH05 9489	12/21/2007	CSO NPDES	3/1/2009	4/3/2009	Flow	18.63	18.38	Elliptical		0.90		0.90	0.00	0.00	0.75		N/A	Unidepth	Continuity	N/A		No	No	MP1 has ultra sensor only,	Complete
NPDES037_MH05 9489 MP2		CSO NPDES	3/1/2009	4/3/2009	Flow	18.63	18.38	Elliptical		0.90		0.90			0.38		N/A	Unidepth	Continuity	N/A	Minimum flows frequently drop to zero due to low velocity.	No	No	MP2 has velocity sensor, ultra and pressure.	Complete

SITE LISTING	DATE INSTALLED	TYPE	DATA START	DATA END	FINAL DATA TYPE	PIPE H	PIPE W	Shape	PO	GAIN	FINAL GAIN if changed after balance	A/P	Depth Ajd	FINAL DEPTH Ajd if changed after balance	Silt	FINAL SILT if changed after balance	Confirmation Weir?	Final D	Final Q	Balance US & DS	Reconstitution	Backwater	Surcharge	Final Comment	Final Check
NPDES038_MH059451	12/21/2007	CSO NPDES	3/1/2009	4/3/2009	Flow	72.75	72.5	Elliptical	1.25	0.90		0.90	0.00		0.00		no, too large	Unidepth	Site not recommended for DWF calculation (not even Mannings)	no, see final comments	None	Stagnant except for events		Site appears to be mostly stagnant except during rain events. Not recommended for DWF calculation.	DATA NOT SUITABLE FOR DWF
NPDES040_MH059491	12/21/2007	CSO NPDES	3/1/2009	4/3/2009	Flow	80.50	80.50	Circular		0.90		0.90	0.00		0.00		No (site too large)	Unidepth	Continuity	Yes	None	Yes, frequently	No	Data gap 4/1-4/2 due to monitor malfunction	Complete
NPDES041A_MH059434	12/21/2007	CSO NPDES	3/1/2009	4/3/2009	Flow	14.50	14.13	Elliptical		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity	N/A	Reconstituted miniml velocity throughout the monitoring period	Yes, 3/25-3/26	No	Slow low flow, vertical scattergraph is an indication to use data with caution. Mannings not an appropriate flow estimate.	Complete
NPDES041B_MH059406	12/21/2007	CSO NPDES	3/1/2009	4/3/2009	Flow	12.00	12.00	Circular		0.84		0.90	0.00		1.00			Unidepth	Continuity	Yes	None, bad velocity flagged	No	Yes	Presence of silt a problem. Silt most likely comes and goes (measured between 0 - 1.75 inches) causing sharp decreases and increases in depth data set for no apparent reason. Set to 1" due to instability of silt presence.	Complete
NPDES042_MH060W052	12/21/2007	CSO NPDES	3/1/2009	4/3/2009	Flow	11.88	16.50	Standard Horseshoe		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity		Velocity frequently drop to zero due to low velocity/silt. Left velocity zeros during backwater.	Yes, frequently	Yes	Slow low flow, vertical scattergraph is an indication to use data with caution.	DATA MARGINAL FOR DWF
NPDES043_MH060W049	12/21/2007	CSO NPDES	3/1/2009	4/3/2009	Flow	24.38	24.13	Elliptical		0.90		0.90	0.00		0.00		No (site too large)	Unidepth	Continuity	N/A	Minimal	yes, frequently	Yes, frequently	Data repeatable.	Complete
NPDES165_MH067078	12/21/2007	CSO NPDES	3/1/2009	4/3/2009	Flow	10	10.13	Elliptical		0.90		0.90	0.00		0.25		N/A	Unidepth	Continuity	Yes	None	No	No	low slow flows, mutiple hydraulic shifts. Silt level most likely fluctuates. Orifce effect at depths > 9".	DATA MARGINAL FOR DWF

SITE LISTING	DATE INSTALLED	TYPE	DATA START	DATA END	FINAL DATA TYPE	PIPE H	PIPE W	Shape	PO	GAIN	FINAL GAIN if changed after balance	A/P	Depth Ajd	FINAL DEPTH Ajd if changed after balance	Silt	FINAL SILT if changed after balance	Confirmation Weir?	Final D	Final Q	Balance US & DS	Reconstitution	Backwater	Surcharge	Final Comment	Final Check
GEN38_059121	12/19/2007	CSO	4/1/2009	4/30/2009	Flow	22.88	25.25	Elliptical	1.38	0.84		0.90	0.00		0.00			Unidepth	Continuity	N/A	None	No	No		complete
GEN38_059131	1/4/2008	CSO	4/1/2009	4/30/2009	Flow	41.75	42.25	Elliptical	1.38	0.90		0.90	0.00		4.00		NA	Unidepth	Continuity	yes	Velocity data reconstituted to BF curve derived for the month	No	No	Hydraulics rarely reach above 2.0 fps	complete
GEN38_059320	12/12/2007	CSO	4/1/2009	4/30/2009	Flow	23.00	23.25	Elliptical	1.50	0.63		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	velocity reconstituted to stored phase ii curve.	No	No		complete
GEN38_059332	12/20/2007	CSO	4/1/2009	4/30/2009	Flow	40.38	38.25	Elliptical	1.38	0.56		0.55	2.70		0.00		NA	Unidepth	Continuity	Yes	Velocity data reconstituted to BF curve derived for the month	No	No	Hydraulics rarely reach above1.50 fps. Crew moved the velocity sensor about 8 feet up the pipe to avoid interference and get better data. Depth adjustment made 11/14 on to correct depth data that was collected with incorrect lif parameters after the velocity sensor was moved up the pipe. Confirmation validated the depth adjustment. Flagged velocity data before the velocity was moved.	complete
GEN38_059346	7/9/2008	OverFlow	4/1/2009	4/30/2009	Flow	72.00	72.88	Elliptical	1.25	0.90		0.90			0.00		N/A	Unidepth	Continuity	N/A	None	No	No	Site is an overflow location. Little response from velocity this month	complete
GEN38_059371	1/3/2008	CSO	4/1/2009	4/30/2009	Flow	15.25	15.00	Elliptical	1.50	0.90		0.90	0.00		0.25	0.00	NA	Unidepth	Continuity	N/A	Reconstitution performed for drops to zero and outlyers using best fit curve for the month	No	No		complete
GEN38_059373	12/12/2007	CSO	4/1/2009	4/30/2009	Flow	29.63	30.00	Elliptical	1.50	0.90		0.90	0.00		0.13		NA	Unidepth	Continuity	N/A	None	No	No	Hydraulics rarely reach above 2.0 fps.	complete
GEN38_059398	12/13/2007	CSO	4/1/2009	4/30/2009	Flow	21.00	21.13	Elliptical	1.50	0.90		0.90	0.50		0.13		NA	Unidepth	Continuity	Yes	Velocity data reconstituted to BF curve derived for the month	No	No	Site gets continuous silt built up in the line and blocking sensor, ring has been rotated as far as possible to still catch mins.	complete
GEN38_059404	12/19/2007	CSO	4/1/2009	4/30/2009	Flow	15.00	14.63	Elliptical	1.38	0.92		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, very tight	None	No	No		complete
GEN38_059451	12/19/2007	CSO	4/1/2009	4/30/2009	Flow	71.88	72.13	Elliptical	1.25	1.08		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, most days	Velocity data reconstituted to stored phase ii BF curve	Yes, brief periods throughout the monitoring period, longer periods on 4/2, 4/3	No		complete
GEN38_059498A	12/18/2007	CSO	4/1/2009	4/30/2009	Flow	72.38	72.38	Circular	1.50	0.88	0.88	0.90	0.00	0.00	2.75		NA	Unidepth	Continuity	No, imbalance seen may be due to storage tank	Yes, to stored BF curve	Yes 4/2, 4/12	No		complete
GEN38_060W012	12/12/2007	CSO	4/1/2009	4/30/2009	Flow	14.75	14.88	Circular	1.25	0.98		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, see also final comments for NPDES165	None	Yes, briefly on 4/3	No		complete
GEN38_D059191	1/31/2008	CSO	4/1/2009	4/30/2009	Flow	96.00	96.00	Circular	1.38	0.90		0.90	0.00		0.25		NA	Unidepth	Continuity	N/A	No data reconstituted due to flow conditions	No	No	Swapped to pulse meter on 12/12/08. Notable increase in depth this month.	complete
GEN40_059407	12/19/2007	CSO	4/1/2009	4/30/2009	Flow	10.13	10.13	Circular	1.75	0.90	0.90	0.90	0.50		0.00		NA	Unidepth	Continuity	Yes, very tight, slightly out of balance on dry days.	None	No	No		complete
GEN40_059409	1/24/2008	CSO	4/1/2009	4/30/2009	Flow	10.00	10.00	Circular	1.25	0.87		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	None	No	No		complete
GEN40_059436	1/24/2008	CSO	4/1/2009	4/30/2009	Flow	14.00	14.00	Circular	1.38	0.90		0.90	0.25		0.00		N/A	Unidepth	Continuity	Yes	Data reconstituted to BF curve derived from month.	No	No		complete
GEN40_059490	12/19/2007	CSO	4/1/2009	4/30/2009	Flow	12.13	12.00	Elliptical	1.38	0.90		0.90	0.00		0.00		NA	Unidepth	Continuity	No, see comments for NPDES040	None	Yes, frquently at depths greater than 5.0"	Yes, frequently		complete
GEN40_059490 Mpt 2	2/7/2008	CSO	4/1/2009	4/30/2009	*Depth Only*	148.50	71.50	Elliptical	123.00	0.90		0.90			1.75			Unidepth	Manning	N/A	None	No	No		complete
GEN42_060W014	12/20/2007	CSO	4/1/2009	4/30/2009	Flow	12.00	11.25	Elliptical	1.50	0.90		0.90	0.00		2.75		NA	Unidepth	Continuity	No, see final comments for NPDES042; in and out of balance	None	Yes at depths > 5"	yes, frequently	Site hydraulics are very slow causing silt build up; left velocity as reported from the meter	complete
GEN42_060W019	12/20/2007	CSO	4/1/2009	4/30/2009	Flow	12.25	11.75	Elliptical	1.63	1.02		0.90	0.38	0.00	0.00		NA	Unidepth	Continuity	No, in and out	None	Yes, at various depths	Yes, frequently	all negative velocity that reading that were obviously wron(per Jackie) were flagged	complete
GEN42_060W047	12/20/2007	CSO	4/1/2009	4/30/2009	Flow	140.50	143.00	Elliptical	1.63	0.73		0.90	0.00		3.00		Pass	avgudepth	Continuity	No	None	Yes, frequently at depths greater than 7.0".	No	The ultra fires from 12ft above the deck into a 12" cunette. Site conditions contribute to low percentage of U-pair firings; velocity zeros at higher depths were not reconstituted. all negative velocity that has previously been edited and left as reported from the meter; Flagged bad depth.	complete
NPDES037_MH059489	12/21/2007	CSO NPDES	4/1/2009	4/30/2009	Flow	18.63	18.38	Elliptical		0.90		0.90	0.00	0.00	0.75		N/A	Unidepth	Continuity	N/A		No	No	MP1 has ultra sensor only,	Complete
NPDES037_MH059489 MP2		CSO NPDES	4/1/2009	4/30/2009	Flow	18.63	18.38	Elliptical		0.90		0.90			0.38		N/A	Unidepth	Continuity	N/A	Minimum flows frequently drop to zero due to low velocity.	No	No	MP2 has velocity sensor, ultra and pressure.	Complete
NPDES038_MH059451	12/21/2007	CSO NPDES	4/1/2009	4/30/2009	Flow	72.75	72.5	Elliptical	1.25	0.90		0.90	0.00		0.00		no, too large	Unidepth	Site not recommended for DWF calculation (not even Mannings)	no, see final comments	None	Stagnant except for events		Site appears to be mostly stagnant except during rain events. Not recommended for DWF calculation.	DATA NOT SUITABLE FOR DWF
NPDES040_MH059491	12/21/2007	CSO NPDES	4/1/2009	4/30/2009	Flow	80.50	80.50	Circular		0.90		0.90	0.00		0.00		No (site too large)	Unidepth	Continuity	Yes	None	Yes, frequently	No	Data gap 4/1-4/2 due to monitor malfunction	Complete
NPDES041A_MH059434	12/21/2007	CSO NPDES	4/1/2009	4/30/2009	Flow	14.50	14.13	Elliptical		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity	N/A	Reconstituted minimi velocity throughout the monitoring period	No	No	Slow low flow, vertical scattergraph is an indication to use data with caution. Mannings not an appropriate flow estimate.	Complete
NPDES041B_MH059406	12/21/2007	CSO NPDES	4/1/2009	4/30/2009	Flow	12.00	12.00	Circular		0.84		0.90	0.00		1.00			Unidepth	Continuity	Yes	Yes	No	Yes	Presence of silt a problem. Silt most likely comes and goes (measured between 0 - 1.75 inches) causing sharp decreases and increases in depth data set for no apparent reason. Set to 1" due to instability of silt presence.	Complete

SITE LISTING	DATE INSTALLED	TYPE	DATA START	DATA END	FINAL DATA TYPE	PIPE H	PIPE W	Shape	PO	GAIN	FINAL GAIN if changed after balance	A/P	Depth Ajd	FINAL DEPTH Ajd if changed after balance	Silt	FINAL SILT if changed after balance	Confirmation Weir?	Final D	Final Q	Balance US & DS	Reconstitution	Backwater	Surcharge	Final Comment	Final Check
NPDES042_MH060W052	12/21/2007	CSO NPDES	4/1/2009	4/30/2009	Flow	11.88	16.50	Standard Horseshoe		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity		Velocity frequently drop to zero due to low velocity/silt. Flagged bad velocity. Left velocity zeros during backwater.	Yes, frequently	Yes	Slow low flow, vertical scattergraph is an indication to use data with caution.	DATA MARGINAL FOR DWF
NPDES043_MH060W049	12/21/2007	CSO NPDES	4/1/2009	4/30/2009	Flow	24.38	24.13	Elliptical		0.90		0.90	0.00		0.00		No (site too large)	Unidepth	Continuity	N/A	Yes	yes, frequently	Yes, frequently	Data repeatable.	Complete
NPDES165_MH067078	12/21/2007	CSO NPDES	4/1/2009	4/30/2009	Flow	10	10.13	Elliptical		0.90		0.90	0.00		0.25		N/A	Unidepth	Continuity	Yes, most days	Minimal	No	Yes, 4/12	low slow flows, mutiple hydraulic shifts. Silt level most likely fluctuates. Orifce effect at depths > 9".	DATA MARGINAL FOR DWF

SITE LISTING	DATE INSTALLED	TYPE	DATA START	DATA END	FINAL DATA TYPE	PIPE H	PIPE W	Shape	PO	GAIN	FINAL GAIN if changed after balance	A/P	Depth Ajd	FINAL DEPTH Ajd if changed after balance	Silt	FINAL SILT if changed after balance	Confirmation Weir?	Final D	Final Q	Balance US & DS	Reconstitution	Backwater	Surcharge	Final Comment	Final Check
GEN38_059121	12/19/2007	CSO	5/1/2009	5/31/2009	Flow	22.88	25.25	Elliptical	1.38	0.84		0.90	0.00		0.00			Unidepth	Continuity	N/A	None	No	No	Removed 6/2/09	complete
GEN38_059131	1/4/2008	CSO	5/1/2009	5/31/2009	Flow	41.75	42.25	Elliptical	1.38	0.90		0.90	0.00		4.00		NA	Unidepth	Continuity	yes	Velocity data reconstituted to BF stored for phase ii	No	No	Hydraulics rarely reach above 2.0 fps. Removed 6/2/09	complete
GEN38_059320	12/12/2007	CSO	5/1/2009	5/31/2009	Flow	23.00	23.25	Elliptical	1.50	0.63		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	velocity reconstituted to stored phase ii curve.	No	No	Removed 6/2/09	complete
GEN38_059332	12/20/2007	CSO	5/1/2009	5/31/2009	Flow	40.38	38.25	Elliptical	1.38	0.56		0.55	2.70		0.00		NA	Unidepth	Continuity	Yes	None	No	No	Hydraulics rarely reach above1.50 fps. Crew moved the velocity sensor about 8 feet up the pipe to avoid interference and get better data. Removed /2/09	complete
GEN38_059346	7/9/2008	OverFlow	5/1/2009	5/31/2009	Flow	72.00	72.88	Elliptical	1.25	0.90		0.90			0.00		N/A	Unidepth	Continuity	N/A	None	No	No	Site is an overflow location. Little response from velocity this month	complete
GEN38_059371	1/3/2008	CSO	5/1/2009	5/31/2009	Flow	15.25	15.00	Elliptical	1.50	0.90		0.90	0.00		0.25	0.00	NA	Unidepth	Continuity	N/A	Reconstitution performed for drops to zero and outlyers using best fit curve for the month	No	No	Removed 6/2/09	complete
GEN38_059373	12/12/2007	CSO	5/1/2009	5/31/2009	Flow	29.63	30.00	Elliptical	1.50	0.90		0.90	0.00		0.13		NA	Unidepth	Continuity	N/A	None	No	No	Hydraulics rarely reach above 2.0 fps. Removed 6/2/09	complete
GEN38_059398	12/13/2007	CSO	5/1/2009	5/31/2009	Flow	21.00	21.13	Elliptical	1.50	0.90		0.90	0.50		0.13		NA	Unidepth	Continuity	Yes	Velocity data reconstituted to BF curve derived for the month	No	No	Site gets continuous silt built up in the line and blocking sensor, ring has been rotated as far as possible to still catch mins. Flagged bad data 5/12-5/14 due to sensor malfunctions.	complete
GEN38_059404	12/19/2007	CSO	5/1/2009	5/31/2009	Flow	15.00	14.63	Elliptical	1.38	0.92		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, very tight	None	No	No	Removed 6/2/09	complete
GEN38_059451	12/19/2007	CSO	5/1/2009	5/31/2009	Flow	71.88	72.13	Elliptical	1.25	1.08		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, most days	None	Yes, throughout the monitoring period	No		complete
GEN38_059498A	12/18/2007	CSO	5/1/2009	5/31/2009	Flow	72.38	72.38	Circular	1.50	0.88	0.88	0.90	0.00	0.00	2.75		NA	Unidepth	Continuity	No, imbalance seen may be due to storage tank	Yes, to stored BF curve	Yes, a few times throughout the monitoring period	No		complete
GEN38_060W012	12/12/2007	CSO	5/1/2009	5/31/2009	Flow	14.75	14.88	Circular	1.25	0.98		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, see also final comments for NPDES165	None	No	No		complete
GEN38_D059191	1/31/2008	CSO	5/1/2009	5/31/2009	Flow	96.00	96.00	Circular	1.38	0.90		0.90	0.00		0.25		NA	Unidepth	Continuity	N/A	No data reconstituted due to flow conditions	No	No	Swapped to pulse meter on 12/12/08. Stagnant flow observed towards the end of the month. Removed 6/4/09.	complete
GEN40_059407	12/19/2007	CSO	5/1/2009	5/31/2009	Flow	10.13	10.13	Circular	1.75	0.90	0.90	0.90	0.50		0.00		NA	Unidepth	Continuity	No,slightly out of balance on most days.	None	No	No		complete
GEN40_059409	1/24/2008	CSO	5/1/2009	5/31/2009	Flow	10.00	10.00	Circular	1.25	0.87		0.90	0.00		0.00		NA	Unidepth	Continuity	N/A	None	No	No	Removed 6/2/09	complete
GEN40_059436	1/24/2008	CSO	5/1/2009	5/31/2009	Flow	14.00	14.00	Circular	1.38	0.90		0.90	0.25		0.00		N/A	Unidepth	Continuity	Yes	Data reconstituted to BF curve derived from 4/1-6/5/09	No	No	Removed 6/2/09	complete
GEN40_059490	12/19/2007	CSO	5/1/2009	5/31/2009	Flow	12.13	12.00	Elliptical	1.38	0.90		0.90	0.00		0.00		NA	Unidepth	Continuity	Yes, see comments for NPDES040	None	Yes, frquently at depths greater than 5.0"	Yes, frequently	Removed 6/2/09	complete
GEN40_059490 Mpt 2	2/7/2008	CSO	5/1/2009	5/31/2009	*Depth Only*	148.50	71.50	Elliptical	123.00	0.90		0.90			1.75			Unidepth	Manning	N/A	None	No	No		complete
GEN42_060W014	12/20/2007	CSO	5/1/2009	5/31/2009	Flow	12.00	11.25	Elliptical	1.50	0.90		0.90	0.00		2.75		NA	Unidepth	Continuity	No, see final comments for NPDES042; in and out of balance	None	Yes at depths > 5"	yes, frequently	Site hydraulics are very slow causing silt build up; left velocity as reported from the meter	complete
GEN42_060W019	12/20/2007	CSO	5/1/2009	5/31/2009	Flow	12.25	11.75	Elliptical	1.63	1.02		0.90	0.38	0.00	0.00		NA	Unidepth	Continuity	No, in and out	None	No	No	all negative velocity that reading that were obviously wrong(per Jackie) were flagged	complete
GEN42_060W047	12/20/2007	CSO	5/1/2009	5/31/2009	Flow	140.50	143.00	Elliptical	1.63	0.73		0.90	0.00		3.00		Pass	unidepth	Continuity	No	None	Yes, frequently at depths greater than 7.0".	No	The ultra fires from 12ft above the deck into a 12" cunette. Site conditions contribute to low percentage of U-pair firings; velocity zeros at higher depths were not reconstituted. all negative velocity that has previously been edited and left as reported from the meter; Flagged bad depth. Removed 6/2/09.	complete
NPDES037_MH059489	12/21/2007	CSO NPDES	5/1/2009	5/31/2009	Flow	18.63	18.38	Elliptical		0.90		0.90	0.00	0.00	0.75		N/A	Unidepth	Continuity	N/A		No	No	MP1 has ultra sensor only,	Complete
NPDES037_MH059489 MP2		CSO NPDES	5/1/2009	5/31/2009	Flow	18.63	18.38	Elliptical		0.90		0.90			0.38		N/A	Unidepth	Continuity	N/A	Minimum flows frequently drop to zero due to low velocity.	No	No	MP2 has velocity sensor, ultra and pressure.	Complete
NPDES040_MH059491	12/21/2007	CSO NPDES	5/1/2009	5/31/2009	Flow	80.50	80.50	Circular		0.90		0.90	0.00		0.00		No (site too large)	Unidepth/ pdepth	Continuity	Yes	None	Yes, frequently	No	5/21/09 start using pdepth for Dfinoal. Ultra was moved above the weir wall. This caused firing off the bench. Pressure more reliable for measuring depth.	Complete
NPDES041A_MH059434	12/21/2007	CSO NPDES	5/1/2009	5/31/2009	Flow	14.50	14.13	Elliptical		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity	N/A	Reconstituted miniml velocity throughout the monitoring period	No	No	Slow low flow; vertical scattergraph is an indication to use data with caution. Mannings not an appropriate flow estimate.	Complete

SITE LISTING	DATE INSTALLED	TYPE	DATA START	DATA END	FINAL DATA TYPE	PIPE H	PIPE W	Shape	PO	GAIN	FINAL GAIN if changed after balance	A/P	Depth Ajd	FINAL DEPTH Ajd if changed after balance	Silt	FINAL SILT if changed after balance	Confirmation Weir?	Final D	Final Q	Balance US & DS	Reconstitution	Backwater	Surcharge	Final Comment	Final Check
NPDES041B_MH059406	12/21/2007	CSO NPDES	5/1/2009	5/31/2009	Flow	12.00	12.00	Circular		0.84		0.90	0.00		1.00			Unidepth	Continuity	Yes	Yes	No	Yes	Presence of silt a problem. Silt most likely comes and goes (measured between 0 - 1.75 inches) causing sharp decreases and increases in depth data set for no apparent reason. Set to 1" due to instability of silt presence. Flagged bad data 5/7-5/11 due to blown ring.	Complete
NPDES042_MH060W052	12/21/2007	CSO NPDES	5/1/2009	5/31/2009	Flow	11.88	16.50	Standard Horseshoe		0.90		0.90	0.00		0.00		No (odd shaped pipe)	Unidepth	Continuity		Velocity frequently drop to zero due to low velocity/silt. Flagged bad velocity. Left velocity zeros during backwater.	Yes, frequently	Yes	Slow low flow, vertical scattergraph is an indication to use data with caution.	DATA MARGINAL FOR DWF
NPDES043_MH060W049	12/21/2007	CSO NPDES	5/1/2009	5/31/2009	Flow	24.38	24.13	Elliptical		0.90		0.90	0.00		0.00		No (site too large)	Unidepth	Continuity	N/A	Yes	yes, frequently	Yes, frequently	Data repeatable.	Complete
NPDES165_MH067078	12/21/2007	CSO NPDES	5/1/2009	5/31/2009	Flow	10	10.13	Elliptical		0.90		0.90	0.00		0.25		N/A	Unidepth	Continuity	Yes	Minimal	No	Yes, 5/19	low slow flows, mutiple hydraulic shifts. Silt level most likely fluctuates. Orifce effect at depths > 9".	DATA MARGINAL FOR DWF

Appendix H: ADS Site Confirmations

059-121 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN38_059121	29-Jan-08	1.75	0	1.91	0.25
GEN38_059121	29-Jan-08	1.75	0	1.91	0.25
GEN38_059121	29-Jan-08	2	0	2.4	0.38
GEN38_059121	29-Jan-08	2	0	2.4	0.38
GEN38_059121	05-Jun-08	1.88	0	2.41	0.25
GEN38_059121	05-Jun-08	1.88	0	2.41	0.25
GEN38_059121	05-Aug-08	1.63	0	2.58	0.25
GEN38_059121	05-Aug-08	1.63	0	2.58	0.25
GEN38_059121	05-Aug-08	1.38	0	2.37	0.25
GEN38_059121	05-Aug-08	1.38	0	2.37	0.25
GEN38_059121	30-Apr-09	1.75	0	2.42	0.25
GEN38_059121	07-May-09	1.88	0	2.56	0.38
GEN38_059121	02-Jun-09	1.75	0	1.74	0.25
GEN38_059121	02-Jun-09	1.75	0	1.87	0.25

059-131 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN38_059131	04-Jan-08	9.38	4	0.6	0.38
GEN38_059131	04-Jan-08	9.38	4	0.6	0.38
GEN38_059131	18-Mar-08	8.38	0.75	0	0.25
GEN38_059131	18-Mar-08	8.38	0.75	0	0.25
GEN38_059131	29-Apr-08	8.38	0	0.47	0.25
GEN38_059131	29-Apr-08	8.38	0	0.47	0.25
GEN38_059131	05-Jun-08	7.75	4.25	0.21	0.38
GEN38_059131	05-Jun-08	7.75	4.25	0.21	0.38
GEN38_059131	02-Jun-09	8	5	0.2	0.25
GEN38_059131	02-Jun-09	8	5	0.25	0.25

059-320 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN38_059320	27-Feb-08	1.88	0	0.78	0.25
GEN38_059320	27-Feb-08	1.88	0	0.78	0.25
GEN38_059320	05-Jun-08	1.75	0	0.72	0.25
GEN38_059320	05-Jun-08	1.75	0	0.72	0.25
GEN38_059320	14-Oct-08	1.25	0	0.43	0.25
GEN38_059320	14-Oct-08	1.25	0	0.43	0.25
GEN38_059320	02-Jun-09	1.75	0	1.02	0.25
GEN38_059320	02-Jun-09	1.75	0	1.06	0.25

059-332 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN38_059332	26-Feb-08	8.13	0	0.35	0.25
GEN38_059332	26-Feb-08	8.13	0	0.35	0.25
GEN38_059332	31-Mar-08	8.75	0	1.08	0.5
GEN38_059332	31-Mar-08	8.75	0	1.08	0.5
GEN38_059332	29-Apr-08	7.75	0	0.89	0.25
GEN38_059332	29-Apr-08	7.75	0	0.89	0.25
GEN38_059332	05-Jun-08	10	0	1.45	0.38
GEN38_059332	05-Jun-08	10	0	1.45	0.38
GEN38_059332	12-Aug-08	6.87	0	0.34	0.38
GEN38_059332	12-Aug-08	6.87	0	0.34	0.38
GEN38_059332	14-Oct-08	7.75	0	0.44	0.38
GEN38_059332	14-Oct-08	7.75	0	0.44	0.38
GEN38_059332	14-Nov-08	12	0	1.94	0.38
GEN38_059332	11-Dec-08	11.25	0	2.86	0.25
GEN38_059332	02-Jun-09	6.5	0	1.42	0.25
GEN38_059332	02-Jun-09	6.5	0	2.23	0.25

059-346 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN38_059346	09-Jul-08	0	0	0	0.13
GEN38_059346	09-Jul-08	0	0	0	0.13
GEN38_059346	09-Sep-08	0	0	0	0.13
GEN38_059346	09-Sep-08	0	0	0	0.13

Note: GEN38_059346 was incorrectly labeled. This site is at MH 059-574, not MH 059-346. See Section 3.2 in the report for more details. Continued monitoring at this location can be found under the label GEN38_059574, which is upstream of NPDES38_MH059574.

059-371 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN38_059371	03-Jan-08	3.25	0	0.76	0.25
GEN38_059371	03-Jan-08	3.25	0	0.76	0.25
GEN38_059371	04-Mar-08	1.38	0.25	0.87	0.25
GEN38_059371	04-Mar-08	1.38	0.25	0.87	0.25
GEN38_059371	16-Apr-08	1.25	0	0.88	0.38
GEN38_059371	16-Apr-08	1.25	0	0.88	0.38
GEN38_059371	16-Apr-08	1.25	0	0	0.13
GEN38_059371	16-Apr-08	1.25	0	0	0.13
GEN38_059371	16-Apr-08	1.25	0	0	0.13
GEN38_059371	16-Apr-08	1.25	0	0	0.13
GEN38_059371	16-Apr-08	1.25	0	0	0.13
GEN38_059371	16-Apr-08	1.25	0	0	0.13
GEN38_059371	04-Jun-08	1.25	0.13	0.27	0.38
GEN38_059371	04-Jun-08	1.25	0.13	0.27	0.38
GEN38_059371	07-Aug-08	1.25	0.13	1.18	0.25
GEN38_059371	07-Aug-08	1.25	0.13	1.18	0.25
GEN38_059371	02-Jun-09	1.88	0.5	0.71	0.25
GEN38_059371	02-Jun-09	1.5	0.5	0.77	0.25

059-373 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN38_059373	26-Feb-08	1.75	0.13	0.72	0.25
GEN38_059373	26-Feb-08	1.75	0.13	0.72	0.25
GEN38_059373	04-Jun-08	1.75	0.13	1.42	0.38
GEN38_059373	04-Jun-08	1.75	0.13	1.42	0.38
GEN38_059373	19-Aug-08	1.63	0.13	0.47	0.25
GEN38_059373	19-Aug-08	1.63	0.13	0.47	0.25
GEN38_059373	19-Aug-08	1.5	0.13	0.75	0.25
GEN38_059373	19-Aug-08	1.5	0.13	0.75	0.25
GEN38_059373	02-Jun-09	1	0	1.15	0.25
GEN38_059373	02-Jun-09	0.75	0	1.08	0.25

059-398 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN38_059398	26-Feb-08	5.75	0	0.91	0.38
GEN38_059398	26-Feb-08	5.75	0	0.91	0.38
GEN38_059398	25-Mar-08	6	0.13	1.08	0.25
GEN38_059398	25-Mar-08	6	0.13	1.08	0.25
GEN38_059398	05-Jun-08	5.63	0.75	0.88	0.25
GEN38_059398	05-Jun-08	5.63	0.75	0.88	0.25

059-404 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN38_059404	27-Feb-08	3.88	0	1.02	0.38
GEN38_059404	27-Feb-08	3.88	0	1.02	0.38
GEN38_059404	23-Apr-08	3.5	0	0.85	0.38
GEN38_059404	23-Apr-08	3.5	0	0.85	0.38
GEN38_059404	04-Jun-08	4.25	0	1.21	0.25
GEN38_059404	04-Jun-08	4.25	0	1.21	0.25
GEN38_059404	27-Oct-08	2.75	0	0.75	0.38
GEN38_059404	02-Jun-09	3.5	0	0.96	0.25
GEN38_059404	02-Jun-09	3.5	0	0.92	0.25

059-406 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
NPDES041B_MH059406	03-Sep-08	5	1.75	0.5	0.25
NPDES041B_MH059406	03-Sep-08	5	1.75	0.5	0.25
NPDES041B_MH059406	03-Sep-08	4.25	1.25	0.6	0.25
NPDES041B_MH059406	03-Sep-08	4.25	1.25	0.6	0.25
NPDES041B_MH059406	04-Mar-09	5.88	1.5	1	0.25
NPDES041B_MH059406	04-Mar-09	5	0	0	0.25
NPDES041B_MH059406	11-May-09	5.13	0	0.76	0.38

059-407 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN40_059407	04-Mar-08	1.38	0	3.25	0.25
GEN40_059407	04-Mar-08	1.38	0	3.25	0.25
GEN40_059407	25-Mar-08	1.75	0	4.38	0.38
GEN40_059407	25-Mar-08	1.75	0	4.38	0.38
GEN40_059407	16-Apr-08	1.25	0	3.54	0.38
GEN40_059407	16-Apr-08	1.25	0	3.54	0.38
GEN40_059407	16-Apr-08	1.25	0	0	0.38
GEN40_059407	16-Apr-08	1.25	0	0	0.38
GEN40_059407	16-Apr-08	1.25	0	0	0.38
GEN40_059407	16-Apr-08	1.25	0	0	0.38
GEN40_059407	16-Apr-08	1.25	0	0	0.38
GEN40_059407	16-Apr-08	1.25	0	0	0.38
GEN40_059407	05-Jun-08	1.38	0	3.22	0.25
GEN40_059407	05-Jun-08	1.38	0	3.22	0.25
GEN40_059407	26-Aug-08	1.38	0	4.02	0.25
GEN40_059407	26-Aug-08	1.38	0	4.02	0.25

059-409 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN40_059409	24-Jan-08	1.38	0	1.57	0.25
GEN40_059409	24-Jan-08	1.38	0	1.57	0.25
GEN40_059409	26-Feb-08	1.13	0	1.08	0.25
GEN40_059409	26-Feb-08	1.13	0	1.08	0.25
GEN40_059409	05-Jun-08	1.38	0	1.75	0.25
GEN40_059409	05-Jun-08	1.38	0	1.75	0.25
GEN40_059409	02-Jun-09	1.25	0	1.23	0.25
GEN40_059409	02-Jun-09	1.25	0	1.2	0.25

059-434 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
NPDES041A_MH059434	21-May-08	0.63	0	0	0.38
NPDES041A_MH059434	21-May-08	0.63	0	0	0.38
NPDES041A_MH059434	21-May-08	0	0	0	0.13
NPDES041A_MH059434	21-May-08	0	0	0	0.13

059-436 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN40_059436	24-Jan-08	1.75	0	1.36	0.25
GEN40_059436	24-Jan-08	1.75	0	1.36	0.25
GEN40_059436	26-Feb-08	1.25	0	1.08	0.38
GEN40_059436	26-Feb-08	1.25	0	1.08	0.38
GEN40_059436	06-Jun-08	1.75	0.13	2.15	0.38
GEN40_059436	06-Jun-08	1.75	0.13	2.15	0.38
GEN40_059436	11-Nov-08	2	0	1.68	0.25
GEN40_059436	11-Nov-08	2.13	0	1.52	0.25
GEN40_059436	02-Jun-09	1.5	0	1.35	0.25
GEN40_059436	02-Jun-09	1.75	0	1.26	0.25

059-443

059-443 is operated by King County. There are no Site Confirmations available for this site.

059-451

Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN38_059451	18-Mar-08	1.63	0	4.28	0.38
GEN38_059451	18-Mar-08	1.63	0	4.28	0.38
GEN38_059451	25-Mar-08	2.5	0	4.42	0.5
GEN38_059451	25-Mar-08	2.5	0	4.42	0.5
GEN38_059451	05-Jun-08	1.88	0	3.47	0.25
GEN38_059451	05-Jun-08	1.88	0	3.47	0.25
GEN38_059451	15-Oct-08	1.5	0	3.91	0.25
GEN38_059451	15-Oct-08	1.5	0	3.91	0.25
GEN38_059451	04-Dec-08	2	0	3.08	0.25

059-451 "A"

Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
NPDES038_MH059451	20-Feb-08	0	0	0	0
NPDES038_MH059451	20-Feb-08	0	0	0	0
NPDES038_MH059451	20-Feb-08	0	0	0	0
NPDES038_MH059451	20-Feb-08	0	0	0	0
NPDES038_MH059451	22-May-08	0.13	0.13	0	0
NPDES038_MH059451	22-May-08	0.13	0.13	0	0
NPDES038_MH059451	22-May-08	12.5	0	0	0.38
NPDES038_MH059451	22-May-08	12.5	0	0	0.38
NPDES038_MH059451	22-Jan-09	0	0	0	0
NPDES038_MH059451	22-Jan-09	0.13	0.13	0	0.25
NPDES038_MH059451	12-Feb-09	3.88	2.5	0.37	0.25
NPDES038_MH059451	13-Feb-09	0	0	0	0.13
NPDES038_MH059451	13-Feb-09	0	0	0	0.13

Note: NPDES_38 MH059451 was incorrectly labeled. This site is at MH 059-574, not MH 059-451. Continued monitoring at this site can be found under the label "NPDES038_MH059574." This site is also known as "Structure A". Please see Section 3.2 *059-451 "A" (Monitoring ID NPDES38_059-451, Structure "A")* in the report for more details.

059-489

Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
NPDES037_MH059489	26-Feb-08	2.25	1.3	1.44	0.38
NPDES037_MH059489	26-Feb-08	2.25	1.3	1.44	0.38
NPDES037_MH059489	02-Sep-08	4.38	0.38	0.67	0.25
NPDES037_MH059489	02-Sep-08	4.38	0.38	0.67	0.25
NPDES037_MH059489	12-Feb-09	3.88	2.5	0.37	0.25

059-490 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN40_059490	07-Feb-08	5.38	1	0	0.38
GEN40_059490	07-Feb-08	5.38	1	0	0.38
GEN40_059490	21-Feb-08	1.5	0	2.96	0.38
GEN40_059490	21-Feb-08	1.5	0	2.96	0.38
GEN40_059490	06-Mar-08	1.37	0	3.64	0.25
GEN40_059490	06-Mar-08	1.37	0	3.64	0.25
GEN40_059490	06-Mar-08	3	2.5	0	0.38
GEN40_059490	06-Mar-08	3	2.5	0	0.38
GEN40_059490	04-Jun-08	1.25	0	2.02	0.25
GEN40_059490	04-Jun-08	1.25	0	2.02	0.25
GEN40_059490	04-Jun-08	3.75	1.75	0	0.38
GEN40_059490	04-Jun-08	3.75	1.75	0	0.38
GEN40_059490	02-Jun-09	1.25	0	2.96	0.25
GEN40_059490	02-Jun-09	9.25	5	0	0.25

059-491 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
NPDES040_MH059491	20-May-08	2.75	0.13	1.95	0.38
NPDES040_MH059491	20-May-08	2.75	0.13	1.95	0.38
NPDES040_MH059491	22-Jan-09	0	0	0	0
NPDES040_MH059491	22-Jan-09	0.13	0.13	0	0.25
NPDES040_MH059491	13-Feb-09	0	0	0	0.13
NPDES040_MH059491	13-Feb-09	0	0	0	0.13
NPDES040_MH059491	21-May-09	0	0	0	0

059-498 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN38_059498A	07-Feb-08	8.75	0.5	0.84	0.25
GEN38_059498A	07-Feb-08	8.75	0.5	0.84	0.25
GEN38_059498A	26-Feb-08	10.25	2.5	0.96	0.25
GEN38_059498A	26-Feb-08	10.25	2.5	0.96	0.25
GEN38_059498A	25-Mar-08	8.63	5	0.77	0.38
GEN38_059498A	25-Mar-08	8.63	5	0.77	0.38
GEN38_059498A	29-Apr-08	7.75	2.75	0.9	0.38
GEN38_059498A	29-Apr-08	7.75	2.75	0.9	0.38
GEN38_059498A	05-Jun-08	6.88	2.88	0.75	0.38
GEN38_059498A	05-Jun-08	6.88	2.88	0.75	0.38

060W-012 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN38_060W012	28-Feb-08	3.25	0	1.54	0.38
GEN38_060W012	28-Feb-08	3.25	0	1.54	0.38
GEN38_060W012	04-Jun-08	2.75	0	1.74	0.25
GEN38_060W012	04-Jun-08	2.75	0	1.74	0.25
GEN38_060W012	11-Dec-08	2.25	0	1.23	0.25

060W-014 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN42_060W014	18-Mar-08	4.58	3	0.45	0.38
GEN42_060W014	18-Mar-08	4.58	3	0.45	0.38
GEN42_060W014	04-Jun-08	4.63	2.5	0.13	0.38
GEN42_060W014	04-Jun-08	4.63	2.5	0.13	0.38
GEN42_060W014	05-Aug-08	3.13	2	0.68	0.25
GEN42_060W014	05-Aug-08	3.13	2	0.68	0.25

060W-019 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN42_060W019	28-Feb-08	1.49	0	7.3	0.38
GEN42_060W019	28-Feb-08	1.49	0	7.3	0.38
GEN42_060W019	04-Jun-08	0.88	0	7.6	0.38
GEN42_060W019	04-Jun-08	0.88	0	7.6	0.38
GEN42_060W019	03-Jul-08	1.12	0	6.52	0.38
GEN42_060W019	03-Jul-08	1.12	0	6.52	0.38
GEN42_060W019	11-Nov-08	1.12	0	9.2	0.38
GEN42_060W019	03-Feb-09	0.5	0	4.5	0.38

060W-025

060W-025 was removed in February, 2008. There are no Site Confirmations available for this site.

060W-026

060W-026 was removed in July, 2008. There are no Site Confirmations available for this site.

060W-047 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN42_060W047	12-Mar-08	5.38	1.75	0.96	0.38
GEN42_060W047	12-Mar-08	5.38	1.75	0.96	0.38
GEN42_060W047	27-Mar-08	5.88	2.5	1.09	0.53
GEN42_060W047	27-Mar-08	5.88	2.5	1.09	0.53
GEN42_060W047	05-Jun-08	7.13	3	1.23	0.25
GEN42_060W047	05-Jun-08	7.13	3	1.23	0.25
GEN42_060W047	16-Oct-08	5.5	4	0.94	0.38
GEN42_060W047	11-Nov-08	6	3	1.33	0.25
GEN42_060W047	19-Feb-09	4.38	2.5	1.22	0.25
GEN42_060W047	02-Jun-09	5.75	3	0.95	0.38
GEN42_060W047	02-Jun-09	5.75	3	0.88	0.38

060W-049 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
NPDES043_MH060W049	09-Apr-09	0	0	0	0.13
NPDES043_MH060W049	13-May-09	1.13	0	3.2	0.38
NPDES043_MH060W049	13-May-09	0	0	0	0.13

060W-052 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
NPDES042_MH060W052	22-May-08	2.5	0	1.35	0.38
NPDES042_MH060W052	22-May-08	2.5	0	1.35	0.38
NPDES042_MH060W052	13-Jun-08	1.38	0	1.03	0.25
NPDES042_MH060W052	13-Jun-08	1.38	0	1.03	0.25
NPDES042_MH060W052	04-Sep-08	0.75	0	0	0.13
NPDES042_MH060W052	04-Sep-08	0.75	0	0	0.13
NPDES042_MH060W052	29-Jan-09	1.5	0.25	0.38	0.13
NPDES042_MH060W052	29-Jan-09	0.63	0	1.02	0.25
NPDES042_MH060W052	23-Apr-09	2.25	1	0	0.25
NPDES042_MH060W052	23-Apr-09	0.75	0	0	0.38

067-014 067-014 is operated by the RainCatchers program. There are no Site Confirmations available for this site.

067-024 067-024 is operated by the RainCatchers program. There are no Site Confirmations available for this site.

067-029 067-029 is operated by the RainCatchers program. There are no

067-078 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
NPDES165_MH067078	28-Jan-09	2	0	0.64	0.25
NPDES165_MH067078	28-Jan-09	0	0	0	0

D059-191 Site Confirmations

Location	DateTime	Depth	Silt	Velocity	DepthAcc
GEN38_D059191	31-Jan-08	10.38	0	0	0.38
GEN38_D059191	31-Jan-08	10.38	0	0	0.38
GEN38_D059191	26-Feb-08	16.25	0	0	0.25
GEN38_D059191	26-Feb-08	16.25	0	0	0.25
GEN38_D059191	04-Jun-08	33.75	0.25	0	0.38
GEN38_D059191	04-Jun-08	33.75	0.25	0	0.38

Pump Station #5 Pump Station #5 is operated by Seattle Public Utilities. There are no Site Confirmations available for this site.

Pump Station #6 Pump Station #6 is operated by Seattle Public Utilities. There are no Site Confirmations available for this site.

Rainier Avenue Lift Station Rainier Avenue Lift Station is operated by Seattle Public Utilities. There are no Site Confirmations available for this site.

Appendix I: Precipitation Analysis

Rain Gage 18: Storms from 1/1/2008 to 5/31/2009 based on project storm definition (6 hour interevent period, 0.3" minimum storm depth)

Storm Definition = 6 hours between measured precip., 0.3" minimum depth. Precipitation not meeting these requirements is not reported.

