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October 30, 2009

Mr. Joseph F. LeMay, P.E.
Regional Project Manager
US Environmental Protection Agency, Region 1
Office of Site Remediation and Restoration
MA Superfund Section
One Congress Street, Suite 1100, (HBO)
Boston, MA 02114-2023

Subject: Industri-plex Operable Unit 2 Superfund Site
Woburn, Massachusetts
Quarterly Storm Flow Surface Water Monitoring Report

Dear Mr. LeMay:

Pursuant to Paragraph 34 of the Consent Decree (CD)(Civil Action No.1:08-cv-10325) and Section V.A.5 of the Remedial Design / Remedial Action (RD/RA) Statement of Work (SOW) for the above referenced site, enclosed please find the Quarterly Storm Flow Surface Water Monitoring Report No. 1.

This report covers the period from June 1, 2009 to August 31, 2009, and is submitted on behalf of the Settling Defendants.

Please contact me if you have any questions.

Sincerely,

Bruce Thompson
Project Coordinator

Enclosure

cc: Jen McWeeney - MassDEP
Settling Defendants
Larry McTiernan – Roux Associates

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Quarterly Storm Flow Surface Water Monitoring Report No. 2
(June-August 2009)

Industri-plex Superfund Site
Operable Unit 2
Woburn, Massachusetts

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Disclaimer: This document is a DRAFT document prepared by the Settling Defendants under a government Consent Decree. This document has not undergone formal review by the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP). The opinions, findings, and conclusions expressed are those of the author and not those of the EPA or the MassDEP.

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In accordance with the Surface Water Monitoring Plan (SWMP), this quarterly Storm Flow Surface Water Monitoring Report has been prepared to summarize the sampling activities performed and the data developed for selected storms occurring during the reporting period (June 1 through August 31, 2009) and to provide a brief discussion of the data. Sampling locations are shown in **Figures 1 and 2**.

Storm Sampling and Related Activities Occurring During the Reporting Period

Storm sampling was conducted for four storm events occurring during the reporting period:

Date(s)	Total Precipitation (inches)[1]
June 18-19, 2009	0.93"- 1.12"
July 1-2, 2009	1.39"- 1.80"
July 7-8, 2009	2.32"- 2.81"
July 23-24, 2009	2.23"- 3.06"

Sampling for each of the storms was conducted in substantial accordance with the SWMP and included automated collection of aliquots over the duration of the storm. Aliquots were inspected after the end of the storm and composited in equal volumes into a single "storm sample" for each station. Grab samples for benzene analysis were collected manually as soon as possible following the onset of the storm, and measurement of surface water and groundwater elevations using staff gauges and piezometers, respectively, were made when safe to do so. Station-specific storm statistics, including "indicator" flows,[2] flow-pacing intervals, the number of aliquots expected at sample termination based on the flow pacing interval used, the total number of sample aliquots collected, and the number of aliquots "successfully" collected,[3] are shown for each storm in **Tables 1a through 1d**. The flows given in Table 1a through 1d are based on rating curves developed by TTNUS during the Multiple Source Groundwater Response Plan

[1] Range indicated is the range in precipitation totals for the entire storm event recorded by the rain gauges at the four stations proximal to the HBHA Pond (SW-01-TT, SW-2-IP, SW-3-IP, and SW-02-TT).

[2] Indicator flows include pre-storm baseflow, peak flow, and estimates of the end of the storm, which is defined either as flow at 2x baseflow or flow at 50% or 75% of the difference between peak flow and baseflow on the falling limb depending on storm (see Tables 1a through 1d).

[3] "Successful collection" of an aliquot is defined in Section 3.1 of the SWMP QAPP.