Storm Date/Time Range		Storm Duration (hours)	Antecedent Dry Period (days)	Total Storm Depth (inches)	Depth and Frequency for Multiple Durations																			
					5 min		10 min		30 min		1 hr		6 hr		12 hr		24 hr		48 hr		96 hr		168 hr	
Begin	End				Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency
12/16/07 18:00	12/17/07 5:00	11.00	0.9	0.39	0.02	< 2 Month	0.03	< 2 Month	0.09	< 2 Month	0.15	< 2 Month	0.20	< 2 Month	0.39	< 2 Month	0.39	< 2 Month	0.45	< 2 Month	0.00	< 2 Month	0.00	< 2 Month
12/18/07 2:25	12/18/07 18:30	16.08	0.9	0.47	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.13	< 2 Month	0.28	< 2 Month	0.42	< 2 Month	0.47	< 2 Month	0.83	< 2 Month	0.88	< 2 Month	0.00	< 2 Month
12/19/07 1:05	12/19/07 9:45	8.67	0.3	0.31	0.02	< 2 Month	0.03	< 2 Month	0.06	< 2 Month	0.09	< 2 Month	0.25	< 2 Month	0.31	< 2 Month	0.63	< 2 Month	0.78	< 2 Month	1.17	< 2 Month	0.00	< 2 Month
12/22/07 4:45	12/22/07 12:15	7.50	1.6	0.35	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.13	< 2 Month	0.32	< 2 Month	0.35	< 2 Month	0.35	< 2 Month	0.36	< 2 Month	0.73	< 2 Month	1.94	2-month
12/23/07 7:10	12/23/07 18:05	10.92	0.8	0.37	0.02	< 2 Month	0.02	< 2 Month	0.06	< 2 Month	0.10	< 2 Month	0.30	< 2 Month	0.37	< 2 Month	0.37	< 2 Month	0.72	< 2 Month	0.72	< 2 Month	2.26	3-month
12/27/07 8:55	12/28/07 2:00	17.08	1.1	0.32	0.01	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.10	< 2 Month	0.23	< 2 Month	0.29	< 2 Month	0.32	< 2 Month	0.33	< 2 Month	0.48	< 2 Month	1.20	< 2 Month
1/2/08 2:40	1/2/08 8:00	5.33	2.9	0.36	0.02	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.09	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.83	< 2 Month
1/2/08 14:05	1/3/08 19:50	29.75	0.3	0.42	0.02	< 2 Month	0.04	< 2 Month	0.09	< 2 Month	0.10	< 2 Month	0.14	< 2 Month	0.37	< 2 Month	0.53	< 2 Month	0.78	< 2 Month	0.78	< 2 Month	1.10	< 2 Month
1/8/08 0:55	1/8/08 8:55	8.00	1.0	0.31	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.07	< 2 Month	0.25	< 2 Month	0.31	< 2 Month	0.31	< 2 Month	0.42	< 2 Month	0.65	< 2 Month	1.55	< 2 Month
1/9/08 21:05	1/10/08 9:45	12.67	1.1	0.47	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.11	< 2 Month	0.38	< 2 Month	0.46	< 2 Month	0.47	< 2 Month	0.70	< 2 Month	0.85	< 2 Month	1.49	< 2 Month
1/10/08 16:50	1/11/08 5:40	12.83	0.3	0.33	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.12	< 2 Month	0.26	< 2 Month	0.31	< 2 Month	0.72	< 2 Month	0.80	< 2 Month	1.15	< 2 Month	1.63	< 2 Month
2/6/08 14:00	2/7/08 1:40	11.67	0.9	0.35	0.03	< 2 Month	0.04	< 2 Month	0.07	< 2 Month	0.08	< 2 Month	0.23	< 2 Month	0.35	< 2 Month	0.35	< 2 Month	0.55	< 2 Month	0.56	< 2 Month	0.73	< 2 Month
2/8/08 13:55	2/9/08 1:15	11.33	1.5	0.35	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.26	< 2 Month	0.35	< 2 Month	0.35	< 2 Month	0.39	< 2 Month	0.70	< 2 Month	0.91	< 2 Month
3/13/08 6:30	3/14/08 16:15	33.75	2.0	0.59	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.07	< 2 Month	0.25	< 2 Month	0.36	< 2 Month	0.47	< 2 Month	0.59	< 2 Month	0.65	< 2 Month	1.04	< 2 Month
3/23/08 4:55	3/23/08 15:10	10.25	2.3	0.75	0.02	< 2 Month	0.04	< 2 Month	0.11	< 2 Month	0.19	2-month	0.46	< 2 Month	0.75	2-month	0.75	< 2 Month	0.75	< 2 Month	0.88	< 2 Month	1.09	< 2 Month
3/25/08 14:25	3/26/08 6:15	15.83	2.0	0.31	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.11	< 2 Month	0.20	< 2 Month	0.27	< 2 Month	0.31	< 2 Month	0.31	< 2 Month	0.94	< 2 Month	1.27	< 2 Month
3/29/08 15:50	3/30/08 3:00	11.17	0.4	0.50	0.03	< 2 Month	0.05	< 2 Month	0.11	< 2 Month	0.14	< 2 Month	0.41	< 2 Month	0.50	< 2 Month	0.63	< 2 Month	1.00	< 2 Month	1.01	< 2 Month	2.22	3-month
4/14/08 14:20	4/14/08 22:20	8.00	0.8	0.30	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.12	< 2 Month	0.29	< 2 Month	0.30	< 2 Month	0.32	< 2 Month	0.39	< 2 Month	0.39	< 2 Month	0.54	< 2 Month
5/19/08 23:30	5/20/08 9:45	10.25	6.4	0.36	0.03	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.09	< 2 Month	0.25	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.56	< 2 Month
5/21/08 18:20	5/21/08 20:00	1.67	0.5	0.44	0.06	2-month	0.12	4-month	0.22	6-month	0.31	6-month	0.44	< 2 Month	0.44	< 2 Month	0.45	< 2 Month	0.81	< 2 Month	0.81	< 2 Month	0.81	< 2 Month
6/2/08 22:50	6/3/08 12:30	13.67	2.3	0.62	0.02	< 2 Month	0.03	< 2 Month	0.08	< 2 Month	0.15	< 2 Month	0.48	2-month	0.59	< 2 Month	0.62	< 2 Month	0.62	< 2 Month	0.66	< 2 Month	0.66	< 2 Month
6/6/08 5:00	6/6/08 19:00	14.00	0.5	0.48	0.05	< 2 Month	0.09	2-month	0.21	6-month	0.33	9-month	0.41	< 2 Month	0.47	< 2 Month	0.48	< 2 Month	0.60	< 2 Month	0.88	< 2 Month	1.48	< 2 Month
7/3/08 5:35	7/3/08 11:30	5.92	22.8	0.46	0.04	< 2 Month	0.07	< 2 Month	0.15	2-month	0.16	< 2 Month	0.46	< 2 Month	0.46	< 2 Month	0.46	< 2 Month	0.46	< 2 Month	0.46	< 2 Month	0.46	< 2 Month
8/19/08 20:45	8/20/08 7:30	10.75	1.2	0.66	0.02	< 2 Month	0.04	< 2 Month	0.10	< 2 Month	0.16	< 2 Month	0.52	2-month	0.66	< 2 Month	0.66	< 2 Month	0.81	< 2 Month	0.81	< 2 Month	0.81	< 2 Month
8/24/08 12:50	8/24/08 23:35	10.75	3.8	0.95	0.04	< 2 Month	0.07	< 2 Month	0.13	< 2 Month	0.22	3-month	0.64	4-month	0.95	4-month	0.95	2-month	0.95	< 2 Month	0.95	< 2 Month	2.04	2-month
8/25/08 12:20	8/25/08 20:45	8.42	0.5	0.65	0.10	9-month	0.16	1-year	0.38	2-year	0.53	2-year	0.64	4-month	0.65	< 2 Month	1.00	2-month	1.60	4-month	1.60	3-month	2.54	4-month
9/20/08 6:40	9/21/08 0:45	18.08	24.2	0.47	0.02	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.08	< 2 Month	0.31	< 2 Month	0.45	< 2 Month	0.47	< 2 Month	0.47	< 2 Month	0.47	< 2 Month	0.47	< 2 Month
10/3/08 6:20	10/4/08 13:20	31.00	0.5	0.72	0.06	2-month	0.08	< 2 Month	0.10	< 2 Month	0.10	< 2 Month	0.30	< 2 Month	0.47	< 2 Month	0.63	< 2 Month	0.73	< 2 Month	0.75	< 2 Month	0.75	< 2 Month
10/6/08 8:10	10/6/08 23:10	15.00	0.4	0.31	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.10	< 2 Month	0.26	< 2 Month	0.30	< 2 Month	0.31	< 2 Month	0.33	< 2 Month	0.77	< 2 Month	1.08	< 2 Month
10/13/08 18:50	10/14/08 1:25	6.58	2.4	0.40	0.12	1-year	0.22	2-year	0.28	1-year	0.30	6-month	0.39	< 2 Month	0.40	< 2 Month	0.40	< 2 Month	0.40	< 2 Month	0.41	< 2 Month	0.42	< 2 Month
10/31/08 3:30	10/31/08 15:15	11.75	7.8	0.36	0.01	< 2 Month	0.02	< 2 Month	0.06	< 2 Month	0.12	< 2 Month	0.31	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.36	< 2 Month
11/2/08 5:40	11/3/08 9:55	28.25	0.3	0.65	0.03	< 2 Month	0.05	< 2 Month	0.13	< 2 Month	0.19	2-month	0.33	< 2 Month	0.39	< 2 Month	0.58	< 2 Month	0.83	< 2 Month	1.14	< 2 Month	1.19	< 2 Month
11/3/08 18:35	11/4/08 8:45	14.17	0.4	0.86	0.02	< 2 Month	0.04	< 2 Month	0.08	< 2 Month	0.14	< 2 Month	0.60	4-month	0.82	3-month	0.88	2-month	1.32	3-month	1.69	3-month	2.05	2-month
11/6/08 1:35	11/7/08 10:00	32.42	1.7	2.26	0.03	< 2 Month	0.05	< 2 Month	0.13	< 2 Month	0.24	4-month	0.80	9-month	1.43	1-year	2.01	2-year	2.26	1-year	2.43	9-month	4.22	1-year
11/11/08 0:00	11/12/08 21:35	45.58	1.1	1.02	0.02	< 2 Month	0.03	< 2 Month	0.09	< 2 Month	0.15	< 2 Month	0.41	< 2 Month	0.66	< 2 Month	0.81	< 2 Month	1.02	< 2 Month	1.06	< 2 Month	3.66	1-year
12/12/08 9:05	12/13/08 8:15	23.17	1.9	0.83	0.04	< 2 Month	0.06	< 2 Month	0.11	< 2 Month	0.14	< 2 Month	0.34	< 2 Month	0.54	< 2 Month	0.83	< 2 Month	0.83	< 2 Month	0.84	< 2 Month	1.05	< 2 Month
12/24/08 12:15	12/25/08 16:20	28.08	0.8	1.03	0.02	< 2 Month	0.04	< 2 Month	0.11	< 2 Month	0.21	2-month	0.68	6-month	0.77	2-month	0.89	2-month	1.03	< 2 Month	1.06	< 2 Month	1.45	< 2 Month
12/28/08 14:45	12/28/08 23:25	8.67	0.3	0.31	0.03	< 2 Month	0.05	< 2 Month	0.11	< 2 Month	0.18	< 2 Month	0.28	< 2 Month	0.31	< 2 Month	0.56	< 2 Month	0.64	< 2 Month	0.82	< 2 Month	2.03	2-month
12/31/08 21:55	1/2/09 4:25	30.50	0.8	0.76	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.13	< 2 Month	0.38	< 2 Month	0.51	< 2 Month	0.62	< 2 Month	0.76	< 2 Month	0.89	< 2 Month	1.90	2-month
1/4/09 16:40	1/5/09 8:25	15.75	1.4	0.91	0.03	< 2 Month	0.06	< 2 Month	0.18	4-month	0.33	9-month	0.82	9-month	0.88	4-month	0.91	2-month	0.92	< 2 Month	0.93	< 2 Month	2.03	2-month
1/6/09 15:25	1/8/09 3:20	35.92	0.4	2.05	0.03	< 2 Month	0.05	< 2 Month	0.11	< 2 Month	0.20	2-month	1.02	1-year	1.44	1-year	1.56	9-month	2.09	9-month	2.96	1-year	3.75	1-year
2/24/09 22:40	2/25/09 16:40	18.00	0.4	0.38	0.02	< 2 Month	0.04	< 2 Month	0.09	< 2 Month	0.11	< 2 Month	0.25	< 2 Month	0.28	< 2 Month	0.38	< 2 Month	0.85	< 2 Month	0.96	< 2 Month	1.02	< 2 Month
2/24/09 22:40	2/25/09 16:40	18.00	0.4	0.38	0.02	< 2 Month	0.04	< 2 Month	0.09	< 2 Month	0.11	< 2 Month	0.25	< 2 Month	0.28	< 2 Month	0.38	< 2 Month	0.85	< 2 Month	0.96	< 2 Month	0.00	< 2 Month
3/1/09 14:25	3/2/09 7:40	17.25	0.3	0.33	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.08	< 2 Month	0.12	< 2 Month	0.24	< 2 Month	0.41	< 2 Month	0.43	< 2 Month	0.43	< 2 Month	1.44	< 2 Month
3/14/09 6:05	3/14/09 20:55	14.83	4.3	0.49	0.01	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.10	< 2 Month	0.32	< 2 Month	0.37	< 2 Month	0.49	< 2 Month	0.49	< 2 Month	0.49	< 2 Month	0.63	< 2 Month
3/15/09 5:50	3/17/09 9:55	52.08	0.4	0.77	0.02	< 2 Month	0.03	< 2 Month	0.08	< 2 Month	0.12	< 2 Month	0.34	< 2 Month	0.38	< 2 Month	0.53	< 2 Month	1.01	< 2 Month	1.22	< 2 Month	1.26	< 2 Month
4/1/09 7:25	4/2/09 1:45	18.33	0.7	0.41	0.01	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.07	< 2 Month	0.28	< 2 Month	0.33	< 2 Month	0.41	< 2 Month	0.45	< 2 Month	0.45	< 2 Month	0.78	< 2 Month
4/2/09 8:55	4/3/09 6:20	21.42	0.3	0.99	0.03	< 2 Month	0.06	< 2 Month	0.15	2-month	0.29	6-month	0.71	6-month	0.79	3-month	0.99	2-month	1.40	3-month	1.44	2-month	1.77	< 2 Month
4/12/09 3:00	4/12/09 18:15	15.25	0.9	1.04	0.12	1-year	0.16	1-year	0.25	9-month	0.33	9-month	0.62	4-month	0.88	4-month	1.04	3-month	1.05	< 2 Month	1.08	< 2 Month	1.10	< 2 Month
5/2/09 11:35	5/2/09 21:20	9.75	3.4	0.33	0.02	< 2 Month	0.04	< 2 Month	0.08	< 2 Month	0.12	< 2 Month	0.29	< 2 Month	0.33	< 2 Month	0.33	< 2 Month	0.33	< 2 Month	0.33	< 2 Month	0.45	< 2 Month
5/4/09 15:55	5/5/09 16:15	24.33	0.8	1.32	0.05	< 2 Month	0.09	2-month	0.21	6-month	0.28	6-month	0.68	6-month	0.95	4-month	1.31	6-month	1.44	3-month	1.73	4-month	1.83	< 2 Month
5/5/09 22:55	5/6/09 22:35	23.67	0.3	0.69	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.12	< 2 Month	0.34	< 2 Month	0.52	< 2 Month	1.03	3-month	1.95	6-month	2.08	6-month	2.46	3-month
5/13/09 14:20	5/14/09 13:25	23.08	2.1	0.82	0.02	< 2 Month	0.04	< 2 Month	0.10	< 2 Month	0.15	< 2 Month	0.41	< 2 Month	0.56	< 2 Month	0.82	< 2 Month	0.82	< 2 Month	0.83	< 2 Month	1.06	< 2 Month
5/18/09 20:00	5/19/09 4:30	8.50	4.3	0.43	0.02	< 2 Month	0.03	< 2 Month	0.09	< 2 Month	0.16	< 2 Month	0.42	< 2 Month	0.43	< 2 Month	0.43	< 2 Month	0.43	< 2 Month	0.43	< 2 Month	1.25	< 2 Month
5/19/09 19:45	5/20/09 0:30	4.75	0.6	0.45	0.08	4-month	0.14	6-month	0.25	9-month	0.35	1-year	0.45	< 2 Month	0.45	< 2 Month	0.72	< 2 Month	0.88	< 2 Month	0.88	< 2 Month	1.70	< 2 Month

Rain Gage 18: Storms from 1/1/2008 to 5/31/2009
All depths reported.

Storm Definition = 6 hours between measured precip. All depths reported.					Depth and Frequency for Multiple Durations																			
Storm Date/Time Range		Storm Duration (hours)	Antecedent Dry Period (days)	Total Storm Depth (inches)	5 min		10 min		30 min		1 hr		6 hr		12 hr		24 hr		48 hr		96 hr		168 hr	
Begin	End				Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency
12/14/07 23:05	12/15/07 20:40	21.58		0.24	0.01	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.09	< 2 Month	0.18	< 2 Month	0.20	< 2 Month	0.24	< 2 Month	0.00	< 2 Month	0.00	< 2 Month	0.00	< 2 Month
12/16/07 18:00	12/17/07 5:00	11.00	0.9	0.39	0.02	< 2 Month	0.03	< 2 Month	0.09	< 2 Month	0.15	< 2 Month	0.20	< 2 Month	0.39	< 2 Month	0.39	< 2 Month	0.45	< 2 Month	0.00	< 2 Month	0.00	< 2 Month
12/18/07 2:25	12/18/07 18:30	16.08	0.9	0.47	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.13	< 2 Month	0.28	< 2 Month	0.42	< 2 Month	0.47	< 2 Month	0.83	< 2 Month	0.88	< 2 Month	0.00	< 2 Month
12/19/07 1:05	12/19/07 9:45	8.67	0.3	0.31	0.02	< 2 Month	0.03	< 2 Month	0.06	< 2 Month	0.09	< 2 Month	0.25	< 2 Month	0.31	< 2 Month	0.63	< 2 Month	0.78	< 2 Month	1.17	< 2 Month	0.00	< 2 Month
12/19/07 16:25	12/19/07 20:40	4.25	0.278	0.28	0.02	< 2 Month	0.03	< 2 Month	0.08	< 2 Month	0.13	< 2 Month	0.28	< 2 Month	0.39	< 2 Month	0.59	< 2 Month	1.06	< 2 Month	1.34	2-month	0.00	< 2 Month
12/20/07 3:15	12/20/07 5:00	1.75	0.274	0.09	0.01	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.06	< 2 Month	0.09	< 2 Month	0.34	< 2 Month	0.60	< 2 Month	1.10	< 2 Month	1.19	< 2 Month	0.00	< 2 Month
12/20/07 15:05	12/20/07 15:05	0.00	0.420	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.10	< 2 Month	0.38	< 2 Month	0.75	< 2 Month	1.16	< 2 Month	0.00	< 2 Month
12/22/07 4:45	12/22/07 12:15	7.50	1.6	0.35	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.13	< 2 Month	0.32	< 2 Month	0.35	< 2 Month	0.35	< 2 Month	0.36	< 2 Month	0.73	< 2 Month	1.94	2-month
12/23/07 7:10	12/23/07 18:05	10.92	0.8	0.37	0.02	< 2 Month	0.02	< 2 Month	0.06	< 2 Month	0.10	< 2 Month	0.30	< 2 Month	0.37	< 2 Month	0.37	< 2 Month	0.72	< 2 Month	0.72	< 2 Month	2.26	3-month
12/25/07 12:35	12/25/07 16:50	4.25	1.771	0.15	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.15	< 2 Month	0.15	< 2 Month	0.15	< 2 Month	0.17	< 2 Month	0.52	< 2 Month	1.62	< 2 Month
12/26/07 7:15	12/26/07 7:15	0.00	0.601	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.16	< 2 Month	0.16	< 2 Month	0.52	< 2 Month	1.39	< 2 Month
12/27/07 8:55	12/28/07 2:00	17.08	1.1	0.32	0.01	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.10	< 2 Month	0.23	< 2 Month	0.29	< 2 Month	0.32	< 2 Month	0.33	< 2 Month	0.48	< 2 Month	1.20	< 2 Month
12/28/07 12:30	12/28/07 15:50	3.33	0.438	0.04	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.28	< 2 Month	0.36	< 2 Month	0.49	< 2 Month	1.24	< 2 Month
12/29/07 13:05	12/29/07 16:20	3.25	0.885	0.10	0.01	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.08	< 2 Month	0.10	< 2 Month	0.10	< 2 Month	0.10	< 2 Month	0.32	< 2 Month	0.46	< 2 Month	0.99	< 2 Month
12/30/07 4:40	12/30/07 4:40	0.00	0.514	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.11	< 2 Month	0.15	< 2 Month	0.47	< 2 Month	1.00	< 2 Month
1/2/08 2:40	1/2/08 8:00	5.33	2.9	0.36	0.02	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.09	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.83	< 2 Month
1/2/08 14:05	1/3/08 19:50	29.75	0.3	0.42	0.02	< 2 Month	0.04	< 2 Month	0.09	< 2 Month	0.10	< 2 Month	0.14	< 2 Month	0.37	< 2 Month	0.53	< 2 Month	0.78	< 2 Month	0.78	< 2 Month	1.10	< 2 Month
1/4/08 4:55	1/4/08 11:35	6.67	0.378	0.06	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.12	< 2 Month	0.24	< 2 Month	0.58	< 2 Month	0.84	< 2 Month	0.99	< 2 Month
1/5/08 1:30	1/5/08 13:15	11.75	0.580	0.19	0.02	< 2 Month	0.02	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.15	< 2 Month	0.19	< 2 Month	0.19	< 2 Month	0.38	< 2 Month	0.85	< 2 Month	1.13	< 2 Month
1/6/08 5:00	1/6/08 13:20	8.33	0.656	0.16	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.07	< 2 Month	0.10	< 2 Month	0.16	< 2 Month	0.25	< 2 Month	0.35	< 2 Month	0.54	< 2 Month	1.19	< 2 Month
1/6/08 22:25	1/7/08 1:55	3.50	0.378	0.05	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.09	< 2 Month	0.21	< 2 Month	0.39	< 2 Month	0.46	< 2 Month	1.24	< 2 Month
1/8/08 0:55	1/8/08 8:55	8.00	1.0	0.31	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.07	< 2 Month	0.25	< 2 Month	0.31	< 2 Month	0.31	< 2 Month	0.42	< 2 Month	0.65	< 2 Month	1.55	< 2 Month
1/8/08 16:10	1/8/08 19:40	3.50	0.302	0.07	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.07	< 2 Month	0.17	< 2 Month	0.38	< 2 Month	0.43	< 2 Month	0.59	< 2 Month	1.62	< 2 Month
1/9/08 21:05	1/10/08 9:45	12.67	1.1	0.47	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.11	< 2 Month	0.38	< 2 Month	0.46	< 2 Month	0.47	< 2 Month	0.70	< 2 Month	0.85	< 2 Month	1.49	< 2 Month
1/10/08 16:50	1/11/08 5:40	12.83	0.3	0.33	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.12	< 2 Month	0.26	< 2 Month	0.31	< 2 Month	0.72	< 2 Month	0.80	< 2 Month	1.15	< 2 Month	1.63	< 2 Month
1/12/08 6:05	1/12/08 8:20	2.25	1.017	0.15	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.11	< 2 Month	0.15	< 2 Month	0.15	< 2 Month	0.15	< 2 Month	0.50	< 2 Month	0.95	< 2 Month	1.67	< 2 Month
1/12/08 14:25	1/12/08 14:25	0.00	0.253	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.16	< 2 Month	0.16	< 2 Month	0.49	< 2 Month	0.96	< 2 Month	1.55	< 2 Month
1/14/08 12:15	1/14/08 16:15	4.00	1.910	0.20	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.10	< 2 Month	0.20	< 2 Month	0.20	< 2 Month	0.20	< 2 Month	0.20	< 2 Month	0.36	< 2 Month	1.54	< 2 Month
1/19/08 16:05	1/19/08 18:00	1.92	4.993	0.19	0.02	< 2 Month	0.04	< 2 Month	0.09	< 2 Month	0.14	< 2 Month	0.19	< 2 Month	0.19	< 2 Month	0.19	< 2 Month	0.19	< 2 Month	0.19	< 2 Month	0.39	< 2 Month
1/20/08 1:45	1/20/08 8:00	6.25	0.323	0.10	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.05	< 2 Month	0.09	< 2 Month	0.22	< 2 Month	0.29	< 2 Month	0.29	< 2 Month	0.29	< 2 Month	0.49	< 2 Month
1/26/08 13:25	1/26/08 23:05	9.67	6.226	0.14	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.13	< 2 Month	0.14	< 2 Month	0.14	< 2 Month	0.14	< 2 Month	0.14	< 2 Month	0.39	< 2 Month
1/28/08 11:30	1/28/08 11:30	0.00	1.517	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.15	< 2 Month	0.15	< 2 Month	0.15	< 2 Month
1/28/08 21:50	1/29/08 7:40	9.83	0.431	0.15	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.11	< 2 Month	0.15	< 2 Month	0.16	< 2 Month	0.16	< 2 Month	0.30	< 2 Month	0.30	< 2 Month
1/30/08 13:40	1/30/08 22:05	8.42	1.250	0.12	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.10	< 2 Month	0.12	< 2 Month	0.12	< 2 Month	0.26	< 2 Month	0.28	< 2 Month	0.42	< 2 Month
1/31/08 9:40	1/31/08 20:45	11.08	0.483	0.17	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.08	< 2 Month	0.16	< 2 Month	0.17	< 2 Month	0.21	< 2 Month	0.29	< 2 Month	0.44	< 2 Month	0.59	< 2 Month
2/5/08 0:40	2/5/08 15:35	14.92	4.163	0.21	0.02	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.05	< 2 Month	0.12	< 2 Month	0.20	< 2 Month	0.21	< 2 Month	0.21	< 2 Month	0.21	< 2 Month	0.50	< 2 Month
2/6/08 14:00	2/7/08 1:40	11.67	0.9	0.35	0.03	< 2 Month	0.04	< 2 Month	0.07	< 2 Month	0.08	< 2 Month	0.23	< 2 Month	0.35	< 2 Month	0.35	< 2 Month	0.55	< 2 Month	0.56	< 2 Month	0.73	< 2 Month
2/8/08 13:55	2/9/08 1:15	11.33	1.5	0.35	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.26	< 2 Month	0.35	< 2 Month	0.35	< 2 Month	0.39	< 2 Month	0.70	< 2 Month	0.91	< 2 Month
2/9/08 22:25	2/10/08 6:15	7.83	0.882	0.23	0.02	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.10	< 2 Month	0.20	< 2 Month	0.23	< 2 Month	0.23	< 2 Month	0.58	< 2 Month	0.58	< 2 Month	1.14	< 2 Month
2/15/08 14:50	2/15/08 18:15	3.42	5.358	0.03	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.56	< 2 Month
2/27/08 8:40	2/27/08 9:20	0.67	11.601	0.03	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month
2/28/08 13:45	2/28/08 13:45	0.00	1.184	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month
2/29/08 15:25	2/29/08 17:55	2.50	1.069	0.17	0.01	< 2 Month	0.02	< 2 Month	0.06	< 2 Month	0.09	< 2 Month	0.17	< 2 Month	0.17	< 2 Month	0.17	< 2 Month	0.18	< 2 Month	0.21	< 2 Month	0.21	< 2 Month
3/1/08 2:35	3/1/08 3:05	0.50	0.361	0.07	0.02	< 2 Month	0.03	< 2 Month	0.06	< 2 Month	0.07	< 2 Month	0.07	< 2 Month	0.24	< 2 Month	0.24	< 2 Month	0.25	< 2 Month	0.28	< 2 Month	0.28	< 2 Month
3/1/08 16:35	3/1/08 18:55	2.33	0.563	0.13	0.03	< 2 Month	0.06	< 2 Month	0.09	< 2 Month	0.12	< 2 Month	0.13	< 2 Month	0.13	< 2 Month	0.21	< 2 Month	0.37	< 2 Month	0.38	< 2 Month	0.41	< 2 Month
3/2/08 1:10	3/2/08 1:10	0.00	0.260	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.14	< 2 Month	0.21	< 2 Month	0.38	< 2 Month	0.39	< 2 Month	0.42	< 2 Month
3/3/08 8:15	3/3/08 12:00	3.75	1.295	0.05	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.19	< 2 Month	0.43	< 2 Month	0.47	< 2 Month
3/7/08 20:20	3/7/08 22:20	2.00	4.347	0.03	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.29	< 2 Month
3/10/08 3:10	3/10/08 7:30	4.33	2.201	0.09	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.12	< 2 Month	0.17	< 2 Month
3/10/08 16:05	3/10/08 20:05	4.00	0.358	0.25	0.04	< 2 Month	0.07	< 2 Month	0.14	< 2 Month	0.19	2-month	0.25	< 2 Month	0.25	< 2 Month	0.34	< 2 Month	0.34	< 2 Month	0.36	< 2 Month	0.37	< 2 Month
3/11/08 2:40	3/11/08 6:35	3.92	0.274	0.08	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.08	< 2 Month	0.28	< 2 Month	0.35	< 2 Month	0.42	< 2 Month	0.42	< 2 Month	0.45	< 2 Month
3/13/08 6:30	3/14/08 16:15	33.75	2.0	0.59	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.07	< 2 Month	0.25	< 2 Month	0.36	< 2 Month	0.47	< 2 Month	0.59	< 2 Month	0.65	< 2 Month	1.04	< 2 Month

Rain Gage 18: Storms from 1/1/2008 to 5/31/2009
All depths reported.

Storm Definition = 6 hours between measured precip. All depths reported.					Depth and Frequency for Multiple Durations																			
Storm Date/Time Range		Storm Duration (hours)	Antecedent Dry Period (days)	Total Storm Depth (inches)	5 min		10 min		30 min		1 hr		6 hr		12 hr		24 hr		48 hr		96 hr		168 hr	
Begin	End				Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency
3/15/08 5:05	3/15/08 6:40	1.58	0.535	0.13	0.02	< 2 Month	0.03	< 2 Month	0.06	< 2 Month	0.10	< 2 Month	0.13	< 2 Month	0.13	< 2 Month	0.25	< 2 Month	0.71	< 2 Month	0.72	< 2 Month	1.14	< 2 Month
3/15/08 15:10	3/15/08 15:10	0.00	0.354	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.14	< 2 Month	0.15	< 2 Month	0.48	< 2 Month	0.73	< 2 Month	1.15	< 2 Month
3/16/08 3:35	3/16/08 5:30	1.92	0.517	0.06	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.18	< 2 Month	0.32	< 2 Month	0.79	< 2 Month	1.21	< 2 Month
3/16/08 18:15	3/16/08 21:45	3.50	0.531	0.13	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.07	< 2 Month	0.13	< 2 Month	0.13	< 2 Month	0.19	< 2 Month	0.33	< 2 Month	0.56	< 2 Month	1.34	< 2 Month
3/19/08 18:20	3/19/08 21:15	2.92	2.858	0.08	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.05	< 2 Month	0.08	< 2 Month	0.08	< 2 Month	0.08	< 2 Month	0.08	< 2 Month	0.12	< 2 Month	1.00	< 2 Month
3/20/08 17:00	3/20/08 21:55	4.92	0.823	0.13	0.02	< 2 Month	0.03	< 2 Month	0.06	< 2 Month	0.09	< 2 Month	0.13	< 2 Month	0.13	< 2 Month	0.13	< 2 Month	0.21	< 2 Month	0.21	< 2 Month	0.77	< 2 Month
3/23/08 4:55	3/23/08 15:10	10.25	2.3	0.75	0.02	< 2 Month	0.04	< 2 Month	0.11	< 2 Month	0.19	2-month	0.46	< 2 Month	0.75	2-month	0.75	< 2 Month	0.75	< 2 Month	0.88	< 2 Month	1.09	< 2 Month
3/25/08 14:25	3/26/08 6:15	15.83	2.0	0.31	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.11	< 2 Month	0.20	< 2 Month	0.27	< 2 Month	0.31	< 2 Month	0.31	< 2 Month	0.94	< 2 Month	1.27	< 2 Month
3/26/08 19:30	3/26/08 21:20	1.83	0.552	0.15	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.11	< 2 Month	0.15	< 2 Month	0.15	< 2 Month	0.40	< 2 Month	0.46	< 2 Month	0.46	< 2 Month	1.34	< 2 Month
3/27/08 4:20	3/27/08 4:20	0.00	0.292	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.16	< 2 Month	0.28	< 2 Month	0.47	< 2 Month	0.47	< 2 Month	1.35	< 2 Month
3/28/08 8:50	3/28/08 14:10	5.33	1.188	0.27	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.09	< 2 Month	0.27	< 2 Month	0.27	< 2 Month	0.27	< 2 Month	0.43	< 2 Month	0.74	< 2 Month	1.49	< 2 Month
3/28/08 20:25	3/29/08 0:30	4.08	0.260	0.21	0.02	< 2 Month	0.03	< 2 Month	0.08	< 2 Month	0.14	< 2 Month	0.21	< 2 Month	0.40	< 2 Month	0.48	< 2 Month	0.49	< 2 Month	0.84	< 2 Month	1.70	< 2 Month
3/29/08 7:00	3/29/08 7:20	0.33	0.271	0.02	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.23	< 2 Month	0.50	< 2 Month	0.50	< 2 Month	0.66	< 2 Month	1.72	< 2 Month
3/29/08 15:50	3/30/08 3:00	11.17	0.4	0.50	0.03	< 2 Month	0.05	< 2 Month	0.11	< 2 Month	0.14	< 2 Month	0.41	< 2 Month	0.50	< 2 Month	0.63	< 2 Month	1.00	< 2 Month	1.01	< 2 Month	2.22	3-month
3/31/08 17:40	3/31/08 22:10	4.50	1.611	0.05	0.02	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.45	< 2 Month	0.77	< 2 Month	1.52	< 2 Month
4/4/08 8:35	4/4/08 12:05	3.50	3.434	0.05	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	1.07	< 2 Month
4/4/08 20:05	4/4/08 22:10	2.08	0.333	0.04	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.07	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.86	< 2 Month
4/5/08 21:05	4/6/08 4:00	6.92	0.955	0.09	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.05	< 2 Month	0.08	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.19	< 2 Month	0.19	< 2 Month	0.24	< 2 Month
4/8/08 7:45	4/8/08 9:50	2.08	2.156	0.03	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.12	< 2 Month	0.22	< 2 Month
4/8/08 17:10	4/8/08 19:10	2.00	0.306	0.11	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.08	< 2 Month	0.11	< 2 Month	0.14	< 2 Month	0.14	< 2 Month	0.14	< 2 Month	0.23	< 2 Month	0.33	< 2 Month
4/9/08 20:15	4/9/08 20:15	0.00	1.045	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.15	< 2 Month	0.15	< 2 Month	0.34	< 2 Month
4/13/08 18:25	4/13/08 20:15	1.83	3.924	0.09	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.24	< 2 Month
4/14/08 14:20	4/14/08 22:20	8.00	0.8	0.30	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.12	< 2 Month	0.29	< 2 Month	0.30	< 2 Month	0.32	< 2 Month	0.39	< 2 Month	0.39	< 2 Month	0.54	< 2 Month
4/15/08 8:05	4/15/08 8:50	0.75	0.406	0.03	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.33	< 2 Month	0.42	< 2 Month	0.42	< 2 Month	0.55	< 2 Month
4/15/08 16:55	4/15/08 20:55	4.00	0.337	0.05	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.07	< 2 Month	0.19	< 2 Month	0.44	< 2 Month	0.47	< 2 Month	0.55	< 2 Month
4/17/08 18:25	4/17/08 18:45	0.33	1.896	0.02	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.16	< 2 Month	0.49	< 2 Month
4/18/08 15:50	4/18/08 20:05	4.25	0.878	0.06	0.02	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.08	< 2 Month	0.11	< 2 Month	0.55	< 2 Month
4/19/08 10:35	4/19/08 16:20	5.75	0.604	0.09	0.02	< 2 Month	0.03	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.11	< 2 Month	0.17	< 2 Month	0.17	< 2 Month	0.64	< 2 Month
4/20/08 5:00	4/20/08 6:10	1.17	0.528	0.03	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.12	< 2 Month	0.18	< 2 Month	0.20	< 2 Month	0.67	< 2 Month
4/21/08 0:50	4/21/08 0:55	0.08	0.778	0.02	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.14	< 2 Month	0.20	< 2 Month	0.60	< 2 Month
4/21/08 18:50	4/21/08 19:10	0.33	0.747	0.03	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.08	< 2 Month	0.19	< 2 Month	0.36	< 2 Month
4/23/08 2:30	4/23/08 4:30	2.00	1.306	0.10	0.01	< 2 Month	0.02	< 2 Month	0.06	< 2 Month	0.08	< 2 Month	0.10	< 2 Month	0.10	< 2 Month	0.10	< 2 Month	0.13	< 2 Month	0.18	< 2 Month	0.35	< 2 Month
4/27/08 17:15	4/27/08 20:15	3.00	4.531	0.04	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.19	< 2 Month
4/28/08 3:15	4/28/08 9:00	5.75	0.292	0.25	0.03	< 2 Month	0.05	< 2 Month	0.08	< 2 Month	0.10	< 2 Month	0.25	< 2 Month	0.25	< 2 Month	0.29	< 2 Month	0.29	< 2 Month	0.29	< 2 Month	0.42	< 2 Month
4/28/08 21:40	4/28/08 21:40	0.00	0.528	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.26	< 2 Month	0.30	< 2 Month	0.30	< 2 Month	0.40	< 2 Month
4/29/08 4:00	4/29/08 4:00	0.00	0.264	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.25	< 2 Month	0.31	< 2 Month	0.31	< 2 Month	0.41	< 2 Month
4/29/08 22:10	4/29/08 23:30	1.33	0.757	0.19	0.03	< 2 Month	0.04	< 2 Month	0.10	< 2 Month	0.16	< 2 Month	0.19	< 2 Month	0.19	< 2 Month	0.20	< 2 Month	0.46	< 2 Month	0.50	< 2 Month	0.60	< 2 Month
4/30/08 23:30	5/1/08 3:05	3.58	1.000	0.07	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.07	< 2 Month	0.07	< 2 Month	0.07	< 2 Month	0.27	< 2 Month	0.53	< 2 Month	0.57	< 2 Month
5/3/08 13:40	5/3/08 13:40	0.00	2.441	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.08	< 2 Month	0.58	< 2 Month
5/11/08 11:50	5/11/08 12:30	0.67	7.924	0.03	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month
5/11/08 19:55	5/11/08 20:00	0.08	0.309	0.02	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.05	< 2 Month
5/13/08 9:35	5/13/08 13:55	4.33	1.566	0.21	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.08	< 2 Month	0.21	< 2 Month	0.21	< 2 Month	0.21	< 2 Month	0.23	< 2 Month	0.26	< 2 Month	0.26	< 2 Month
5/19/08 23:30	5/20/08 9:45	10.25	6.4	0.36	0.03	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.09	< 2 Month	0.25	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.56	< 2 Month
5/21/08 5:15	5/21/08 5:15	0.00	0.813	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.25	< 2 Month	0.37	< 2 Month	0.37	< 2 Month	0.37	< 2 Month
5/21/08 18:20	5/21/08 20:00	1.67	0.5	0.44	0.06	2-month	0.12	4-month	0.22	6-month	0.31	6-month	0.44	< 2 Month	0.44	< 2 Month	0.45	< 2 Month	0.81	< 2 Month	0.81	< 2 Month	0.81	< 2 Month
5/23/08 8:40	5/23/08 8:45	0.08	1.528	0.02	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.46	< 2 Month	0.54	< 2 Month	0.83	< 2 Month
5/23/08 19:50	5/23/08 19:50	0.00	0.462	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.48	< 2 Month	0.84	< 2 Month
5/25/08 0:15	5/25/08 5:35	5.33	1.184	0.14	0.03	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.14	< 2 Month	0.14	< 2 Month	0.14	< 2 Month	0.17	< 2 Month	0.17	< 2 Month	0.98	< 2 Month
5/31/08 14:15	5/31/08 16:45	2.50	6.361	0.04	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month
6/2/08 22:50	6/3/08 12:30	13.67	2.3	0.62	0.02	< 2 Month	0.03	< 2 Month	0.08	< 2 Month	0.15	< 2 Month	0.48	2-month	0.59	< 2 Month	0.62	< 2 Month	0.62	< 2 Month	0.66	< 2 Month	0.66	< 2 Month
6/3/08 20:00	6/4/08 9:50	13.83	0.313	0.22	0.03	< 2 Month	0.05	< 2 Month	0.08	< 2 Month	0.10	< 2 Month	0.15	< 2 Month	0.24	< 2 Month	0.76	< 2 Month	0.84	< 2 Month	0.84	< 2 Month	0.88	< 2 Month
6/5/08 10:00	6/5/08 17:05	7.08	1.007	0.12	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.10	< 2 Month	0.12	< 2 Month	0.12	< 2 Month	0.38	< 2 Month	0.96	< 2 Month	1.00	< 2 Month
6/6/08 5:00	6/6/08 19:00	14.00	0.5	0.48	0.05	< 2 Month	0.09	2-month	0.21	6-month	0.33	9-month	0.41	< 2 Month	0.47	< 2 Month	0.48	< 2 Month	0.60	< 2 Month	0.88	< 2 Month	1.48	< 2 Month
6/9/08 7:25	6/9/08 16:20	8.92	2.517	0.15	0.02	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.07	< 2 Month	0.11	< 2 Month	0.15	< 2 Month	0.15	< 2 Month	0.15	< 2 Month	0.52	< 2 Month	1.59	< 2 Month
6/10/08 8:25	6/10/08 9:40	1.25	0.670	0.02	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.15	< 2 Month	0.17	< 2 Month	0.17	< 2 Month	1.16	< 2 Month
7/3/08 5:35	7/3/08 11:30	5.92	22.8	0.46	0.04	< 2 Month	0.07	< 2 Month	0.15	2-month	0.16	< 2 Month	0.46	< 2 Month	0.46	< 2 Month	0.46	< 2 Month	0.46	< 2 Month	0.46	< 2 Month	0.46	< 2 Month

Rain Gage 18: Storms from 1/1/2008 to 5/31/2009
All depths reported.

Storm Definition = 6 hours between measured precip. All depths reported.					Depth and Frequency for Multiple Durations																			
Storm Date/Time Range		Storm Duration (hours)	Antecedent Dry Period (days)	Total Storm Depth (inches)	5 min		10 min		30 min		1 hr		6 hr		12 hr		24 hr		48 hr		96 hr		168 hr	
Begin	End				Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency
7/29/08 14:50	7/29/08 21:05	6.25	26.139	0.05	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.00	< 2 Month
7/31/08 17:45	8/1/08 6:05	12.33	1.861	0.28	0.03	< 2 Month	0.05	< 2 Month	0.07	< 2 Month	0.09	< 2 Month	0.17	< 2 Month	0.27	< 2 Month	0.28	< 2 Month	0.28	< 2 Month	0.33	< 2 Month	0.33	< 2 Month
8/9/08 5:10	8/9/08 7:35	2.42	7.962	0.09	0.02	< 2 Month	0.04	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.09	< 2 Month
8/9/08 16:10	8/9/08 18:30	2.33	0.358	0.18	0.06	2-month	0.08	< 2 Month	0.13	< 2 Month	0.15	< 2 Month	0.18	< 2 Month	0.21	< 2 Month	0.27	< 2 Month	0.27	< 2 Month	0.27	< 2 Month	0.27	< 2 Month
8/18/08 9:35	8/18/08 16:30	6.92	8.628	0.15	0.02	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.12	< 2 Month	0.15	< 2 Month	0.15	< 2 Month	0.15	< 2 Month	0.15	< 2 Month	0.15	< 2 Month
8/19/08 20:45	8/20/08 7:30	10.75	1.2	0.66	0.02	< 2 Month	0.04	< 2 Month	0.10	< 2 Month	0.16	< 2 Month	0.52	2-month	0.66	< 2 Month	0.66	< 2 Month	0.81	< 2 Month	0.81	< 2 Month	0.81	< 2 Month
8/20/08 13:55	8/20/08 18:05	4.17	0.267	0.28	0.03	< 2 Month	0.05	< 2 Month	0.10	< 2 Month	0.11	< 2 Month	0.28	< 2 Month	0.35	< 2 Month	0.94	2-month	0.94	< 2 Month	1.09	< 2 Month	1.09	< 2 Month
8/24/08 12:50	8/24/08 23:35	10.75	3.8	0.95	0.04	< 2 Month	0.07	< 2 Month	0.13	< 2 Month	0.22	3-month	0.64	4-month	0.95	4-month	0.95	2-month	0.95	< 2 Month	0.95	< 2 Month	2.04	2-month
8/25/08 12:20	8/25/08 20:45	8.42	0.5	0.65	0.10	9-month	0.16	1-year	0.38	2-year	0.53	2-year	0.64	4-month	0.65	< 2 Month	1.00	2-month	1.60	4-month	1.60	3-month	2.54	4-month
8/26/08 20:55	8/27/08 2:05	5.17	1.007	0.25	0.02	< 2 Month	0.03	< 2 Month	0.08	< 2 Month	0.13	< 2 Month	0.25	< 2 Month	0.25	< 2 Month	0.25	< 2 Month	0.95	< 2 Month	1.85	4-month	2.54	4-month
9/20/08 6:40	9/21/08 0:45	18.08	24.2	0.47	0.02	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.08	< 2 Month	0.31	< 2 Month	0.45	< 2 Month	0.47	< 2 Month	0.47	< 2 Month	0.47	< 2 Month	0.47	< 2 Month
9/21/08 21:05	9/21/08 21:05	0.00	0.847	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.48	< 2 Month	0.48	< 2 Month	0.48	< 2 Month
9/22/08 6:30	9/22/08 6:30	0.00	0.392	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.49	< 2 Month	0.49	< 2 Month	0.49	< 2 Month
9/24/08 13:05	9/24/08 17:25	4.33	2.274	0.09	0.02	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.07	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.11	< 2 Month	0.58	< 2 Month
9/25/08 0:30	9/25/08 1:45	1.25	0.295	0.16	0.03	< 2 Month	0.04	< 2 Month	0.09	< 2 Month	0.15	< 2 Month	0.16	< 2 Month	0.24	< 2 Month	0.25	< 2 Month	0.25	< 2 Month	0.26	< 2 Month	0.74	< 2 Month
10/2/08 10:35	10/2/08 10:50	0.25	7.368	0.02	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month
10/2/08 18:45	10/2/08 18:45	0.00	0.330	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month
10/3/08 6:20	10/4/08 13:20	31.00	0.5	0.72	0.06	2-month	0.08	< 2 Month	0.10	< 2 Month	0.10	< 2 Month	0.30	< 2 Month	0.47	< 2 Month	0.63	< 2 Month	0.73	< 2 Month	0.75	< 2 Month	0.75	< 2 Month
10/5/08 12:00	10/5/08 12:00	0.00	0.944	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.11	< 2 Month	0.69	< 2 Month	0.74	< 2 Month	0.76	< 2 Month
10/5/08 21:45	10/5/08 21:45	0.00	0.406	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.34	< 2 Month	0.74	< 2 Month	0.77	< 2 Month
10/6/08 8:10	10/6/08 23:10	15.00	0.4	0.31	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.10	< 2 Month	0.26	< 2 Month	0.30	< 2 Month	0.31	< 2 Month	0.33	< 2 Month	0.77	< 2 Month	1.08	< 2 Month
10/11/08 9:10	10/11/08 9:10	0.00	4.417	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.49	< 2 Month
10/13/08 18:50	10/14/08 1:25	6.58	2.4	0.40	0.12	1-year	0.22	2-year	0.28	1-year	0.30	6-month	0.39	< 2 Month	0.40	< 2 Month	0.40	< 2 Month	0.40	< 2 Month	0.41	< 2 Month	0.42	< 2 Month
10/15/08 19:30	10/16/08 4:35	9.08	1.753	0.12	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.06	< 2 Month	0.10	< 2 Month	0.12	< 2 Month	0.12	< 2 Month	0.13	< 2 Month	0.52	< 2 Month	0.53	< 2 Month
10/17/08 21:10	10/17/08 22:55	1.75	1.691	0.07	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.07	< 2 Month	0.07	< 2 Month	0.07	< 2 Month	0.09	< 2 Month	0.19	< 2 Month	0.60	< 2 Month
10/20/08 7:50	10/20/08 16:20	8.50	2.372	0.14	0.01	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.06	< 2 Month	0.09	< 2 Month	0.14	< 2 Month	0.14	< 2 Month	0.14	< 2 Month	0.21	< 2 Month	0.73	< 2 Month
10/23/08 4:15	10/23/08 8:05	3.83	2.497	0.09	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.05	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.22	< 2 Month	0.30	< 2 Month
10/31/08 3:30	10/31/08 15:15	11.75	7.8	0.36	0.01	< 2 Month	0.02	< 2 Month	0.06	< 2 Month	0.12	< 2 Month	0.31	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.36	< 2 Month	0.36	< 2 Month
11/1/08 13:45	11/1/08 23:05	9.33	0.938	0.18	0.02	< 2 Month	0.03	< 2 Month	0.08	< 2 Month	0.13	< 2 Month	0.17	< 2 Month	0.18	< 2 Month	0.18	< 2 Month	0.54	< 2 Month	0.54	< 2 Month	0.54	< 2 Month
11/2/08 5:40	11/3/08 9:55	28.25	0.3	0.65	0.03	< 2 Month	0.05	< 2 Month	0.13	< 2 Month	0.19	2-month	0.33	< 2 Month	0.39	< 2 Month	0.58	< 2 Month	0.83	< 2 Month	1.14	< 2 Month	1.19	< 2 Month
11/3/08 18:35	11/4/08 8:45	14.17	0.4	0.86	0.02	< 2 Month	0.04	< 2 Month	0.08	< 2 Month	0.14	< 2 Month	0.60	4-month	0.82	3-month	0.88	2-month	1.32	3-month	1.69	3-month	2.05	2-month
11/6/08 1:35	11/7/08 10:00	32.42	1.7	2.26	0.03	< 2 Month	0.05	< 2 Month	0.13	< 2 Month	0.24	4-month	0.80	9-month	1.43	1-year	2.01	2-year	2.26	1-year	2.43	9-month	4.22	1-year
11/7/08 19:55	11/8/08 11:50	15.92	0.413	0.29	0.02	< 2 Month	0.04	< 2 Month	0.09	< 2 Month	0.12	< 2 Month	0.17	< 2 Month	0.25	< 2 Month	1.30	6-month	2.36	1-year	2.55	1-year	4.24	1-year
11/9/08 2:15	11/9/08 8:25	6.17	0.601	0.04	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.20	< 2 Month	0.77	< 2 Month	2.54	1-year	4.09	1-year
11/9/08 19:05	11/9/08 21:55	2.83	0.444	0.05	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.09	< 2 Month	0.35	< 2 Month	1.69	3-month	3.74	1-year
11/11/08 0:00	11/12/08 21:35	45.58	1.1	1.02	0.02	< 2 Month	0.03	< 2 Month	0.09	< 2 Month	0.15	< 2 Month	0.41	< 2 Month	0.66	< 2 Month	0.81	< 2 Month	1.02	< 2 Month	1.06	< 2 Month	3.66	1-year
11/13/08 6:40	11/13/08 7:55	1.25	0.378	0.08	0.01	< 2 Month	0.02	< 2 Month	0.06	< 2 Month	0.07	< 2 Month	0.08	< 2 Month	0.09	< 2 Month	0.22	< 2 Month	0.95	< 2 Month	1.10	< 2 Month	3.54	9-month
11/18/08 5:45	11/18/08 7:20	1.58	4.910	0.04	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.99	< 2 Month
11/20/08 8:35	11/20/08 15:10	6.58	2.052	0.26	0.02	< 2 Month	0.04	< 2 Month	0.10	< 2 Month	0.13	< 2 Month	0.24	< 2 Month	0.26	< 2 Month	0.26	< 2 Month	0.26	< 2 Month	0.30	< 2 Month	0.30	< 2 Month
11/21/08 19:00	11/21/08 20:25	1.42	1.160	0.15	0.02	< 2 Month	0.03	< 2 Month	0.08	< 2 Month	0.11	< 2 Month	0.15	< 2 Month	0.15	< 2 Month	0.15	< 2 Month	0.41	< 2 Month	0.41	< 2 Month	0.45	< 2 Month
11/23/08 9:10	11/23/08 9:10	0.00	1.531	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.16	< 2 Month	0.36	< 2 Month	0.46	< 2 Month
11/24/08 9:00	11/24/08 9:00	0.00	0.993	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.17	< 2 Month	0.47	< 2 Month
11/25/08 12:05	11/25/08 18:10	6.08	1.128	0.08	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.07	< 2 Month	0.08	< 2 Month	0.08	< 2 Month	0.09	< 2 Month	0.10	< 2 Month	0.51	< 2 Month
11/26/08 8:05	11/26/08 8:05	0.00	0.580	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.09	< 2 Month	0.10	< 2 Month	0.11	< 2 Month	0.52	< 2 Month
11/28/08 9:35	11/28/08 13:20	3.75	2.063	0.05	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.13	< 2 Month	0.31	< 2 Month
11/30/08 2:35	11/30/08 6:00	3.42	1.552	0.04	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.20	< 2 Month
12/1/08 15:40	12/1/08 21:35	5.92	1.403	0.16	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.16	< 2 Month	0.16	< 2 Month	0.16	< 2 Month	0.20	< 2 Month	0.20	< 2 Month	0.34	< 2 Month
12/2/08 16:40	12/2/08 16:40	0.00	0.795	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.14	< 2 Month	0.17	< 2 Month	0.21	< 2 Month	0.30	< 2 Month
12/7/08 5:35	12/7/08 5:35	0.00	4.538	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.19	< 2 Month
12/7/08 14:40	12/7/08 14:40	0.00	0.378	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.19	< 2 Month
12/7/08 23:35	12/8/08 3:50	4.25	0.372	0.07	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.07	< 2 Month	0.07	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.26	< 2 Month
12/9/08 9:35	12/9/08 15:15	5.67	1.240	0.12	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.12	< 2 Month	0.12	< 2 Month	0.12	< 2 Month	0.19	< 2 Month	0.21	< 2 Month	0.22	< 2 Month
12/10/08 12:00	12/10/08 12:00	0.00	0.865	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.06	< 2 Month	0.13	< 2 Month	0.21	< 2 Month	0.22	< 2 Month
12/12/08 9:05	12/13/08 8:15	23.17	1.9	0.83	0.04	< 2 Month	0.06	< 2 Month	0.11	< 2 Month	0.14	< 2 Month	0.34	< 2 Month	0.54	< 2 Month	0.83	< 2 Month	0.83	< 2 Month	0.84	< 2 Month	1.05	< 2 Month
12/14/08 12:35	12/14/08 14:15	1.67	1.181	0.05	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.58	< 2 Month	0.88	< 2 Month	1.09	< 2 Month
12/17/08 15:45	12/17/08 15:45	0.00	3.063	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.89	< 2 Month

Rain Gage 18: Storms from 1/1/2008 to 5/31/2009
All depths reported.