(MSGRP). As described later, new rating curves are being developed which may change flow estimates. Charts showing the rainfall, and surface water velocity, level, and flow (i.e., hydrographs)[4] recorded at each station during the four storms sampled during the reporting period are provided in **Appendix A**. In each hydrograph, the points in time at which sample aliquots were collected are indicated by small triangles.[5]

Samples were collected on four different occasions during the reporting period in an effort to refine the sampling approaches and procedures, and optimize sampling success. For example, flow pacing intervals selected for the first storm yielded fewer sample aliquots than desired at several stations. Therefore, for subsequent storms, adjustments were made to the flow pacing intervals at these stations.

Modifications to SWMP Protocols during Reporting Period

Pre-storm preparation was also modified and expanded. Refinements in equipment preparation with successive storms were made to reduce malfunctions in the sampling programs. The "Storm Narratives" included with the storm charts in **Appendix A** list problems associated with equipment malfunctions. In addition, the following modifications to the SWMP were made during the reporting period:

1. Prior to commencement of full-scale storm sampling, a field test determined that the use of the Isco Pro-Pak bags specified in the SWMP typically results in a lower percentage of containers filled with target volumes as compared to standard Isco polyethylene bottles, especially when the Isco units are activated following several weeks of stand-by deployment. Early trials with the Pro-Pak bags had indicated that, despite precautions taken to ensure that the bags were properly installed (i.e., properly seated within their holders and with mouths completely opened), unavoidable disturbance of the Pro-Pak bags and holders during weekly O&M activities resulted in some spillage during subsequent automated sampling and, thus, collection of aliquot volumes that

[4] See Footnote No. 2 with regard to calculated flows.

[5] Not all of the points shown are necessarily aliquots included in the composite storm samples. Due to software limitations, in some cases grab samples, samples collected during pump-head tubing calibration, and/or samples otherwise not included as part of the composite are shown. In addition, in some instances, not all of the samples included in the composite storm samples are indicated on the hydrograph due to equipment failure or loss of data; such instances are identified in Appendix A.

were smaller than desired. Accordingly, all Pro-Pak bags were removed and replaced with Isco polyethylene bottles, and the bottles were used following soap and water decontamination after each event for all subsequent storm sampling.

2. Consistent with the approach used by TTNUS during the RI/FS, sampling at Station SW-03-TT was triggered manually for all storms during the reporting period, rather than automatically (i.e., based on precipitation and stage increase) as prescribed in the SWMP. In addition, sampling at monitoring stations SW-2-IP and SW-3-IP was triggered based only on precipitation of 0.1 inches of rain over one hour since these are new stations for which station-specific stage increase triggers have not yet been developed.

3. Due to the unpredictable nature and brevity of some of the storms (e.g., summer thunderstorms), not all grab samples for benzene analysis could be collected during the rising limb of the storm hydrograph. Field teams were mobilized to the site shortly after the onset of precipitation for these events, but the rising limb of the storm hydrograph sometimes ended (i.e., flow had crested) before all of the benzene grab samples could be collected.

4. Based on the results of the first two storms, the decision was made to terminate storm sampling after flow had reached levels between 50% and 75% down the falling limb (i.e., after flow had peaked and then decreased by at leat 50% but no more than 75% of the "delta" between pre-storm baseflow and peak flow), rather than after decreasing to two times baseflow as prescribed in the SWMP. This approach is consistent with that described on page 2-20 of TTNUS's Draft Evaluation of Flow, Suspended Sediment, and Heavy Metals in the Aberjona River. It also avoids terminating sampling too early when baseflow is high and is more logical for stations where there is little to no pre-storm baseflow.

5. Manual gauging of flow was conducted during several of the storm events to augment the manual gauging that is performed on a monthly basis (in conjunction with baseflow sampling) pursuant to the SWMP.

6. During the larger storms, when more than the projected number of aliquots was collected due to the length of the storm, the composite sample was made using a smaller but uniform volume from each bottle in order to fit all aliquots in the 24-liter compositing vessel.

7. Since compositing of samples is being conducted *en masse* at the former groundwater treatment building, rather than individually at each monitoring station as envisioned in the SWMP, excess aliquots were returned to the Atlantic Avenue Drainway following each storm, rather than to the stream at each station as specified in the SWMP.

Most of the modifications to the SWMP protocols described above will be adopted as permanent field changes going forward. The exception is that benzene grab samples will continue to be collected, whenever practicable, during the rising limb of the storm hydrograph, in accordance with the SWMP. However, in order to expedite the collection of benzene grab samples and minimize the potential for subsequent sampling/equipment errors, these samples will be collected as direct (i.e., in-stream) grab samples using a procedure identical to that used for collecting baseflow samples. In addition, station-specific stage increase triggers will be developed for stations SW-2-IP and SW-3-IP once the response of flow at these stations to precipitation is better understood. Until that time, a precipitation trigger of 0.01 inches of rain over a one hour period will continue to be used.

Post-Storm Maintenance and Monitoring

Following three of the four storm events during which sampling was performed, sample and pump-head tubing was replaced, suction volumes were recalibrated, and post-storm surveying was conducted at each station. These activities were not performed, or were not performed in their entirety, following the July 1-2 storm due to the limited time

between the July 1-2 storm, rainfall on July 6 that triggered sampling but did not qualify as a sampling event (discussed below), and the next storm which occurred on July 7-8.

In accordance with the SWMP, post-storm surveying included surveying of the area-velocity sensors at each station to determine if any sensor elevations changed significantly as a result of storm-related scouring. In addition, at the Montvale Avenue station (SW-06-TT), surveying of the entire cross-sectional profile of the stream was carried out pursuant to the SWMP. Post-storm survey results for the area-velocity sensors are shown in **Table 2**, while the post-storm cross-sectional profiles for the Montvale Avenue station are shown in **Figure 3**. As shown in **Table 2**, sensor elevations did not change significantly; **Figure 3** shows that there were no material changes to the stream profile at the Montvale Avenue station during the reporting period. The post-storm survey of the stream channel at the Montvale Avenue station performed following the July 7-8 storm was mistakenly referenced to a different survey stake located approximately 20 feet downstream from that used for earlier surveys. Consequently, the post-storm profile for this storm is not comparable to the earlier surveys and is thus not shown.

On four occasions during the reporting period, sampling was triggered at one or more stations but was terminated shortly thereafter due to insufficient precipitation. These events occurred on the following dates:

- June 26, 2009
- July 6, 2009
- July 21, 2009
- August 28, 2009

In accordance with the SWMP, following each of these events, sample and pump-head tubing was replaced and suction volumes were recalibrated at each station that was activated. In addition, any bottles that had been filled with sample aliquots were decontaminated and placed back into the rosette.

Data Generated During the Reporting Period

1. Storm hydrologic data, including precipitation, peak stage, peak velocity, peak flow, and runoff at 75% of the falling limb, are shown in **Tables 3a through 3j**.

2. The ranges of water quality parameters recorded for the storm events during the monitoring period are provided in **Tables 4a through 4j**, along with the water quality measurements recorded during all previous "early action" storm sampling events.

3. Validated analytical results for composite samples collected during storms occurring in the reporting period are provided in **Tables 5a through 5j**, along with validated analytical laboratory results for storm samples collected during the "early action" sampling and other previous sampling programs at the site (i.e., the Groundwater and Surface Water Investigation Plan [GSIP] and the MSGRP).

4. Data developed as a result of the manual flow gauging events conducted to-date during both baseflow and storm events are given in **Table 6**.

Data Analysis

Data trends – Benzene, total arsenic, dissolved arsenic, and ammonia concentrations observed in samples collected during the SWMP and previous sampling programs (MSGRP, GSIP, and "Early Action") are summarized in box-whisker plots in **Appendix B**. The "boxes" indicate the range within which the central fifty percent of the results fall (the box edges mark the first and third quartiles and the line dividing the box in two marks the median value), while the "whiskers" show the full range of values reported.[6] Since at least two values are required to construct a "box," cases where an analyte was detected in only one sample during a particular sampling program are shown as diamonds.