Storm Definition = 6 hours between measured precip. All depths reported.					Depth and Frequency for Multiple Durations																			
Storm Date/Time Range		Storm Duration (hours)	Antecedent Dry Period (days)	Total Storm Depth (inches)	5 min		10 min		30 min		1 hr		6 hr		12 hr		24 hr		48 hr		96 hr		168 hr	
Begin	End				Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency
12/18/08 5:35	12/18/08 5:40	0.08	0.576	0.03	0.02	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.92	< 2 Month
12/19/08 11:55	12/19/08 14:50	2.92	1.260	0.24	0.01	< 2 Month	0.02	< 2 Month	0.06	< 2 Month	0.12	< 2 Month	0.24	< 2 Month	0.24	< 2 Month	0.24	< 2 Month	0.28	< 2 Month	0.28	< 2 Month	0.82	< 2 Month
12/22/08 12:10	12/22/08 15:45	3.58	2.889	0.15	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.07	< 2 Month	0.15	< 2 Month	0.15	< 2 Month	0.15	< 2 Month	0.15	< 2 Month	0.22	< 2 Month	0.43	< 2 Month
12/23/08 11:15	12/23/08 16:05	4.83	0.813	0.03	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.16	< 2 Month	0.18	< 2 Month	0.18	< 2 Month	0.46	< 2 Month
12/24/08 12:15	12/25/08 16:20	28.08	0.8	1.03	0.02	< 2 Month	0.04	< 2 Month	0.11	< 2 Month	0.21	2-month	0.68	6-month	0.77	2-month	0.89	2-month	1.03	< 2 Month	1.06	< 2 Month	1.45	< 2 Month
12/25/08 23:45	12/26/08 0:00	0.25	0.309	0.04	0.02	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.19	< 2 Month	0.30	< 2 Month	1.07	< 2 Month	1.10	< 2 Month	1.49	< 2 Month
12/26/08 12:25	12/26/08 15:45	3.33	0.517	0.14	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.06	< 2 Month	0.14	< 2 Month	0.14	< 2 Month	0.20	< 2 Month	1.05	< 2 Month	1.22	< 2 Month	1.44	< 2 Month
12/27/08 2:05	12/27/08 7:15	5.17	0.431	0.05	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.05	< 2 Month	0.07	< 2 Month	0.19	< 2 Month	0.41	< 2 Month	1.26	< 2 Month	1.44	< 2 Month
12/27/08 22:35	12/28/08 6:40	8.08	0.639	0.28	0.01	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.09	< 2 Month	0.24	< 2 Month	0.28	< 2 Month	0.29	< 2 Month	0.47	< 2 Month	0.69	< 2 Month	1.72	< 2 Month
12/28/08 14:45	12/28/08 23:25	8.67	0.3	0.31	0.03	< 2 Month	0.05	< 2 Month	0.11	< 2 Month	0.18	< 2 Month	0.28	< 2 Month	0.31	< 2 Month	0.56	< 2 Month	0.64	< 2 Month	0.82	< 2 Month	2.03	2-month
12/29/08 7:25	12/29/08 11:05	3.67	0.333	0.23	0.03	< 2 Month	0.04	< 2 Month	0.10	< 2 Month	0.13	< 2 Month	0.23	< 2 Month	0.25	< 2 Month	0.54	< 2 Month	0.82	< 2 Month	1.01	< 2 Month	2.26	3-month
12/30/08 20:15	12/31/08 2:00	5.75	1.382	0.13	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.13	< 2 Month	0.13	< 2 Month	0.13	< 2 Month	0.36	< 2 Month	0.89	< 2 Month	2.21	3-month
12/31/08 21:55	1/2/09 4:25	30.50	0.8	0.76	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.13	< 2 Month	0.38	< 2 Month	0.51	< 2 Month	0.62	< 2 Month	0.76	< 2 Month	0.89	< 2 Month	1.90	2-month
1/3/09 7:50	1/3/09 8:00	0.17	1.142	0.02	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.29	< 2 Month	0.78	< 2 Month	1.73	< 2 Month
1/4/09 16:40	1/5/09 8:25	15.75	1.4	0.91	0.03	< 2 Month	0.06	< 2 Month	0.18	4-month	0.33	9-month	0.82	9-month	0.88	4-month	0.91	2-month	0.92	< 2 Month	0.93	< 2 Month	2.03	2-month
1/5/09 15:10	1/5/09 15:10	0.00	0.281	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.56	< 2 Month	0.92	2-month	0.92	< 2 Month	0.94	< 2 Month	1.83	< 2 Month
1/6/09 0:05	1/6/09 6:45	6.67	0.372	0.10	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.09	< 2 Month	0.10	< 2 Month	0.88	2-month	1.02	< 2 Month	1.04	< 2 Month	1.93	2-month
1/6/09 15:25	1/8/09 3:20	35.92	0.4	2.05	0.03	< 2 Month	0.05	< 2 Month	0.11	< 2 Month	0.20	2-month	1.02	1-year	1.44	1-year	1.56	9-month	2.09	9-month	2.96	1-year	3.75	1-year
1/8/09 16:05	1/8/09 16:50	0.75	0.531	0.07	0.01	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.07	< 2 Month	0.07	< 2 Month	0.07	< 2 Month	1.35	6-month	2.07	9-month	2.22	6-month	3.33	9-month
1/10/09 7:50	1/10/09 8:25	0.58	1.625	0.02	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.09	< 2 Month	1.60	3-month	3.16	6-month
1/10/09 16:55	1/11/09 5:55	13.00	0.354	0.17	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.08	< 2 Month	0.14	< 2 Month	0.16	< 2 Month	0.19	< 2 Month	0.19	< 2 Month	1.31	2-month	3.33	9-month
1/12/09 0:30	1/12/09 1:25	0.92	0.774	0.02	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.21	< 2 Month	0.21	< 2 Month	3.28	6-month
1/12/09 12:35	1/12/09 20:05	7.50	0.465	0.04	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.22	< 2 Month	0.25	< 2 Month	2.47	3-month
1/18/09 9:10	1/18/09 9:10	0.00	5.545	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.07	< 2 Month
1/19/09 5:15	1/19/09 5:15	0.00	0.837	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.06	< 2 Month
1/20/09 0:05	1/20/09 0:05	0.00	0.785	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month
1/20/09 8:10	1/20/09 8:10	0.00	0.337	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month
1/24/09 21:00	1/25/09 5:00	8.00	4.535	0.09	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.08	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.13	< 2 Month
1/27/09 10:50	1/27/09 17:15	6.42	2.243	0.07	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.05	< 2 Month	0.07	< 2 Month	0.07	< 2 Month	0.07	< 2 Month	0.16	< 2 Month	0.16	< 2 Month
1/30/09 20:55	1/30/09 22:05	1.17	3.153	0.07	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.07	< 2 Month	0.07	< 2 Month	0.07	< 2 Month	0.07	< 2 Month	0.07	< 2 Month	0.23	< 2 Month
2/5/09 10:15	2/5/09 10:15	0.00	5.507	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.08	< 2 Month
2/5/09 22:45	2/5/09 22:45	0.00	0.521	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.09	< 2 Month
2/6/09 5:55	2/6/09 14:25	8.50	0.299	0.07	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.06	< 2 Month	0.07	< 2 Month	0.08	< 2 Month	0.09	< 2 Month	0.09	< 2 Month	0.16	< 2 Month
2/8/09 19:40	2/9/09 9:25	13.75	2.219	0.27	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.12	< 2 Month	0.22	< 2 Month	0.24	< 2 Month	0.27	< 2 Month	0.27	< 2 Month	0.31	< 2 Month	0.36	< 2 Month
2/9/09 20:10	2/9/09 22:50	2.67	0.448	0.03	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.14	< 2 Month	0.27	< 2 Month	0.30	< 2 Month	0.30	< 2 Month	0.39	< 2 Month
2/10/09 9:40	2/10/09 20:15	10.58	0.451	0.28	0.01	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.08	< 2 Month	0.25	< 2 Month	0.28	< 2 Month	0.30	< 2 Month	0.57	< 2 Month	0.58	< 2 Month	0.67	< 2 Month
2/15/09 17:35	2/15/09 18:50	1.25	4.889	0.03	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.61	< 2 Month
2/16/09 5:50	2/16/09 5:50	0.00	0.458	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.50	< 2 Month
2/21/09 8:15	2/21/09 8:15	0.00	5.101	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.05	< 2 Month
2/22/09 5:20	2/22/09 9:25	4.08	0.878	0.05	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.10	< 2 Month
2/22/09 18:15	2/23/09 4:30	10.25	0.368	0.08	0.02	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.07	< 2 Month	0.08	< 2 Month	0.13	< 2 Month	0.14	< 2 Month	0.14	< 2 Month	0.15	< 2 Month
2/23/09 14:35	2/23/09 16:20	1.75	0.420	0.22	0.02	< 2 Month	0.04	< 2 Month	0.11	< 2 Month	0.17	< 2 Month	0.22	< 2 Month	0.23	< 2 Month	0.30	< 2 Month	0.35	< 2 Month	0.36	< 2 Month	0.36	< 2 Month
2/23/09 23:20	2/24/09 12:10	12.83	0.292	0.28	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.10	< 2 Month	0.21	< 2 Month	0.26	< 2 Month	0.50	< 2 Month	0.58	< 2 Month	0.63	< 2 Month	0.64	< 2 Month
2/24/09 22:40	2/25/09 16:40	18.00	0.4	0.38	0.02	< 2 Month	0.04	< 2 Month	0.09	< 2 Month	0.11	< 2 Month	0.25	< 2 Month	0.28	< 2 Month	0.38	< 2 Month	0.85	< 2 Month	0.96	< 2 Month	1.02	< 2 Month
2/26/09 9:50	2/26/09 13:05	3.25	0.715	0.13	0.01	< 2 Month	0.02	< 2 Month	0.06	< 2 Month	0.11	< 2 Month	0.13	< 2 Month	0.13	< 2 Month	0.34	< 2 Month	0.59	< 2 Month	1.01	< 2 Month	1.15	< 2 Month
2/22/09 5:55	2/22/09 9:25	3.50	-4.299	0.03	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.00	< 2 Month	0.00	< 2 Month	0.00	< 2 Month	0.00	< 2 Month	0.00	< 2 Month
2/22/09 18:15	2/23/09 4:30	10.25	0.368	0.08	0.02	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.07	< 2 Month	0.08	< 2 Month	0.13	< 2 Month	0.00	< 2 Month	0.00	< 2 Month	0.00	< 2 Month
2/23/09 14:35	2/23/09 16:20	1.75	0.420	0.22	0.02	< 2 Month	0.04	< 2 Month	0.11	< 2 Month	0.17	< 2 Month	0.22	< 2 Month	0.23	< 2 Month	0.30	< 2 Month	0.00	< 2 Month	0.00	< 2 Month	0.00	< 2 Month
2/23/09 23:20	2/24/09 12:10	12.83	0.292	0.28	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.10	< 2 Month	0.21	< 2 Month	0.26	< 2 Month	0.50	< 2 Month	0.58	< 2 Month	0.00	< 2 Month	0.00	< 2 Month
2/24/09 22:40	2/25/09 16:40	18.00	0.4	0.38	0.02	< 2 Month	0.04	< 2 Month	0.09	< 2 Month	0.11	< 2 Month	0.25	< 2 Month	0.28	< 2 Month	0.38	< 2 Month	0.85	< 2 Month	0.96	< 2 Month	0.00	< 2 Month
2/26/09 9:50	2/26/09 13:05	3.25	0.715	0.13	0.01	< 2 Month	0.02	< 2 Month	0.06	< 2 Month	0.11	< 2 Month	0.13	< 2 Month	0.13	< 2 Month	0.34	< 2 Month	0.59	< 2 Month	1.01	< 2 Month	0.00	< 2 Month
3/1/09 1:15	3/1/09 8:00	6.75	2.507	0.10	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.06	< 2 Month	0.09	< 2 Month	0.10	< 2 Month	0.10	< 2 Month	0.10	< 2 Month	0.23	< 2 Month	1.21	< 2 Month
3/1/09 14:25	3/2/09 7:40	17.25	0.3	0.33	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.08	< 2 Month	0.12	< 2 Month	0.24	< 2 Month	0.41	< 2 Month	0.43	< 2 Month	0.43	< 2 Month	1.44	< 2 Month
3/2/09 18:05	3/2/09 18:15	0.17	0.434	0.07	0.04	< 2 Month	0.06	< 2 Month	0.07	< 2 Month	0.07	< 2 Month	0.07	< 2 Month	0.08	< 2 Month	0.28	< 2 Month	0.50	< 2 Month	0.50	< 2 Month	1.29	< 2 Month
3/3/09 4:15	3/3/09 8:05	3.83	0.417	0.11	0.02	< 2 Month	0.03	< 2 Month	0.06	< 2 Month	0.08	< 2 Month	0.11	< 2 Month	0.17	< 2 Month	0.18	< 2 Month	0.57	< 2 Month	0.61	< 2 Month	1.32	< 2 Month
3/3/09 18:00	3/3/09 19:10	1.17	0.413	0.16	0.03	< 2 Month	0.05	< 2 Month	0.12	< 2 Month	0.15	< 2 Month	0.16	< 2 Month	0.17	< 2 Month	0.27	< 2 Month	0.55	< 2 Month	0.77	< 2 Month	1.28	< 2 Month

Rain Gage 18: Storms from 1/1/2008 to 5/31/2009
All depths reported.

Storm Definition = 6 hours between measured precip. All depths reported.					Depth and Frequency for Multiple Durations																			
Storm Date/Time Range		Storm Duration (hours)	Antecedent Dry Period (days)	Total Storm Depth (inches)	5 min		10 min		30 min		1 hr		6 hr		12 hr		24 hr		48 hr		96 hr		168 hr	
Begin	End				Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency	Max Depth	Frequency
3/4/09 4:15	3/4/09 4:15	0.00	0.378	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.17	< 2 Month	0.27	< 2 Month	0.40	< 2 Month	0.77	< 2 Month	1.19	< 2 Month
3/5/09 7:00	3/5/09 11:55	4.92	1.115	0.22	0.03	< 2 Month	0.05	< 2 Month	0.09	< 2 Month	0.11	< 2 Month	0.22	< 2 Month	0.22	< 2 Month	0.22	< 2 Month	0.39	< 2 Month	0.57	< 2 Month	1.07	< 2 Month
3/7/09 7:45	3/7/09 11:05	3.33	1.826	0.20	0.02	< 2 Month	0.03	< 2 Month	0.06	< 2 Month	0.10	< 2 Month	0.20	< 2 Month	0.20	< 2 Month	0.20	< 2 Month	0.26	< 2 Month	0.42	< 2 Month	1.20	< 2 Month
3/8/09 7:20	3/8/09 12:05	4.75	0.844	0.03	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.21	< 2 Month	0.23	< 2 Month	0.39	< 2 Month	1.13	< 2 Month
3/8/09 19:45	3/9/09 13:20	17.58	0.319	0.10	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.08	< 2 Month	0.11	< 2 Month	0.30	< 2 Month	0.33	< 2 Month	1.02	< 2 Month
3/9/09 23:45	3/9/09 23:45	0.00	0.434	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.08	< 2 Month	0.14	< 2 Month	0.34	< 2 Month	0.84	< 2 Month
3/14/09 6:05	3/14/09 20:55	14.83	4.3	0.49	0.01	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.10	< 2 Month	0.32	< 2 Month	0.37	< 2 Month	0.49	< 2 Month	0.49	< 2 Month	0.49	< 2 Month	0.63	< 2 Month
3/15/09 5:50	3/17/09 9:55	52.08	0.4	0.77	0.02	< 2 Month	0.03	< 2 Month	0.08	< 2 Month	0.12	< 2 Month	0.34	< 2 Month	0.38	< 2 Month	0.53	< 2 Month	1.01	< 2 Month	1.22	< 2 Month	1.26	< 2 Month
3/17/09 16:15	3/17/09 16:15	0.00	0.264	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.09	< 2 Month	0.19	< 2 Month	0.41	< 2 Month	0.93	< 2 Month	1.27	< 2 Month
3/19/09 1:10	3/19/09 10:40	9.50	1.372	0.05	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.15	< 2 Month	0.33	< 2 Month	1.32	< 2 Month
3/20/09 2:25	3/20/09 15:15	12.83	0.656	0.20	0.07	3-month	0.09	2-month	0.11	< 2 Month	0.11	< 2 Month	0.16	< 2 Month	0.17	< 2 Month	0.20	< 2 Month	0.25	< 2 Month	0.26	< 2 Month	1.52	< 2 Month
3/22/09 9:05	3/22/09 9:05	0.00	1.743	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.17	< 2 Month	0.23	< 2 Month	0.84	< 2 Month
3/23/09 18:20	3/23/09 18:50	0.50	1.385	0.02	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.43	< 2 Month
3/24/09 1:25	3/24/09 1:25	0.00	0.274	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.43	< 2 Month
3/25/09 1:15	3/25/09 11:30	10.25	0.993	0.26	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.21	< 2 Month	0.26	< 2 Month	0.26	< 2 Month	0.29	< 2 Month	0.29	< 2 Month	0.55	< 2 Month
3/28/09 8:20	3/28/09 18:55	10.58	2.868	0.28	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.06	< 2 Month	0.16	< 2 Month	0.28	< 2 Month	0.28	< 2 Month	0.28	< 2 Month	0.28	< 2 Month	0.58	< 2 Month
3/29/09 4:05	3/29/09 4:50	0.75	0.382	0.05	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.10	< 2 Month	0.33	< 2 Month	0.33	< 2 Month	0.33	< 2 Month	0.63	< 2 Month
3/31/09 9:40	3/31/09 15:30	5.83	2.201	0.04	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.29	< 2 Month	0.63	< 2 Month
4/1/09 7:25	4/2/09 1:45	18.33	0.7	0.41	0.01	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.07	< 2 Month	0.28	< 2 Month	0.33	< 2 Month	0.41	< 2 Month	0.45	< 2 Month	0.45	< 2 Month	0.78	< 2 Month
4/2/09 8:55	4/3/09 6:20	21.42	0.3	0.99	0.03	< 2 Month	0.06	< 2 Month	0.15	2-month	0.29	6-month	0.71	6-month	0.79	3-month	0.99	2-month	1.40	3-month	1.44	2-month	1.77	< 2 Month
4/4/09 7:55	4/4/09 7:55	0.00	1.066	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	1.00	< 2 Month	1.38	2-month	1.78	< 2 Month
4/9/09 4:35	4/9/09 7:55	3.33	4.861	0.02	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	1.02	< 2 Month
4/10/09 3:40	4/10/09 7:15	3.58	0.823	0.02	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.14	< 2 Month
4/10/09 16:00	4/10/09 16:00	0.00	0.365	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.06	< 2 Month
4/11/09 6:15	4/11/09 6:15	0.00	0.594	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.06	< 2 Month	0.07	< 2 Month
4/12/09 3:00	4/12/09 18:15	15.25	0.9	1.04	0.12	1-year	0.16	1-year	0.25	9-month	0.33	9-month	0.62	4-month	0.88	4-month	1.04	3-month	1.05	< 2 Month	1.08	< 2 Month	1.10	< 2 Month
4/13/09 15:35	4/13/09 20:10	4.58	0.889	0.13	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.13	< 2 Month	0.13	< 2 Month	0.46	< 2 Month	1.17	2-month	1.18	< 2 Month	1.23	< 2 Month
4/14/09 4:35	4/14/09 4:35	0.00	0.351	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.09	< 2 Month	0.14	< 2 Month	1.12	< 2 Month	1.19	< 2 Month	1.24	< 2 Month
4/17/09 0:35	4/17/09 7:50	7.25	2.833	0.21	0.01	< 2 Month	0.01	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.19	< 2 Month	0.21	< 2 Month	0.21	< 2 Month	0.21	< 2 Month	0.21	< 2 Month	1.41	< 2 Month
4/22/09 6:30	4/22/09 8:25	1.92	4.944	0.06	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.27	< 2 Month
4/22/09 20:50	4/22/09 23:30	2.67	0.517	0.08	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.04	< 2 Month	0.08	< 2 Month	0.08	< 2 Month	0.14	< 2 Month	0.14	< 2 Month	0.14	< 2 Month	0.35	< 2 Month
4/23/09 8:35	4/23/09 9:15	0.67	0.378	0.06	0.01	< 2 Month	0.02	< 2 Month	0.05	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.10	< 2 Month	0.14	< 2 Month	0.20	< 2 Month	0.20	< 2 Month	0.41	< 2 Month
4/28/09 2:20	4/28/09 3:15	0.92	4.712	0.06	0.02	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.06	< 2 Month	0.26	< 2 Month
4/28/09 19:50	4/28/09 20:25	0.58	0.691	0.05	0.01	< 2 Month	0.02	< 2 Month	0.04	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.11	< 2 Month	0.11	< 2 Month	0.11	< 2 Month	0.31	< 2 Month
4/29/09 2:55	4/29/09 2:55	0.00	0.271	0.01	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.06	< 2 Month	0.07	< 2 Month	0.12	< 2 Month	0.12	< 2 Month	0.32	< 2 Month
5/2/09 11:35	5/2/09 21:20	9.75	3.4	0.33	0.02	< 2 Month	0.04	< 2 Month	0.08	< 2 Month	0.12	< 2 Month	0.29	< 2 Month	0.33	< 2 Month	0.33	< 2 Month	0.33	< 2 Month	0.33	< 2 Month	0.45	< 2 Month
5/3/09 19:25	5/3/09 19:40	0.25	0.920	0.12	0.04	< 2 Month	0.08	< 2 Month	0.12	< 2 Month	0.12	< 2 Month	0.12	< 2 Month	0.12	< 2 Month	0.18	< 2 Month	0.45	< 2 Month	0.45	< 2 Month	0.57	< 2 Month
5/4/09 15:55	5/5/09 16:15	24.33	0.8	1.32	0.05	< 2 Month	0.09	2-month	0.21	6-month	0.28	6-month	0.68	6-month	0.95	4-month	1.31	6-month	1.44	3-month	1.73	4-month	1.83	< 2 Month
5/5/09 22:55	5/6/09 22:35	23.67	0.3	0.69	0.02	< 2 Month	0.03	< 2 Month	0.07	< 2 Month	0.12	< 2 Month	0.34	< 2 Month	0.52	< 2 Month	1.03	3-month	1.95	6-month	2.08	6-month	2.46	3-month
5/7/09 17:40	5/8/09 4:45	11.08	0.795	0.19	0.02	< 2 Month	0.04	< 2 Month	0.07	< 2 Month	0.11	< 2 Month	0.17	< 2 Month	0.19	< 2 Month	0.19	< 2 Month	0.83	< 2 Month	1.99	4-month	2.65	4-month
5/11/09 1:20	5/11/09 12:05	10.75	2.858	0.05	0.01	< 2 Month	0.01	< 2 Month	0.01	< 2 Month	0.02	< 2 Month	0.03	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	0.05	< 2 Month	2.25	3-month
5/13/09 14:20	5/14/09 13:25	23.08	2.1	0.82	0.02	< 2 Month	0.04	< 2 Month	0.10	< 2 Month	0.15	< 2 Month	0.41	< 2 Month	0.56	< 2 Month	0.82	< 2 Month	0.82	< 2 Month	0.83	< 2 Month	1.06	< 2 Month
5/18/09 20:00	5/19/09 4:30	8.50	4.3	0.43	0.02	< 2 Month	0.03	< 2 Month	0.09	< 2 Month	0.16	< 2 Month	0.42	< 2 Month	0.43	< 2 Month	0.43	< 2 Month	0.43	< 2 Month	0.43	< 2 Month	1.25	< 2 Month
5/19/09 19:45	5/20/09 0:30	4.75	0.6	0.45	0.08	4-month	0.14	6-month	0.25	9-month	0.35	1-year	0.45	< 2 Month	0.45	< 2 Month	0.72	< 2 Month	0.88	< 2 Month	0.88	< 2 Month	1.70	< 2 Month

Precipitation Depth-Duration-Frequency table used for storm evalutation

Duration / Frequency	168 hr.	96 hr.	48 hr.	24 hr.	12 hr.	6 hr.	3 hr.	2 hr.	1 hr.	30 min.	15 min.	10 min.	5 min.
2-month	1.83	1.30	1.16	0.87	0.67	0.46	0.31	0.26	0.19	0.14	0.10	0.09	0.058
3-month	2.19	1.54	1.27	1.01	0.78	0.53	0.36	0.30	0.22	0.16	0.11	0.10	0.067
4-month	2.48	1.73	1.51	1.11	0.85	0.58	0.39	0.33	0.24	0.18	0.12	0.11	0.076
6-month	2.87	2.01	1.74	1.28	0.98	0.67	0.45	0.38	0.28	0.21	0.15	0.12	0.084
9-month	3.30	2.31	2.01	1.46	1.12	0.77	0.52	0.44	0.31	0.24	0.17	0.14	0.098
1-year	3.59	2.51	2.18	1.58	1.22	0.83	0.56	0.47	0.34	0.26	0.18	0.15	0.107
2-year	4.35	3.03	2.66	1.95	1.49	1.03	0.69	0.58	0.42	0.32	0.22	0.18	0.133
5-year	5.14	3.63	3.20	2.36	1.78	1.21	0.81	0.70	0.53	0.41	0.29	0.25	0.187
10-year	5.68	4.07	6.30	2.66	1.99	1.34	0.93	0.78	0.61	0.47	0.35	0.30	0.223
25-year	6.45	4.71	4.19	3.11	2.30	1.54	1.08	0.92	0.72	0.56	0.42	0.36	0.273
50-year	6.99	5.20	4.65	3.44	2.53	1.69	1.20	1.04	0.80	0.64	0.47	0.41	0.312
100-year	7.52	5.70	5.12	3.79	2.76	1.84	1.35	1.14	0.89	0.71	0.53	0.45	0.350

Sources:

Pat Stevens - King County

Schaefer, M.G., "Analysis of Precipitation Frequency and Storm Characteristics for the City of Seattle, Table 5, 2003, MGS Consultants.

Ibid - Table E-17, Figure E-17, Precipitation Magnitude-Frequency Estimates for SPU Gage 18

Appendix J: Data Screening Notes

Appendix J – Data Screening Notes

059-121 (GEN38_059121)

Location: S Charleston St/34th Ave S

Flows to KC 059-442. Used to be proposed at 059-442 (poor site). Field team looked and N and E lines- low flow and poor sites. Decided to not monitor N and E lines into 059-121.

TABLE J-1
Notes for Monitor 059-121

Begin Date	End Date	Screening Comments	Response
12/19/2007	1/16/2008	OK. Velocity varies between 1.5 and 4 ft/sec. Scattergraph shows rough flow below 3.1 in.	None needed.
1/16/2008	1/22/2008	Hydrograph ok, though relationship between velocity and level not tight. Scattergraph has wide scatter below 3 in. depth	Need to confirm with ADS that wide scatter below 3 in depth is most likely due to rough choppy flow.
1/22/2008	1/29/2008	OK	None needed.
1/29/2008	2/4/2008	Pdepth seems to be off ultras.	ADS email 2/5: " It looks like the pressure sensor is not in the flow (less than 2 inches of depth). I will double check with the fieldcrew to make sure the install is best we can do. "
2/7/2008	2/19/2008	OK	None needed. ADS has requested service for the pressure sensor.
2/19/2008	3/11/2008	Good.	None needed.
3/11/2008	6/17/2008	OK	None needed.
6/17/2008	7/1/2008	Looks like something has changed at the site around 6/25 - all sensors seem to be a little elevated when compared to previous data.	ADS email 7/9/08: A mound of debris was scrubbed off. Then the pressure o/s was re-measured.
7/1/2008	7/31/2008	OK	None needed.
7/31/2008	8/15/2008	Small data gaps and .75 in or more difference between pressure and ultrasonic depth during storm 8/9.	ADS email 8/15: Requested pressure service.
8/15/2008	11/3/2008	OK	None needed.
11/3/2008	11/11/2008	PDEPTH not reading with UNIDEPTH during dry nor wet periods	
11/11/2008	12/16/2008	OK	None needed.

Begin Date	End Date	Screening Comments	Response
12/16/2008	1/7/2009	Data gap 1/3 to 1/6, increasingly noisy velocity readings - possibly in need of scrubbing	
1/7/2009	1/14/2009	Data gap 1/8	
1/7/2009	3/18/2009	OK	None needed.
3/18/2009	3/25/2009	OK - slight hydraulic shifting due to decreasing groundwater	None needed.
3/25/2009	4/1/2009	Data gap 3/26.	
4/1/2009	4/14/2009	OK - significant rainfall early April, site appears to respond quickly and returns to normal flow within 3-4 days. Indicates groundwater contribution to flow.	None needed.
4/14/2009	4/27/2009	Unusual shift in UNIDEPTH readings, sudden jump during day flows but no corresponding jump in velocity. Night flows are reasonable. Increase in depth not seen in downstream monitors. Could wrong data have been loaded?	
4/27/2009	5/26/2009	OK	None needed.

059-131 (GEN38_059131)

Location: Oregon St. & 36th Ave S.

Replaces GEN38_059468, which was not accessible. This site will fill in for GEN38_059130 if the data quality is high enough.

TABLE J-2
Notes for Monitor 059-131

Begin Date	End Date	Screening Comments	Response
12/17/2007	1/16/2008	No data in Intelliserve yet.	1/9/08 email from Mike Hinson to Shay Koerber: "059-468 was not field assessable. 059-130 was selected as the alternate. Install should be at 059-130 with a site id as GEN38_059130. You have a Site Rptthat you sent me with 059-131. This is not a site that we selected. We need a meter at 059-130 since 059-468 or 059-565 are not assessable. I sent a GIS map for 059130 to you on 1/3/08." Will follow up with Shay during field trip 1/17/08.
1/10/2008	1/23/2008	No data in Intelliserve, but ADS comments on data in 1/22/08 email indicate that the data is available in Profile. Velocity scrub requested at that time.	Need data to be uploaded to Intelliserve so that decision can be made on whether or not to keep this site or to install at GEN38_059130 instead.
1/10/2008	1/29/2008	Velocity only kicks in when level rises (looks like some daily pumping activity.) The velocity probe may be rotated up the pipe out of silt.	Referring this site to modelers for evaluation of whether the site data is of sufficient quality to keep the site.
1/29/2008	2/19/2008	OK	None needed.
2/19/2008	3/11/2008	Good.	None needed.
3/11/2008	3/18/2008	Ultrasonics popping since 3/17.	Sent email to ADS on 3/18/08.
3/18/2008	4/16/2008	OK	None needed.
4/16/2008	4/22/2008	None needed.	OK
4/22/2008	5/12/2008	OK	None needed.
5/12/2008	5/19/2008	More spikes in vel data since 5/16.	ADS email 5/19: "Service request has been issued."
5/19/2008	7/31/2008	OK	None needed
7/31/2008	8/15/2008	During baseflow, velocity readings are only consistently generated during pumping. Question: is this the most velocity points that can be obtained at this site?	ADS email 8/15: I think this is the best we will get but I will get a second opinion.
8/15/2008	8/29/2008	OK	None needed.

Begin Date	End Date	Screening Comments	Response
8/29/2008	9/26/2008	Short data gap 9/18, followed by data from HEN46_081131 uploaded to this site 9/18 -9/26. Baseflow and velocity completely different.	Notified ADS 9/18 of ata gap 9/3 to 9/11, pressure, ultras, and velocity all abnormal since 9/18/08. ADS response in 9/22/08 email : Crew verified flow barely moving.
9/26/2008	10/3/2008	Still some data from another site (HEN 131) 10/2 -10/3.	ADS email 10/3/08: : you will still see incorrect data on 10/3. There was a mix-up with the lifs in Intelliserve and data from another site was collected this morning. I could not overwrite it because I was not able to get online with 131. I will have the correct data imported when the crew visits the site on Tuesday.
10/3/2008	10/13/2008	No velocity since 10/11, intermittent/erratic since 10/5.	Service scheduled today.
10/13/2008	11/3/2008	OK	None needed.
11/3/2008	11/11/2008	Experiences daily industrial discharge - even during large storm events (such as 11.6-7) which is a potential problem in causing CSOs. - Erroneous velocity readings during low flows results in spike in scattergraph at low depths – will require data scrubb	
11/11/2008	2/16/2009	OK	None needed.
2/16/2009	2/24/2009	Unusual depth occurring 2/20 to 2/21, possibly incorrect data?	
2/24/2009	4/14/2009	OK	None needed.
4/14/2009	4/27/2009	OK - Typical - Unusual jump in flow and depth around midnight of 4/22 - seen in downstream monitors 059-451 and 059-498.	None needed.
4/27/2009	5/26/2009	OK	None needed.

059-320 (GEN38_059320)

Location: S Genesee St./45th Ave S

Input at Genesee St. Used to be 059-317. Changed on 10/17/07 field visit. Can also use 059-319 (if it can be opened). Night velocity dropouts.

TABLE J-3
Notes for Monitor 059-320

Begin Date	End Date	Screening Comments	Response
12/17/2007	1/16/2008	Hydrograph and scattergraph both track well.	None needed.
1/16/2008	1/21/2008	OK	None needed.
1/21/2008	1/29/2008	A few night velocity dropouts, but otherwise ok.	None needed.
1/29/2008	2/7/2008	OK	None needed.
2/7/2008	2/12/2008	Data gap 2/7-2/11 in Intelliserve, but data is present in Profile.	None needed.
2/12/2008	2/19/2008	OK	None needed.
2/19/2008	3/11/2008	Good.	None needed.
3/11/2008	4/11/2008	OK	None needed.
4/11/2008	4/20/2008	Velocity looks obstructed 4/17-4/18, then velocity slightly higher than historical data afterwards.	ADS email 4/22: "The field should verify, confirmation requested."
4/20/2008	7/1/2008	OK	None needed.
7/1/2008	7/17/2008	Data gap 7/10 -7/15.	ADS email 7/17/08: Crew discovered the battery was not plugged in all the way (since the previous site visit.)
7/17/2008	8/10/2008	OK	None needed.
8/10/2008	8/28/2008	320: Data gap 8/13 -8/15 and 8/19 - 8/21, equipment failure causing bad depth and velocity 8/14-8/19.	8/19: crew replaced monitor. Data gaps are real, monitor/sensor malfunction.
8/28/2008	9/17/2008	OK	None needed.
9/17/2008	10/5/2008	Time step set to 15 min interval 8/26-9/2, and 9/4-9/25. Some loss of velocity 9/20-9/22, data gap 9/22 -9/25 during small storm. Velocity improves after scrub 9/23. OK now.	Velocity scrubbed 9/23.
10/5/2008	12/1/2008	OK	None needed.
12/1/2008	12/9/2008	Experiencing significantly more data dropouts since rain event on 12/2, possibly due for scrubbing?	
12/9/2008	3/11/2009	OK	None needed.
3/11/2009	3/18/2009	Data gap 3/16 to 3/17	

Begin Date	End Date	Screening Comments	Response
3/18/2009	3/25/2009	OK	None needed.
3/25/2009	4/1/2009	Velocity data suggests presence of "abominable snowman" effect, whereby presence of early morning snowfall causes magnetic variations in velocity prograttomatic component. Results in spontaneous combustion of sewage. Suggest evacuation of city, notificati	None needed.
4/1/2009	4/14/2009	OK - Increased groundwater contribution during storm resulting in drawnout response.	None needed.
4/14/2009	5/26/2009	OK	None needed.

059-332 (GEN38_059332)

Location: 4430 42nd Ave S

GIS indicates Drop MH. Not verified in field by SPU or CH2M Hill staff. ADS to confirm suitability of site. If not suitable, 2nd choice is one node u/s at 059-330 (has a bend). Was moved from 059-356 at request of SPU on 10/24/07. West side inflow to 72" Sewer (IMS_ID 059-356 059-355). Line from S. (S. of 059-356) is a drop pipe- team elected not to monitor.

TABLE J-4
Notes for Monitor 059-332

Begin Date	End Date	Screening Comments	Response
12/21/2007	1/16/2008	Hydrograph shows velocity drops that appear unrelated to low levels, also a few velocity spikes. Depth ok. Scattergraph ok.	None needed.
12/29/2007	1/23/2008	Velocity spikes and drops at low level, low velocity. More drops recently.	Will refer to ADS to check on velocity integrity.
1/16/2008	1/23/2008	No data in Intelliserve since 1/16/08.	Will follow up with ADS.
1/23/2008	1/29/2008	Pressure depth consistently higher than ultrasonic depth.	Will follow up with ADS
1/29/2008	1/29/2008	No new data.	2/5 email from ADS: "Service issued."
1/29/2008	2/11/2008	Ultras lower than pressure depth by 2-3 inches, more dropouts in velocity lately.	Will follow up with ADS.
2/11/2008	2/19/2008	Velocity has many more dropouts since 2/7, especially 2/10 to 2/14.	Sent email to ADS re: this problem 2/20/08.
2/14/2008	2/20/2008	Pressure depth routinely 2-3 in greater than unidepth.	ADS email 2/26: "THIS MAY BE AS GOOD AS IT GETS. I WILL ASK A CREW TO CHECK IT OUT."
2/20/2008	3/4/2008	Good.	None needed.
3/4/2008	3/10/2008	Scatter has cluster of points low and high - most likely due to pumping pattern.	None needed.
3/10/2008	3/17/2008	Velocity has more spikes since 3/10/08. Pressure depth routinely 2 in + off ultrasonics.	Sent email to ADS on 3/18/08.
3/17/2008	3/20/2008	Velocity erratic until 3/17, then improved after.	None needed.
3/20/2008	3/26/2008	OK	None needed.

Begin Date	End Date	Screening Comments	Response
3/26/2008	4/11/2008	Unrecoverable data gap 3/26 - 3/31 (from ADS service notes.) Data regime changed significantly 4/8. Scatter shows 2 regimes. Velocity drops on the rise. Problem from last week of wrong data file loaded repaired.	ADS email 4/11/08: "Someone in client services was able to retrieve the data for gap 4/4-4/8. Iserve had the wrong lif. I have corrected the problem and replaced the bad data with correct data through 4/8. This is a site with communication problems so the 4/8-4/11 data will be corrected when a crew visits the site (scheduled for today.)
4/11/2008	5/29/2008	OK	None needed.
5/29/2008	6/17/2008	Pressure depth regularly 2 in higher than ultrasonic depth - cause for concern when site surcharges?	ADS email 6/18/08 from KaTonya Sledge: "I have been using the ultra to finalize the data. The site has never come close to surcharge depths, but in that case I would probably switch to pressure and make adjustments if I felt it was slightly over-stating the depth."
6/17/2008	7/1/2008	Looks like pressure is drifting a bit off the ultrasonics.	ADS email 7/9/08: Crew has scrubbed, pressure looking better. I will have crew service in tomorrow's visits.
7/1/2008	7/17/2008	Velocity is a bit more erratic than last month, but seems improved following service 7/9.	None needed.
7/17/2008	7/31/2008	OK	None needed.
7/31/2008	8/15/2008	Poor velocity (erratic) 7/31 - 8/12, intermittent velocity only after velocity sensor replacment 8/12.	ADS email 8/15: The sensitivity is turned up. The crew observed that the flow was barely moving on the 8/12 site visit.
8/15/2008	8/29/2008	Change in velocity signature since monitor swap, and odd flat line at 1.09 fps. Scattergraph abnormal-looking.	Service requested for this week
8/29/2008	9/19/2008	Velocity more erratic lately, worse than historic. Only 2 velocity points recorded during 9/20/08 storm.	ADS 9/22/08 email: crew verified flow barely moving. Velocity scrubbed 9/23.
9/19/2008	10/6/2008	No velocity between 9/27 -9/30. Decreasing velocity signal since 10/3. Velocity during storm 10/3 not consistent.	ADS velocity check 9/30: crew confirmed flow barely moving, tested v-sensor by speeding up the flow, sensor ok.
10/6/2008	10/13/2008	No velocity since 10/10.	Service scheduled today.
10/13/2008	10/16/2008	Data gap of 13 hours on 10/13. Only a few points of velocity data collected each day, less than in the past.	ADS: Velocity service requested; manually collected on 10/21 and imported to Iserve.
10/20/2008	10/23/2008	No or very erratic velocity.	
10/20/2008	11/3/2008	No velocity readings available, but PDEPTH and UNIDEPTH readings available.	
11/3/2008	11/11/2008	No velocity	

Begin Date	End Date	Screening Comments	Response
11/6/2008	11/18/2008	Velocity sensor back online	
11/18/2008	12/3/2008	OK	None needed.
12/3/2008	12/9/2008	Data that was previously available is no longer available (12/2 to 12/4)	
12/9/2008	1/13/2009	OK	None needed.
1/13/2009	1/22/2009	Velocity readings appear noisier than in the past, possibly due to debris - request velocity scrub	
1/22/2009	2/12/2009	OK	None needed.
2/12/2009	2/12/2009	Communication problem - no new data since 2/12	
2/12/2009	3/18/2009	OK	None needed.
3/18/2009	3/25/2009	OK - slight hydraulic shifting due to decreasing groundwater infiltration	None needed.
3/25/2009	4/1/2009	OK	None needed.
4/1/2009	4/12/2009	OK - Industrial discharge combined with rainfall results in significant spread in scatterplot, two flow regimes apparent.	None needed.
4/12/2009	5/26/2009	OK	None needed.

059-346 (GEN38_059346)

Location: 45th Ave S and Lk Wash Blvd S

Installed later than other sites (7/9/08) because extensive cleaning of the pipe was required. Normally a dry pipe.

TABLE J-5
Notes for Monitor 059-346

Begin Date	End Date	Screening Comments	Response	
7/9/2008	7/23/2008	Site installed 7/9/08. Data indicates pipe is dry (this is the expected condition.)	None needed.	Note: GEN38_059346 was incorrectly labeled. This site is at MH 059-574, not MH 059-346. See Section 3.2 in the report for more details. Continued monitoring at this location can be found under the label GEN38_059574, which is upstream of NPDES38_MH059574.
7/23/2008	7/31/2008	OK	None needed.	
7/31/2008	8/15/2008	Data shows a dry pipe.	None needed.	
8/15/2008	8/29/2008	Data shows dry pipe.	None needed.	
8/29/2008	9/19/2008	OK	None needed.	
9/19/2008	10/13/2008	Data shows dry pipe.	None needed.	
10/13/2008	10/20/2008	Data shows a dry pipe.	None needed.	
10/20/2008	10/27/2008	OK. Data shows dry pipe.	None needed.	
10/20/2008	11/12/2008	OK - no flow (expected)	None needed.	
11/12/2008	11/18/2008	OK - no flow - overflow pipe	None needed.	
11/25/2008	1/15/2009	OK	None needed.	
1/15/2009	1/27/2009	Depth data appears 1/22 - could wrong data have been uploaded?		
1/27/2009	3/18/2009	OK	None needed.	
3/18/2009	3/25/2009	No flow - continued standing water at <1"	None needed.	
3/25/2009	4/1/2009	Occasional erroneous depth spikes - one outlying data point		
4/1/2009	4/14/2009	Apparent flow for several hours 4/9. Possibly erroneous since it does not align with rainfall and depth does not indicate flow. Several other brief blips of flow (4/2 - during rain, 4/11 and 4/13 not during rain). NPDES 38 data does not indicate abnormal		
4/14/2009	4/27/2009	OK - Occasional blips of flow - appear to be caused by grease that builds up on sensors then sloughs off to create period of flow - corresponds with increase in depth followed by period of flow and decreasing depth.	None needed.	
4/27/2009	5/21/2009	OK - no flow	None needed.	

059-371 (GEN38_059371)

Location: 4434 46th Ave S

Not verified in field by SPU or CH2M Hill. ADS to confirm suitability of site. Was moved from 059-356 at request of SPU on 10/24/07. Together with monitor at 059-373 below used for flow loading from east input to 72" Sewer (IMS_ID 059-356 059-355). 3 junctions between 059-356 and 059-371 to east are tees (505 & 503) and Drop MH (372) and are thus not suitable for monitoring. Line from S. (S. of 059-356) is a drop pipe- team elected not to monitor based on field eval. Diurnal ow level velocity drop outs observed.