Rating curves – Plots of the manual flow measurements and concurrent staff gauge readings made by Roux Associates and Geosyntec Consultants are shown in **Appendix C**. The rating curves developed during the MSGRP are also shown on these

[6] Any statistical outliers have not been determined or identified.

plots.[7] The Settling Parties are collecting stage versus flow data during storms in an effort to determine if the MSGRP rating curves warrant refinement or replacement and/or assess whether sufficient data exist with which to develop a rating curve for monitoring station SW-2-IP (which was not monitored during the MSGRP). A memorandum presenting this evaluation is provided in **Appendix D**. Key conclusions of the memorandum include the following:

- Based on the flows measured at higher stage by Geosyntec Consultants, some of the rating curves developed by TTNUS need to be adjusted to more accurately predict flows at higher stage.
- Sufficient data exist to support the use of new rating curves for monitoring stations SW-01-TT, SW-02-TT, SW-04-TT, and SW-08-TT. The new rating curves for these three stations may continue to be refined as additional data are developed.
- Insufficient additional data currently exist to determine if new rating curves are warranted for Stations SW-03-TT, SW-05-TT, SW-06-TT, and SW-07-TT. The need to refine the MSGRP rating curves for these stations will be further evaluated as new data are collected.
- Adequate data exist with which to develop a rating curve for monitoring station SW-2-IP.

A new rating curve was programmed into the primary Isco unit at Station SW-08-TT on August 28, 2009. The basis for this curve is data provided by the U.S. Geological Survey (see **Appendix D** for further discussion on the rating curve for SW-08-TT). New rating curves will be programmed into the Isco units at Stations SW-01-TT, SW-2-IP, SW-02-TT, and SW-04-TT during the next reporting period. The transition to new rating curves is expected to improve estimates of flow and yield more representative samples, particularly during storms events.

[7] The TTNUS rating curves have been adjusted where needed to be relative to the deepest point in the channel.

TABLES

Table 1a
Storm Statistics - June 18, 2009
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

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Station	Pre-Storm Baseflow (cfs)	Peak Flow (cfs)	2x Baseflow (cfs)	50% Falling Limb (cfs)	75% Falling Limb (cfs)	Flow at Termination of Sampling (cfs)	Flow Pacing[1] (cf)	Expected Number of Aliquots[2]	Total Aliquots Collected	Aliquots Successfully Collected[3]	Notes
SW-01-TT	0.81	13.92	1.62	7.36	4.09	3.77	100,000	11	54	6	a
SW-2-IP	0.66	9.05	1.32	4.86	2.76	2.04	35,000	13	7	7	b
SW-3-IP	0.00	4.63	0.00	2.32	1.16	3.19	17,000	8	5	5	b
SW-02-TT	0.88	17.67	1.76	9.28	5.08	--	50,000	39	0	0	c
SW-03-TT	2.84	14.37	5.68	8.60	5.72	5.06	50,000	25	24	24	
SW-04-TT	3.30	10.42	6.60	6.86	5.08	6.73	100,000	12	56	8	a
SW-05-TT	NA	NA	NA	NA	NA	NA	80,000	NA	6	NA	d
SW-06-TT	1.35	30.67	2.70	16.01	8.68	16.29	75,000	57	40	40	b,e
SW-07-TT	3.86	82.67	7.72	43.27	23.56	56.86	200,000	40	21	21	
SW-08-TT	117.80	202.28	235.59	160.04	144.27	170.92	800,000	39	29	29	f

Notes:

- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.

in = inches
cfs = cubic feet per second
-- = Not applicable
ERR = Equipment malfunction (e.g., obstructed rain gauge)

1 Flow Pacing for stations SW-01-TT, SW-02-TT, SW-03-TT, SW-05-TT, SW-06-TT, and SW-07-TT is adapted from the flowing pacing reported by TTNUS in the MSGRP RI Report
2 Expected Number of Aliquots = Total Runoff at 2x Baseflow / Flow Pacing
3 Aliquots Successfully Collected represent aliquots collected as defined in the SWMP QAPP (Sec. 3.1)

a. Total aliquots collected includes 48 aliquots inadvertently collected as time-paced
b. Flow shown for 2x baseflow represents the lowest post-storm flow achieved (new rising limb caused by subsequent precipitation)
c. No aliquots collected due to Isco 6712 programming error (activation trigger)
d. Not available (NA) due to data loss caused by Isco 6712 equipment failure
e. Flow shown for termination of sampling represents flow 2 hours following actual termination of sampling due to data gap
f. 2x Baseflow is greater than Peak Flow, and therefore never attained; Total Runoff for Flow at Termination of Sampling used to calculate Expected Number of Aliquots

Table 1b
Storm Statistics - July 1, 2009
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

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Station	Pre-Storm Baseflow (cfs)	Peak Flow (cfs)	2x Baseflow (cfs)	Flow at Termination of Sampling (cfs)	Flow Pacing[1] (cf)	Expected Number of Aliquots[2]	Total Aliquots Collected	Aliquots Successfully Collected[3]	Notes
SW-01-TT	0.81	22.58	1.62	8.57	50,000	25	30	30	
SW-2-IP	0.19	26.32	0.39	4.50	10,000	142	41	41	a
SW-3-IP	0.05	14.97	0.09	3.49	5,000	121	23	23	
SW-02-TT	2.09	26.85	4.18	16.08	50,000	78	48	48	
SW-03-TT	0.25	27.96	0.51	11.52	50,000	64	39	39	a
SW-04-TT	3.73	13.63	7.47	9.99	50,000	36	32	32	
SW-05-TT	6.69	72.72	13.38	69.09	80,000	146	48	48	
SW-06-TT	5.67	52.56	11.33	32.03	100,000	66	46	46	
SW-07-TT	3.87	200.44	7.74	132.97	200,000	104	48	48	
SW-08-TT	73.13	315.40	146.26	265.34	800,000	131	41	40	a

Notes:

change the flow estimates for these stations.

• Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.

in = inches
cfs = cubic feet per second
ERR = Equipment malfunction (e.g., obstructed rain gauge)

1 Flow Pacing for stations SW-01-TT, SW-02-TT, SW-03-TT, SW-05-TT, SW-06-TT, and SW-07-TT is adapted from the flowing pacing reported by TTNUS in the MSGRP RI Report
2 Expected Number of Aliquots = Total Runoff at 2x Baseflow / Flow Pacing
3 Aliquots Successfully Collected represent aliquots collected as defined in the SWMP QAPP (Sec. 3.1)

a. Flow shown for 2x baseflow represents the lowest post-storm flow achieved (new rising limb caused by subsequent precipitation)

Table 1c
Storm Statistics - July 7, 2009
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Station	Pre-Storm Baseflow (cfs)	Peak Flow (cfs)	50% Falling Limb (cfs)	75% Falling Limb (cfs)	Flow at Termination of Sampling (cfs)	Flow Pacing[1] (cf)	Expected Number of Aliquots[2]	Total Aliquots Collected	Aliquots Successfully Collected[3]	Notes
SW-01-TT	0.81	25.42	13.11	6.96	7.24	50,000	38 - 46	45	45	
SW-2-IP	1.31	41.07	21.19	11.25	4.84	10,000	21 - 64	58	58	
SW-3-IP	0.11	35.13	17.62	8.87	1.79	15,000	8 - 8	12	12	
SW-02-TT	2.76	32.84	17.80	10.28	14.67	50,000	69 - 89	70	70	
SW-03-TT	1.13	38.39	19.76	10.45	8.56	50,000	38 - 51	55	55	
SW-04-TT	4.15	17.60	10.88	7.51	9.18	50,000	37 - 50	43	43	
SW-05-TT	9.52	92.22	50.87	30.19	48.14	80,000	112 139	96	96	
SW-06-TT	4.23	55.19	29.71	16.97	26.90	100,000	60 - 71	61	61	
SW-07-TT	6.13	164.87	85.50	45.81	85.51	200,000	100 - 133	96	96	
SW-08-TT	77.86	261.03	169.45	159.18	164.59	800,000	79 - 95	85	85	a