TABLE J-6
Notes for Monitor 059-371

Begin Date	End Date	Screening Comments	Response
1/3/2008	1/10/2008	After initial instability 1/3 to 1/6, data tracks well with only a few velocity dropouts.	None needed.
1/16/2008	1/22/2008	Low level (night-time) velocity dropouts. Otherwise ok.	None needed.
1/21/2008	1/21/2008	No data.	May be related to AT&T problems.
1/21/2008	2/4/2008	Data gap from 1/23 to 1/29, otherwise ok.	Will follow up with ADS.
2/4/2008	2/4/2008	No new data.	None needed.
2/4/2008	2/11/2008	OK	None needed.
2/11/2008	2/17/2008	Velocity has more spikes/drops lately.	ADS 2/19/08 email: "On 2/14 crew went to site for pressure problem. The crew tried to rotate it a little more but pressure can't be rotated much more b/c of the ultra (it would have to be put to surcharge mount.)"
2/17/2008	2/25/2008	Scatter has lots of zeros and a very flat relationship between level and velocity (site signature.)	None needed.
2/25/2008	3/4/2008	Two distinct signatures for scatterplot.	Will follow up with ADS.
3/4/2008	3/10/2008	3/4-3/6 data gap. Velocity seems increasingly erratic at this site - spikes and drops more frequently, even when low flow is considered. Velocity still responds to storm events, but drops out immediately after. CH2MHill has identified this site as having "frequent and persistent spurious velocity readings."	ADS email 3/12: If you look at the last rain events on 3/3 and 3/10, you will see that when depth increases, we do not have the velocity dropouts that we have during normal flow levels. The data gap is due to the monitor malfunctioning briefly, we tried the collect here and in the field but did not get any data for those two days from the meter.
3/10/2008	3/17/2008	Small data gap 4AM - 12PM 3/17.	Sent follow up email to ADS on 3/18/08.
3/17/2008	3/30/2008	OK	None needed.

Begin Date	End Date	Screening Comments	Response
3/30/2008	4/11/2008	Unrecoverable data gap 3/30 - 4/2. 4/8 data gap, data regime changed 4/2 - 4/8, again 4/8 -4/9. Baseflow depth approximately 3 in higher than historic levels. Scatterplot shows 2 regimes.	ADS 4/11/08 email: The lif was wrong in Iserve. I corrected the problem and imported the correct data through 4/9. This is a comm. Problem as well. The correct data for 4/9-4/11 will be uploaded when a crew visits the site to assistance in data collection (may be next week)
4/11/2008	4/16/2008	Still looks like the wrong lif for 4/9-4/11 (correct data is to be uploaded this week by the field crew.) Data gap 4/11 - 4/14. Scatter shows two regimes.	ADS email 4/16/08: "Data gap 4/10-4/14 is real. The monitor was replaced on 4/15."
4/16/2008	4/22/2008	OK	None needed.
4/22/2008	4/29/2008	Scatterplot has "spur" between 1.5 & 2 in, otherwise OK.	None needed.
4/29/2008	5/6/2008	Data gap 5/3 - 5/6.	ADS email 5/7/08: "No data available, technician said it was due to a memory problem in the monitor. The monitor was replaced yesterday."
5/6/2008	6/18/2008	OK	None needed.
6/18/2008	7/1/2008	Velocity looking more erratic lately, small data gap 6/24.	ADS email 7/9/08: Crew has been scrubbing, will get with Sean about site conditions, data uploaded
7/1/2008	7/16/2008	Velocity sensor data looks a bit degraded after 6/29 - not improved particularly after scrub service.	ADS email 7/17/08: Crew observed the velocity rarely gets above 0.70 fps, which makes it hard to get readings. They have this site on the list for routine weekly scrubs.
7/16/2008	7/31/2008	OK	None needed.
7/31/2008	8/15/2008	Data gap 7/31 - 8/7 due to monitor failure. More dropouts and spikes in velocity readings 8/10 to present.	Data rescue is being attempted by ADS. ADS email 8/15: Requested scrub.
8/15/2008	3/18/2009	OK	None needed.
3/18/2009	3/25/2009	Increasing velocity dropouts during day - suggest velocity scrub	
3/25/2009	4/14/2009	OK	None needed.
4/14/2009	4/27/2009	OK - typical low flow dropouts	None needed.
4/27/2009	4/12/2009	OK	None needed.

059-373 (GEN38_059373)

Location: 4504 46th Ave S

Not verified in field by SPU or CH2M Hill. ADS to confirm suitability of site. Was moved from 059-356 at request of SPU on 10/24/07. Together with monitor at 059-371 above used for flow loading from east input to 72" Sewer (IMS_ID 059-356 059-355). 3 junctions between 059-356 and 059-373 are Tees (505 & 503) and Drop MH (372) and are thus not suitable for monitoring. Line from S. (S. of 059-356) is a drop pipe- team elected not to monitor based on field eval.

TABLE J-7
Notes for Monitor 059-373

Begin Date	End Date	Screening Comments	Response
12/12/2007	1/10/2008	Ultrasonics appear to pop periodically, but pressure depth is ok. Not a great relationship between level and velocity at lower depths, but due to site condition?	Check and evaluate during site visit 1/17/08.
1/16/2008	1/23/2008	No data available in Intelliserve, but ADS notes on site in 1/22/08 email: "Velocity, pressure depth good, needs a data collect ultrasonics has excessive popping, scrub/troubleshoot/replace, sensor needs data collect."	Need to get data uploaded to Intelliserve.
1/22/2008	1/23/2008	No data since 1/23/08.	May be related to AT&T problem.
1/23/2008	1/29/2008	Ok	None needed.
1/29/2008	1/29/2008	No new data	Will follow up with ADS.
1/29/2008	2/11/2008	Some ultra pops on 2/10, but better recently.	None needed.
2/11/2008	2/15/2008	OK	None needed.
2/15/2008	2/20/2008	Velocity decrease combined with level increase since 2/18 - possible downstream blockage?	ADS email 2/26: "CREW WAS THERE YESTERDAY AND NOTICED LARGE AMOUNTS OF DEBRIS ROLLING THROUGH THE LINE GETTING CAUGHT ON THE SENSORS AS IT PASSED."
2/20/2008	2/26/2008	ADS note: "Crew has notes that large amounts of silt roll through the line and at times gets on the velocity sensor. It looks like the line was backed up for a while and returned free-flow conditions again on 3/1/08. When depths increase like that, the velocity stays at a more constant rate so you will not see the normal diurnal pattern you would see at lower depths.	It will be necessary to keep a watch on this site due to the shifting silt issue.
3/4/2008	3/6/2008	Data gap 3/4 - 3/6.	ADS 3/12/08 email: "Data gap real due to monitor malfunction."

Begin Date	End Date	Screening Comments	Response
3/6/2008	3/17/2008	Significant change in data signature 3/4-3/12. Data from another site loaded during this period (wrong .lif file?)	Sent follow up email to ADS on 3/18/08.
3/17/2008	4/15/2008	OK	None needed.
4/15/2008	4/22/2008	Ultras look wonky 4/17, then fine after.	None needed.
4/22/2008	6/3/2008	OK	None needed.
6/3/2008	6/17/2008	Some splitting in the scatterplot - looks almost like two regimes below 2.5 inches.	ADS email 6/18/08: "Depth increased while velocity decreased on 5/30-6/3 and again on 6/15. Both backed-up during weekends. I'm not sure what happened, but looks ok now."
6/17/2008	7/1/2008	OK	None needed.
7/1/2008	7/17/2008	Short data gap 7/15/08.	ADS email 7/17/08: Data uploaded.
7/17/2008	7/28/2008	Slight rise in depth and drop in vel since 7/27.	ADS email 8/6/08: Looks like there was a blockage. The flow went back to normal, but looks blocked again starting 8/3, will request site visit.
7/28/2008	8/14/2008	Change in data signature. Not sure what's up with this site. Service report mentions jetting the line improving velocity, but vel data looks worse to me after 8/7. Data gap 8/10 - 8/11.	ADS email 8/15: Requesting more service.
8/14/2008	8/28/2008	Are the pipe debris noted in the service reports causing the velocity spikes and dropouts here? Scatterplot does not follow site signature.	ADS email 9/8/08: Service requested for this week. Default velocity parameters are set, so should not have spikes unless there is silt/debris on the sensor.
8/28/2008	9/17/2008	OK	None needed.
9/17/2008	10/6/2008	Velocity somewhat erratic, but OK during storms.	None needed.
10/6/2008	10/9/2008	OK	None needed.
10/9/2008	10/19/2008	Some shifting in scatterplot below 2 in of depth- looks like periodically partial blockages form and clear themselves inside the pipe.	None needed.
10/20/2008	10/27/2008	OK	None needed.
10/20/2008	11/3/2008	Much more velocity dropouts than in historic data - due for a velocity scrubbing?	
11/3/2008	11/6/2008	PDEPTH appears to have some difficulty following UNIDEPTH during storms	
11/6/2008	11/13/2008	OK	None needed.
11/13/2008	11/25/2008	Data gap 11/13 to 11/20	
11/25/2008	12/11/2008	OK	None needed.

Begin Date	End Date	Screening Comments	Response
12/11/2008	1/7/2009	Unusual UNIDEPTH spikes occuring since 1/1	
1/7/2009	2/12/2009	OK	None needed.
2/12/2009	2/12/2009	Communication problem - no new data since 2/12	
2/12/2009	3/12/2009	OK	None needed.
3/12/2009	3/19/2009	OK - site appears to experience high amounts of hydraulic shifting, possibly due to reverse install of sensors.	None needed.
3/19/2009	3/26/2009	OK	None needed.
3/26/2009	4/7/2009	OK - groundwater contribution results in drawnout response.	None needed.
4/7/2009	4/23/2009	OK - this site experiences a high amount of hydraulic shifting - likely caused by reverse install.	None needed.
4/27/2009	5/7/2009	Data gap 4/23 to 4/28	
5/7/2009	5/21/2009	OK	

059-398 (GEN38_059398)

Location: 4610 Lake Washington Blvd in park, east of 46th Ave S

Low level velocity drop outs.

TABLE J-8
Notes for Monitor 059-398

Begin Date	End Date	Screening Comments	Response
12/13/2007	1/15/2008	Some velocity spikes plus diurnal pattern of low levels/slow velocity dropouts. Scatter ok.	None needed.
1/16/2008	1/22/2008	Velocity dropouts at low levels (night), but otherwise ok. ADS comment in 1/22/08 email: "Pressure depth good, ultrasonics has had bad data historically, velocity needs a scrub."	Velocity scrub needed (work order may have already been issued.)
1/22/2008	1/29/2008	More velocity dropouts 1/28 to 1/29.	Will refer to ADS.
1/29/2008	2/3/2008	Looks good.	None needed.
2/3/2008	2/6/2008	Looks like since 1/31, there have been more velocity spikes than usual.	Will follow up with ADS.
2/6/2008	2/11/2008	OK	None needed.
2/11/2008	2/19/2008	Lots of zero readings, popping.	Sent email to ADS 2/20/08 re: this site.
2/19/2008	2/25/2008	Velocity more erratic since 2/22.	ADS email 2/26: " THE VELOCITY SENSOR WAS SCRUBBED TODAY."
2/25/2008	3/12/2008	Good.	None needed.
3/12/2008	3/18/2008	OK	None needed.
3/18/2008	3/25/2008	Short data gap 3/18/08.	ADS email 3/26/08: "Real data gap, monitor malfunctioned, both the crew and myself tried to collect it; meter is now working fine."
3/25/2008	3/25/2008	No new data.	Monitor swap, awaiting data rescue
3/25/2008	4/11/2008	Unrecoverable data gap 3/25 - 3/31. Data gap 4/3-4/4. Data regime different for 3/31-4/3 period, baseflow depth 6in prior, 21.5 in btwn 3/31-4/3. Scatter shows 2 regimes. Dropouts and spikes in velocity data greatly increased since 4/8.	ADS 4/11/08 email: "The correct data will be uploaded to Iserve today. The lif was correct. I believe it was just a mix-up with the import."
4/11/2008	4/16/2008	Velocity looks much more erratic 4/8-4/16, even with the scrubs 4/11.	ADS email 4/16/08: "Requested velocity scrub/swap."
4/16/2008	4/22/2008	Scatter shows increased variability between 3.5-6 in.	ADS email 4/22: "Velocity service requested."
4/22/2008	4/29/2008	OK	None needed.

Begin Date	End Date	Screening Comments	Response
4/29/2008	5/6/2008	Velocity data has more and more dropouts and spikes - much more erratic since 4/22.	ADS email 5/7/08: "Service requested."
5/6/2008	7/3/2008	OK	None needed.
7/3/2008	7/17/2008	Ultras spiking a bit.	ADS email 7/17/08: Ultra and velocity were scrubbed on 7/17/08.
7/17/2008	7/31/2008	Some velocity loss 7/16 - 7/24 - improved after scrub 7/24.	None needed.
7/31/2008	8/14/2008	A few ultra spikes.	None needed.
8/14/2008	8/29/2008	Velocity data looks erratic, and not improved that I can tell by scrubbing of the sensor. Has this velocity sensor been replaced during the course of the monitoring, and if so, did the new one make any difference?	ADS 9/8/08 email: The velocity sensor was replaced back in April with no real improvement. The crew has had to rotate the velocity sensor out of the silt line a couple of times and have it positioned as far as it can go without being out of the flow. We have routine scrubs at this site.
8/29/2008	9/19/2008	OK	None needed.
9/19/2008	10/6/2008	Velocity somewhat erratic, but OK during storms.	None needed.
10/6/2008	10/13/2008	OK	None needed.
10/13/2008	10/18/2008	OK. Velocity erratic except during storms.	None needed.
10/20/2008	12/7/2008	OK	None needed.
12/7/2008	1/6/2009	Unusual UNIDEPTH spikes occuring since 1/1, short data gap 12/28	
1/6/2009	3/17/2009	OK	None needed.
3/17/2009	3/17/2009	No new data since 3/17	
3/17/2009	3/26/2009	OK	None needed.
3/26/2009	4/2/2009	OK - Brief period of erratic UNIDEPTH behavior - appears to have been linking to PDEPTH 4/1. Does not seem to cause serious problems, as site reads wet weather well.	None needed.
4/2/2009	5/5/2009	OK	None needed.
5/5/2009	5/21/2009	Unusual increase in UNIDEPTH readings from 5/12 to 5/13 - site signature significantly changed after increase. Can ADS confirm if maintenance was done?	

059-404 (GEN38_059404)

Location: 4016 Lake Washington Blvd S.

Good site.

TABLE J-9
Notes for Monitor 059-404

Begin Date	End Date	Screening Comments	Response
12/17/2007	1/16/2008	Looks good - tracks well. Couple of ultrasonic pops, but that's it.	None needed.
1/16/2008	2/4/2008	OK	None needed.
2/4/2008	2/7/2008	Looks good	None needed.
2/7/2008	2/19/2008	OK	None needed.
2/19/2008	3/11/2008	Good.	None needed.
3/11/2008	3/17/2008	Small data gap 3/17. Ultra pops and drops since.	Sent follow up email to ADS on 3/18/08.
3/17/2008	3/25/2008	A few ultrasonic pops and drops, but mostly great.	None needed.
3/25/2008	3/31/2008	OK	None needed.
3/31/2008	4/8/2008	Fairly severe ultrasonic depth pops 4/1, 4/6-4/7, but pressure depth OK during that period. Problem appears to be solved currently.	None needed.
4/8/2008	10/13/2008	OK	None needed.
10/13/2008	10/19/2008	Ultrasonics spiking to top of pipe 10/18, 10/19.	ADS: Debris caught on sensor caused sensor to foul. Current data looks ok.
10/20/2008	10/27/2008	Pressure sensor varying widely from ultrasonic.	
10/20/2008	5/26/2009	OK	None needed.
12/17/2007	1/16/2008	Looks good - tracks well. Couple of ultrasonic pops, but that's it.	None needed.
1/16/2008	2/4/2008	OK	None needed.
2/4/2008	2/7/2008	Looks good	None needed.
2/7/2008	2/19/2008	OK	None needed.
2/19/2008	3/11/2008	Good.	None needed.
3/11/2008	3/17/2008	Small data gap 3/17. Ultra pops and drops since.	Sent follow up email to ADS on 3/18/08.
3/17/2008	3/25/2008	A few ultrasonic pops and drops, but mostly great.	None needed.
3/25/2008	3/31/2008	OK	None needed.

059-406 (NPDES041B_MH059406)

Location: 49th Ave S & Lk Washington Blvd S

TABLE J-10
Notes for Monitor 059-406

Begin Date	End Date	Screening Comments	Response
10/20/2008	11/3/2008	OK	None needed.
11/3/2008	11/11/2008	CSO based on raw data	
11/11/2008	11/18/2008	OK	None needed.
2/16/2009	2/24/2009	OK - apparent CSO 2/23	None needed.
2/24/2009	3/4/2009	OK	None needed.
4/1/2009	4/14/2009	Data gap 4/14 to 4/15	
4/22/2009	5/12/2009	Shifting depth readings - UNIDEPTH may be loose. Request ADS site visit.	
4/27/2009	4/28/2009	OK	None needed.

059-407 (GEN40_059407)

Location: 4020 49th Ave S.

Downstream of Hydrobrake (FCM 059-490) All flow monitored into 490 except flow from west (059-420 field evaluation showed too little flow- monitor removed at 059-420)

TABLE J-11
Notes for Monitor 059-407

Begin Date	End Date	Screening Comments	Response
12/28/2007	1/7/2008	Ultrasonics intermittent. Multiple velocity drops. Depth not clear from ultrasonics or pressure depth. Older data indicates very low depths at this site, possibly below instrument minimums. Scattergraph is very abnormal.	Will refer to ADS, should check during field visit 1/17/08.
1/16/2008	1/19/2008	ADS 1/22/08 email note: "Ultrasonics and velocity were cleaned up yesterday from excessive popping." Intelliserve data gap from 1/10/08 to 1/15/08, data much better since 1/15/08, but still velocity does not appear to track with depth.	Need to check with ADS about whether data gap is real and whether or not the site is going to have chronic problems with the ultrasonics due to small pipe and soap issues noted by Shay Koerber in field.
1/19/2008	1/29/2008	OK	None needed.
1/23/2008	1/23/2008	No new data since 1/23, pressure depth not responding to rise in level as recorded by ultrasonics, velocity signature significantly different before and after 1/19/08.	Will follow up with ADS. It's a high priority to stabilize the velocity at this site - it looks troubled when looked at for the month of January.
1/23/2008	2/15/2008	OK	None needed.
2/15/2008	3/10/2008	Good.	None needed.
3/10/2008	4/29/2008	OK	None needed.
4/29/2008	5/6/2008	Monitor reset to 15 min time step 4/22 - 5/6	ADS email 5/7/08: "Corrected yesterday with field crew assistance."
5/6/2008	7/1/2008	OK	None needed.
7/1/2008	7/17/2008	Looks lovely!	None needed.
7/17/2008	11/14/2008	OK	None needed.
11/14/2008	11/26/2008	UNIDPETH and PDEPTH experience very unusual jump an 11/26 – unclear whether monitor is reading properly	
11/26/2008	12/4/2008	OK	None needed.
12/4/2008	12/12/2008	Significantly altered site signature continued - wrong data may have been uploaded	
12/12/2008	1/6/2009	OK	None needed.

Begin Date	End Date	Screening Comments	Response
1/6/2009	1/13/2009	UNIDEPTH not switching to PDEPTH during storm event 1/8	
1/13/2009	2/12/2009	OK	None needed.
2/12/2009	2/12/2009	Communication problem - no new data since 2/12	
2/12/2009	3/26/2009	OK	None needed.
3/26/2009	4/9/2009	OK - slight backwater condition during storm.	None needed.
4/9/2009	5/21/2009	OK	None needed.

059-409 (GEN40_059409)

Location: 49th Ave S / S Adams St

TABLE J-12
Notes for Monitor 059-409

Begin Date	End Date	Screening Comments	Response
1/24/2008	2/15/2008	OK	None needed.
2/15/2008	2/20/2008	Good.	None needed.
2/20/2008	3/4/2008	Data gap 2/21 - 2/22.	ADS note, 3/4/08 email: "Crew manually collected yesterday, asked them to back collect to fill the gap, but did not retrieve any data. The monitor must have malfunctioned for a period of time, gap is real."
3/4/2008	3/10/2008	Good.	None needed.
3/10/2008	4/24/2008	OK	None needed.
4/24/2008	5/1/2008	Partial obstruction 4/26 - 4/27? Velocity drops, level rises during that period.	ADS email 5/7/08: "Debris present, data will be edited on April preliminary data submittal."
5/1/2008	5/8/2008	OK	None needed.
5/8/2008	5/15/2008	Sudden jump in unidepth 5/13, pdepth stairstepping	ADS email 5/19: "Service request has been issued."
5/15/2008	6/3/2008	OK	None needed
6/3/2008	6/17/2008	Partial, temporary pipe obstruction 6/14, which self corrected. No problems currently.	None needed.
6/17/2008	12/4/2008	OK	None needed.
12/4/2008	12/4/2008	Communication problem - no new data since 12/4	
12/12/2008	2/12/2009	OK	None needed.
2/12/2009	2/12/2009	Communication problem - no new data since 2/12	
2/12/2009	5/21/2009	OK	None needed.

059-434 (NPDES041A_MH059434)

Location: 50th Ave S & Lk Washington Blvd S

TABLE J-13
Notes for Monitor 059-434

Begin Date	End Date	Screening Comments	Response
10/20/2008	11/3/2008	OK	None needed.
11/3/2008	11/11/2008	- PDEPTH and UNIDEPTH reading erratically – PDEPTH jumps during strange times and UNIDEPTH just reads a constant depth	
11/11/2008	11/17/2008	PDEPTH and UNIDEPTH reading erratically – PDEPTH jumps during strange times and UNIDEPTH just reads a constant depth	
11/25/2008	12/1/2008	OK	None needed.
1/20/2009	1/27/2009	Brief data gap 1/23	
1/27/2009	2/3/2009	OK	None needed.

059-436 (GEN40_059436)

Location: 50th Ave S / S Adams St

TABLE J-14
Notes for Monitor 059-436

Begin Date	End Date	Screening Comments	Response
1/24/2008	2/15/2008	OK	None needed.
2/15/2008	2/20/2008	Good.	None needed.
2/20/2008	2/26/2008	No data for 7 days.	Awaiting manual collect by field crew.
2/26/2008	3/10/2008	Good.	None needed.
3/10/2008	4/2/2008	OK	None needed.
4/2/2008	4/16/2008	Data gap 4/2-4/9.	Follow up email sent to ADS 4/16/08.
4/16/2008	4/24/2008	OK	None needed.
4/24/2008	5/1/2008	Data gap 4/24 -4/25	ADS email 5/7/08: "Data gaps real due to monitor malfunction, not retrieved by field crew."
5/1/2008	5/8/2008	OK	None needed.
5/8/2008	5/15/2008	Pdepth unresponsive during small storm 5/13.	ADS email 5/19: "Service request has been issued."
5/15/2008	7/1/2008	OK	None needed
7/1/2008	7/15/2008	Starting 7/14, depth rises,velocity falls - pipe obstruction?	ADS email 7/17/08: I will have a crew re-visit the site. They just scrubbed the sensor there, but did not mention seeing obstruction.
7/15/2008	7/29/2008	Upward shift in scatter.	ADS email 8/6/08: Looks like a blockage. There was an increase in depth and decrease in velocity. I will request another site visit.
7/29/2008	8/14/2008	Slight rise in level, drop in velocity observed 7/31 - 8/7. Likely partial obstruction cleared during service 8/7.	None needed.
8/14/2008	1/22/2009	OK	None needed.
1/22/2009	1/29/2009	Data gap 1/22	
1/29/2009	2/12/2009	OK	None needed.
2/12/2009	2/12/2009	Communication problem - no new data since 2/12	
2/12/2009	3/26/2009	OK	None needed.
3/26/2009	4/14/2009	Spread in velocity results in layered scattergraph - can ADS explain why the spread results in layers in the scattergraph?	

059-443 (KC 059-443)

Location: S. Charlestown St. and Courtland Pl. SE

The monitor in MH 059-443 is owned and operated by King County. Data screening was not performed on the data from this monitor as part of the Genesee Flow Monitoring project.

059-451 (GEN38_059451)

Location: Lake Washington Blvd S./46th Ave S.

Downstream of FCM 059-498. HB Tailwater Monitoring (low flow) & Stage Discharge. Confirm w/ ADS that AV monitor is on dry-weather flow side of horseshoe weir. Could not be confirmed on 10/17 field visit. After discussion w/ ADS, we will know if we are capturing high flow through the outflow (including high flow through HB). Existing Site Visit states: "configure to provide bi-direction flow readouts."

TABLE J-16
Notes for Monitor 059-451

Begin Date	End Date	Screening Comments	Response
12/21/2007	1/8/2008	Data gaps in Intelliserve 12/28 to 1/02 and 1/2 to 1/8. Pressure depth is flat-lined at all levels and times. Sensors not working for 12/22 storm. Ultrasonics and and pressure depth out 1/6 through 1/8/08. Scattergraph has some vertical lines of data.	Will refer to ADS.
1/8/2008	1/11/2008	3 weeks since last data.	Need to see data from this site uploaded soon.
1/11/2008	1/13/2008	It's a bit worrying that it has been such a long time that the data rescue has been in process.	2/1/08 email from K. Sledge: "Manual collect processed, however still waiting big data rescue from tech." Will follow up with ADS.
1/13/2008	1/13/2008	ADS email 2/5 indicates still waiting for data rescue.	Still waiting for data rescue.
1/13/2008	2/11/2008	Data gap between 1/13 and 1/25 non-recoverable. Pressure depth does not look as though it is engaging.	Pressure sensor issues being resolved.
1/16/2008	1/23/2008	No data in Intelliserve since 1/07/08. Velocity not tracking with depth. Ultrasonics popping. Data gaps. ADS 1/22/08 email: "Bad activation at this site causing data loss from 12/28-1/3, ultra has some popping. Needs data collect."	Need to follow up with ADS on these issues.
2/11/2008	2/15/2008	Data gap 2/12 to 2/14.	Will follow up with ADS.
2/15/2008	2/25/2008	OK	None needed.
2/25/2008	3/4/2008	Pump activity creates odd backwater affect at elevated levels. This is evident in the scatterplot.	None needed.
3/4/2008	3/12/2008	Small data gap 3/4-3/5, otherwise data looks OK. 30-minute cycling pumping pattern in level stops 3/6.	None needed.
3/12/2008	3/25/2008	OK	None needed.
3/25/2008	3/31/2008	Ultrasonic pops.	None needed.

Begin Date	End Date	Screening Comments	Response
3/31/2008	4/8/2008	Velocity data increasingly erratic.	Sent email follow up to ADS 4/11.
4/8/2008	4/18/2008	OK	None necessary.
4/18/2008	4/28/2008	Data gap on 4/23 (less than 24 hours.)	None needed.
4/28/2008	5/30/2008	OK	None needed.
5/30/2008	6/17/2008	Possible obstruction of pressure sensor - did not respond as usual to ultra depth change since 6/12. Also, scatter seems to have some backwater not present last month.	ADS email 6/18/08: "It looks like a totally different diurnal pattern on 6/3-6/4 experienced by all the upairs and velocity. Is there pump station influence where the cycle may have changes? This is a residential site, but I do not see mention of pump station influence on the site report. Data looks like historical pattern now. There was silt built up on the velocity sensor recently. It was scrubbed on Tuesday."
6/17/2008	6/24/2008	No data past 6/24, and very different data signature btwn 6/17 and 6/19. Scatter shows two separate plots.	ADS email 7/9/08: Data uploaded. (Looks like small period of bad data between 6/17 and 6/19.)
7/1/2008	7/17/2008	Pressure sensor gone haywire 7/15? Looks odd.	ADS email 7/17/08: Crew installed a new monitor on 7/15, no other service done. I will make sure there was no problem with the activation, otherwise will issue service request.
7/17/2008	8/15/2008	OK	None needed.
8/15/2008	8/29/2008	During 8/24/08 rain event, ultrasonic level went to 33.57 in, pressure depth stayed at 5.92 in, similar situation 8/27. Velocity data looks bad 8/24-8/26.	ADS 9/8/08 email: I'm not sure how to diagnose the pressure, will have crew visit.
8/29/2008	9/19/2008	OK	None needed.
9/19/2008	10/5/2008	Pressure depth did not trigger during storms 9/20 and 10/3, staying at around 4 in while the ultrasonic depth went to as high as 20 in.	LR will follow up with ADS.
10/5/2008	10/9/2008	Pressure depth did not trigger when ultrasonics did during storms 10/3 and 10/6. Ultra depth went up to 23 in, pressure depth stayed at 3.8 in during 10/3 storm.	Service scheduled for comm. problem today, will ask for pressure service as well.
10/9/2008	10/19/2008	OK. Pressure and ultrasonic agreement much better after 10/15 replacment of pressure sensor.	None needed.
10/20/2008	11/3/2008	OK	None needed.
11/3/2008	11/11/2008	PDEPTH not reading properly	

Begin Date	End Date	Screening Comments	Response
11/11/2008	11/17/2008	- Very high flows – does not match historic trend – also does not balance with balance with upstream flow, depth readings much higher than in historic reviews	
11/25/2008	3/22/2009	OK	None needed.
3/22/2009	4/1/2009	OK - unusual spike in flow, possibly caused by additional discharge by upstream Darigold facility.	None needed.
4/1/2009	5/26/2009	OK	None needed.

059-451 “A” (NPDES038_MH059451)

Location: Lk Washington Blvd S & 45th Ave S

Note: NPDES_38 MH059451 was incorrectly labeled. This site is at MH 059-574, not MH 059-451. Continued monitoring at this site can be found under the label "NPDES038_MH059574." This site is also known as "Structure A". Please see Section 3.2 *059-451 "A" (Monitoring ID NPDES38_059-451, Structure "A")* in the report for more details.

TABLE J-17
Notes for Monitor 059-451”A”

Begin Date	End Date	Screening Comments	Response
10/20/2008	11/3/2008	OK - no flow	None needed.
4/27/2009	5/12/2009	Unusual spike in depth occurring 5/9 to 5/10. Possibly caused by wrong data being loaded. ADS to investigate.	

059-489 (NPDES037_MH059-489)

Location: Lake Washington Blvd S & S Horton St

TABLE J-18
Notes for Monitor 059-489

Begin Date	End Date	Screening Comments	Response
5/28/2009	7/10/2009	OK	None needed.
4/27/2009	5/12/2009	Unusual spike in depth occurring 5/9 to 5/10. Possibly caused by wrong data being loaded. ADS to investigate.	
10/20/2008	11/3/2008	OK - No flow	None needed.
5/28/2009	7/10/2009	OK	None needed.

059-490 (GEN40_059490)

Location: S. Dakota St/48th Ave S

Just upstream, at Hydrobrake (FCM 059-490)

TABLE J-19
Notes for Monitor 059-490

Begin Date	End Date	Screening Comments	Response
12/28/2007	1/14/2008	Level is not clear from data. Velocity ok. Site backwaters, multiple velocity dropouts. Small data gap 1/3 to 1/4, but lack of consistent depth reading is main problem.	Will refer to ADS.
1/16/2008	1/17/2008	No data in Intelliserve since 1/17/08. Velocity does not track with depth. ADS email comments: "Ultra was cleaned up on yesterday; before ultra experienced bad data readings Ultra , vel, pressure data are good through 12/28 then ultra data begins experiencing problems. Looks like a dry pipe or poor site condition causing extremely erratic data. Data loss is experienced daily some days more than others. Client should be advised as the problems with data quality hence data availability at this location." SPU request to ADS made 1/22/08: "Replace the AG meter with a BG model and include depth over the hydrobrake in this location."	Need to follow up with ADS on this site and whether sensor change will improve data enough at this site.
1/17/2008	1/29/2008	Major data gap 1/17 to 1/27. Otherwise OK.	Will follow up with ADS about data gap.
1/29/2008	2/3/2008	Velocity sensor looks obstructed since 1/29 - still abnormal. No velocity during storm 1/31.	Will follow up with ADS to see if service has been requested for this site.
2/3/2008	2/3/2008	No new data	None needed.
2/3/2008	2/12/2008	Velocity and depth are abnormal.	Service has been requested for velocity and depth (ADS 2/13/08.)
2/11/2008	2/11/2008	No new data since 2/11/08. Data before that date looked abnormal.	ADS email 2/20/08: "Crew swapped the monitor on 2/19; original monitor tagged from data rescue from 2/15-2/19p."
2/11/2008	2/22/2008	Velocity data absent or erratic 2/11 - 2/22. Data gap 2/17 - 2/21 (may be recoverable from Profile.) Data much improved after monitor change out 2/21.	ADS: Monitor changed out 2/21. Data looks a lot better since then.
2/22/2008	3/4/2008	Surcharge evident.	Will follow up with ADS to confirm configuration of site.

Begin Date	End Date	Screening Comments	Response
3/4/2008	3/11/2008	Good.	Checked with CH2MHill on site configuration, received tentative OK from Tyler Jantzen that ultrasonic depth only over the hydrobrake (490_2) would meet modeling needs.
3/11/2008	3/18/2008	Scatter shows surcharge.	None needed.
3/18/2008	7/1/2008	OK	None needed.
7/1/2008	7/31/2008	Monitoring point 2 (downstream) is rising. Monitoring point 1 (upstream) was on 15 minute timestep 7/3-7/23/08.	ADS email 8/6/08: I did not see a response in MP1. I will ask for a site visit to verify the depth at MP2.
7/31/2008	8/13/2008	OK	None needed.
8/13/2008	8/29/2008	OK.	None needed.
8/29/2008	9/23/2008	Big change in depth for MP2 9/4 - different data signature	Data uploaded to Iserve for data gap 9/2 -9/4.
9/23/2008	10/20/2008	OK	None needed.
10/20/2008	11/3/2008	During storms, PDEPTH on MP2 appears to be reading better than UNIDEPTH or PDEPTH at MP1	
10/30/2008	11/25/2008	OK	None needed.
11/25/2008	12/1/2008	Significant velocity shift after storm on 11/20 – shift pattern has continued – not seen in historic data since beginning of October. Communication problem – no new data since 11/20	
12/1/2008	12/8/2008	Correct data appears to be loaded from site (previous review period had wrong data collected) - data gap occurring 12/1 to 12/2, is data recovery possible (occurs during wet weather)	
12/8/2008	5/5/2009	OK	None needed.

059-491 (NPDES040_MH059491)

Location: S Dakota St & 49th Ave S

TABLE J-20
Notes for Monitor 059-491

Begin Date	End Date	Screening Comments	Response
10/20/2008	11/3/2008	Negative velocities, velocity flatlines during storm events. Santtu - talk with Tyler and Dan about what data is needed from this site.	
11/3/2008	11/7/2008	Velocity reading continuous negative values, most important are depth measurements, which appear to be accurate and consistent. CSO	
11/7/2008	11/18/2008	Data gap 11/7 to 11/10, CSO 11/7	
11/25/2008	12/1/2008	OK	None needed.
11/25/2008	12/1/2008	OK	None needed.
12/1/2008	12/3/2008	OK	None needed.
12/3/2008	1/7/2009	OK	None needed.
1/7/2009	1/20/2009	Data gap 1/7 to 1/12 - during large storm event, is data recoverable?	
1/20/2009	1/24/2009	OK	None needed.
1/24/2009	2/2/2009	Data gap 1/25 to 1/30	
2/2/2009	2/9/2009	Brief data gap 2/5	
2/9/2009	2/16/2009	OK	None needed.
2/16/2009	2/20/2009	OK	None needed.
2/20/2009	2/28/2009	Communication problem - no new data since 2/27	
2/28/2009	3/9/2009	UNIDEPTH popping - possibly reading bench of cunette - request sensor relevel?	
3/9/2009	3/13/2009	OK	None needed.
3/13/2009	3/23/2009	UNIDEPTH does not track with PDEPTH during storms, UNIDEPTH does not appear to respond to rainfall events as expected (should be significant surcharging due to downstream hydrobrake).	
3/23/2009	3/27/2009	OK	None needed.
3/27/2009	4/1/2009	Data gap 4/1 to 4/2.	
4/14/2009	4/28/2009	OK	None needed.
4/28/2009	5/12/2009	OK	None needed.

059-498 (GEN38_059498A)

Location: Lake Washington Blvd S./46th Ave S.

Ultrasonic needed to monitor the level upstream at the hydrobrake. Site visit revealed signficant grease--site to be maintained during the monitoring period. Extremely low velocity site. AV type sensor also requested to determine flow through hydrobrake. Consult with ADS, but "Accusonic" monitor, or equivalent suggested to monitor the low velocity. LR and Mike H talked about this site with Shay K. on 1/23/08. The site needs to be cleaned before pressure depth and velocity can be added to the parameters for the site. Currently, the site is only recording ultrasonic depth. Mike H. is following up on the O&M cleaning of the site internally at SPU.

TABLE J-21
Notes for Monitor 059-498

Begin Date	End Date	Screening Comments	Response
12/17/2007	1/16/2008	Depth only site. Looks good.	None needed.
1/16/2008	1/22/2008	LR and Mike H talked about this site with Shay K. on 1/23/08. The site needs to be cleaned before pressure depth and velocity can be added to the parameters for the site. Currently, the site is only recording ultrasonic depth. Mike H. is following up on the O&M cleaning of the site internally at SPU. Ultrasonic depth data ok.	None needed.
1/22/2008	1/29/2008	OK. Waiting for site to be cleaned before pressure sensor and velocity can be installed.	None needed.
1/29/2008	2/6/2008	OK	None needed.
2/6/2008	2/11/2008	Oddly flat scatterplot. Velocity dropping out a lot.	Will follow up with ADS - may be a grease issue.
2/11/2008	2/14/2008	A few velocity problems.	Will follow up with ADS. ADS email 2/19/08: "small data gap 2/6p-2/7p due to incomplete manual collect"
2/14/2008	2/25/2008	Data gap 2/14 - 2/20. Velocity after 2/20 not responding to level increase.	ADS: Data currently being rescued for data gap. SENSOR MAY BE GETTING COATED WITH GREASE. I WILL ASK A CREW IF THEY THINK WE WILL GET BETTER DATA WITH ROUTINE SCRUBS EVERY COUPLE OF DAYS.
2/25/2008	3/4/2008	Velocity does not increase with an increase in level, even after monitor switchout.	Data gap 2/16-2/20 unrecoverable. Will follow up with ADS to see if this site can yield useable data. Tagged as having poor data in latest CH2MHill review.
3/4/2008	3/12/2008	Ultrasonics pop/flatline 3/10 -3/12.	Looks like the ultras need service.
3/12/2008	3/18/2008	OK	None needed.

Begin Date	End Date	Screening Comments	Response
3/18/2008	3/24/2008	Sensor data looks a bit erratic like it might need scrubbing.	ADS email 3/26/08: "Sensors were scrubbed yesterday."
3/24/2008	3/31/2008	Velocity data looks more erratic since 3/26.	ADS service request issued 3/31.
3/31/2008	4/8/2008	OK	None needed.
4/8/2008	4/16/2008	Velocity looks totally unresponsive to rain events - it doesn't drop out, but it doesn't rise, either. Scatter looks odd, stranger than usual this week. Can the crews test the vel sensor to see if it is working?	ADS email 4/16/08: "Requested velocity test."
4/16/2008	4/22/2008	OK	None needed.
4/22/2008	4/29/2008	More velocity dropouts, spikes since 4/23.	Sent email to ADS regarding this site on 4/29/08.
4/29/2008	5/19/2008	OK	None needed
5/19/2008	6/1/2008	Data gap between 5/25 - 5/27.	Non-recoverable 2 day data gap.
6/1/2008	6/18/2008	Velocity sensor has more spikes and drops since 6/14.	ADS email 6/18/08: "A crew went on a scheduled routine site visit for a velocity scrub on Tuesday. They noted that it did not look like the velocity had been completely in the flow and will be ok during higher flow. The sensor gets silted easily so was scrubbed per the routine service request."
6/18/2008	7/3/2008	OK. Sensor has been scrubbed frequently over past week, and is on edge of flow.	None needed.
7/3/2008	9/18/2008	OK	None needed.
9/18/2008	10/6/2008	No consistent velocity even during storms. Should consider moving location.	LR will follow up with CH2MHill and ADS.
10/6/2008	10/12/2008	Velocity is erratic as per usual at this site.	None needed.
10/12/2008	11/11/2008	OK	None needed.
11/11/2008	11/18/2008	Site not reading velocity properly - velocity data has been in better shape in the past	

060W-012 (GEN38_060W012)

Location: S. Genesee Wy/Lake Washington Blvd.

Good site.

TABLE J-22
Notes for Monitor 060W-012

Begin Date	End Date	Screening Comments	Response
12/12/2007	1/15/2008	Strong pumping signature to site. Data tracks well. Some backwater during storms. Scattergraph shows backwater at higher levels.	None needed.
1/16/2008	1/22/2008	ADS email comment 1/22/08: "V,P good slight drifting in pressure."	Need to follow up with ADS about ultrasonic pressure drift (work order may already have been issued.)
1/22/2008	2/19/2008	OK	None needed.
2/19/2008	2/25/2008	Good.	None needed.
2/25/2008	3/4/2008	Scatter shows some shifting.	ADS 3/4/08 email note: " It looks like the flow is slightly restricted right after the storm events, causing a second data regime on the scatter."
3/4/2008	3/11/2008	Pressure depth off ultras during storm events, more off than during low flow.	ADS email 3/12/08: "Looks like pressure drifting a little."
3/11/2008	3/18/2008	OK	None needed.
3/18/2008	3/25/2008	On 3/23, pressure depth 8.77 in, ultrasonic depth 7.55 in.	ADS email 3/26/08: "Pressure data has improved since yesterday."
3/25/2008	7/27/2008	OK	None needed.
7/27/2008	8/4/2008	Data gap 8/4 - 8/6.	Remaining data gap following ADS import into Intelliserve.
8/4/2008	8/29/2008	Peak level during storm events 8/20, 8/24, and 8/27 show difference of 1 in or more between pressure and ultrasonics.	ADS 9/8/08 email: I'm not sure how to diagnose pressure problem, will need help with auto-cal function.
8/29/2008	9/17/2008	OK	None needed.
9/17/2008	10/5/2008	Data gap 9/23-9/25.	ADS: The data gap from 9/23-9/25 is real. The monitor was not storing data because of a blown fuse in the monitor battery. It was replaced on 9/25.
10/5/2008	10/9/2008	Data gap in Intelliserve btwn 10/7 and 10/9.	Monitor malfunctioned on 10/7, replaced on 10/9, no data rescued.
10/9/2008	10/20/2008	OK	None needed.
10/20/2008	11/3/2008	Appears to be some sort of upstream blockage (occurring at 10/28 12:00PM)	

Begin Date	End Date	Screening Comments	Response
11/3/2008	11/6/2008	Flow dropped out even though depth and velocity available – 11/3	None needed.
11/6/2008	11/17/2008	Data gap 11/9 to 11/13	
11/17/2008	12/2/2008	Appears that wrong data may have been uploaded – otherwise site is in bad need of maintenance – very unusual hydraulic shift occurring on 11/17	
12/2/2008	12/4/2008	Unusual hydraulic shift beginning on 11/17 still apparent - appears that data for different site was uploaded. Noted previous screening period - has problem been identified?	
12/4/2008	12/12/2008	OK	None needed.
12/12/2008	1/6/2009	PDEPTH not operating properly, measuring very spiky depths since 12/24	
1/6/2009	1/30/2009	OK	None needed.
1/30/2009	2/10/2009	Data gap 2/5 - 2/10	
2/10/2009	3/5/2009	OK	None needed.
3/5/2009	3/12/2009	Apparent maintenance activity 3/10 - shift in hydraulic profile preceded by a short dropout, can ADS confirm maintenance is the cause?	
3/12/2009	3/19/2009	OK - site appears to experience two different flow regimes during wet and dry weather	None needed.
3/19/2009	3/24/2009	OK	None needed.
3/24/2009	4/14/2009	OK - Maintenance performed in this manhole 4/3 by SPU. Pipes cleaned via jetting between manholes 060W-012 and 060W-013. Resulted in dropouts from 4/3 to 4/8. Pipe data signature changed following cleaning - shift to the left in scattergraph (indicating e	None needed.
4/14/2009	5/12/2009	OK	None needed.
5/12/2009	5/26/2009	Unusual hydraulics with shifting depth and flow, but appears to be valid because no change in flow is seen.	

060W-014 (GEN42_060W014)

Location: S. Snoqualmie St./Lake Washington Blvd S.

Downstream of Hydrobrake (FCM 060W-052, 1 link). Measures flow from 060W-052. Velocity drops out all the time at this site - but that is the site data signature. Bi-directional flow turned on in August 2008 at request of CH2MHill/SPU.

TABLE J-23
Notes for Monitor 060W-014

Begin Date	End Date	Screening Comments	Response
12/17/2007	1/15/2008	Strong pumping pattern. Backwaters every time pump kicks in or any time level goes up. Some velocity spikes. Slow velocities 0.5 -1.0 ft/sec. Velocity may be dropping below measurable levels. Scatterplot shows lots of surcharge and zero velocities.	Check with ADS during field trip 1/17/08.
1/16/2008	1/22/2008	ADS email comment: "Velocity & ultras are consistently popping, troubleshoot." Scattergraph looks abnormal, with vertical lines of data.	Will follow up with ADS on status of this site.
1/22/2008	1/28/2008	Velocity drops out as level rises, depth ok. Lots of zero data. This is data signature for site.	None needed.
1/28/2008	2/4/2008	OK.	None needed.
2/4/2008	2/7/2008	OK	None needed.
2/7/2008	2/19/2008	Velocity drops out all the time at this site - but that is site data signature.	None needed.
2/19/2008	2/25/2008	Good.	None needed.
2/25/2008	3/4/2008	Velocity drops out when level rises - site signature.	Data quality assessment for this site from ADS requested in latest CH2MHill bi-weekly report. Will follow up with ADS.
3/4/2008	3/11/2008	No velocity data recorded for 3/10 PM storm.	ADS email 3/12/08: "Surcharge and backwater conditions during 3/10 storm. It looks like the pressure sensor worked properly during the elevated depth levels caused by the storm."
3/11/2008	6/1/2008	OK	None needed.
6/1/2008	6/17/2008	When the velocity data is plotted over a couple of months, the data is much more variable with many more spikes and a change in signature after 5/15.	ADS email 6/18/08: "Service requested."
6/17/2008	7/2/2008	Velocity data always kind of poor at this site.	ADS email 7/9/08: Needs jetting, crew recently mentioned.
7/2/2008	7/15/2008	Velocity data is erratic, but that's the typical signature. ADS crew noted that flow is barely moving 7/9/08.	None needed.

Begin Date	End Date	Screening Comments	Response
7/15/2008	7/31/2008	Velocity data looks improved after 7/29.	None needed.
7/31/2008	8/15/2008	Erratic velocity (cycles between 2.5 ft/sec and 0) since 8/3/08.	ADS email 8/15: Velocity scrub requested.
8/15/2008	8/29/2008	Scatterplot looks different this period.	ADS 9/8/08 email: Bidirectional velocity turned on by client request. Logging more zero and negative velocity readings now.
8/29/2008	9/19/2008	Velocity worse lately. Scatterplot lacks a repeatable pattern.	ADS data loaded to fill Iserve data gap.
9/19/2008	10/5/2008	Time interval set to 15 minutes 9/23-10/3. Scatterplot is most unusual.	LR will follow up with ADS.
10/5/2008	10/13/2008	Not sure how to interpret the negative velocities at this site (about 60% of the time, the velocity is in negative range.) Scatter shows sort of a mirror image around the 0 velocity point. Called Tyler Jantzen to ask about it 10/13.	Tyler is investigating velocity issue further, but preliminary evaluation indicates velocity data is reporting within the range where it is considered to be accurate, and is likely representative of site hydraulics.
10/13/2008	10/19/2008	Data gap 10/16 - 10/17. Velocity reported bi-directional 10/13- 10/16, then the velocity signature changes and is no longer bidirectional 10/17.	ADS: The firmware was upgraded on 10/17 because of questions on validity of velocity data. I saw an improvement for a few days, but noticed negative velocity again beginning on 10/19 or 10/20. I requested R&D to look further into all Genesee sites activated with bi-directional flow.
10/20/2008	10/27/2008	OK. Velocity data looks much improved since 10/17/2008.	None needed.
10/20/2008	11/3/2008	Velocity readings at 1.6 ft/sec (horizontal line at top left of scattergraph) appears to be erroneous data. Corresponds with frequent velocity spikes.	
10/30/2008	11/11/2008	OK	None needed.
11/11/2008	11/18/2008	Poor velocity readings - top out consistently at different levels, creating unusual scattergraph	
11/22/2008	1/7/2009	OK	None needed.
1/7/2009	1/14/2009	UNIDEPTH consistently not switching to PDEPTH during storms	
1/14/2009	2/15/2009	OK	None needed.
2/15/2009	2/26/2009	Data gap 2/24 to 2/25	
2/26/2009	3/9/2009	OK	None needed.
3/9/2009	3/18/2009	Unusual jump in velocity 3/17	
3/18/2009	3/25/2009	Unusual data signature change occurs 3/19	

Begin Date	End Date	Screening Comments	Response
3/25/2009	3/30/2009	Brief period from 3/25 to 3/26 does not correspond with site signature - could wrong data have been uploaded?	
3/30/2009	4/14/2009	OK - Maintenance performed in this manhole 4/3 by SPU. Pipes cleaned via jetting between manholes 060W-012 and 060W-013. Resulted in dropouts from 4/3 to 4/12. Site continues to experience negative flows - most likely not associated with constriction, but	None needed.

060W-019 (GEN42_060W019)

Location: 4500 Lake Washington Blvd S

Downstream of Hydrobrake (FCM 060W-047). May already have data from before. SPU will check and verify quality of location. May be affected by discharge from LS 6. Request ADS to install sensor as far U/S on pipe as possible.

TABLE J-24
Notes for Monitor 060W-019

Begin Date	End Date	Screening Comments	Response
12/17/2007	1/15/2008	High velocities, 6-10 ft/s sec. Baseflow is low around 1 in. Supercritical flow. Backwaters during storms. Storms also show pumping pattern. Scatter is abnormal-looking.	Will check during field trip 1/17/08.
1/16/2008	1/22/2008	OK. Flow appears supercritical.	None needed.
1/22/2008	2/19/2008	OK	None needed.
2/19/2008	2/25/2008	Good.	None needed.
2/25/2008	3/4/2008	Site surcharged.	None needed.
3/4/2008	3/11/2008	Good.	None needed.
3/11/2008	4/9/2008	OK	None needed.
4/9/2008	4/16/2008	Scatter has more seemingly random points > 2 in depth	ADS email 4/16/08: "Data looks ok, more brief periods of backwater experienced."
4/16/2008	6/17/2008	OK	None needed.
6/17/2008	7/3/2008	Looks like level went off track briefly 6/29-7/1 but is now restored to normal pattern.	None needed.
7/3/2008	7/17/2008	Scatter shows a bit of shift to the right.	ADS email 7/17/08: I see an increase in depth with no real change in velocity 6/29-7/1, and backwater on 7/3. I don't see any shift in data since then.
7/17/2008	8/14/2008	OK	None needed.
8/14/2008	8/29/2008	Unidepth not switching to pressure depth when ultrasonic under water.	Service requested.
8/29/2008	10/20/2008	OK	None needed.
10/20/2008	11/3/2008	Negative velocity readings	
10/30/2008	11/11/2008	OK - negative flows	None needed.
11/11/2008	2/16/2009	OK	None needed.
2/16/2009	2/24/2009	Short data gap 2/20, otherwise typical	
2/24/2009	3/24/2009	OK	None needed.

Begin Date	End Date	Screening Comments	Response
3/24/2009	4/14/2009	Site indicates that it experiences negative velocities as high as -15 ft/sec, which are most likely inaccurate based on upstream flow data (060W-047). Can ADS confirm if this is a sensor setting problem?	
4/14/2009	5/25/2009	OK	None needed.

060W-025 (GEN43_060W025)

Location: 53rd Ave S/ S Alaska St

Upstream of CSO (NPDES 043) 067-014 monitors flow from the SE. This monitor proposed at 060W-025 monitors flow from the SW. Field visit 1/17/08 determined site will be replaced by Data Gator monitor upstream at GEN43_060026.

TABLE J-25
Notes for Monitor 060W-025

Begin Date	End Date	Screening Comments	Response
12/13/2007	1/16/2008	Depth is very low. The ultrasonics are all over the place. Storm signature tracks better. ADS notes that site appears not to be monitorable.	Discuss during field trip 1/17/08.
1/16/2008	1/23/2008	Data not evaluated since field visit 1/17/08 determined site will be replaced by Data Gator monitor upstream at GEN43_060026.	Data Gator is being installed 1/23/08. Data screening plus additional documentation will be done by Laura Reed for this new site.
1/23/2008	1/28/2008	Site discontinued following field evalution. Replaced by a Data Gator in GEN43_060W026.	None needed.
11/3/2008	11/11/2008	CSO based on raw data	

060W-026 (GEN43_060W026)

Location: 53rd Ave S/ S Alaska St

Data Gator site installed 1/22/08. Flow only data.

TABLE J-26
Notes for Monitor 060W-026

Begin Date	End Date	Screening Comments	Response
1/22/2008	1/29/2008	Site installed 1/22/08. Data to be uploaded for first time 1/30/08, and will be checked then.	Send data to CH2M Hill?
1/30/2008	2/4/2008	Data not yet evaluated due to software issues. Will be evaluated within next 2 days.	Data will be sent to CH2M Hill when extracted.
2/5/2008	2/13/2008	Data gap 2/5, 2/6-2/8. Data recovered by Renaissance Systems.	File has been sent for data recovery to Renaissance Systems. Due to 8% slope and slight problem with suction in line, custom software file with corrections to the DataGator for this site is being prepared by Renaissance Systems and will be installed this week. This should address the chronic dropout problems at this site. Data sent to CH2MHill 2/13/08.
2/13/2008	2/19/2008	Data looks improved since custom software file uploaded 2/14 and sensors changed out.	Data sent to CH2M Hill 2/20/08.
2/19/2008	2/26/2008	Looks normal.	None needed. Data sent to CH2MHill 2/26/08.
2/26/2008	3/3/2008	One spike 3/1/08 that may not be correct.	Flow returned to normal after 3/1/08 spike.
3/3/2008	3/11/2008	Field crew (FM&A) noticed that some of the pressure readings were negative during download 3/4. The crew returned 3/5/08 to service monitor. Data gap 10-12 N related to service performed.	Flow data looks appropriate. Site file sent to CH2M Hill 3/11/08.
3/11/2008	3/17/2008	Flow looks within expected levels.	Data sent to CH2MHill 3/19/08.
3/18/2008	3/25/2008	Flow data is a bit erratic - bounces around quite a bit.	Asked for help with interpreting the data from this site from CH2M Hill.
3/24/2008	4/1/2008	Flow responds to rain events, but the flow rate is still a bit sporadic (jumps up and down frequently.)	Uploaded data file to CH2MHill .ftp site 4/1/08.
4/1/2008	4/7/2008	Flows still fairly erratic, but consistent with past data.	None needed.
4/1/2008	4/7/2008	OK	Uploaded data file to CH2MHill ftp site 4/11/08.
4/7/2008	4/7/2008	No new data.	Request for data from FM&A field crew has been made.

Begin Date	End Date	Screening Comments	Response
4/7/2008	4/14/2008	Field upload problem caused delay in most recent data delivery.	None needed. Data sent to CH2MHill 4/23/08.
4/14/2008	4/28/2008	Non-recoverable data gap 4/15-4/23.	Sent data to CH2MHill 4/29/08.
4/28/2008	5/5/2008	One dropout 4/28, otherwise OK.	Data sent to CH2MHill 5/7/08.
5/5/2008	5/13/2008	OK	Data sent to CH2MHill 5/14/08.
5/13/2008	5/20/2008	Not much response in the meter to 5/13 rain event, but OK for 5/20 rain. Some plugging of the flume suspected for 5/15 -5/16.	Data posted to City of Seattle ftp site 5/20/08.
5/20/2008	5/20/2008	Laptop with data on it for this site was stolen out of a vehicle 6/3/08.	Data will have to be retrieved again from the monitor, should be available either 6/6 or 6/9.
5/20/2008	6/16/2008	Flow data between 6/8 and 6/16 appears overestimated.	Monitor was serviced this week by FM&A, following which the flows went down to normal baseflow levels. Data sent to CH2MHill 6/18/08.
6/16/2008	7/7/2008	Data looks generally poor during this period. While the data is no longer being overestimated, it is frequently slipping negative and is unstable.	LR will request FM&A troubleshoot the meter for problems, remove, maintain, and replace if necessary. Data sent to CH2MHill 7/7/08.
7/7/2008	7/15/2008	Data still fairly erratic following fieldwork, some 0 readings.	LR has requested additional data and a report on the field troubleshooting from FM&A.
7/15/2008	7/24/2008	Chronic problems with data quality and data accuracy at this site.	Following consultation with Mike Hinson and CH2M Hill, the site has been removed. There were continuing problems with steep slope, low levels, and pipe debris at this site. There is an ISCO meter located upstream of this location that should yield good storm data (but not good low flow data due to inadequate minimum level) and a permanent location with decent dry weather flow data downstream.

060W-047 (GEN42_060W047)

Location: S Alaska St/Lake Washington Blvd

Upstream at Hydrobrake (FCM 060W-047). Site is very slimy and odiferous.

TABLE J-27
Notes for Monitor 060W-047

Begin Date	End Date	Screening Comments	Response
12/17/2007	1/16/2008	Depth only site. Mild disagreement between ultrasonics and pressure depth, but OK.	None needed.
1/16/2008	1/23/2008	ADS email 1/22/08: "Upairs seem to be all bad; troubleshoot/replace sensor." Field visit recommended adding velocity to this site. Data seems better recently.	None needed.
1/21/2008	2/6/2008	OK	None needed.
2/6/2008	2/12/2008	Velocity added to site 2/11.	None needed.
2/12/2008	2/19/2008	No velocity at low flow. Odd scatter.	None needed.
2/19/2008	2/25/2008	Velocity data erratic 2/19 - 2/21, better after. Scattergraph has negative slope.	None needed.
2/25/2008	3/4/2008	Good.	None needed.
3/4/2008	3/11/2008	Ultrasonic pops 3/6. No velocity during 3/10 storm. Scatter has negative slope.	ADS email 3/12/08: " It looks like there was debris over all sensors during the first part of the storm on 3/10. The ultra malfunctioned and the velocity went out. We will have to flag that data. Starting at around 16:00, the pressure and ultrasonic sensors started working again. So, I believe the debris washed away and backwater conditions with stagnant flow occurred until around 20:15."
3/11/2008	3/18/2008	OK	None needed.
3/18/2008	3/23/2008	Pressure depth drifted way off ultras - to 143 inches when ultra reads 5.5 inches. Some ultrasonic pops.	ADS email 3/26/08: "Pressure data has improved since yesterday."
3/23/2008	3/31/2008	OK	None needed.
3/31/2008	4/11/2008	Velocity dropping out for hours since early morning 4/11.	Sent followup email to ADS 4/11.
4/11/2008	4/16/2008	Ultras more variable - dirty? - since 4/14 storm. Scatter shows vertical line at 6 in.	ADS email 4/16/08: "Ultra scrub/swap requested."
4/16/2008	4/22/2008	Ultras more variable post storm 4/14. Vertical line in scatter at around 6in.	None needed.

Begin Date	End Date	Screening Comments	Response
4/22/2008	4/29/2008	Unidepth looks compromised 4/22 -4/24 and 4/29. Velocity spikes increasing 4/28.	Sent email to ADS regarding this site on 4/29/08.
4/29/2008	5/3/2008	Unidepth routinely spiking to 9 in at low flows, but this is a result of site conditions. Higher flows seem normal. Situation is explained in ADS response from field crew (below.)	Email from Sean Winder, ADS 4/30/08: "GEN42_060W047 is a big pipe/storage structure that is 12 ft x 12 ft. The ultra is firing from 12ft above down into a 12" cunette. Upon most firings of the ultra we are getting about 50% of the pairs reading correctly. 50% of the pair readings is plenty for us to conduct our analysis. I wanted to bring this to your attention because believe members of your team have been requesting us to swap the ultra. We have done several tests with the ultra to ensure that it is working correctly and that it is purely the site conditions causing the low percentage of good U-pairs. Unfortunately I don't think we have too many options for arranging this site due to its size."
5/3/2008	6/18/2008	OK	None needed.
6/18/2008	7/1/2008	Pressure and ultrasonics altered after 6/27, velocity remains the same. (More than expected with cunette edge readings in the mix.)	ADS email 7/9/08: Nothing but routine scrubs to both sensors has been done. Crew says sensors cannot be moved. On 6/26 the crew scrubbed the sensors and the velocity was silted. They continually mention that these problems are due to the conditions of the site.
7/1/2008	8/15/2008	OK	None needed.
8/15/2008	8/29/2008	Velocity sensor silted up 8/20 to 8/26, when it was scrubbed.	None needed.
8/29/2008	9/17/2008	Site backwatered 9/20/08, no velocity recorded. Velocity looks rough 9/17 to 9/23.	None needed.
9/17/2008	10/12/2008	OK	None needed.
10/12/2008	10/16/2008	Velocity goes intermittent 10/9/08, loses pattern.	ADS: The firmware was upgraded on 10/17 because of questions on validity of velocity data. I saw an improvement for a few days, but noticed negative velocity again beginning on 10/19 or 10/20. I requested R&D to look further into all Genesee sites activated with bi-directional flow. There was a comm. problem that was resolved by a monitor swap on 10/21. The original monitor was tagged for a data rescue.
10/20/2008	10/23/2008	Back data gap from 10/21/2008 to prior.	
10/20/2008	11/3/2008	Negative velocities	
11/3/2008	11/9/2008	Data gap – 11/3 to 11/6	

Begin Date	End Date	Screening Comments	Response
11/9/2008	11/13/2008	OK	None needed.
11/13/2008	11/25/2008	PDEPTH reading erratically – does not track UNIDPETH at all	
11/25/2008	2/14/2009	OK	None needed.
2/14/2009	2/24/2009	Data gap 2/18 to 2/19, erratic UNIDEPTH readings (2/20 to 2/23)	
2/24/2009	3/4/2009	PDEPTH continues to read constant value of 325" - meter most likely not submerged, but should not be reading +300"	
3/4/2009	3/11/2009	OK	None needed.
3/11/2009	3/18/2009	Site continues erratic depth measurements in both UNIDEPTH and PDEPTH (don't appear to be accurate).	
3/18/2009	3/24/2009	OK - ADS "Mice had chewed through the pressure cable again and unidepth was following the pressure. Pressure sensor was swapped and all sensors tracking normally now."	None needed.
3/24/2009	4/1/2009	Erratic depth readings - site continues to read +300" of depth.	
4/1/2009	4/14/2009	Extended periods of time of no data (does not appear to be data dropout, but zero data). PDEPTH continues to read +300" of depth, resulting in extremely high flows.	
4/14/2009	4/28/2009	OK - Maintenance work from 4/15 has improved this site.	None needed.
4/28/2009	5/8/2009	OK	None needed.

060W-049 (NPDES043_MH060W049)

Location: S Alaska St & 54th Ave S

TABLE J-28
Notes for Monitor 060W-049

Begin Date	End Date	Screening Comments	Response
11/11/2008	11/18/2008	Under wrong basin in CSOSurveyWorksheet, belongs under Genesee	None needed
10/20/2008	11/3/2008	Velocity dropping out during storm events – possibly due to debris blocking sensor. Should the sensor be rotated?	
11/25/2008	1/7/2009	OK	None needed.
1/7/2009	1/14/2009	UNIDEPTH not switching to PDEPTH during storms.	None needed.
1/14/2009	2/8/2009	OK	None needed.
1/20/2009	1/20/2009	Communication problem - no new data sinced 1/20	
2/8/2009	2/20/2009	OK	None needed.
2/20/2009	3/4/2009	Data gap 2/20 to 2/27	
3/4/2009	3/18/2009	OK	None needed.
3/18/2009	3/25/2009	OK - hydraulic shift due to rainfall	None needed.
3/25/2009	4/1/2009	OK	None needed.
4/1/2009	4/14/2009	Data gap 4/8 to 4/9, site also experiencing significant velocity dropouts, suggest velocity scrub.	
4/14/2009	7/10/2009	OK	None needed.

060W-052 (NPDES042_MH060W052)

Location: Lake Washington Blvd S & north of 53rd Ave S

TABLE J-29
Notes for Monitor 059-131

Begin Date	End Date	Screening Comments	Response
10/20/2008	11/3/2008	OK - no flow	None needed.
11/1/2008	11/11/2008	UNIDEPTH does not appear to be reading properly	
11/11/2008	11/16/2008	OK	None needed.
1/12/2009	1/27/2009	Data gap 1/25 to 1/26	
1/27/2009	2/1/2009	OK	None needed.
3/18/2009	3/24/2009	OK - hydraulic shift occurring 3/20 after storm event	None needed.
3/24/2009	4/1/2009	OK	None needed.

067-014 (RC 067-014)

Location: 53rd Ave S. between S Alaska St. and S Angeline St.

The monitor in MH 067-014 was operated by the SPU RainCatchers program. Data from this site was provided as-is. Data screening was not performed on this data.

067-024 (RC 067-024)

Location: 54th Ave S. between S. Angeline St. and S. Ferdinand St.

The monitor in MH 067-024 was operated by the SPU RainCatchers program. Data from this site was provided as-is. Data screening was not performed on this data.

067-029 (RC 067-029)

Location: S. Pearl St. and 55th Ave.

The monitor in MH 067-029 was operated by the SPU RainCatchers program. Data from this site was provided as-is. Data screening was not performed on this data.

067-078 (NPDES165_MH067078)

Location: Lk Washington Blvd & S Alaska St

TABLE J-28
Notes for Monitor 067-078

Begin Date	End Date	Screening Comments	Response
3/18/2009	3/25/2009	OK	None needed.

D059-191 (GEN38_D059191)

Location: 43rd Ave S. & S. Dakota St.

Storm drain that is backwatered by Lake Washington.

TABLE J-30
Notes for Monitor D059-191

Begin Date	End Date	Screening Comments	Response
1/31/2008	2/23/2008	Velocity only high enough to register during storm events, but scatterplot for site is ok. Rise in level 2/15 corresponds to rise in Lake Washington Lake levels as recorded at the H.C. Locks.	None needed - looks like flow will be available during storm events.
2/23/2008	2/26/2008	No data for last 7 days.	Awaiting manual upload.
2/26/2008	3/10/2008	No velocity during 3/10 AM storm - perhaps not enough flow to trigger. Data gap in Intelliserve 3/4 to 3/8.	Data available in Profile, will be uploaded shortly.
3/10/2008	3/17/2008	Some velocity recorded during storms.	None needed.
3/17/2008	3/25/2008	Velocity recorded for rain events.	None needed.
3/25/2008	3/31/2008	OK	None needed.
3/31/2008	4/11/2008	Velocity sensor records when level rises, but scatterplot for period of record does not appear to have unique relationship between level and velocity. Not sure if this is a problem.	Slow velocities typical for this site. Latest bi-weekly review indicates that wet weather data is sufficient for modeling purposes.
4/11/2008	4/17/2008	Velocity recorded during storms.	None necessary.
4/17/2008	7/15/2008	OK	None needed.
7/15/2008	7/28/2008	Looks like the lake level is gradually dropping.	None needed.
7/28/2008	8/13/2008	OK	None needed.
8/13/2008	8/29/2008	OK. Velocity recorded during rain events.	None needed.
8/29/2008	9/19/2008	OK	None needed.
9/19/2008	10/5/2008	OK. Some velocity registered during storms. Scatterplot has no particular pattern.	None needed.
10/5/2008	10/12/2008	OK. Velocity registered during 10/3 and 10/6 events.	None needed.
10/12/2008	10/20/2008	OK	None needed.
10/20/2008	11/3/2008	OK - stormwater pipe, very little flow	None needed.
11/3/2008	12/12/2008	OK	None needed.
12/12/2008	12/12/2008	Switched to pulse meter 12/12, no data has been uploaded since then.	

Begin Date	End Date	Screening Comments	Response
12/12/2008	12/12/2008	No new data since 12/12 - already reported in previous screenings	
12/12/2008	1/6/2009	OK - Site is recording data, switched to pulse meter 12/12	None needed.
1/7/2009	2/3/2009	OK	None needed.
2/3/2009	2/3/2009	Communication problem, no new data since 2/3	
2/3/2009	3/18/2009	OK	None needed.
3/18/2009	3/18/2009	Communication problem - no new data since 3/18	
3/18/2009	5/14/2009	OK	None needed.

WW005

Location: 3800 Lake WA. Blvd S.

TABLE J-31
Notes for Monitor Lift Station #5

Begin Date	End Date	Screening Comments	Response
1/20/2009	2/3/2009	OK	None needed.

WW006

Location: 4645 Lake WA Blvd. S

TABLE J-32
Notes for Monitor Lift Station #6

Begin Date	End Date	Screening Comments	Response
1/20/2009	6/23/2009	OK	None needed.

Rainier Ave. Lift Station

Location: S. Charlestown St. and Rainier Ave. S.

Appendix K: Weir Elevations Technical Memorandum

Genesee Weir Elevations for use in Infoworks CSO Model

PREPARED FOR: Seattle Public Utilities

PREPARED BY: CH2M HILL -Tyler Jantzen, Dan O'Leary & Santtu Winter

DATE: December 9, 2008; Updated March 10, 2009.

Introduction

Weir elevations and manhole chamber geometry has been determined using multiple data sources including SPU field survey, ADS detailed site drawings, as-built plans from the City of Seattle plans vault, plans from previous modeling reports, and SPU's GIS. In some cases these sources have conflicting weir elevation measurements. Unless stated otherwise in this memo, the accuracy of conflicting data is assumed to follow the order of the sources presented above (SPU field survey is most accurate, SPU GIS is least accurate). In many cases the weir elevation is not directly measured, and has to be calculated. For each weir in the S. Genesee CSO model, this memorandum summarizes the following:

- Available elevation data
- Weir elevation to be used, if multiple conflicting sources exist
- Methods of calculation
- Status of additional data collection
- Additional data requests

Copies of the source elevation data are included in description for each weir. Where multiple calculation steps are used to determine elevations, letters in parenthesis have been used to denote steps in the text and on the drawings. Where multiple elevations for a single point exist, the elevation used in the model (or to calculate that used in the model) is underlined in red.

Weir Elevation Summary

The following table describes the weir and chamber geometry elevations to be used in the S. Genesee CSO model.

WEIR SUMMARY TABLE

Weir	MH ID	Weir crest elevation[1]	Chamber roof elevation*	Weir length[2], ft	Weir discharge coefficient	Weir monitor sensor elevation (pipe invert)*	Additional Data Requested?
NPDES 37	059-489	32.4	Not available	5.92	0.46	31.0	Yes
NPDES 38, Structure A, Weir #1	059-346	21.26	25.39	8	0.62	17.79	No
NPDES 38, Structure A, Weir # 2	059-346	19.26	25.39	8	0.62	16.18	No
NPDES 40	059-491	33.8	35.27	21.67	0.46	26.49	No
NPDES 41A	059-434	21.8	28.02	6.625	0.62	21.38	No
NPDES 41B	059-406	20.23	Not available	5.833	0.46	19.2	Yes
NPDES 42 Storage	060W-045	29.54	31.29	8.83	0.46	24.93	No
NDPES 42 Overflow	060W-052	30.17	32.54	8	0.46	24.93	No
NPDES 43	060W-049	44.40	52.33	7.67	0.46	40.33	No
NPDES 165	067-078	21.76	24.72	2.917	0.46	20.05	No
GEN38_059-498A	059-498	26.74	28.7	7.02	0.46	22.00	No
GEN38_059-451 (Horseshoe Weir)	059-451	23.14	28.40	23.89	0.46	Pending	No

[1] All elevations are in feet, NAVD 1988

[2] All weir lengths determined from ADS detailed drawings unless specified in the narratives below.

Weir Discharge Coefficients

There was insufficient monitor data available to determine the discharge coefficients individually for each weir. The typical discharge coefficient for a standard thin plate weir is 0.62 (Street, et. al). This value assumes a flat and smooth weir. However, only the two weirs inside of Structure A and the overflow weir at NPDES 41A, which are all 0.5 inch thick steel plates, fit these assumptions. All of the other weirs in the Genesee model are 6 inch thick concrete weirs with rounded tops.

The discharge coefficient is used to account for head loss as the water flows over the weir; a higher discharge coefficient corresponds with a lower headloss. Since a 6″ concrete weir most likely has a higher headloss than a 0.5 inch thick steel plate weir, a lower discharge coefficient would be appropriate for the 6 inch thick concrete weirs. The monthly CSO Discharge Reports prepared by ADS for submittal by SPU to the Washington State Department of Ecology assume a discharge coefficient of 0.46 in calculating the discharge volume. In the Genesee model, all weirs except for those in Structure A and the weir at NPDES 41A have a discharge coefficient of 0.46. The two weirs in Structure A and the weir at NPDES 41A have a discharge coefficient of 0.62.

NPDES 37 Outfall Weir (MH 059-489)

The weir located in manhole 059-489 is a side cast weir, overflowing directly into NPDES 37. No as-built drawings for this weir have been obtained. The weir crest elevation was determined from the GIS pipe invert elevation of the incoming pipe into the manhole (31 feet) and adding the smallest height of the weir wall (16.38 inches) from the ADS detailed drawings, resulting in a weir crest elevation of 32.4 feet.

The available information for this manhole did not specify anything about the presence or location of the chamber roof.

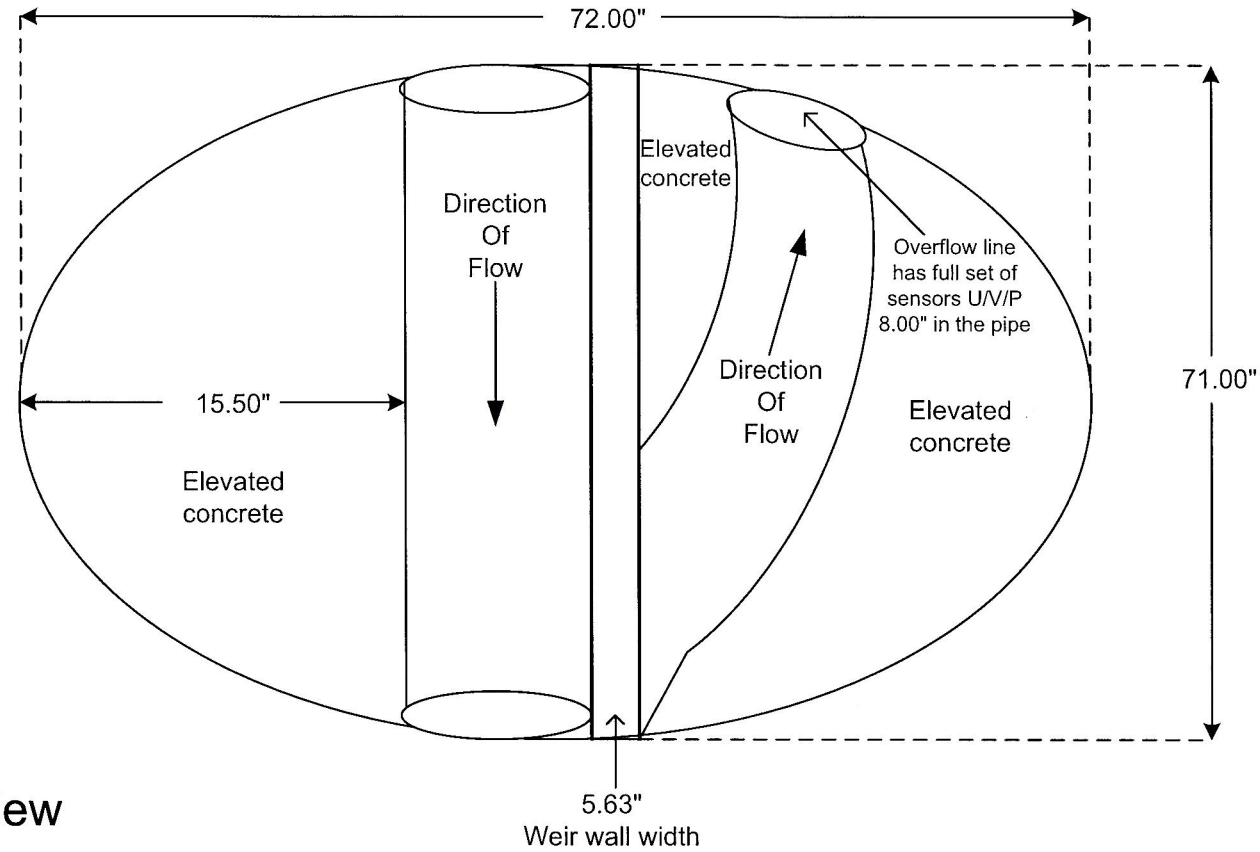
Sources: SPU GIS data

ADS Detailed Drawings

In order to improve the accuracy of the weir data, the following information is requested:

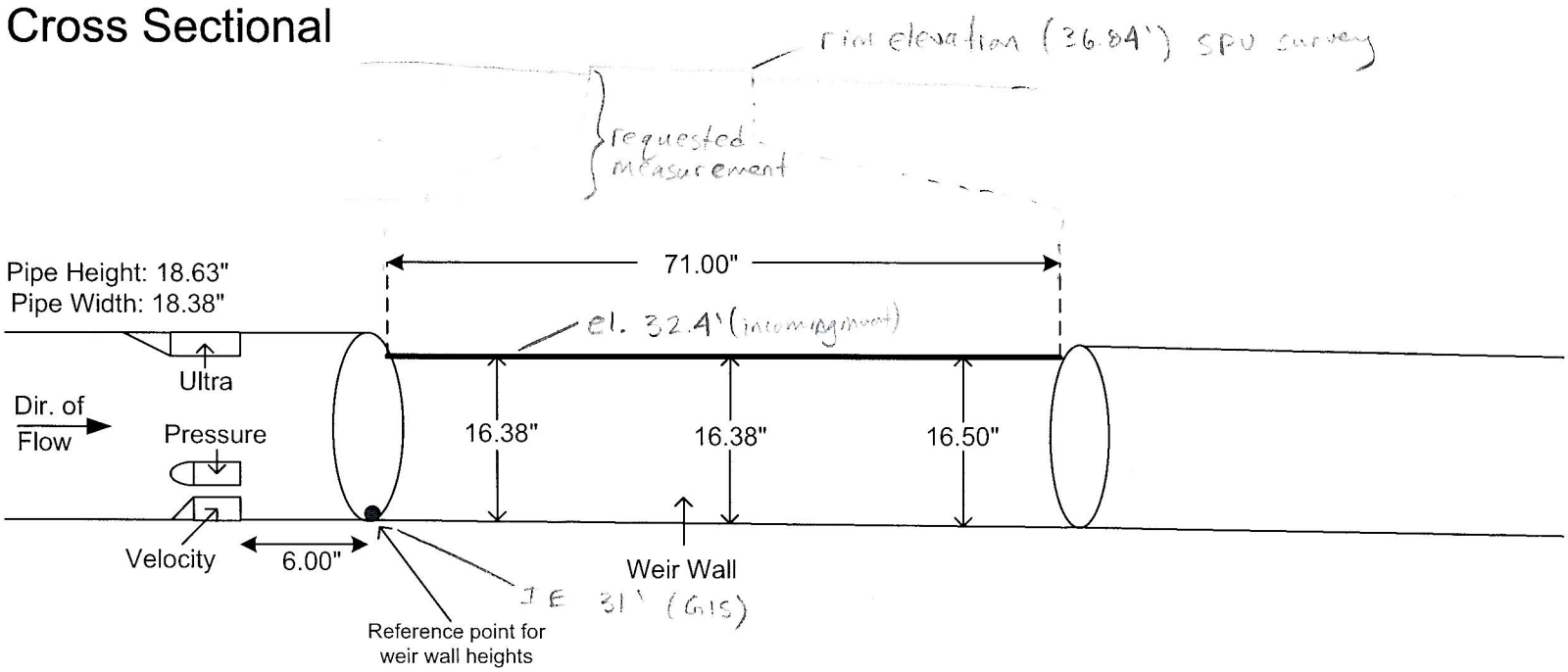
- As-built drawings for this structure. If they are not available, a field check to determine whether or not a chamber roof exists in this manhole. If one does exist, a measurement from the rim of the manhole to the chamber roof is suggested.

NPDES_37 MH059-489
Detailed Drawing



Top View

Cross Sectional



Overflow quantity is calculated by Q-final in monitoring point 2

Not to scale
Rev. 1 10/15/08

NPDES 38 Structure A Weir #1 (059-346)

Flow that goes over the horseshoe weir in manhole 059-451 flows into a long storage pipe, which then flows into Structure A. Structure A contains two weirs, the first of which is the storage overflow weir. A pinch valve allows flows through this first weir, and is controlled by wet well levels in Lift Station 5. Flow that goes over this weir either drains to Lift Station 5 or builds up until it overflows the second weir in Structure A. Overflows on the second weir discharge into NPDES 38.

The as-built drawings for Structure A indicates that the invert of the incoming pipe into Structure A is 17.79 feet (a). GIS information for this structure indicates that the invert of the incoming pipe is 13.7 feet, which is most likely incorrect based on photographs from Structure A. Based on the ADS detailed drawings, the height from the invert of the pipe to the floor of Structure A is 19.88 inches, resulting in a floor elevation of 16.13 feet (b). From this point, the floor of Structure A slopes down towards the weir at a slope of 2% (based on the as-built drawings). The ADS drawings indicate that the length from the invert of the pipe to the first weir is 8.18 feet, resulting in a drop of 0.16 feet (8.18 * 0.02). This results in an elevation at the base of the weir of 15.97 feet (c). The weir height according to the ADS drawings is 63.5 inches, resulting in a crest elevation of 21.26 feet (d), which differs from the as-built weir crest elevation of 21.37 feet by 0.11 feet or 1.3 inches. The weir crest elevation calculated based on the incoming pipe invert elevation will be used (21.26 feet), because the ADS measurements are believed to be more accurate than the as-built drawings.

A chamber roof elevation of 25.39 feet will be used, determined using the method described in NPDES 38 Structure A Weir #2 (059-346).

NPDES 38 Structure A Weir #2 (059-346)

Continuing from the weir crest of weir #1 above, the height from the crest of weir #1 to the roof of Structure A is 46.25 inches, resulting in a chamber roof elevation of 25.11 feet. The ADS detailed drawings indicate that the distance from the roof of Structure A to the weir crest of weir #2 is 73.5 inches, resulting in a weir crest elevation for weir #2 of 18.99 feet. Another method to calculate the height of weir #2 is by using the invert elevation of the outgoing pipe in Structure A, which was obtained from as-built drawings. The invert elevation of the outgoing pipe from Structure A is 17.76 feet (m). The ADS detailed drawings indicate that the height from the invert of the outgoing pipe to the crest of weir #2 is 18 inches, resulting in a weir crest height of 19.26 feet (n). The as-built weir crest elevation for weir #2 is 19.12 feet. This calculated weir crest elevation differs from the as-built elevation by 0.13 feet, or 1.53 inches. The weir crest elevation calculated based on the invert of the outgoing pipe invert elevation will be used (19.26 feet), because the calculations using this invert are less complex than using the incoming pipe invert.

As reported on the ADS detailed drawings, the height of weir #2 is 37.00 inches above the trough. Thus, the invert of the trough (and reference point for the sensors) is calculated as 16.18 feet (19.26 feet - 37 inches) (p). The as built shows this invert (to pump station) at 15.39′. In order to be consistent with other elevations throughout Structure A, the calculated elevation (16.18 feet) of this point is used for the model.

As discussed above, a chamber roof elevation of 25.11 feet was determined using the invert of the incoming pipe. However, using the invert of the outgoing pipe (17.76 feet) as a starting point to calculate the chamber roof elevation results in a different elevation. The ADS detailed drawings indicate that the distance from the invert of the outgoing pipe to the crest of weir #2 is 18 inches, and the distance from the crest of weir #2 to the chamber roof is 73.5 inches. This total distance (91.5 inches) results in a chamber roof elevation of 25.39 feet (o). This chamber roof elevation (25.39 feet) will be used, because the calculations are less complex than those using the incoming pipe invert elevation.

Sources: ADS Detailed Drawings

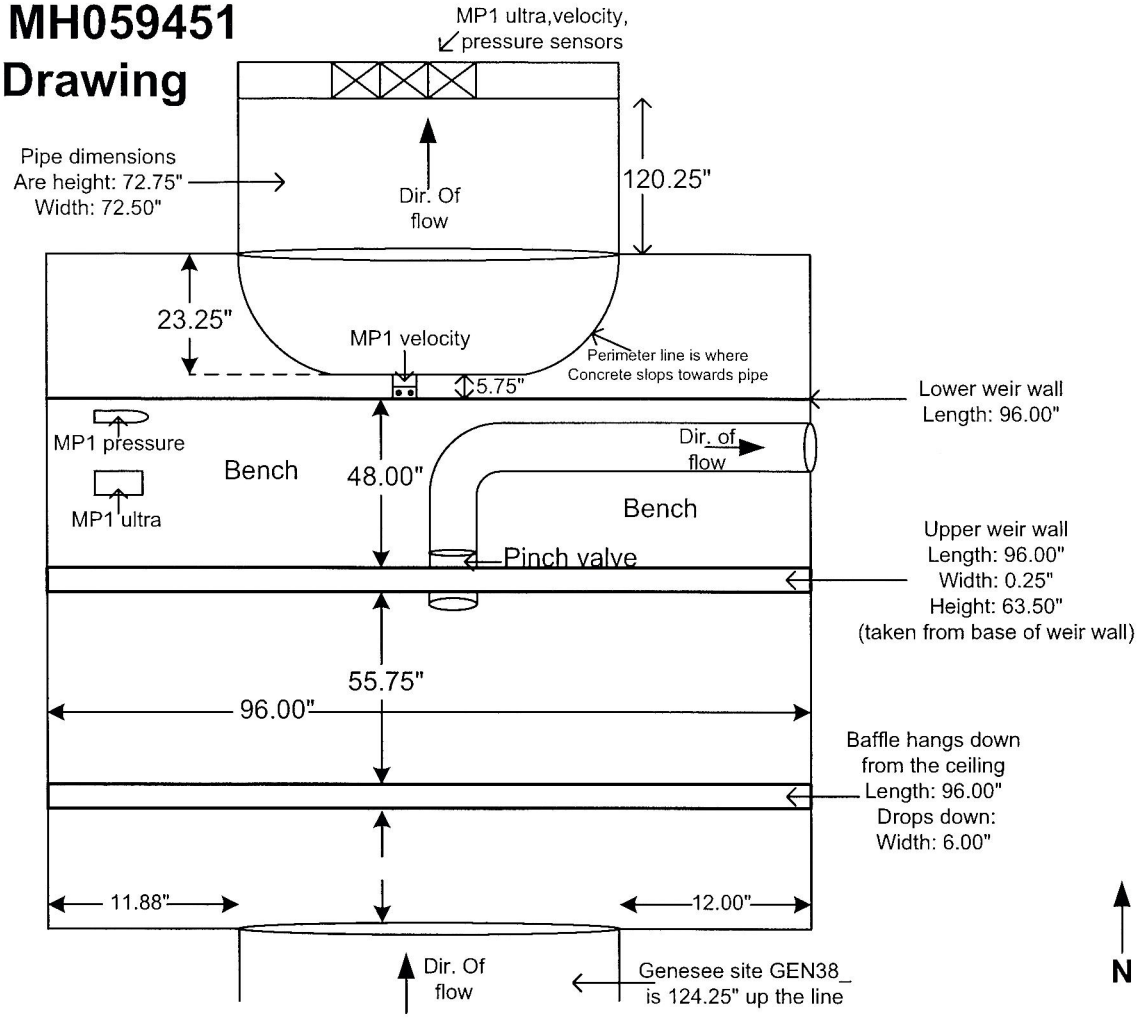
SPU GIS data

Design file back-up. Engineer, Patrick Murphy. CSO Reduction Program - 2005 Retrofit project PW# 2005-051. Contract drawing 777-608

No additional information requested.

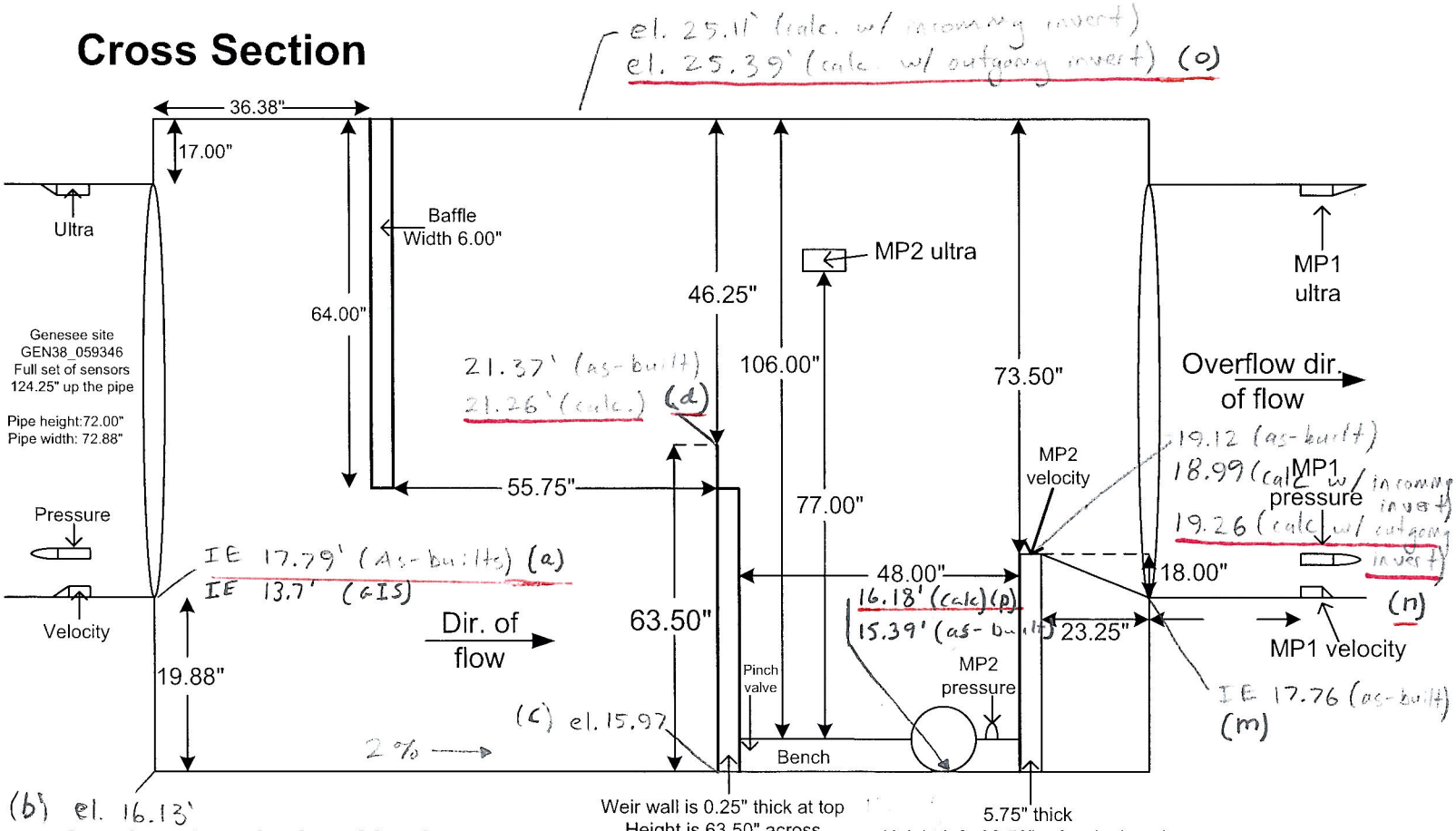
Note: NPDES_38 MH059451 was incorrectly labeled. This site is at MH 059-574, not MH 059-451. Continued monitoring at this site can be found under the label "NPDES038_MH059574." This site is also known as "Structure A". Please see Section 3.2 *059-451 "A" (Monitoring ID NPDES38_059-451, Structure "A")* in the report for more details.

NPDES_38 MH059451
Detailed Drawing



Top View

Cross Section



Overflow is calculated by Q-final in monitoring point 2

Weir wall is 0.25" thick at top
Height is 63.50" across
Ref. point base of wall

5.75" thick
Height left: 32.50" ref. point bench
Height center: 32.50" ref. point bench
Height right: 37.00" ref. point trough

Not to scale
Rev. 1 10/20/08

Per 10/9 meeting
these datums are NAVD '88

City Datum + 9.60 = Navd88 Datum

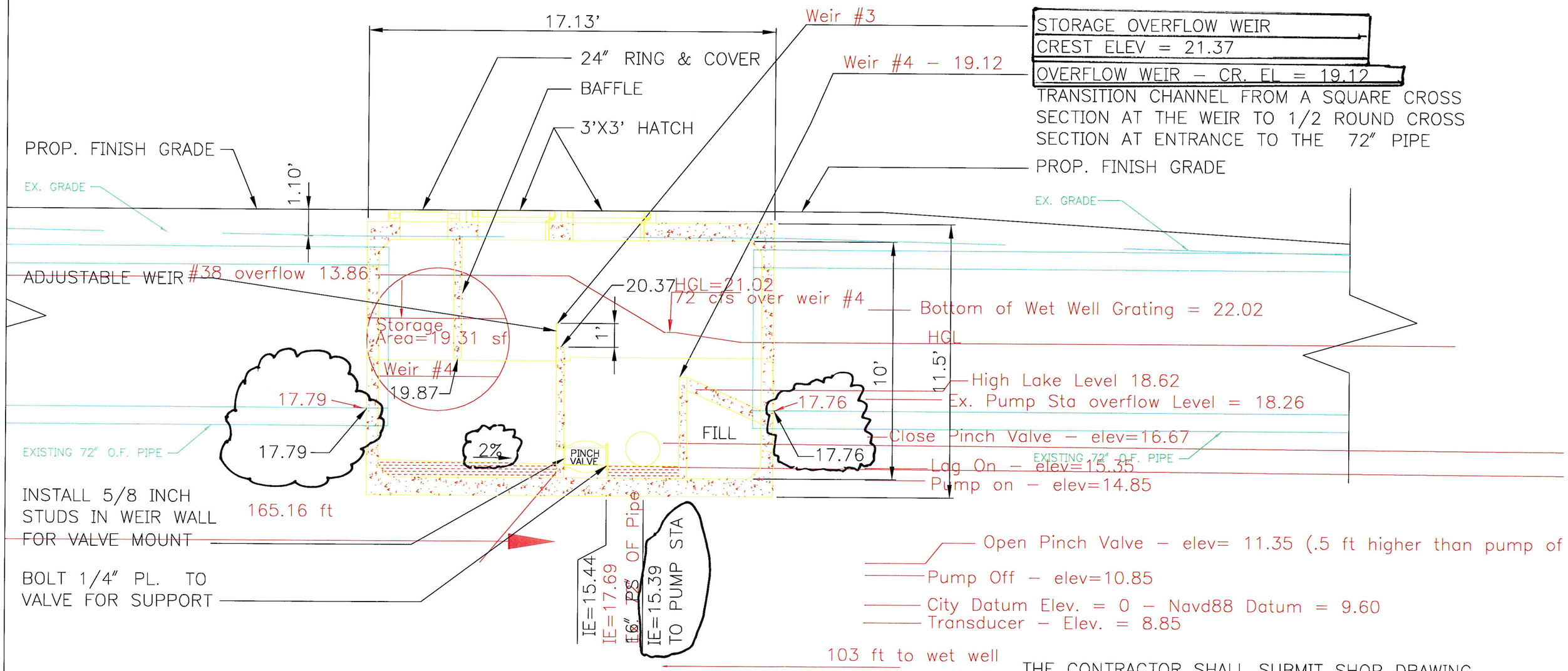
ELEVATIONS OF PUMP STATION SET POINTS

Scada readout −0.75 (transducer elev.) + 9.6 (NAVD88 correction)

Pump off = 2 − 0.75 +9.6 = 10.85

lead on 6.5 − 0.75 + 9.6 =15.35

Etc. with all other SCADA read out points lag=6.5, High Alarm=9.0, Ov



THE CONTRACTOR SHALL SUBMIT SHOP DRAWING OF THE VAULT . THE DRAWING SHALL INCLUDE THE ELEVATIONS OF THE INVERT OF THE 16" PS, THE FLOOR OF THE VAULT, AND THE TOP OF THE FOOTING.