Notes:

• For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.

• Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.

in = inches
cfs = cubic feet per second
ERR = Equipment malfunction (e.g., obstructed rain gauge)

1 Flow Pacing for stations SW-01-TT, SW-02-TT, SW-03-TT, SW-05-TT, SW-06-TT, and SW-07-TT is adapted from the flowing pacing reported by TTNUS in the MSGRP RI Report
2 Expected Number of Aliquots = (flow at 50% falling limb / flow pacing) to (flow at 75% falling limb / flow pacing)
3 Aliquots Successfully Collected represent aliquots collected as defined in the SWMP QAPP (Sec. 3.1)

a. Flow shown for 75% falling limb represents the lowest post-storm flow achieved (new rising limb caused by subsequent precipitation)

Table 1d
Storm Statistics - July 23, 2009
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

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Station	Pre-Storm Baseflow (cfs)	Peak Flow (cfs)	50% Falling Limb (cfs)	75% Falling Limb (cfs)	Flow at Termination of Sampling (cfs)	Flow Pacing[1] (cf)	Expected Number of Aliquots[2]	Total Aliquots Collected	Aliquots Successfully Collected[3]	Notes
SW-01-TT	0.81	33.08	16.95	8.88	10.38	50,000	49 - 80	69	69	
SW-2-IP	1.12	24.94	13.03	7.07	4.62	10,000	61 - 116	96	96	
SW-3-IP	0.02	12.14	6.08	3.05	3.05	2,000	98 - 98	78	78	
SW-02-TT	2.13	40.94	21.53	11.83	10.76	50,000	58 - 80	72	71	
SW-03-TT	3.72	43.52	23.62	13.67	10.02	50,000	62 - 82	49	49	
SW-04-TT	4.32	21.02	12.67	8.49	8.30	50,000	35 - 48	48	48	
SW-05-TT	8.12	102.98	55.55	31.84	24.89	266,667	35 45	32	32	
SW-06-TT	4.78	65.74	35.26	20.02	21.78	100,000	63 - 81	71	71	
SW-07-TT	NA	NA	NA	NA	NA	400,000	NA - NA	50	NA	a
SW-08-TT	176.19	306.76	241.48	208.83	175.59	800,000	46 - 53	42	42	

Notes:

• For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.

• Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.

in = inches
cfs = cubic feet per second

1 Flow Pacing for stations SW-01-TT, SW-02-TT, SW-03-TT, SW-05-TT, SW-06-TT, and SW-07-TT is adapted from the flowing pacing reported by TTNUS in the MSGRP RI Report
2 Expected Number of Aliquots = (flow at 50% falling limb / flow pacing) to (flow at 75% falling limb / flow pacing)
3 Aliquots Successfully Collected represent aliquots collected as defined in the SWMP QAPP (Sec. 3.1)

a. Not available (NA) due to data loss caused by Isco 6712 equipment failure

Table 2
Post-Storm Survey Results for the Area-Velocity Sensors
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