SECTION A−A 12

SCALE: 3" = 1'−0"

DESIGN FILE BACKUP.
ENGINEER: PATRICK MURPHY
CSO REDUCTION PROGRAM - 2005 RETROFIT PROJECT
PW # 2005-051
CONTRACT DRAWING 777-608

NPDES 40 (MH 059-491)

The weir located in manhole 059-491 is a stormwater pipe cut in half and suspended 7.3 feet up from the bottom of the chamber. Overflows into the weir are discharged into NPDES 40.

Based on the as-built drawings of this weir, the invert elevation of the incoming pipe into MH059-491 is 26.48 feet 9 (a), and the incoming pipe is set at a slope of 0.9%. SPU GIS data indicates that the invert elevation of the incoming pipe is 28.4 feet. In this case it is assumed that the as-built information is more accurate, and GIS data is erroneous. The ADS detailed drawings indicate that the sensors are located 18.75 inches up-slope in the pipe. This results in an elevation of increase of 0.01 feet (18.75/12 * 0.009), resulting in an elevation at the location of the sensors of 26.49 feet (b). The ADS detailed drawings indicate that the distance from the sensors to the crest of the weir is 87.63 inches. This results in a weir crest elevation of 33.8 feet (c). This differs from the as-built weir crest elevation of 33.6 feet by 0.2 feet, or 2.3 inches. The elevation calculated from the ADS detailed drawing measurements (33.8 feet) will be used, as these measurements are considered more accurate than the as-built drawings.

The chamber roof elevation is not specified in the as-built drawings, and there is no measurement in the ADS detailed drawings to the chamber roof. However, the recent SPU survey indicates that the elevation of the rim of manhole 059-491 is 40.97 feet. Measuring the distance from the rim of the manhole to the chamber roof off of the scaled as-built drawings results in a distance of 5.7 feet. This results in a chamber roof elevation of 35.27 feet.

The length used for modeling this weir was determined by doubling the length of the stormwater pipe, because flow could overflow over either side of the stormwater pipe. Each side of the stormwater pipe is 130 inches long, resulting in a total length of 260 inches, or 21.67 feet.

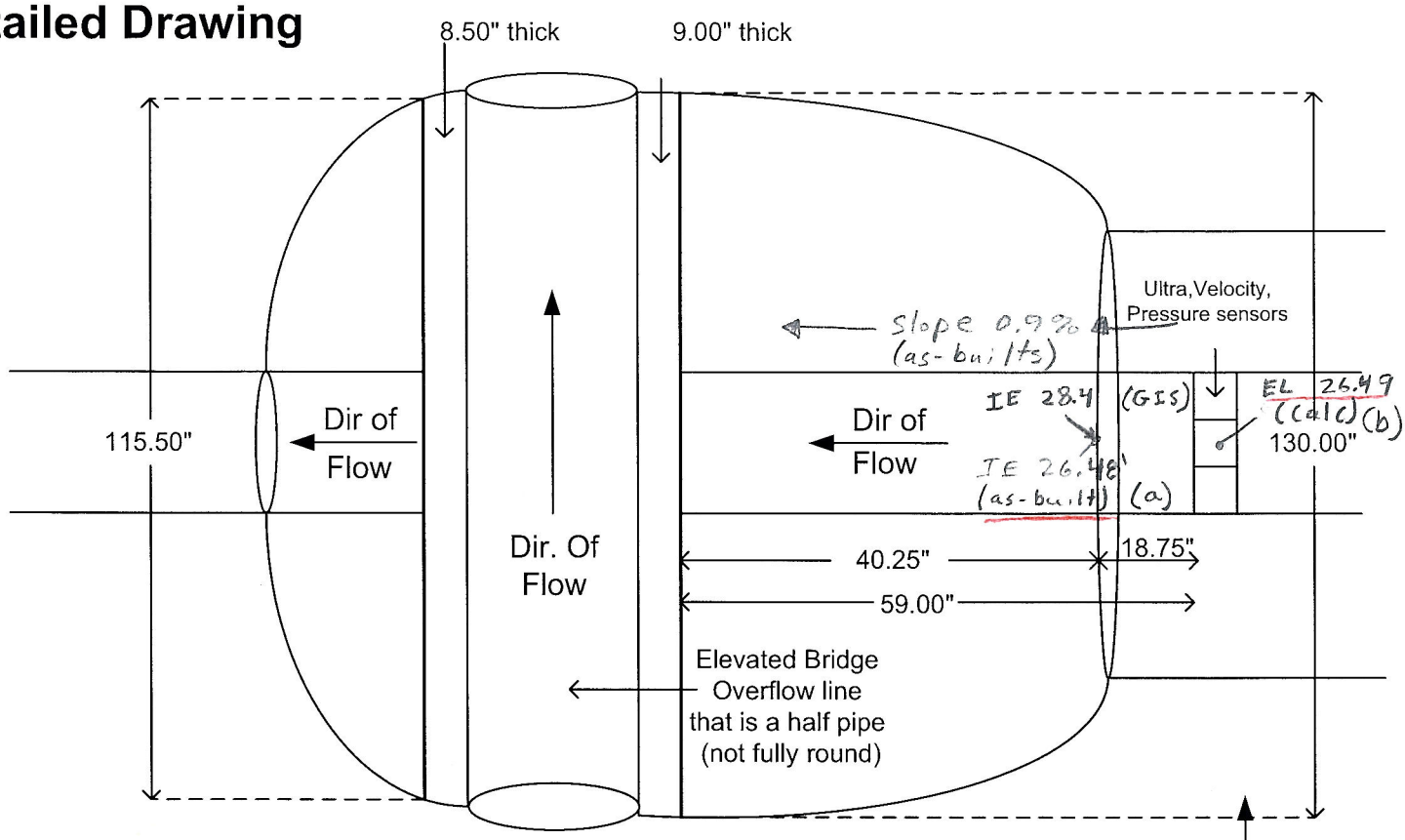
Sources: ADS Detailed Drawings

SPU GIS data

"Lake Washington South Beaches CSO, Seward Park/Mt. Baker CSO, Contract 1" (11/7/1990) As-Built

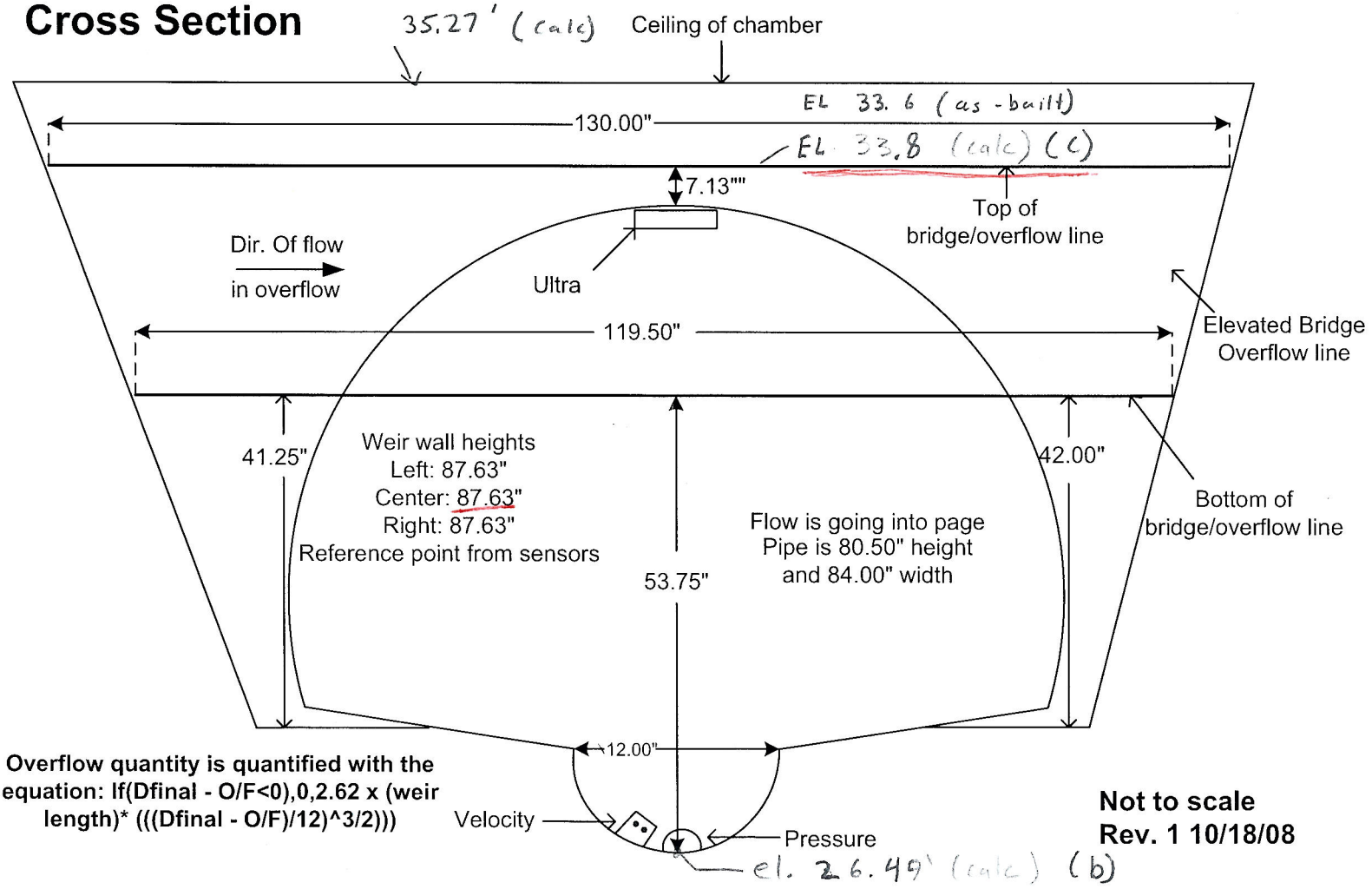
No additional information requested.

NPDES_40 MH059-491
Detailed Drawing



Top View

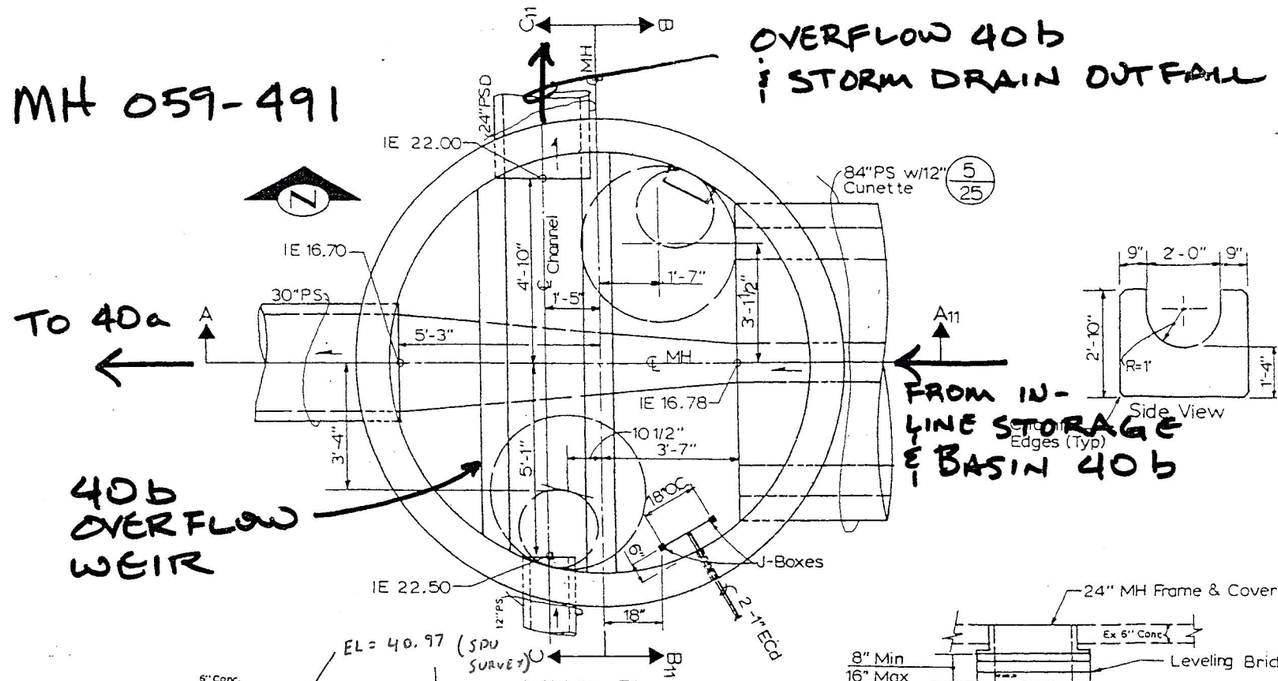
Cross Section



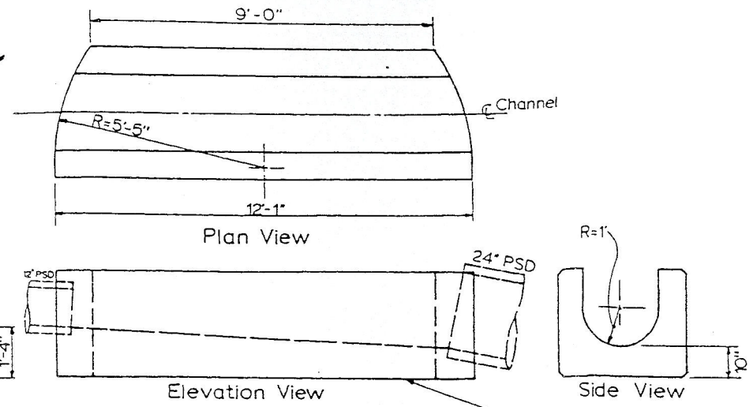
Overflow quantity is quantified with the equation: If(Dfinal - O/F<0),0,2.62 x (weir length)* (((Dfinal - O/F)/12)^3/2)))

Not to scale
Rev. 1 10/18/08

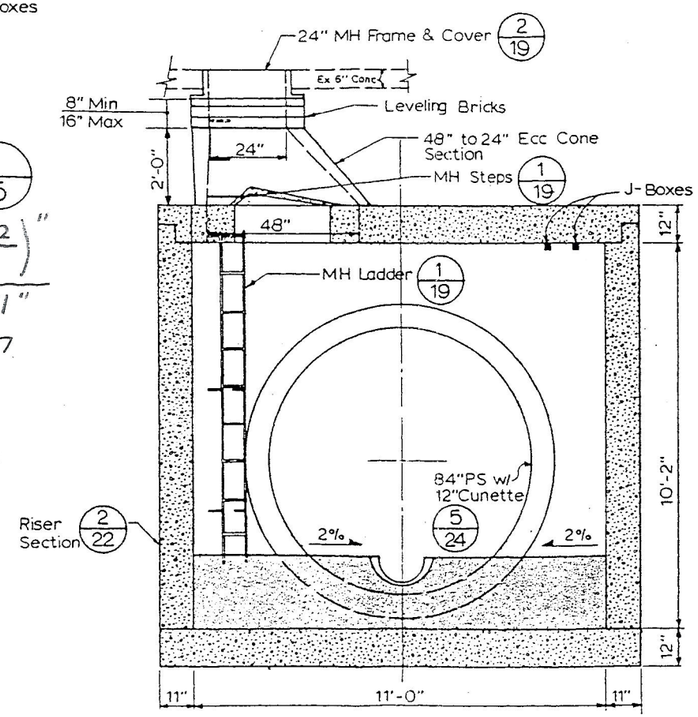
MH 059-491



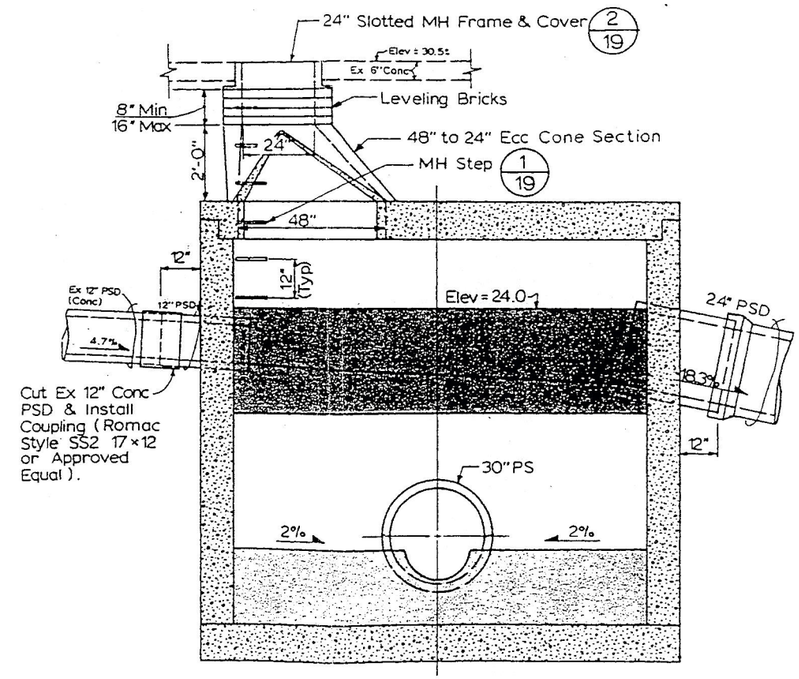
MH11 Plan
Top Slab Removed 1/5
Scale 1/2"=1'-0"



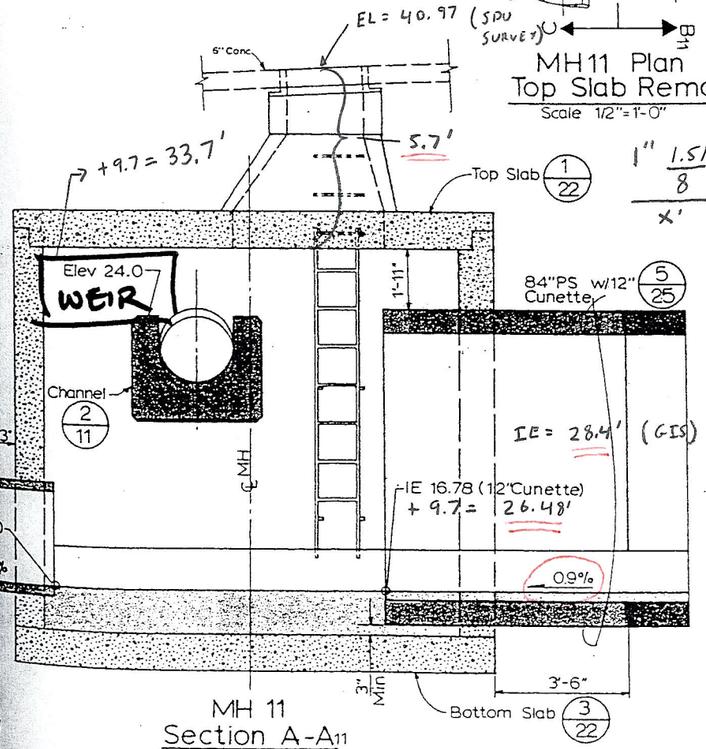
Cast-in-Place Channel 2/11
Scale: 1/2 = 1'-0"



MH 11 Section B-B11
Scale: 1/2"=1'-0"



MH 11 Section C-C11
Scale 1/2"=1'-0"



$$\frac{1'' \; \frac{1.51}{8}}{x'} = \frac{\left(\frac{3.2}{8}\right)''}{1.11''}$$

$x = 5.7$

MH 11 Section A-A11
Scale 1/2"=1'-0"

NOTE: Add 9.7 feet to elevations shown

Sewer & Electrical Details

"AS BUILT" PER PLAN EXCEPT AS NOTED

APPROVED FOR ADVERTISING BY THE BOARD OF PUBLIC WORKS SEATTLE WASHINGTON	NAME OR INITIALS AND DATE	INITIALS AND DATE		THE CITY OF SEATTLE DEPARTMENT OF ENGINEERING	Lake Washington South Beaches CSO Seward Park / Mt. Baker CSO Contract 1 BASIN 040	JOB NO. PC S1311A R/W CO S1311C
Sept. 27 1985 CHAIRMAN	DESIGNED KCW GKH	REVIEWED OES 2/24/86	EUGENE V. AVERY STATE OF WASHINGTON REGISTERED PROFESSIONAL ENGINEER	EUGENE V. AVERY P. E., DIRECTOR OF ENGINEERING		VAULT PLAN NO. 777-357
ATTEST: Barbara K. Faber EXECUTIVE SECRETARY	CHECKED JPW GKH	TRANS. DYG. MGR. KWD		ORDINANCE NO. 111925 APPROVED		SHEET 11 OF 32
PROJECT NO.	DRAWN JPW	RECEIVED		FUND:		
	CHECKED GKH	REVISED AS BUILT 11-7-90		SCALE: H. V. As Shown INSPECTOR'S BOOK		
	DESIGN REVIEW 8/7/85					

All work done in accordance with the City of Seattle Standard Plans and Specifications in effect on the date shown above, and supplemented by Special Provisions

NPDES 41A (MH 059-434)

The weir located in manhole 059-434 is a side cast weir that overflows directly into NPDES 41. The invert of the incoming pipe into MH 059-434 is 21.38 feet (a), based on as-built drawings and 21.3 feet based on GIS. The as-built elevation of 21.38 feet is assumed to be more accurate. According to the ADS detailed drawings the shortest height from the invert of the incoming pipe to the weir crest is 5.38 inches, resulting in a weir crest elevation of 21.8 feet (b).

The chamber roof elevation is not specified in the as built drawings or the ADS detailed drawings. However, SPU survey data indicates that the rim elevation of the manhole is 29.44 feet. The scaled as-built drawings indicate that the distance from the rim of the manhole to the chamber roof is 17 inches, resulting in a chamber roof elevation of 28.02 feet.

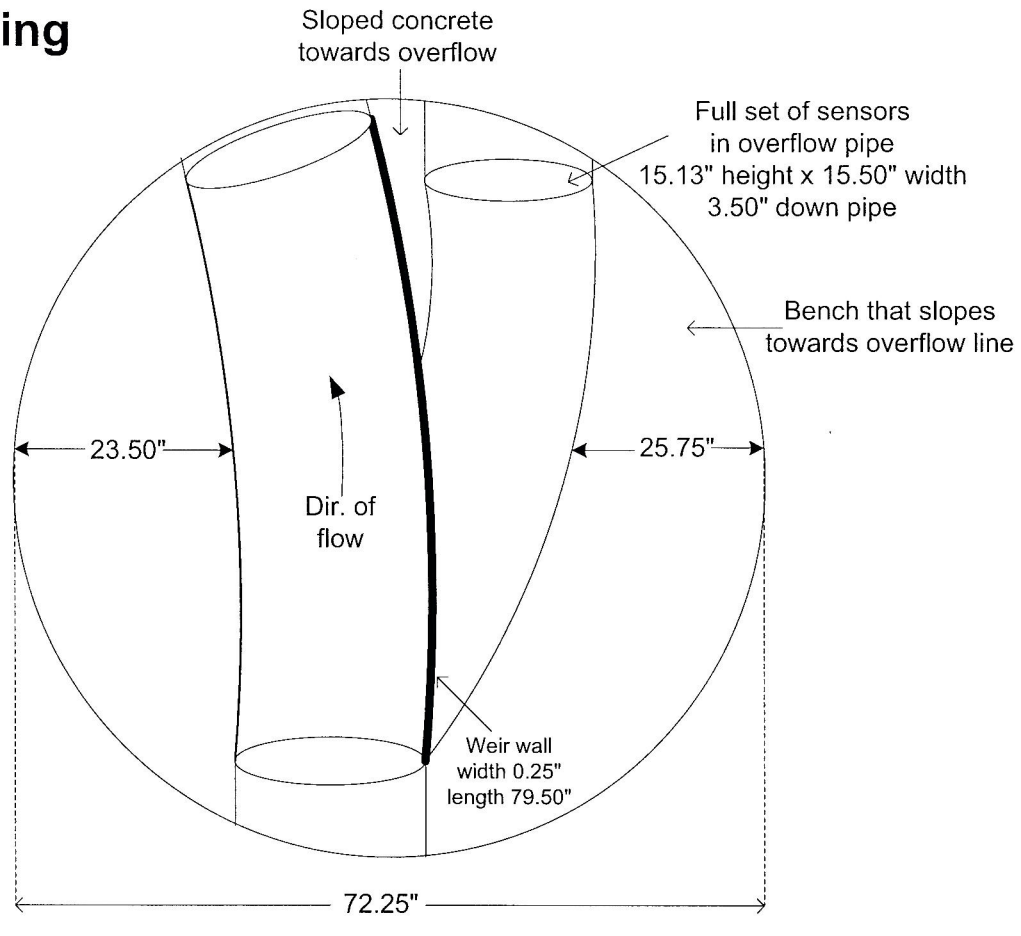
Sources: ADS Detailed Drawings

SPU GIS data

"Improvement of Charlestown Street et al Trunk Sewer etc." Sheet 10 of 32 (12/17/1930) As-Built

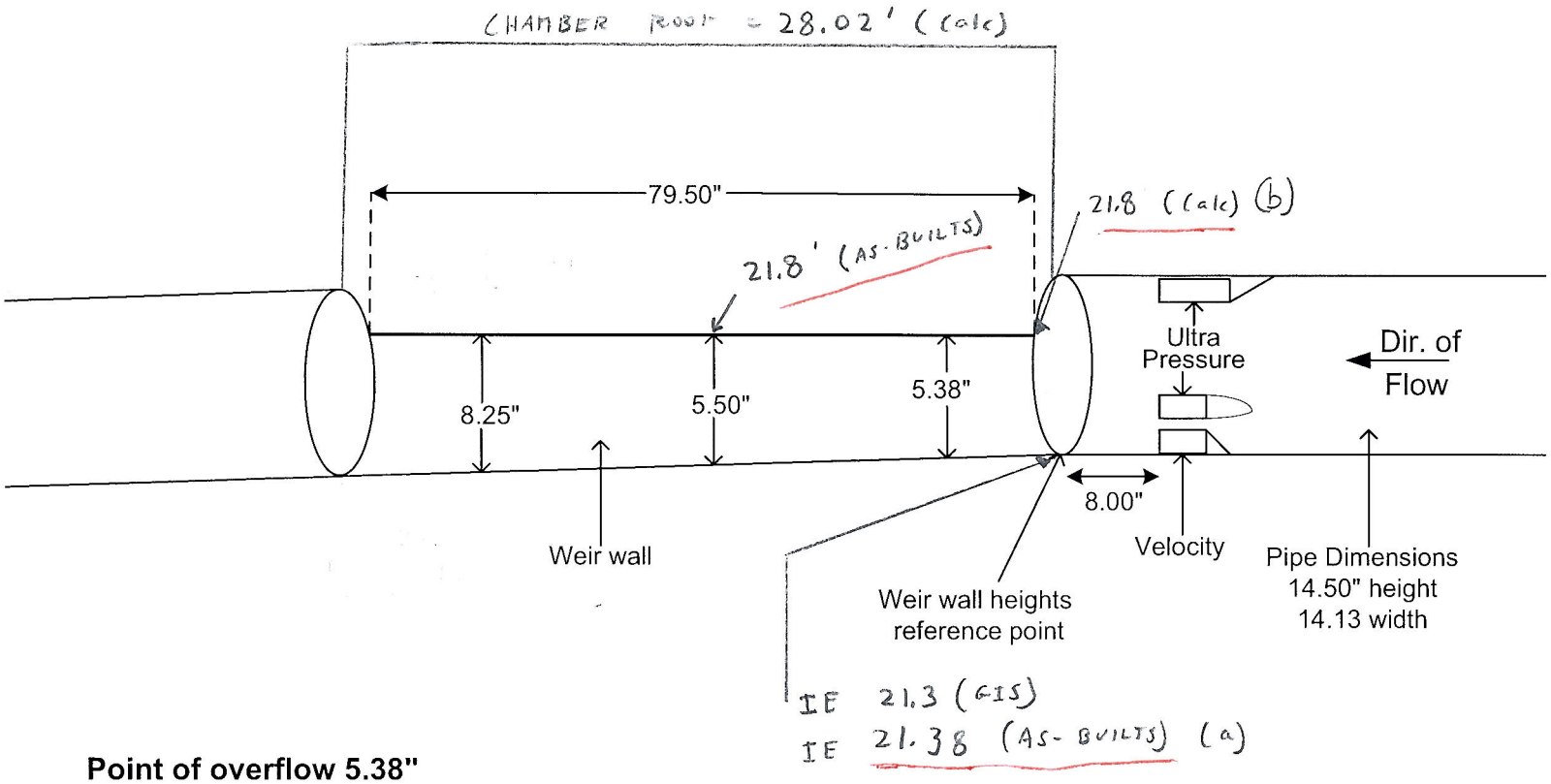
No additional information requested.

NPDES_41A MH059-434
Detailed drawing



Top View

Cross Section



Point of overflow 5.38"
Overflow quantified by Q-final in monitoring point 2

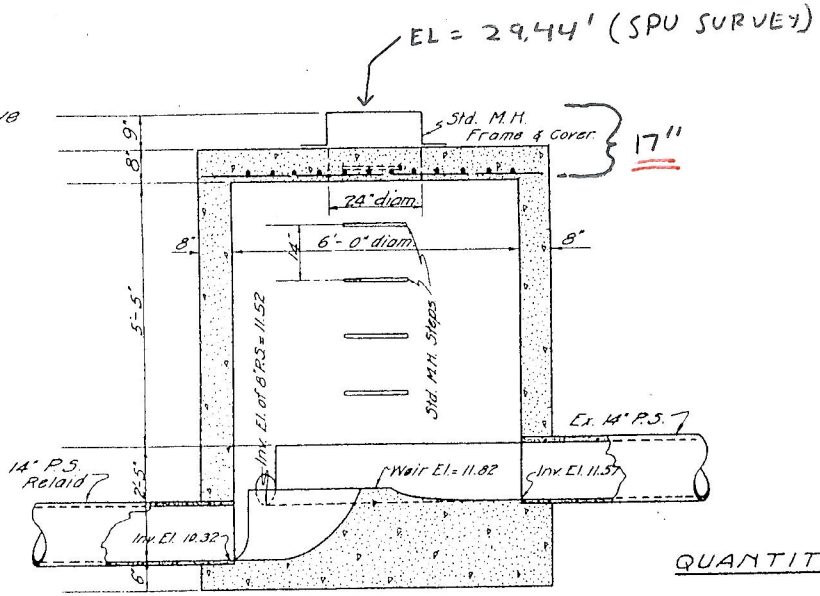
Not to scale
Rev. 1 10/16/08

OVERFLOW MANHOLE
AT 50TH. AVE. S. & ANDOVER ST.

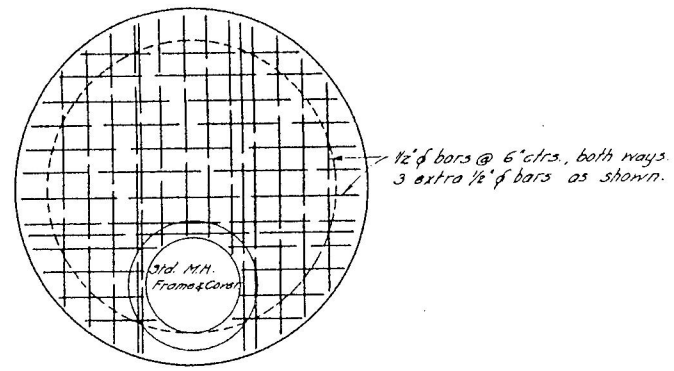
See Sheet 3.

NPDES 041 OVERFLOW MH

tions)
and to have



SECTION A-A.



PLAN OF TOP.

QUANTITIES.

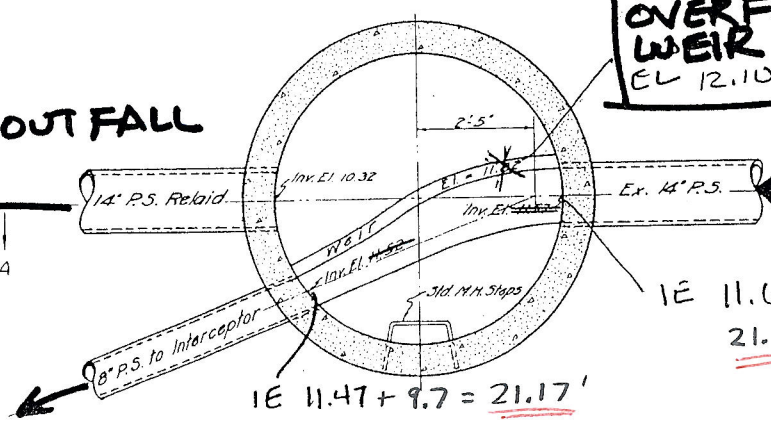
Concrete 177 cu. ft.
Steel
1/2" ϕ bars - 100.#
M.H. Steps - 42.#
1 Std. M.H. Frame & Cover.

M.H. 059-434

OVERFLOW WEIR
EL 12.10 + 9.7 = 21.8'

TO OUTFALL 41

FROM BASIN 041



IE 11.68 + 9.7 = 21.38'

IE 11.47 + 9.7 = 21.17'

PLAN OF BOTTOM.

NOTE: Add 9.7 feet to elevations shown

Improvement of

Charlestown Street et al Trunk Sewer etc.

MICROFILMED SEP 1 5 1995

Resolution No. 9646

Ordinance No. 60423 Approved Dec. 17 - 1930

Local Improvement District No. 5231.

32 Sheets Sheet 10.

March, 1930

Scale: 1/2" = 1'-0" R.H. Thomson, City Engineer.

Overflow Manholes

Made by Hammond 3-30	Approved by
Traced by "	
Checked by Sinler	

Approved by the Board of Public Works

Seattle, Wash. Oct. 3 1930

Attest:

NPDES 41B (MH 059-406)

The weir located in manhole 059-406 is a side cast weir that overflows directly into NPDES 41. The weir crest elevation for the overflow weir for NPDES 41B was determined from the ADS detailed drawings and GIS pipe invert elevation data for the incoming pipe into manhole 059-406. There were no as-built drawings available for this weir. The invert elevation of the incoming pipe was 19.2 feet based on GIS. The ADS detailed drawing indicates that the shortest weir height with respect to the invert of the incoming pipe is 12.38 inches, resulting in a weir crest elevation of 20.23 feet. SPU survey data is available for the rim elevation of this manhole, but there is no measurement connecting the rim elevation to the ADS detailed drawings.

There was no data available to determine if a chamber roof exists for this manhole, nor what the elevation of the chamber roof is.

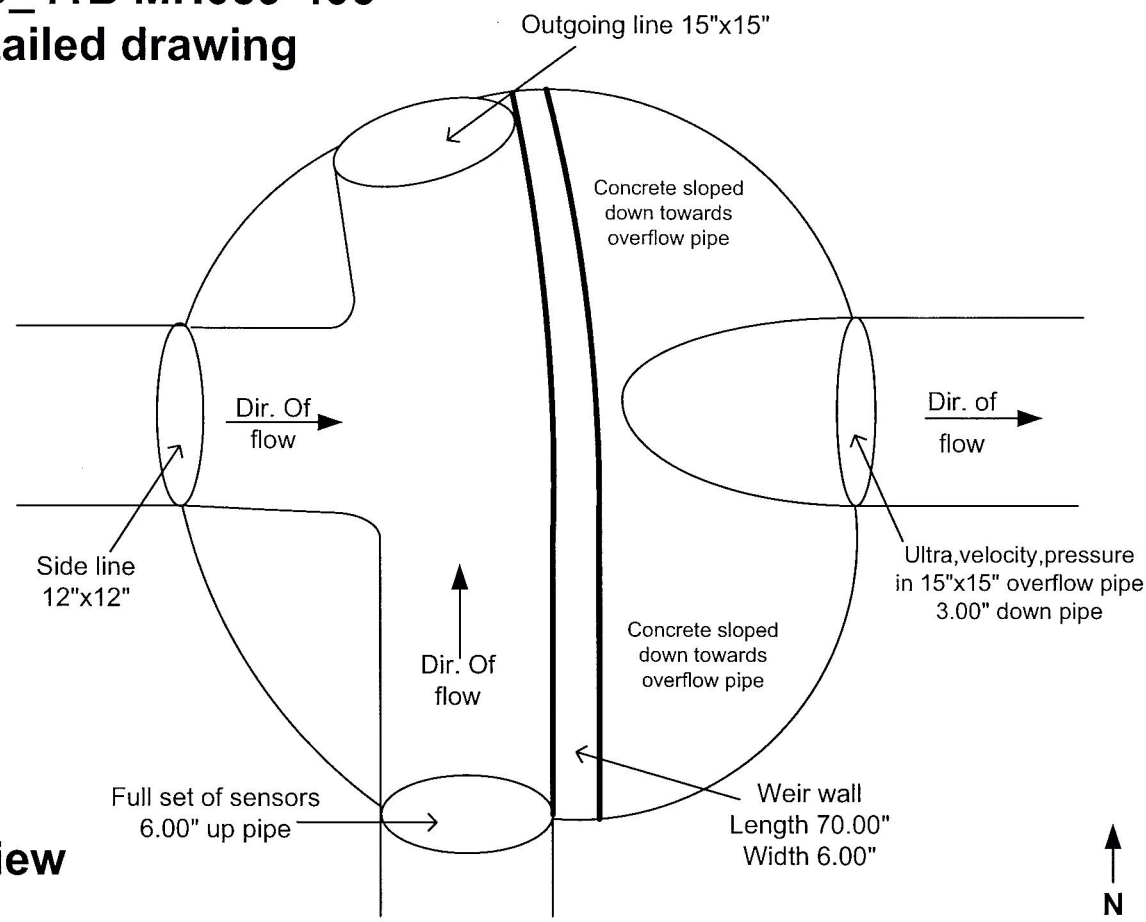
Sources: ADS Detailed Drawings

SPU GIS data

In order to improve the accuracy of the weir data, the following information is suggested:

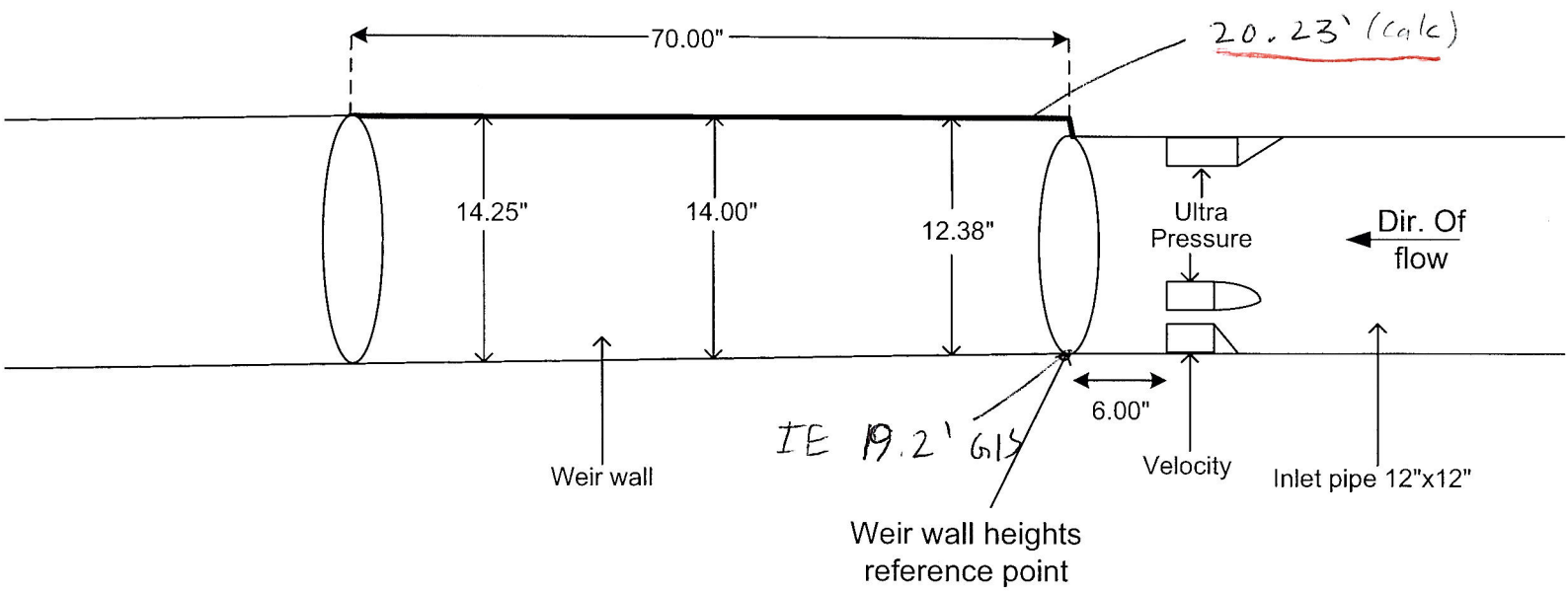
- As-built drawings for this structure. If they are not available, a field check to determine whether or not a chamber roof exists in this manhole. If one does exist, a measurement from the rim of the manhole to the chamber roof is suggested.

NPDES_41B MH059-406
Detailed drawing



Top View

Cross Section



Overflow quantity is quantified with the equation: If(Dfinal - O/F<0),0,2.62 x (weir length)* (((Dfinal - O/F)/12)^3/2)))

Not to scale
Rev. 1 10/17/08

NPDES 42 (MH 060W-045) Storage Weir

The adjustable weir in manhole 060W-045 controls the flow into and out of the dual 54" storage tanks that are part of CSO Control Facility #10. These tanks are one manhole upstream of 060W-052, a hydrobrake, and an NPDES overflow weir (see below). The storage drains through a check valve underneath the weir wall. The only source of data for this weir are SPU as-built drawings from 2005, which shows the weir crest at 19.84 feet, and the weir crest value in the 2005 Earthtech model at 29.54. Although the as-built plans have a vertical datum of NAVD88, the elevation value is suspiciously low and is suspected to be City of Seattle datum. If 9.7 feet is added to the as-built elevation (City of Seattle Datum to NAVD88 converstion), the result (29.54 feet) matches the value previously used by the EarthTech model. Thus, a crest elevation of 29.54 feet will be used.

The chamber roof elevation is calculated on sheet 7 of the 2005 Retrofit Project as 31.29 feet based on the reported elevation of the weir wall and the dimensioned height to the top of the chamber (2'-9").

The same set of sensors used to measure overflows downstream at MH 060W-052 is used to evaluate storage in the 54" storage tanks. See below for a discussion of sensor elevation.

Source: "CSO Reduction Program, 2005 Retrofit Project" Sheet 5 & 7of 13, Vault Plan No. 777-608 (7/11/2005)

EarthTech 2005 InfoWorks model for S. Genesee Basin.

No additional information requested.

NPDES 42 (MH 060W-052) Overflow Weir

The weir located in manhole 060W-052 is located in a structure that also contains a hydrobrake. Overflows from this weir discharge directly into NPDES 42. The invert of the incoming pipe into MH 060W-052 is 24.9 feet based on GIS data and 24.93 feet based on the 1990 as-built information. The 1990 as-built information is assumed to be a more precise value of the same measurement. The ADS detailed drawing indicates that the height from the invert of the incoming pipe to the top of the weir wall is 62.88 inches, resulting in a weir crest elevation of 30.17 feet. The 1990 as-built drawings indicate that the weir crest elevation is 29.04 feet and the 2005 as-built indicate a weir crest elevation of 30.04 feet (assuming a datum conversion of 9.7 feet, see discussion in Storage Weir section above). The weir crest elevation calculated from the 1990 as-built invert and ADS detailed drawing (30.17 feet) is believed to be most accurate.

The chamber roof elevation was determined by using the manhole rim elevation of 34.22 feet (based on the SPU survey) and scaling the distance from the rim of the manhole to the chamber roof off of the as-built drawings (1.68 feet). This results in a chamber roof elevation of 25.9 feet.

Sources: ADS Detailed Drawings

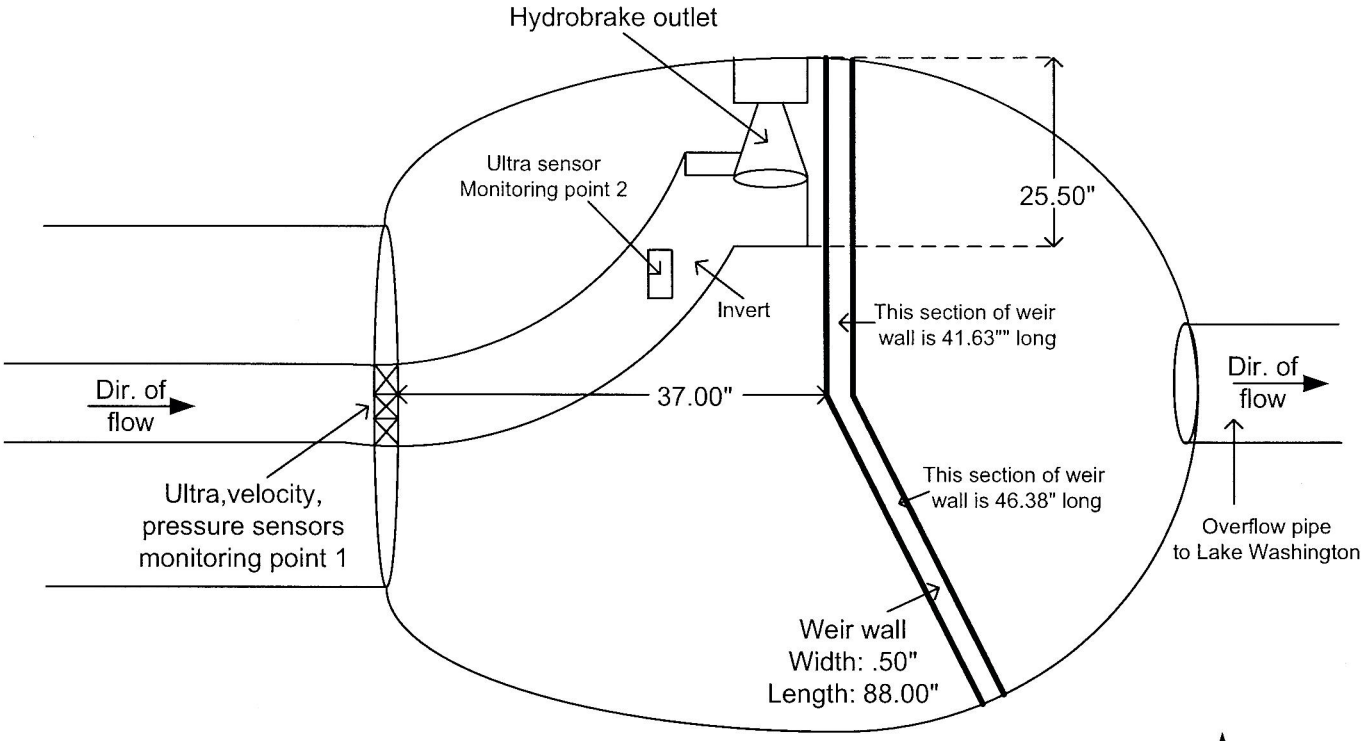
SPU GIS data

"Lake Washington South Beaches CSO, Seward Park/Mt. Baker CSO, Contract 1" Sheet 14 of 32 (11/7/1990) As-Built

"CSO Reduction Program, 2005 Retrofit Project" Sheet 4 of 13, Vault Plan No. 777-608 (7/11/2005)

No additional information requested.

NPDES_42 MH060W052
Detailed Drawing

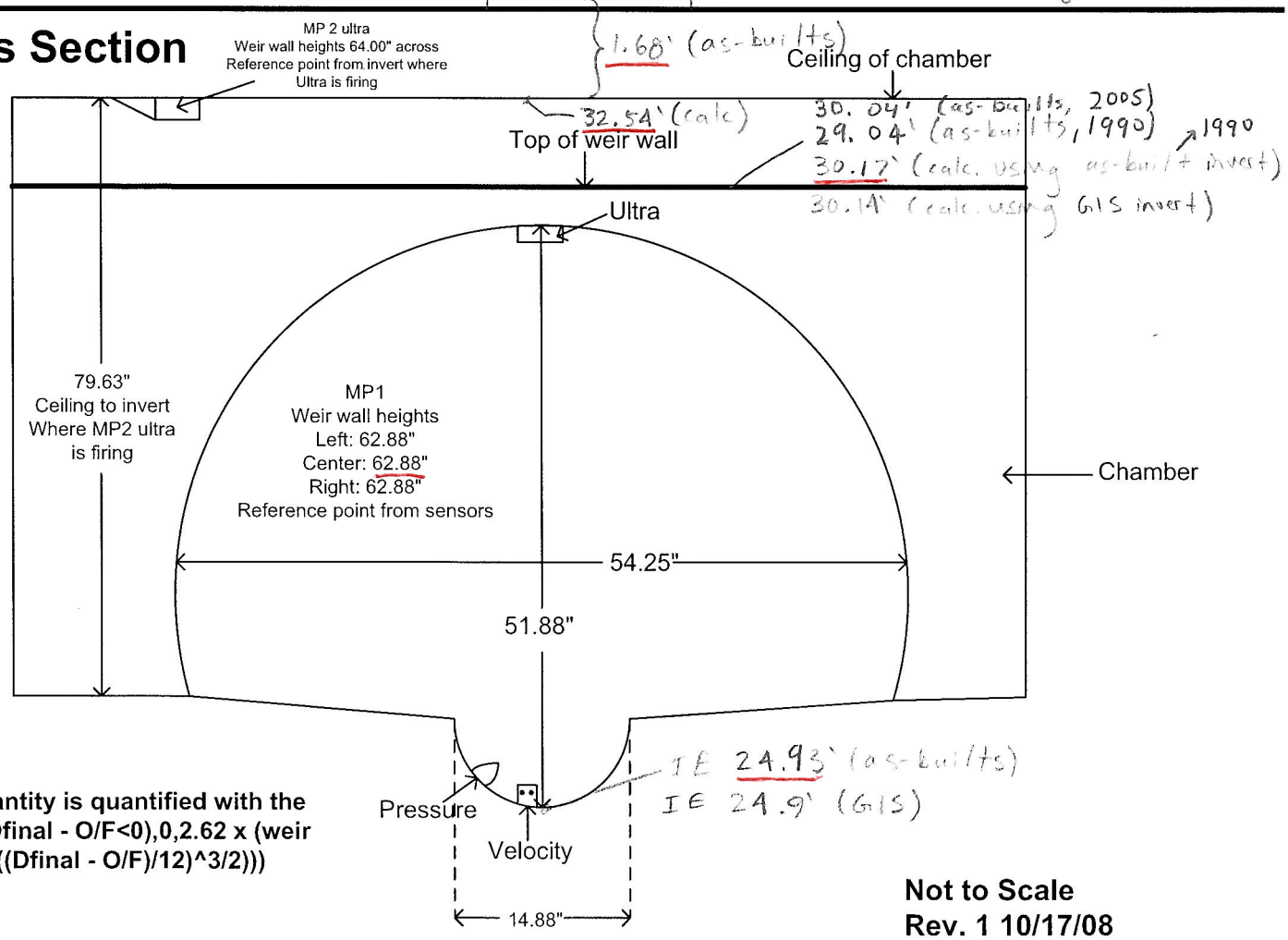


Top View

N

Rim elevation 34.22' (SPU survey)

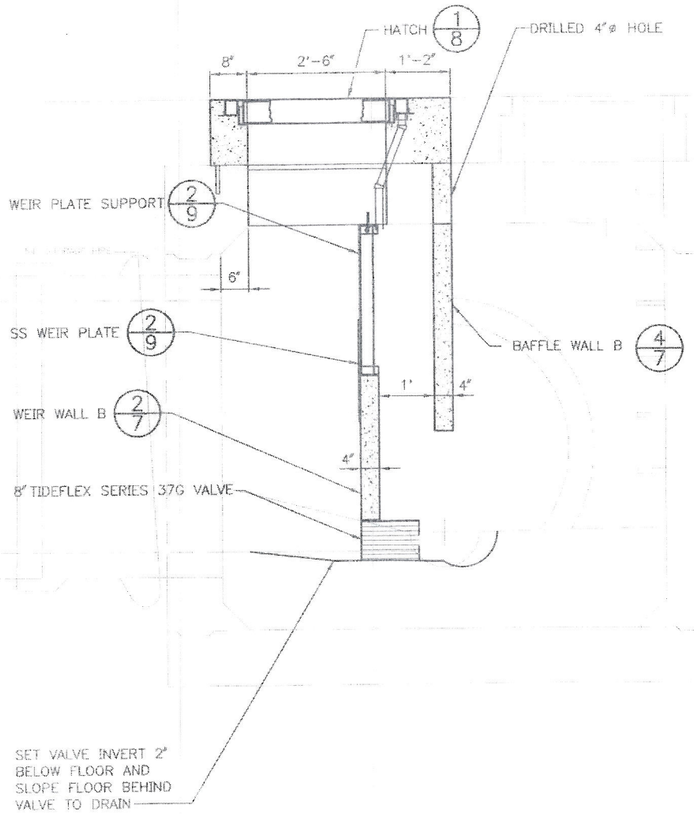
Cross Section



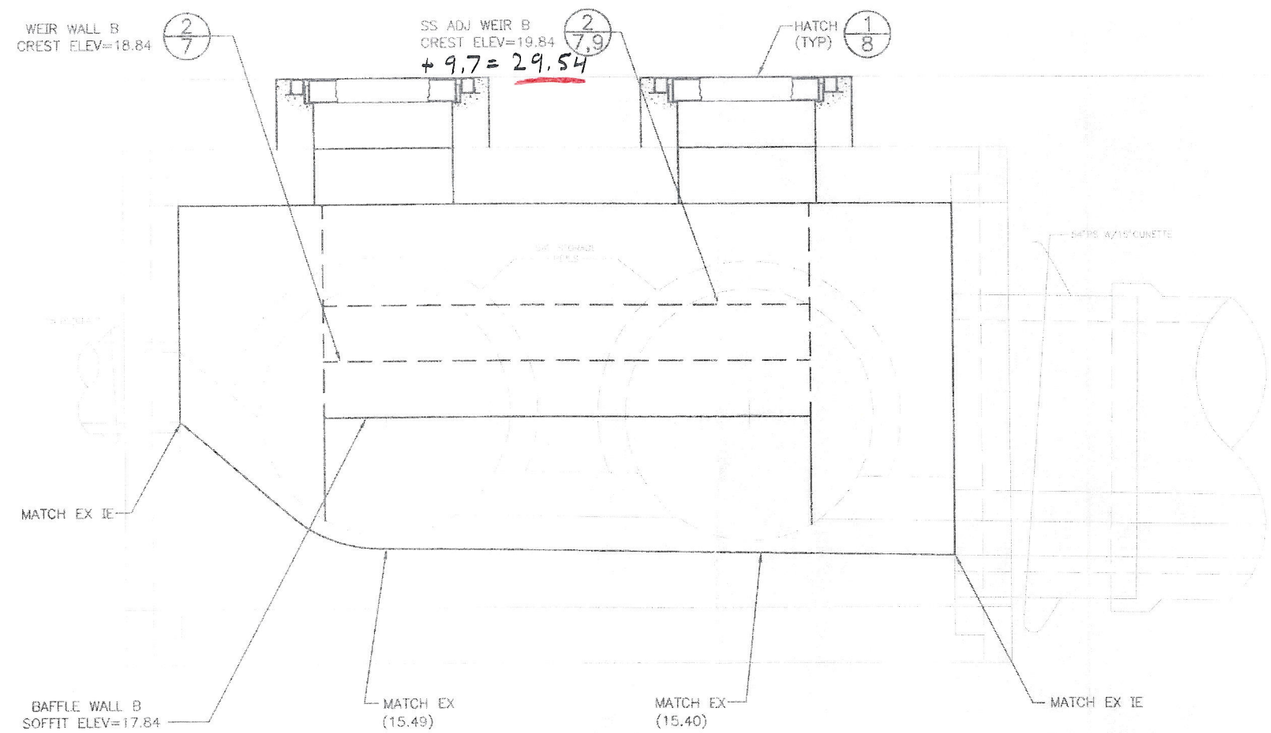
Overflow quantity is quantified with the equation: If(Dfinal - O/F<0),0,2.62 x (weir length)* (((Dfinal - O/F)/12)^3/2)))

Not to Scale
Rev. 1 10/17/08

NOTE:
REGRADE TO DRAIN AWAY FROM HATCHES AT 3% FOR 5 FEET.



MH #45 – SECTION C–C3
SCALE: 3/4"=1'-0"



MH #45 – SECTION D–D3
SCALE: 3/4"=1'-0"

060W-045

NPDES #42
MH #45 DETAILS

MARK	DATE	REVISIONS	MADE	CHK'D	BR'D

VAULT SERIAL NO. 34497

Property of City of Seattle
777-608-5

APPROVED FOR ADVERTISING
KENNETH J. NAKATSU
DEPARTMENT OF EXECUTIVE ADMINISTRATION
SEATTLE, WASHINGTON 20
BY: DIRECTOR, CONTRACTING SERVICES

NAME OR INITIALS AND DATE
DESIGNED RMM
CHECKED GKH
DRAWN JCJ 3-28-05
CHECKED TMR 3-28-05
ALL WORK DONE IN ACCORDANCE WITH THE CITY OF SEATTLE STANDARD PLANS AND SPECIFICATIONS AND OTHER DOCUMENTS CALLED FOR IN SECTION 0-02.3 OF THE PROJECT MANUAL

INITIALS AND DATE
REVIEWED:
DES. CONST. GKH
SDOT PROJ. MGR. LL
RECEIVED
REVISED AS BUILT

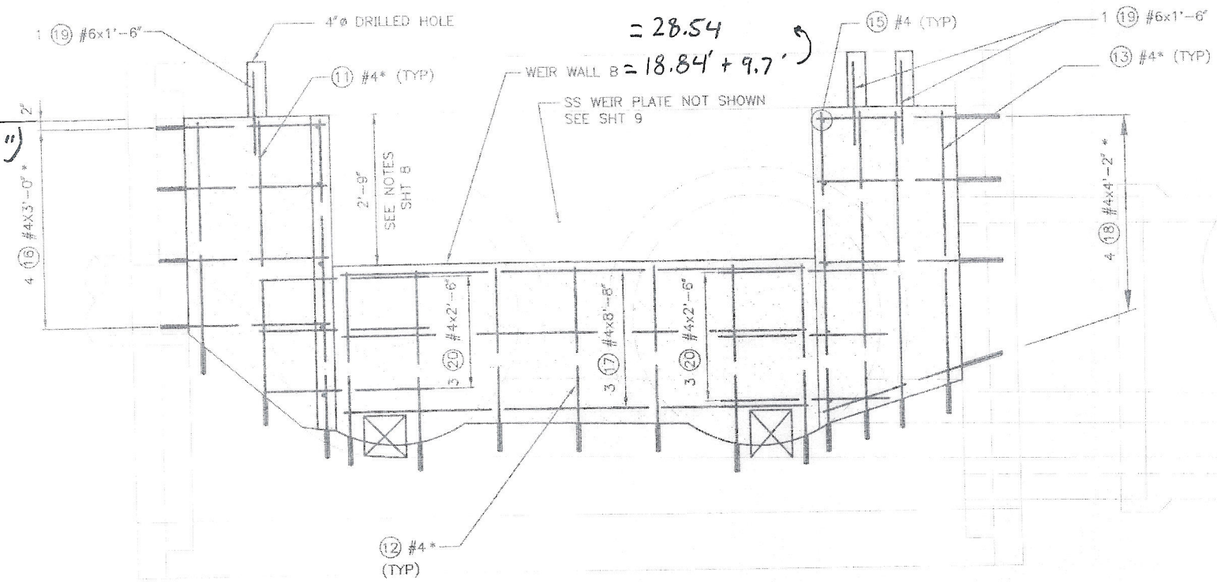
PATRICK T. MURPHY 3/23/05 STATE OF WASHINGTON 21460 REGISTERED PROFESSIONAL ENGINEER
EXPIRES 08-21-2005

Seattle Public Utilities
City of Seattle
Chuck Clarke, Director
ORDINANCE NO.
APPROVED
FUND:
SCALE: AS NOTED
INSPECTOR'S BOOK

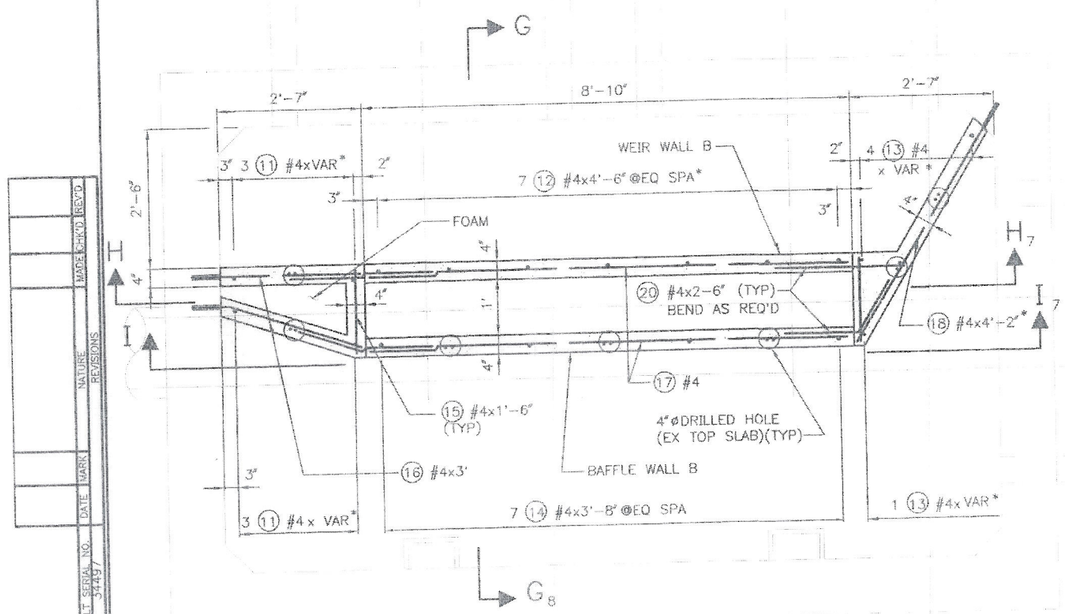
CSO REDUCTION PROGRAM 2005 RETROFIT PROJECT

JOB NO. PC C302102
R/W
CO
VAULT PLAN NO. 777-608
SHEET 5 OF 13

CHAMBER ROOF
= 28.54' + (2'-9")
= 31.29



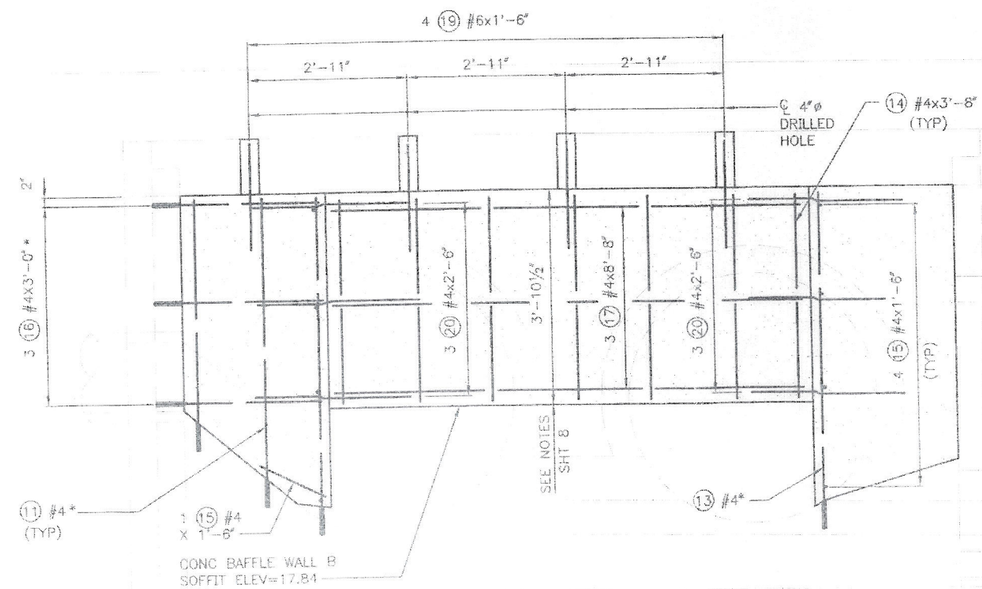
SECTION H-H – WEIR WALL B (2 / 3,5,8)
SCALE: 3/4" = 1'-0"



* EMBEDDED REBARS INTO 3/4"x4" DEEP DRILLED HOLES WITH APPROVED EPOXY BONDING AGENT

PLAN – MH #45 (TOP SLAB NOT SHOWN)
(WALL, WEIR & BAFFLE REINFORCEMENT) (1 / 3)
SCALE: 3/4" = 1'-0"
NOTE: TOP SLAB CANNOT BE REMOVED.

N



SECTION I-I – BAFFLE WALL B (3 / 3,5,8)
SCALE: 3/4" = 1'-0"

NPDES #42
MH #45 DETAILS

NO.	DATE	MARK	REVISIONS	NATURE	MADE K	CKD	REV'D

VAULT SERIAL NO. 3447

Property of City of Seattle
777-608-7

APPROVED FOR ADVERTISING
KENNETH J. NAKATSU
DEPARTMENT OF EXECUTIVE ADMINISTRATION
SEATTLE, WASHINGTON 20
BY: DIRECTOR, CONTRACTING SERVICES

NAME OR INITIALS AND DATE
DESIGNED CG
CHECKED CKB
DRAWN JCJ 3-28-05
CHECKED 3-28-05
ALL WORK DONE IN ACCORDANCE WITH THE CITY OF SEATTLE STANDARD PLANS AND SPECIFICATIONS AND OTHER DOCUMENTS CALLED FOR IN SECTION 0-02.3 OF THE PROJECT MANUAL.

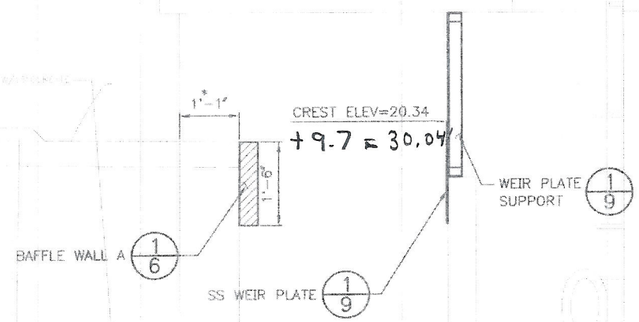
INITIALS AND DATE
REVIEWED:
DES. CONST.
SDOT PROJ. MGR.
RECEIVED
REVISED AS BUILT

CHRISTOPHER GARRISON
STATE OF WASHINGTON
22212
REGISTERED PROFESSIONAL ENGINEER
EXPIRES 05/11/06

Seattle Public Utilities
City of Seattle
Chuck Clarke, Director
ORDINANCE NO.
FUND:
SCALE: AS NOTED
APPROVED
INSPECTOR'S BOOK

CSO REDUCTION PROGRAM 2005 RETROFIT PROJECT

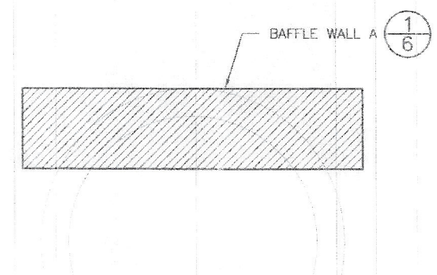
JOB NO. PC C302102
R/W
CO
VAULT PLAN NO. 777-608
SHEET 7 OF 13



MH #52 – SECTION A–A 3

SCALE: 3/4" = 1'-0"

•CONTRACTOR SHALL FIELD MEASURE



MH #52 – SECTION B–B 3

SCALE: 3/4" = 1'-0"

VAULT SERIAL NO.	DATE	MARK	NATURE REVISIONS	MADE	CHK'D	REV'D
3449						

NPDES #42
MH #52 DETAILS

Property of City of Seattle

777-608-4

APPROVED FOR ADVERTISING
KENNETH J. NAKATSU
DEPARTMENT OF EXECUTIVE ADMINISTRATION
SEATTLE, WASHINGTON 20
BY: DIRECTOR, CONTRACTING SERVICES

NAME OR INITIALS AND DATE
DESIGNED PBJ
CHECKED GKH
DRAWN JCJ 3-28-05
CHECKED TMR 3-28-05

INITIALS AND DATE
REVIEWED:
DES. CONST. AB
SDOT PROJ. MGR. LL
RECEIVED
REVISED AS BUILT

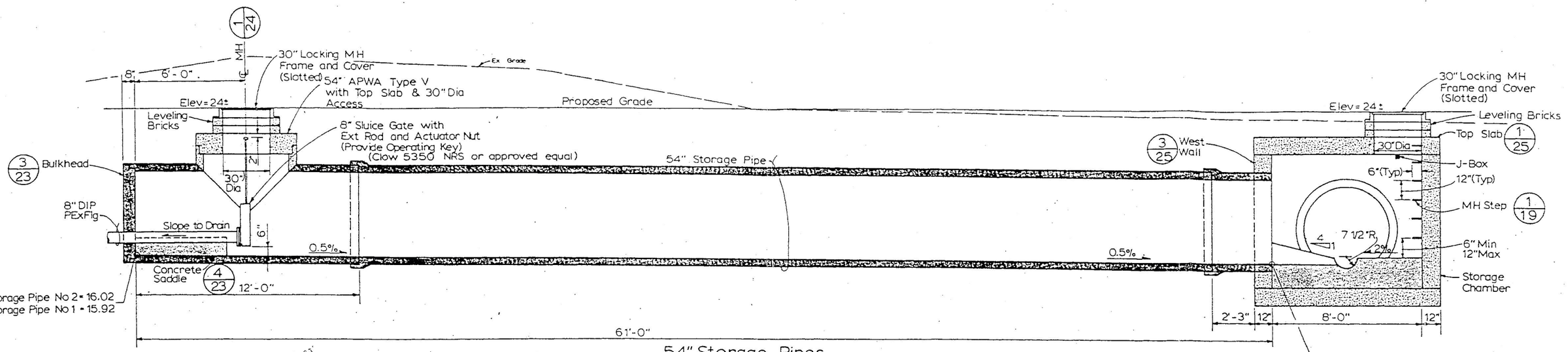
ALL WORK DONE IN ACCORDANCE WITH THE CITY OF SEATTLE STANDARD PLANS AND SPECIFICATIONS AND OTHER DOCUMENTS CALLED FOR IN SECTION 0-02.3 OF THE PROJECT MANUAL

STATE OF WASHINGTON
PATRICK T. MURPHY
27146
REGISTERED PROFESSIONAL ENGINEER
EXPIRES 08-21-2005

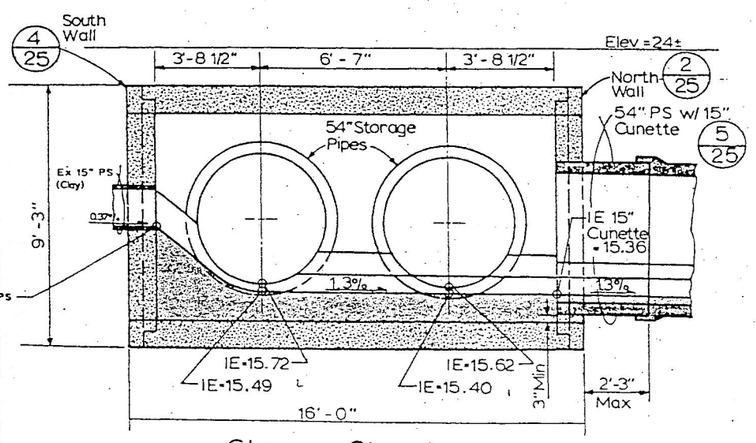
Seattle Public Utilities
City of Seattle
Chuck Clarke, Director
ORDINANCE NO.
FUND
SCALE: AS NOTED
APPROVED
INSPECTOR'S BOOK

CSO REDUCTION PROGRAM
2005 RETROFIT PROJECT

JOB NO. PC C302102
R/W
CO
VAULT PLAN NO. 777-608
SHEET 4 OF 13



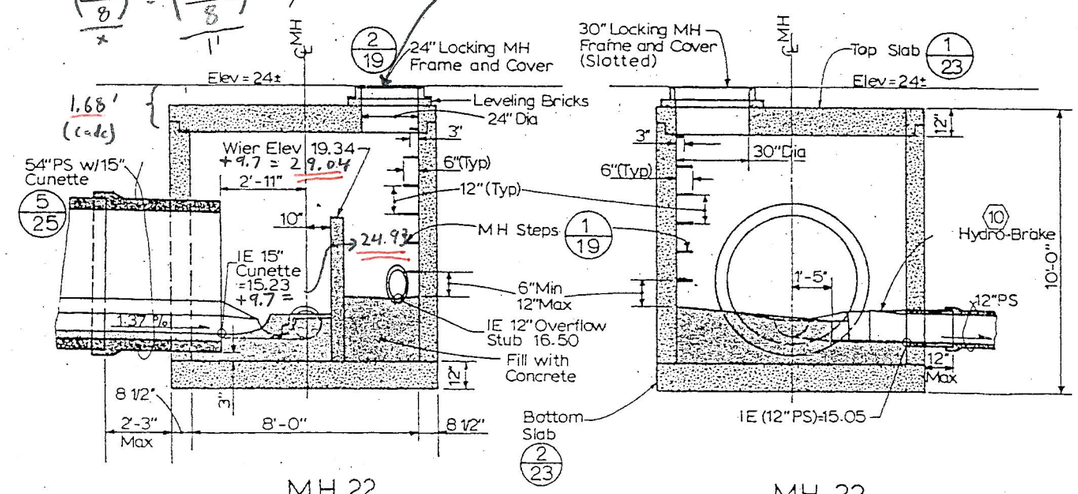
54" Storage Pipes
Section A-A13
Scale 3/8"=1'-0"
(Looking North)



Storage Chamber
Section B-B13
Scale: 3/8"=1'-0"
(Looking West)

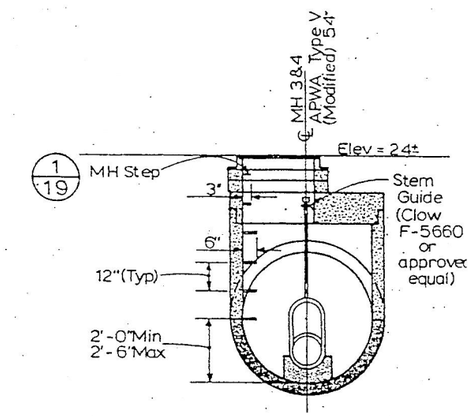
$\frac{(2.5)''}{8} = \frac{(1.49)''}{8}$; $x = 1.68'$

34.22' (SPU SURVEY)



MH 22
Section C-C13
Scale: 3/8"=1'-0"
(Looking West)

MH 22
Section D-D13
Scale: 3/8"=1'-0"
(Looking South)



MH 23 & 24
Section E-E13
Scale: 3/8"=1'-0"
(Looking West)

MH 060W-052

NOTE: Add 9.7 feet to elevations shown

BASIN 042

"AS BUILT" PER PLAN EXCEPT AS NOTED

Sewer & Electrical Details

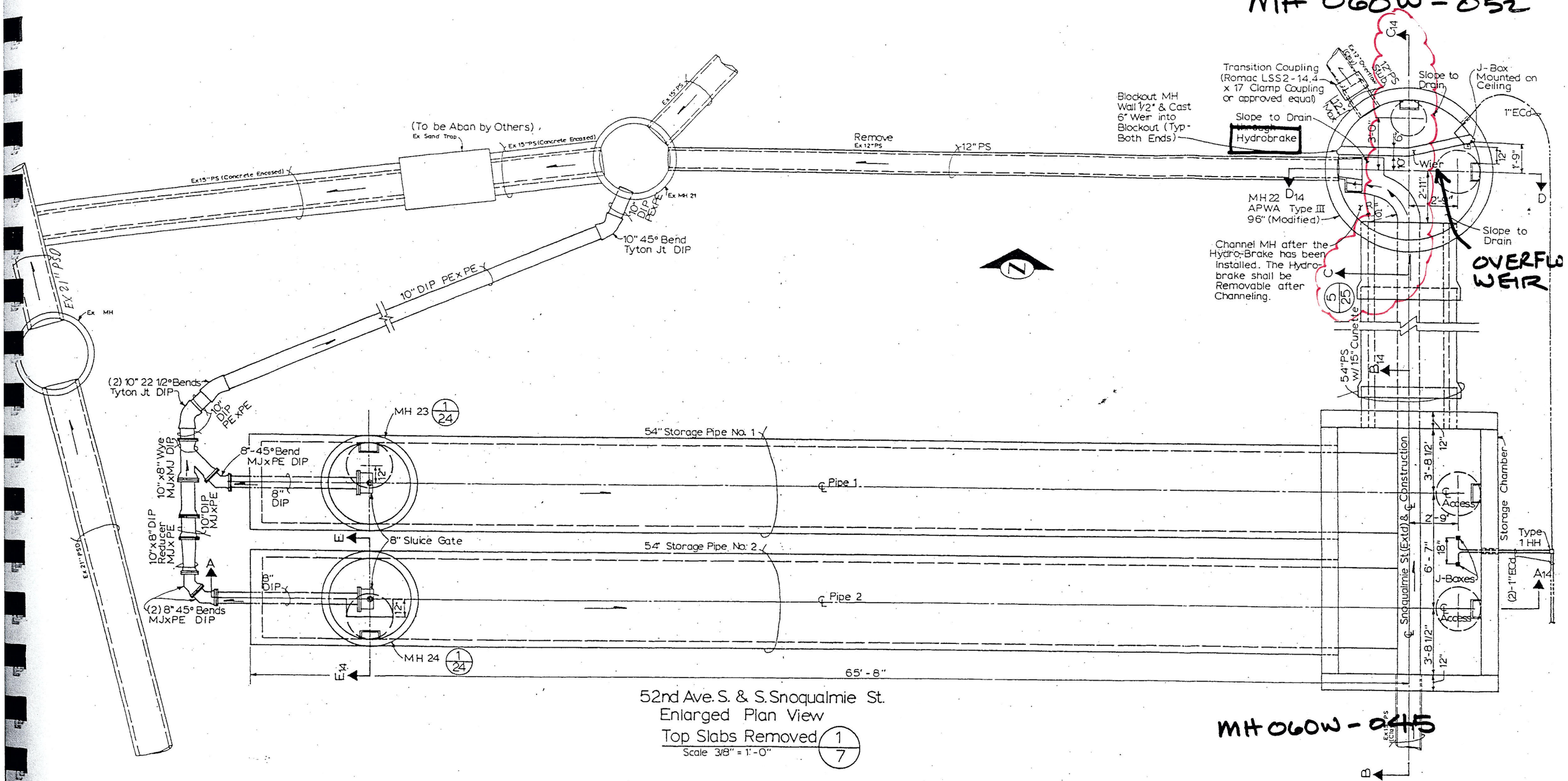
APPROVED FOR ADVERTISING BY THE BOARD OF PUBLIC WORKS SEATTLE WASHINGTON ATTEST: EXECUTIVE SECRETARY / CHAIRMAN / PROJECT NO.	NAME OR INITIALS AND DATE: DESIGNED KRF GKH; CHECKED SAH GJH; DRAWN JAW; CHECKED GLH; DESIGN REVIEW 8/7/85	INITIALS AND DATE: REVIEWED: DES; TRANS. SVC.; PROJ. MGR.; RECEIVED; REVISED AS BUILT 11-7-90	THE CITY OF SEATTLE DEPARTMENT OF ENGINEERING EUGENE V. AVERY P.E., DIRECTOR OF ENGINEERING; ORDINANCE NO. 111929; FUND; SCALE: H. V.; APPROVED; INSPECTOR'S BOOK

All work done in accordance with the City of Seattle Standard Plans and Specifications in effect on the date shown above, and supplemented by Special Provisions

Lake Washington South Beaches CSO
Seward Park / Mt. Baker CSO
Contract 1

JOB NO. PC S1311A R/W CO S1311C
VAULT PLAN NO. 777-357
SHEET 14 OF 32

MH 060W - 052



52nd Ave. S. & S. Snoqualmie St.
Enlarged Plan View
Top Slabs Removed (1/7)
Scale 3/8" = 1'-0"

NOTE: Add 9.7 feet to elevations shown

Sewer & Electrical Details

"AS BUILT" PER PLAN EXCEPT AS NOTED

APPROVED FOR ADVERTISING BY THE BOARD OF PUBLIC WORKS SEATTLE WASHINGTON	NAME OR INITIALS AND DATE	INITIALS AND DATE	THE CITY OF SEATTLE DEPARTMENT OF ENGINEERING	Lake Washington South Beaches CSO Seward Park / Mt. Baker CSO Contract 1	JOB NO.
ATTEST: EXECUTIVE SECRETARY — CHAIRMAN — PROJECT NO	DESIGNED KCW GKH; CHECKED SOU GKH; DRAWN JAW; CHECKED GKH; DESIGN REVIEW 8/7/95	REVIEWED: DES; TRANS. SVC. PROJ. MGR.; RECEIVED; REVISED AS BUILT 11-1-90	EUGENE V. AVERY P.E., DIRECTOR OF ENGINEERING; ORDINANCE NO. 111925 APPROVED; FUND; SCALE: H. V. INSPECTOR'S BOOK		PC S1311A; R/W; CO S1311C; VAULT PLAN NO. 777-357
	All work done in accordance with the City of Seattle Standard Plans and Specifications in effect on the date shown above, and supplemented by Special Provisions				

NPDES 43 (MH 060W-049)

The weir located in manhole 060W-049 overflows into NPDES 43. This flow monitor is a reverse install (it has been installed downstream of the manhole chamber). The invert of the outgoing pipe is 40.3 feet based on GIS data and 40.33 feet based on the as-built drawings. The as-built information is assumed to be a more precise value of the same measurement. According to the ADS detailed drawings, the shortest distance from the invert of the outgoing pipe to the crest of the weir is 48.88 inches, resulting in a weir crest elevation of 44.40 feet. This value differs from the as-built crest elevation of 44.7 feet by 0.30 feet, or 3.6 inches. The height calculated from the detailed drawing weir height (44.40 feet) will be used because this information is considered more accurate than the as-built data.

The chamber roof elevation was determined by scaling the distance from the manhole rim elevation to the chamber roof off of the as-built drawings. This distance (2.5 feet) was then subtracted from the SPU survey rim elevation of 54.83 feet, resulting in a chamber roof elevation of 52.33 feet.

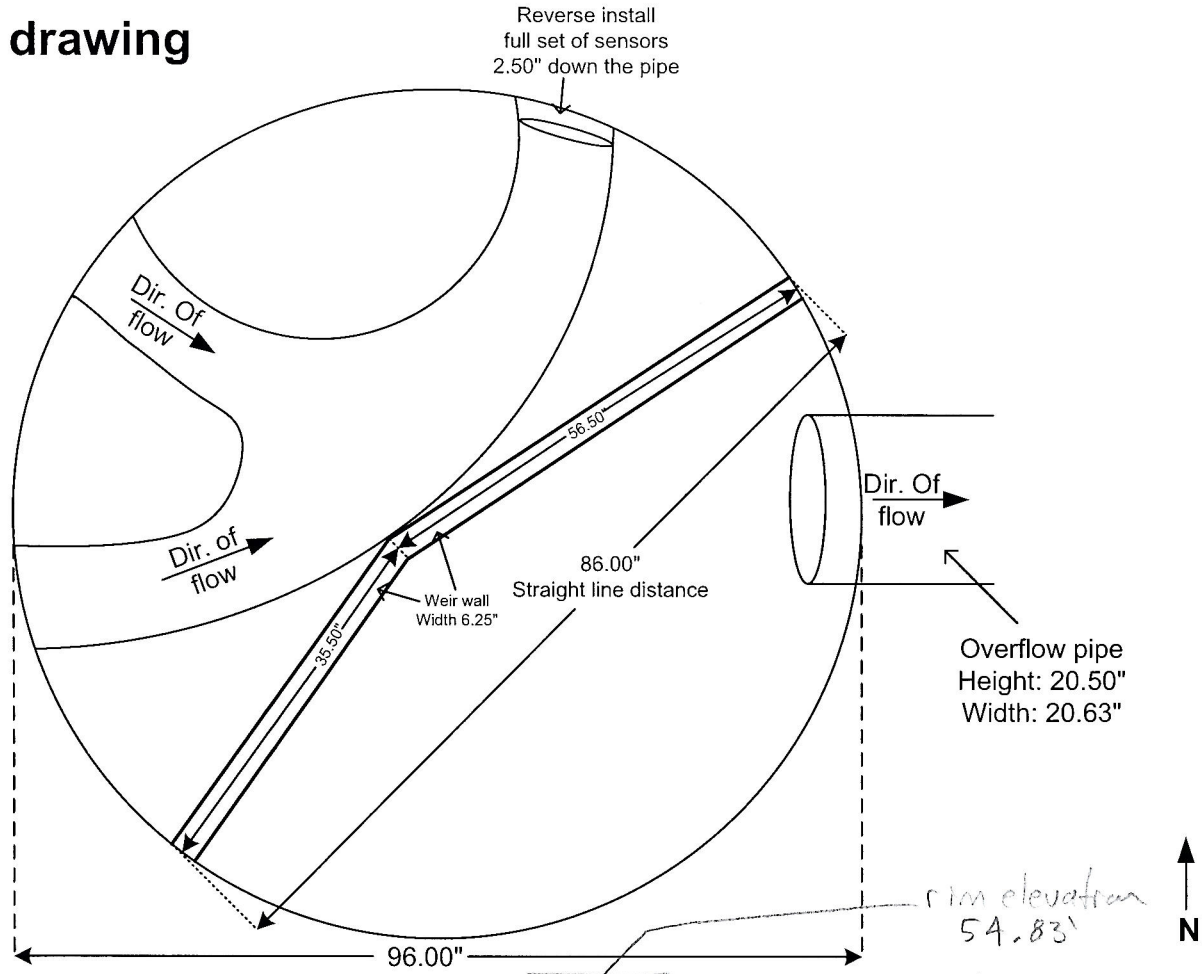
Sources: ADS Detailed Drawings

SPU GIS data

"Lake Washington South Beaches CSO, Seward Park/Mt. Baker CSO, Contract 1" MH27 (11/7/1990) As-Built

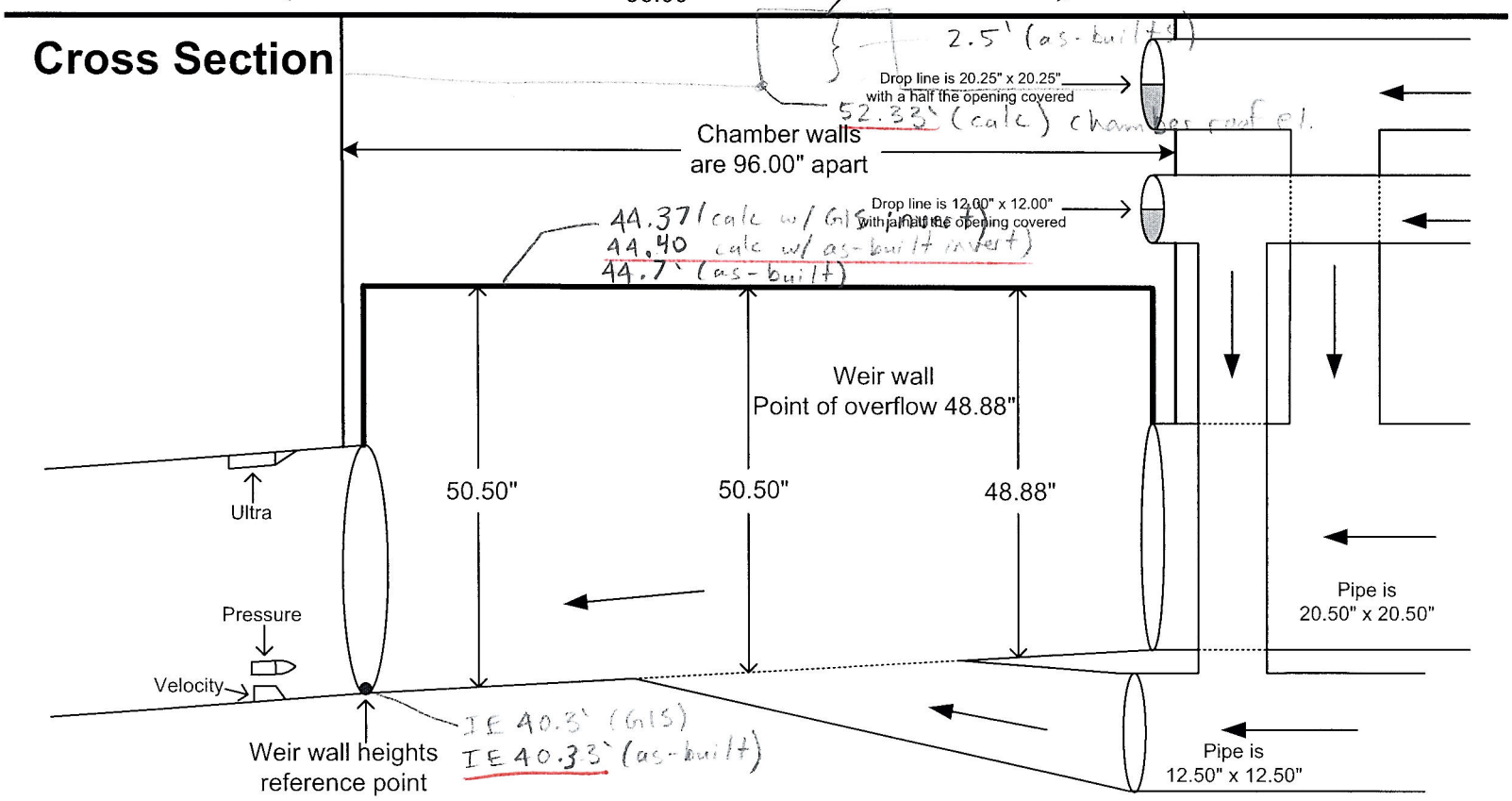
No additional information requested.

NPDES_43 MH060W049
Detailed drawing



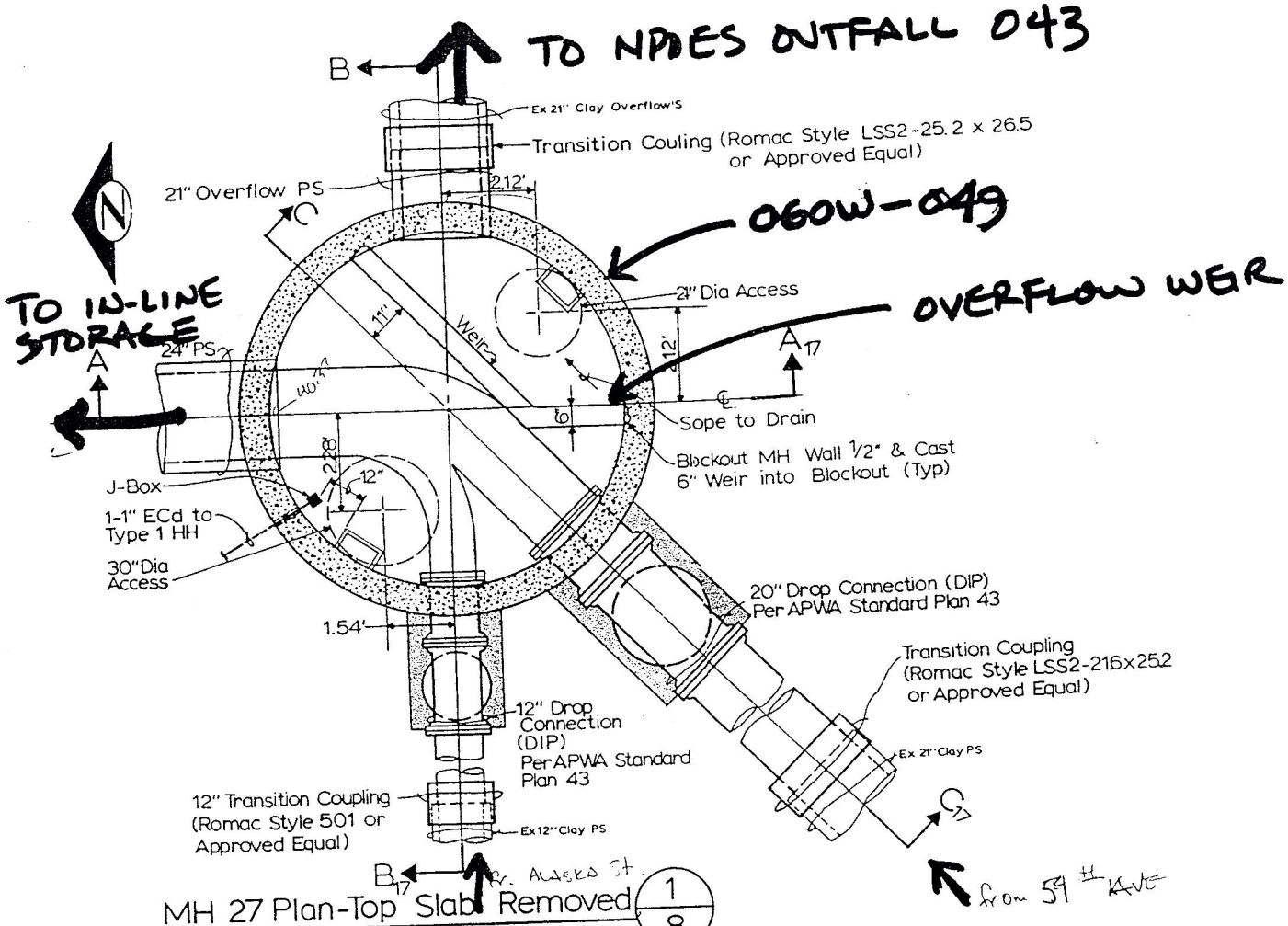
Top View

Cross Section



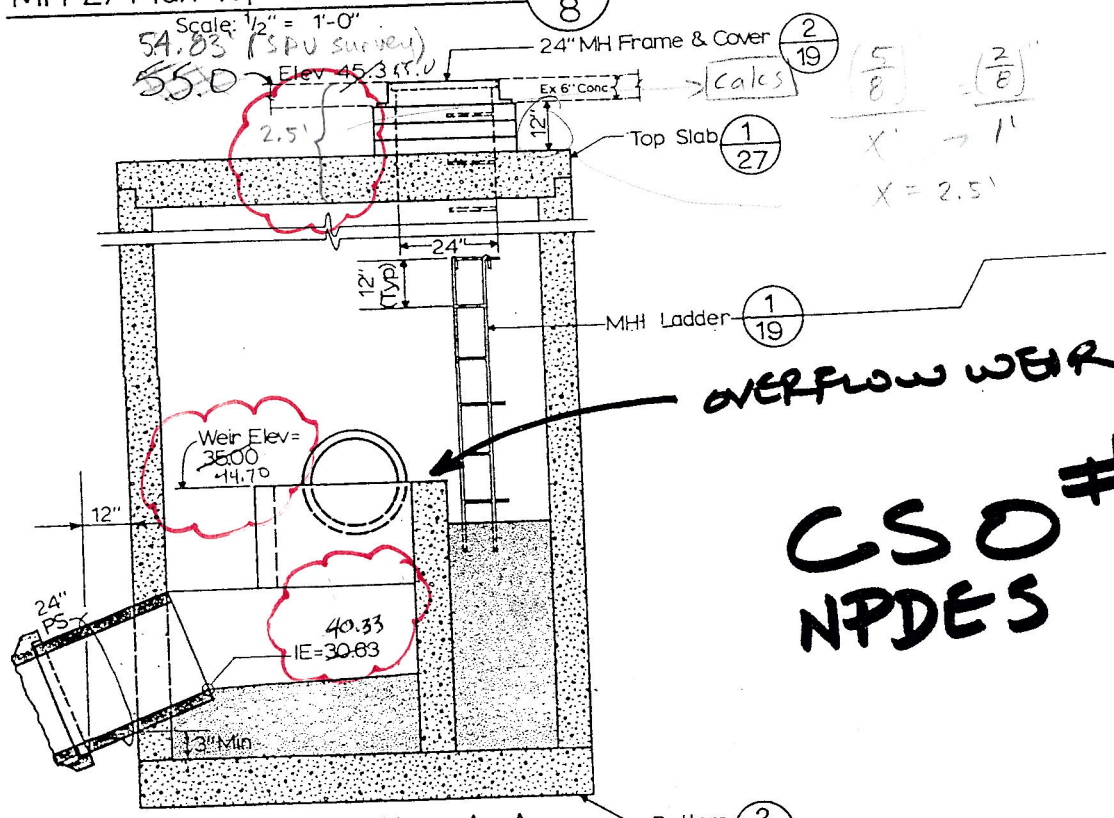
Overflow quantity is quantified with the equation: If(Dfinal - O/F<0),0,2.62 x (weir length)* (((Dfinal - O/F)/12)^3/2)))

Not to scale
Rev. 1 10/20/08



MH 27 Plan-Top Slab Removed (1/8)

Scale: 1/2" = 1'-0"



MH 27 Section A-A17

Scale: 1/2" = 1'-0"

(Looking East)

CSO #9
NPDES 43

BASIN 43 CONTROL STRUCTU

NPDES 165 (MH 067-078)

The weir located in manhole 067-078 overflows directly into NPDES 165. The weir crest elevation for the NPDES 165 outfall weir was determined from the ADS detailed drawings and recent SPU survey data. According to the recent SPU survey, the manhole rim elevation at manhole 067-078 is 26.30 feet. The ADS detailed drawing for this outfall indicates that the distance from the rim of the manhole to the chamber floor is 75 inches, resulting in a chamber floor elevation of 20.05 feet. The detailed drawing also indicates that the distance from the chamber floor to the weir crest is 20.5 inches, resulting in a weir crest elevation of 21.76 feet. The as-built weir crest elevation for this weir is not updated with the most recent changes to the weir. In September 2008, the weir was raised by approximately 10 inches.

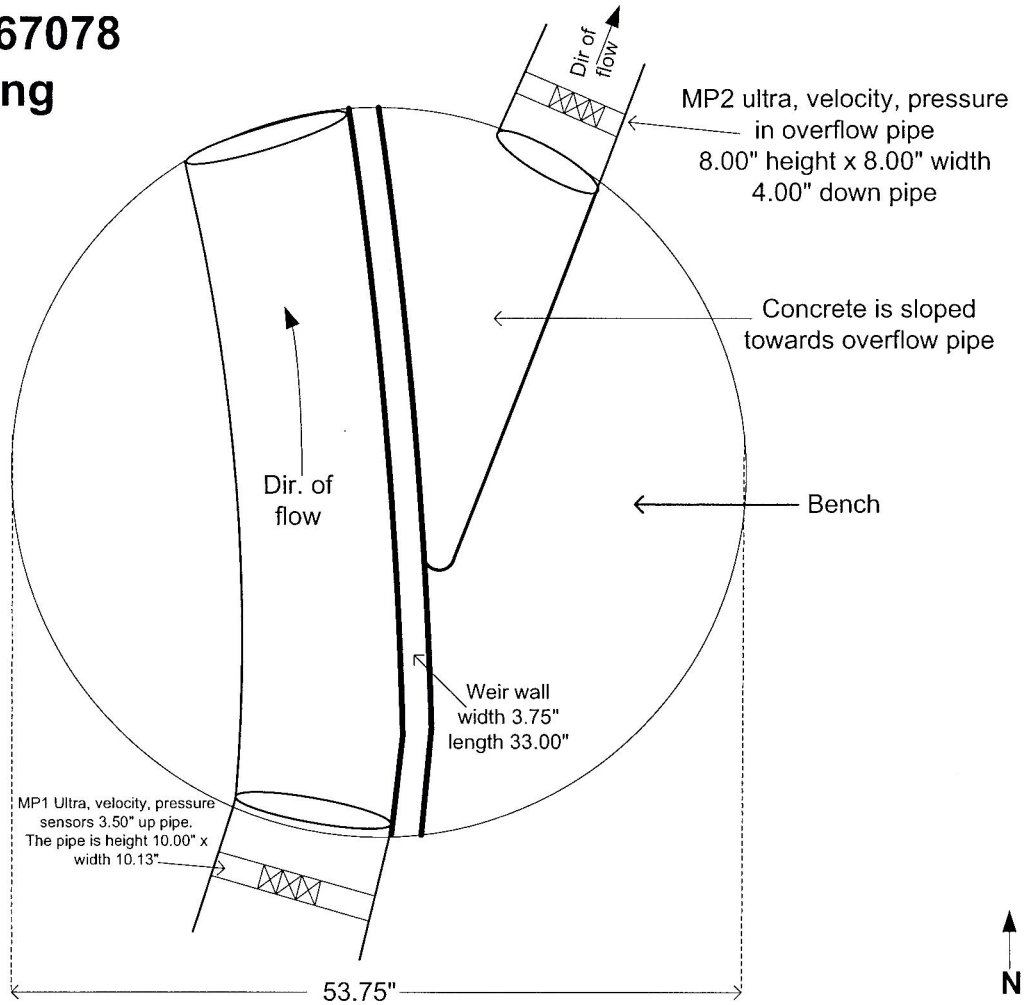
The chamber roof elevation was determined from the SPU survey data and the ADS detailed drawings. The distance from the rim of the manhole to the chamber roof is indicated as 19 inches in the ADS detailed drawings. This results in a chamber roof elevation of 24.72 feet.

Sources: SPU survey data

ADS Detailed Drawings

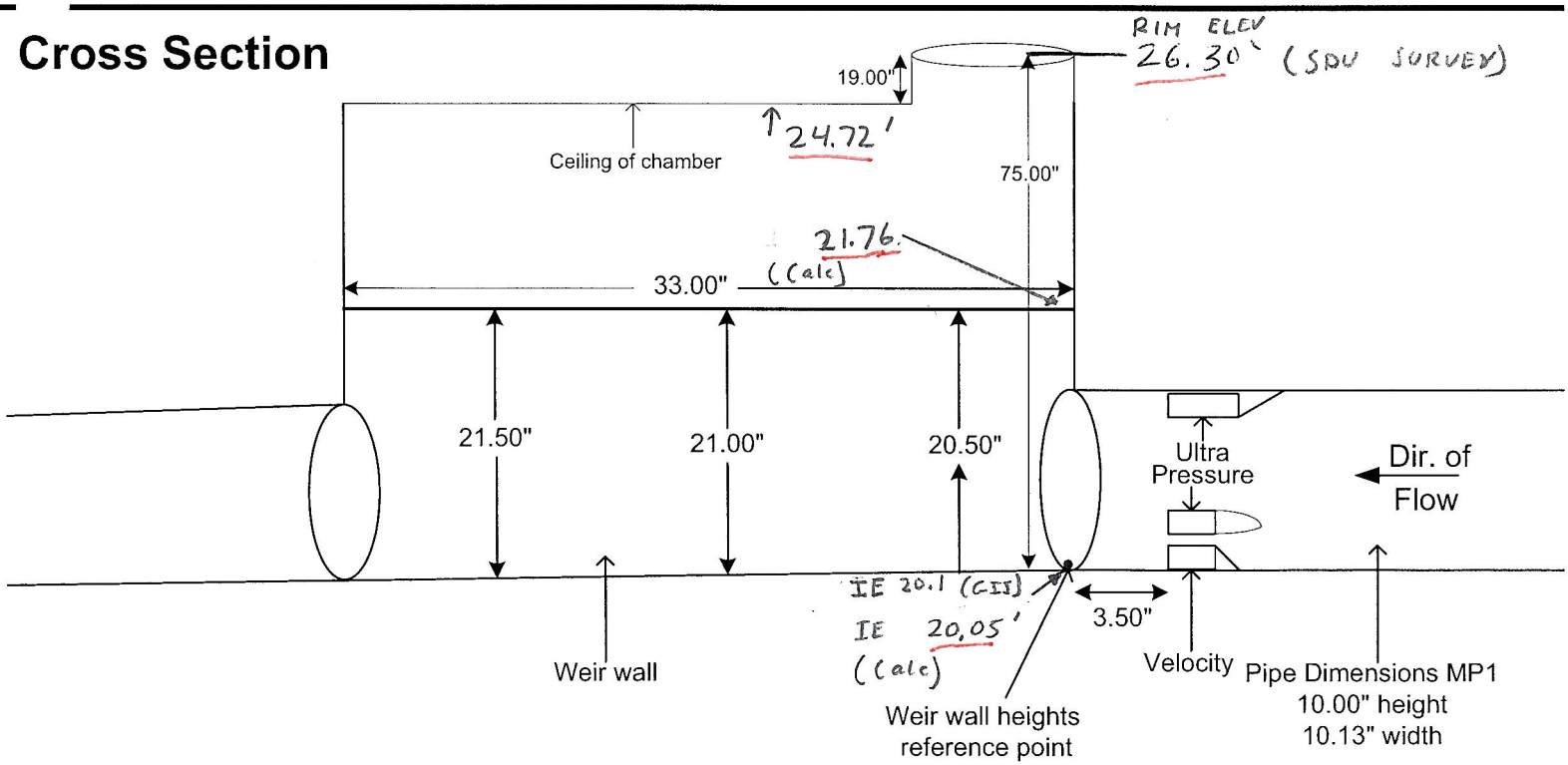
No additional information requested.

NPDES_165 MH067078
Detailed drawing



Top View

Cross Section



Point of overflow 20.50"
Overflow quantity is quantified with the equation:
If(Dfinal - O/F<0),0,2.62 x (weir length)* (((Dfinal - O/F)/12)^3/2)))

Not to scale
Rev. 1 10/16/08

GEN38_059-498A

The weir located in manhole 059-498 is a bypass weir for the hydrobrake located in the same structure. The SPU survey indicates that the rim elevation of this manhole is 30.37 feet. The distance from the rim to the weir crest is indicated in the ADS detailed drawing as 27.13 inches, resulting in a weir crest elevation of 26.74 feet. As-built drawings show the weir crest elevation as 26.7 feet. The more precise value calculated from the SPU Survey (26.7 feet) will be used.

The as-built invert elevation of the incoming pipe (assumed to be the point of reference for the ADS sensors) is 22.4 feet. The ADS detailed drawings show the distance from the invert of the incoming pipe to the roof of the rim elevation to be 100.38 inches. Using the ADS drawing and the SPU survey of the rim elevation (30.37 feet) as a reference point results in an invert elevation of 22.00 feet, a difference of 0.4 feet or 5 inches. The ADS detailed drawing is assumed to be more accurate than the as-built drawings, so an invert elevation of 22.00 feet will be used.

The ADS detailed drawing indicates that the chamber roof is located 20 inches below the rim of the manhole, resulting in a chamber roof elevation of 28.7 feet.

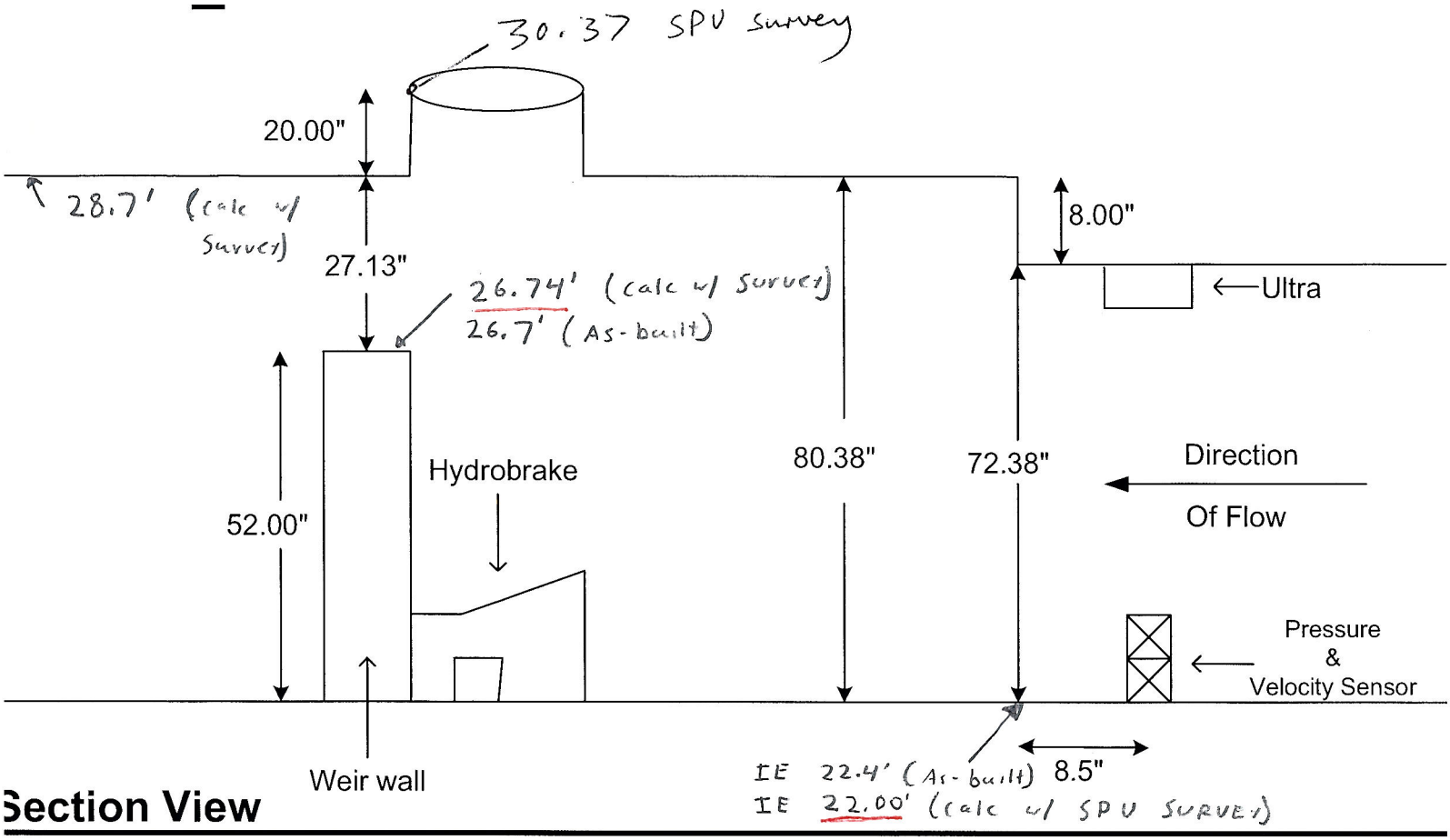
Source: SPU survey data

ADS Detailed Drawings

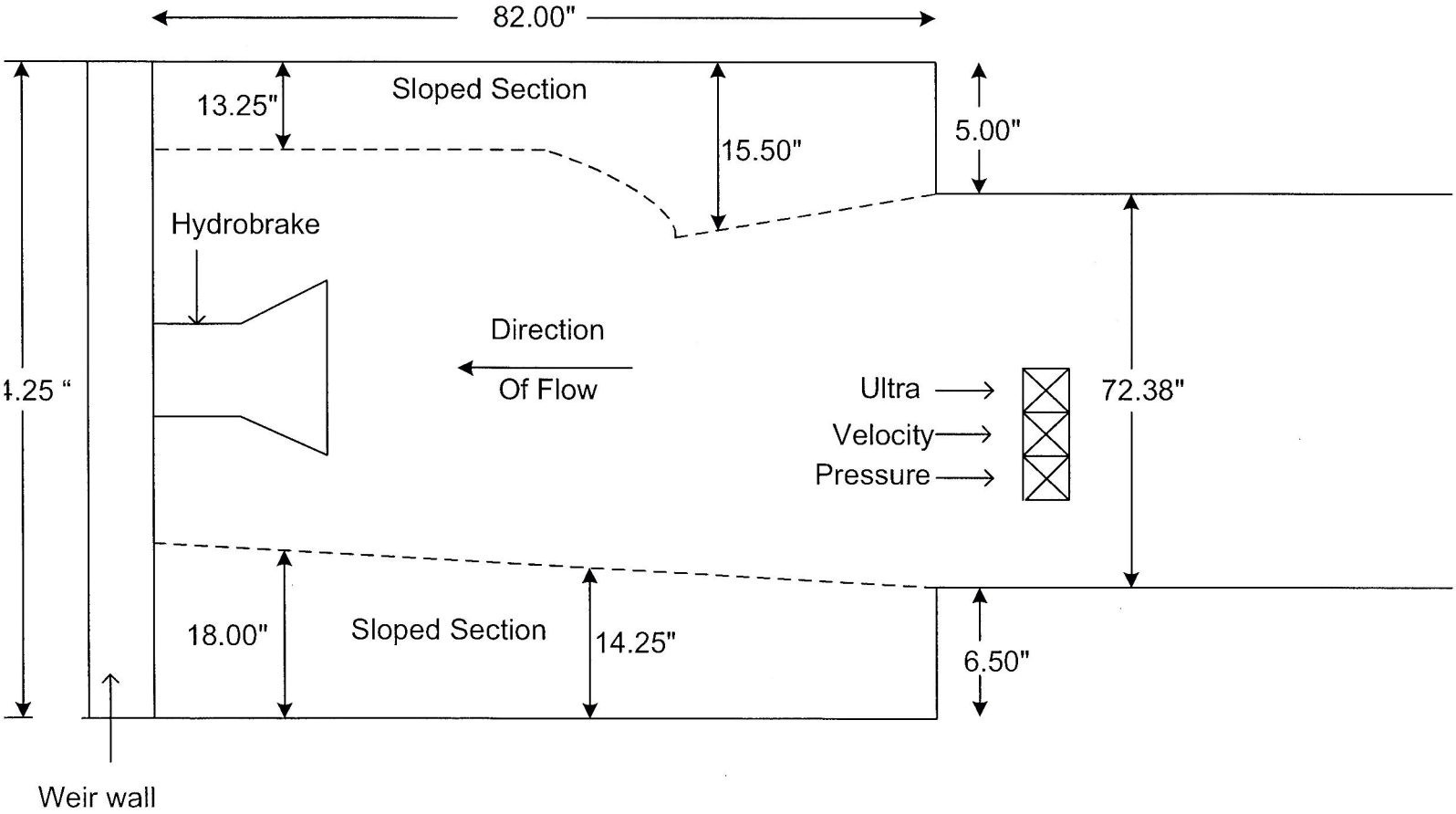
"Lake Washington South Beaches CSO, Seward Park/Mt. Baker CSO, Contract 2, Sheet 37 of 44, (11/7/1990) As-Built

No additional information requested.

GEN38_059498A



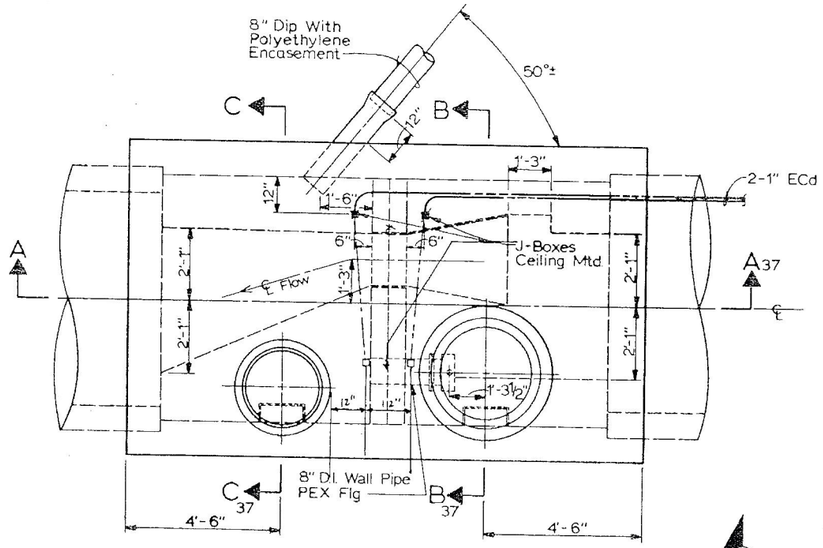
Section View



Top View

Not to Scale

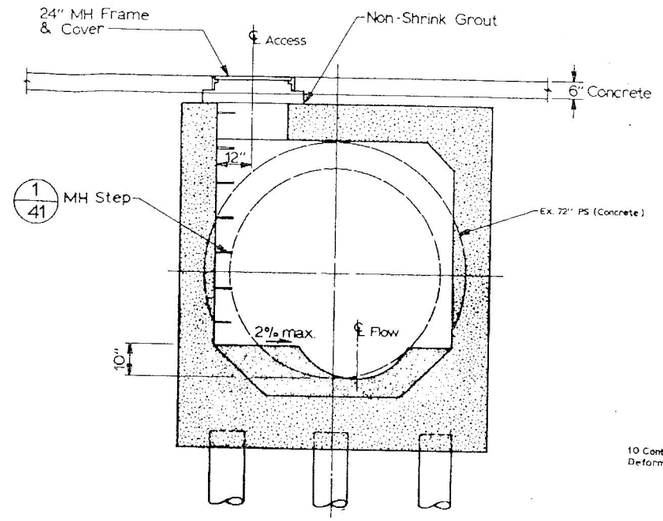
GEN 38_059-496A



Plan - Flow Control Chamber (1/35)

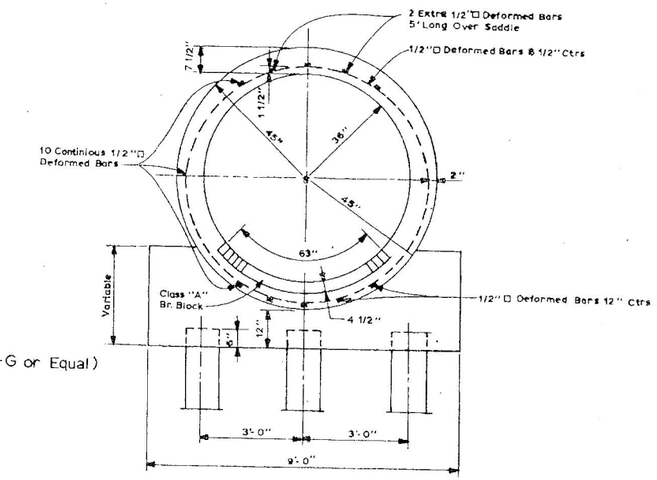
Scale: 1/2" = 1'-0"

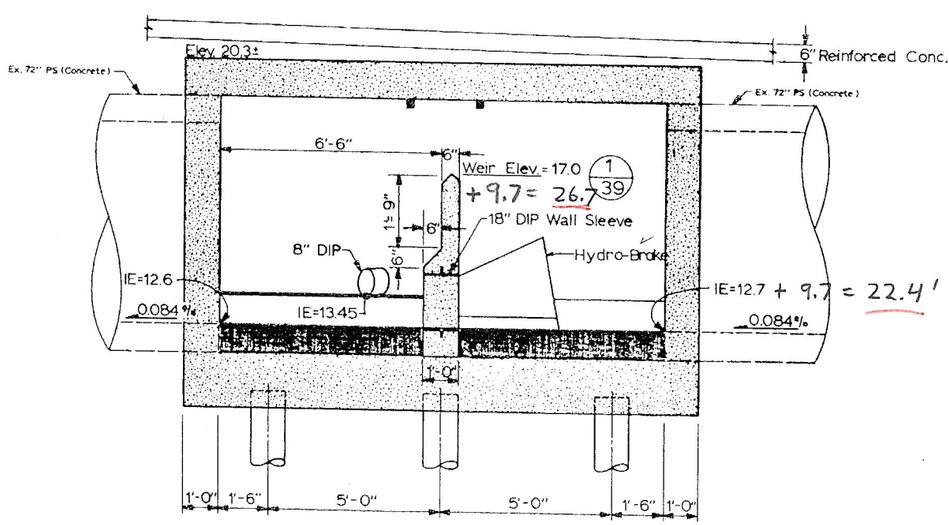
(For Structural Detail, See Sheet 38)



Section C-C 37

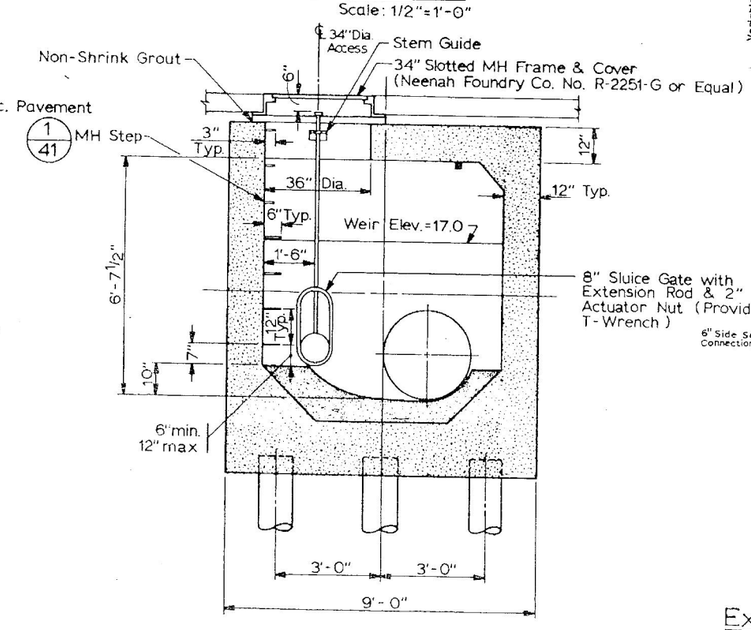
Scale: 1/2" = 1'-0"





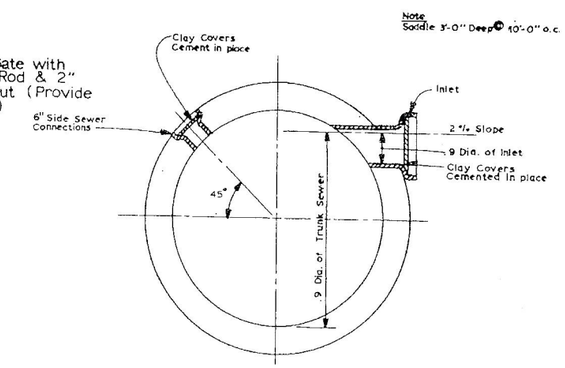
Section A-A 37

Scale: 1/2" = 1'-0"



Section B-B 37

Scale: 1/2" = 1'-0"



Existing 72" Sewer For Reference

Scale: 1/2" = 1'-0"

Sewer Details

APPROVED FOR ADVERTISING BY THE BOARD OF PUBLIC WORKS SEATTLE WASHINGTON Okay 19 76 ATTEST: EXECUTIVE SECRETARY / CHAIRMAN / PROJECT NO	NAME OR INITIALS AND DATE: DESIGNED, CHECKED, DRAWN LCW & CO, CHECKED, DESIGN REVIEW 9/1/76	INITIALS AND DATE: REVIEWED DES, TRANS SVC, CONST, PROJ MGR, RECEIVED, REVISED AS BUILT	THE CITY OF SEATTLE DEPARTMENT OF ENGINEERING DIRECTOR OF ENGINEERING. ORDINANCE NO. 112600 APPROVED. FUND. SCALE: H. V. INSPECTOR'S BOOK

All work done in accordance with the City of Seattle Standard Plans and Specifications in effect on the date shown above, and supplemented by Special Provisions

Lake Washington South Beaches CSO
Seward Park / Mt. Baker CSO
Contract 2

JOB NO. PC S1312A, R/W, CO S1312C

VAULT PLAN NO. 777-378

SHEET 37 OF 44

VAULT SERIAL NO.	DATE	MARK	NATURE REVISIONS	MADE/CHK (REV.)
3116				

Property of City of Seattle 777-378-37

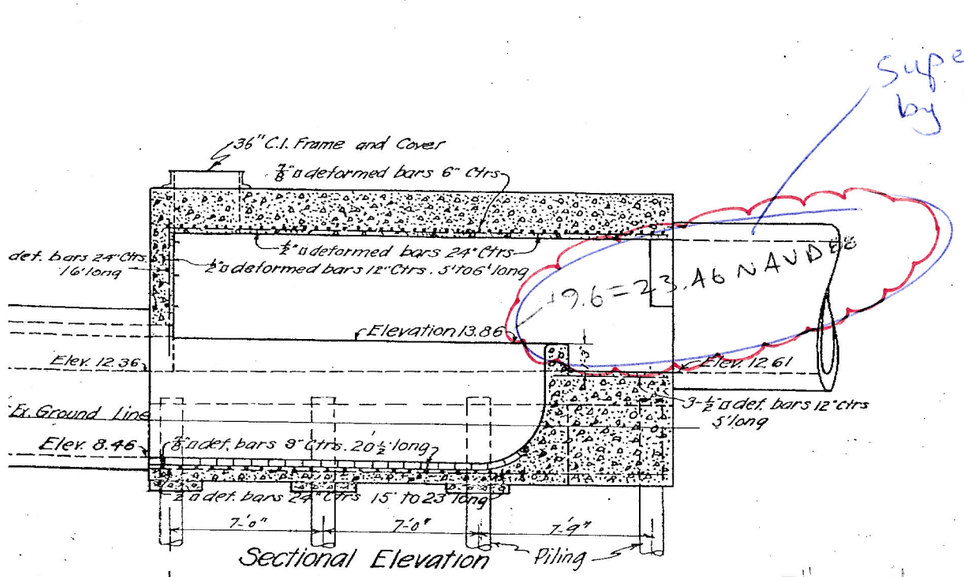
GEN38_059-451 (Horseshoe weir)

The horseshoe weir located in manhole 059-451 overflows into Structure A, which is part of NPDES 38. The weir crest elevation for this weir was determined from an SPU survey conducted in 2008. The survey indicates that the lowest point of the weir crest is located at an elevation of 23.19 feet. As-built drawings from 1923 indicate that the weir crest elevation is 23.56 feet, while drawings from 1973 indicate that the weir crest elevation is 23.12 feet. The SPU surveyed weir crest elevation will be used.

The chamber roof elevation was determined from both the SPU survey and the as-built drawings from 1923. The distance from the weir crest to the chamber roof at the northern-most section is 4.65 feet. The weir crest elevation at this location is 23.24 feet (it differs from the weir crest elevation selected above because the weir is not level). This results in a chamber roof elevation of 27.89 feet.

Sources: As-built drawings, "Lakewood . . . Oregon . . . Local Improvements" [Incomplete title block on copy] (June 28, 1923)

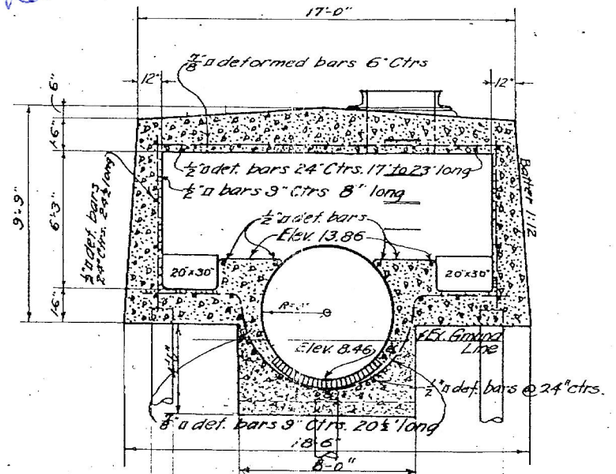
"Modernization Rainier Ave Pumping Station – Discharge Structure Miscellaneous Modifications" Sheet 11 of 62 (April, 1973) As-Builts



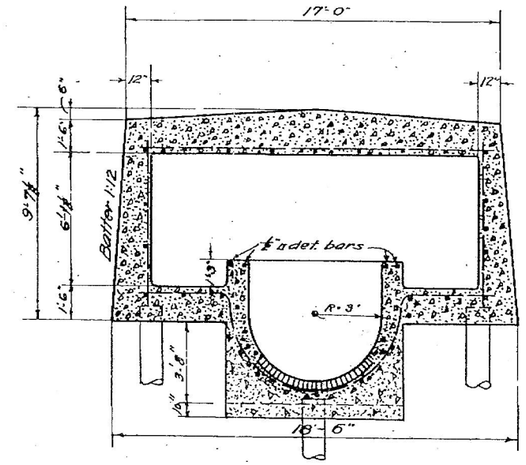
Sectional Elevation

Superceded by newer as-built

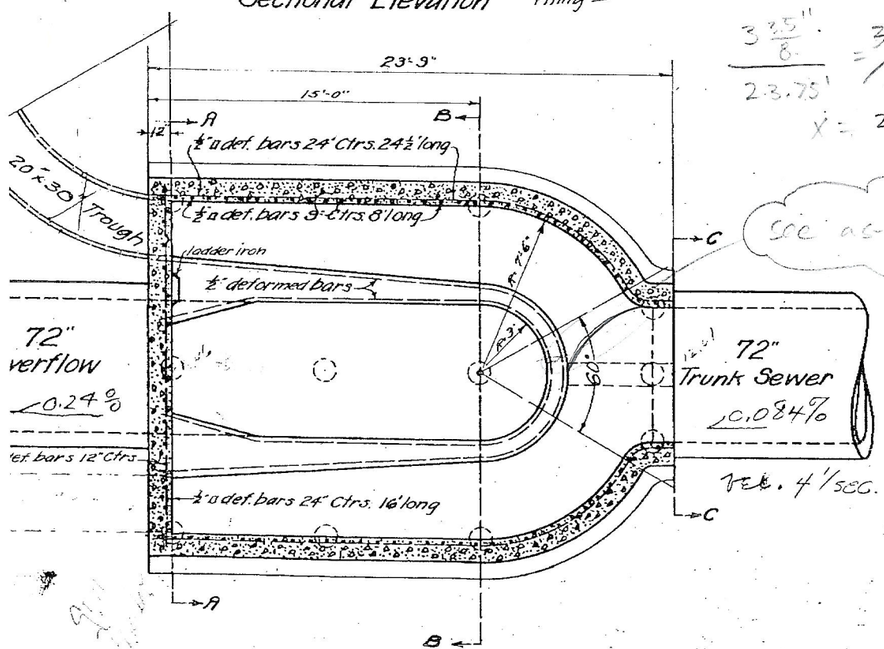
19.6 = 23.46 NAVD 88



Section AA



Section B-B

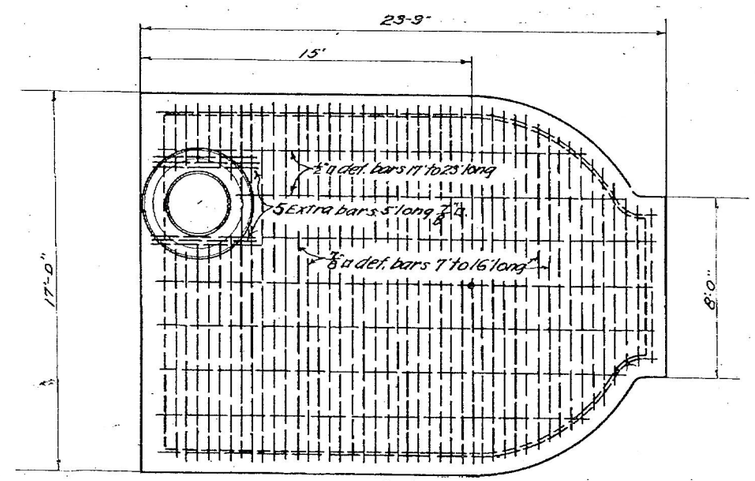


Plan

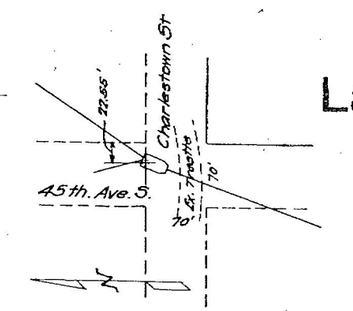
$\frac{3\frac{25}{8}'}{23.75'} = \frac{3'}{x}$

x = 20.7 ft

See as-built's 4/73



Plan of Top



Sketch Showing Location

SEE SHEET SHOWING 1962 REPAIR TO JUNCTION STRUCTURE AT OREGON ST. & TRUNK NORTH

Approximate Si
Concrete
Invert Brick
Reinforcing St
Ladder Steel
M.H. Cover and F

Impro

Lakewood

Oregon S

Resolut

Ordinance No. 46751

Local Improveme

14 Sheets

Ma

Scale: 1/4" = 1'-0"

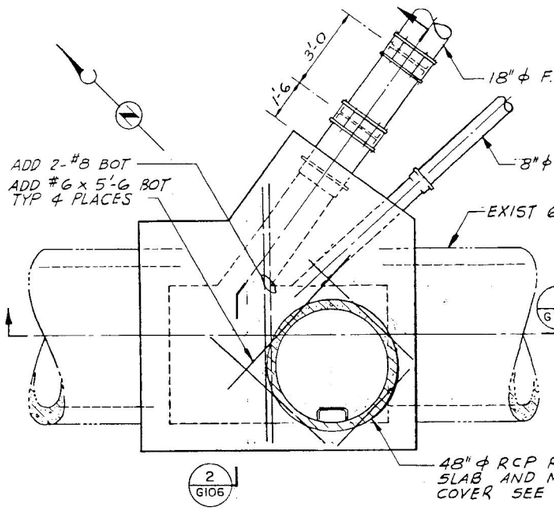
Made by C.L. Young 6-23-73
Traced by " 5 "
Checked by

Approved by the B
Seattle, Was

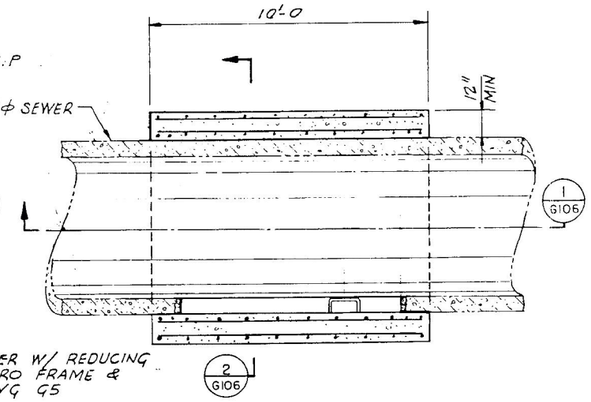
Attest: G. F. Bagley
Secretary

SEWER PLA

— 18263 —



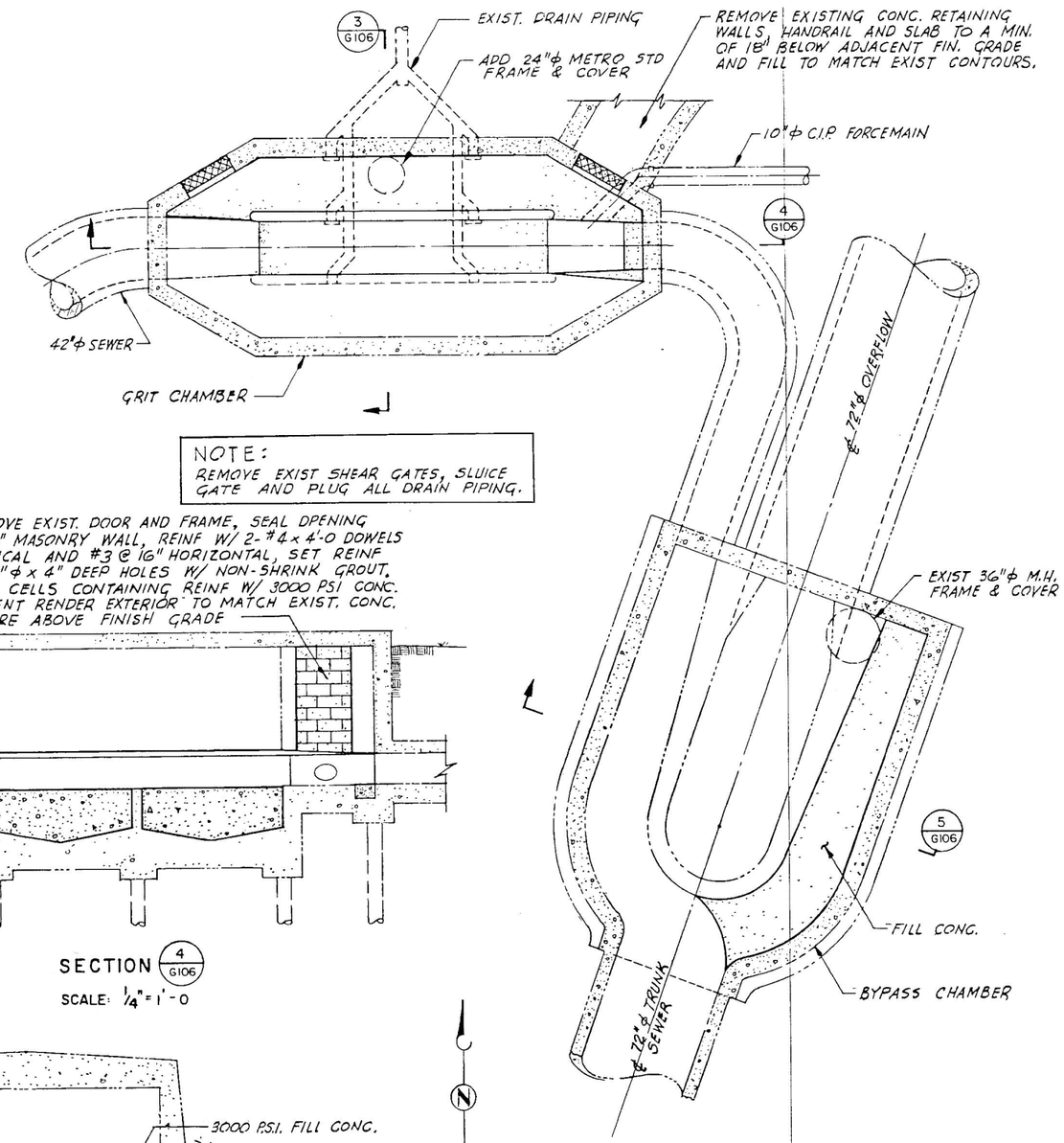
TOP PLAN



BOTTOM PLAN

DISCHARGE STRUCTURE

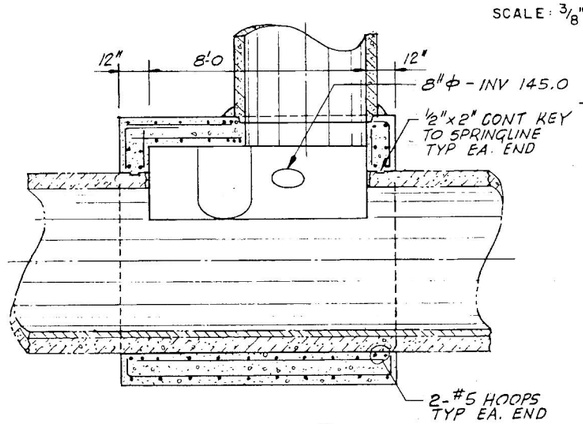
SCALE: 3/8" = 1'-0



NOTE:
REMOVE EXIST SHEAR GATES, SLUICE GATE AND PLUG ALL DRAIN PIPING.

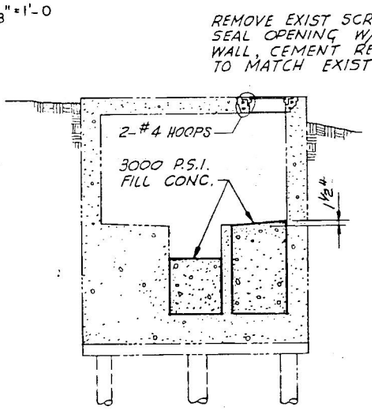
EXISTING BYPASS AND GRIT CHAMBER - MODIFICATIONS

SCALE: 1/4" = 1'-0



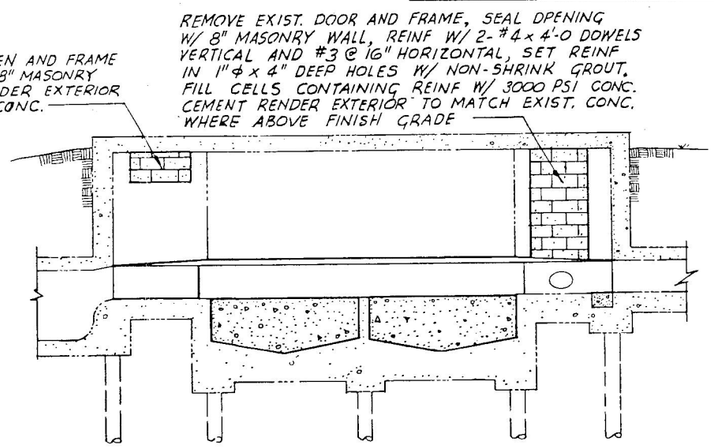
SECTION 1 / G106

SCALE: 3/8" = 1'-0



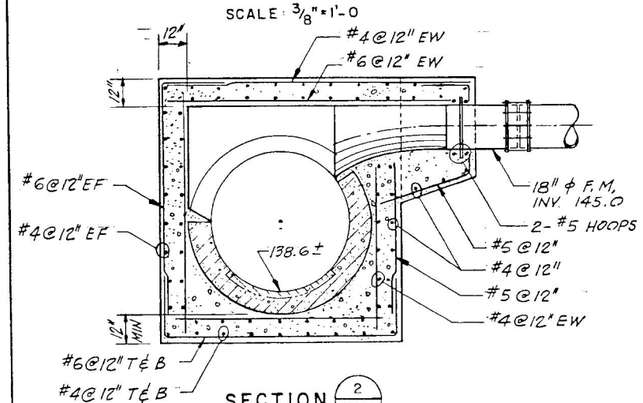
SECTION 3 / G106

SCALE: 1/4" = 1'-0



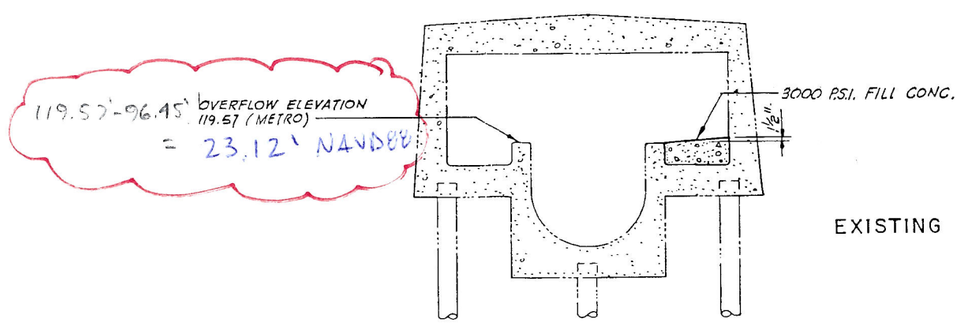
SECTION 4 / G106

SCALE: 1/4" = 1'-0



SECTION 2 / G106

SCALE: 3/8" = 1'-0



SECTION 5 / G106

SCALE: 1/4" = 1'-0

AS CONSTRUCTED
DATE APRIL, 1973

101490

MARTIN C. DIRKS — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER

ROGER F. WILCOX — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER

DESIGNED WTJ DRAWN WG CHECKED MCD	METROPOLITAN ENGINEERS BROWN AND CALDWELL — CAREY AND KRAMER HILL AND INGMAN — R.W. BECK AND ASSOCIATES	MUNICIPALITY OF METROPOLITAN SEATTLE SUBMITTED Design Engineer - Metropolitan Engineers RECOMMENDED Project Engineer - Metropolitan Engineers APPROVED Chief Engineer - Metropolitan Engineers APPROVED For Metropolitan Engineers APPROVED For Municipality of Metropolitan Seattle	SCALE AS NOTED DATE APR 1971	FILE M 228 J	WEST POINT SYSTEM	MODERNIZATION, RAINIER AVE. PUMPING STATION DISCHARGE STRUCTURE MISCELLANEOUS MODIFICATIONS	DRAWING NUMBER G 106 SHEET NUMBER 11 OF 62

Appendix L: ADS Finalized Flow Monitoring Data: January 2008 through May 2009 (CD)