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Station Number	Station Location	Baseline Sensor Elevation	6/25/2009		7/7/2009			7/14/2009			7/27/2009		
			Post-Storm Sensor Elevation	Δ from Baseline Elevation	Post-Storm Sensor Elevation[1]	Δ from Pre-Storm Elevation[2]	Δ from Baseline Elevation	Post-Storm Sensor Elevation	Δ from Pre-Storm Elevation[3]	Δ from Baseline Elevation	Post-Storm Sensor Elevation	Δ from Pre-Storm Elevation	Δ from Initial Elevation
SW-01-TT	Halls Brook	93.20	93.20	0.00	93.27	0.07	0.07	93.00	-0.27	-0.20	93.17	0.17	-0.03
SW-2-IP	Atlantic Avenue Drainway	92.38	NM	NA	NM	NA	NA	92.38	NA	0.00	NM	NA	NA
SW-3-IP	BECO Right-of-Way	93.68	93.66	-0.02	93.74	0.08	0.06	93.66	-0.08	-0.02	93.65	-0.01	-0.03
SW-02-TT	HBHA Pond Outlet[4]	92.05	92.05	0.00	92.03	-0.02	-0.02	NA	NA	NA	NA	NA	NA
SW-02-TT	HBHA Pond Outlet[5]	97.82	NA	NA	NA	NA	NA	97.82	0.02	0.00	97.82	0.00	0.00
SW-03-TT	Aberjona River @ Mishawum Rd.	93.25	93.20	-0.05	93.22	0.02	-0.03	93.24	0.02	-0.01	93.22	-0.02	-0.03
SW-04-TT	HBHA Wetland Outlet	90.90	NM	NA	NM	NA	NA	90.92	NA	0.02	NM	NA	NA
SW-05-TT	Aberjona River @ Salem Street	94.15	94.15	0.00	NM	NA	NA	94.14	-0.01	-0.01	94.13	-0.01	-0.02
SW-06-TT	Aberjona River @ Montvale Avenue	93.05	92.98	-0.07	NM	NA	NA	93.03	0.05	-0.02	93.02	-0.01	-0.03
SW-07-TT	Aberjona River @ Swanton Street	89.84	89.85	0.01	NM	NA	NA	89.86	0.01	0.02	89.84	-0.02	0.00
SW-08-TT	Aberjona River @ USGS Gaging Station	89.79	89.77	-0.02	NM	NA	NA	89.66	-0.11	-0.13	89.86	0.20	0.07

Notes: 1. Post-storm survey on 7/7 was only partially completed due to need to prepare for impending storm.
2. Pre-Storm elevation is same as post-storm elevation from previous storm event.
3. Post-storm elevations measured at Stations SW-05-TT through SW-08-TT on 7/14 are compared to 6/25 post-storm elevations.
4. HBHA Pond Outlet baseline was initially referenced to a benchmark at Final GSIP Station SW-5.
5. Subsequent to 7/7, the HBHA Pond Outlet baseline was referenced to a benchmark at Station SW-02-TT (which is 5.77' lower than benchmark at Final GSIP Station SW-5).

Table 3a
Storm Hydrologic Data for SW-01-TT (Halls Brook)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Station	Date	Precipitation (in)	Peak Stage (ft)	Peak Velocity[1] (ft/s)	Peak Flow (cfs)	Total Runoff at 75% Falling Limb (cf)
SW-01-TT	06/18/09	1.07	1.59	2.27	13.92	974,772
	07/01/09	1.80	2.09	3.76	21.67	1,665,930
	07/07/09	2.87	2.25	4.36	25.42	2,251,596
	07/23/09	3.06	2.69	3.27	33.08	3,940,374

Notes:
• For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
• Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.

1 Due to "noise," Peak Velocity value is approximated.

in = inches
ft = feet
ft/s = feet per second
cfs = cubic feet per second
cf = cubic feet

Table 3b
Storm Hydrologic Data for SW-2-IP (Atlantic Avenue Drainway)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Station	Date	Precipitation (in)	Peak Stage (ft)	Peak Velocity[1] (ft/s)	Peak Flow (cfs)	Total Runoff at 75% Falling Limb (cf)
SW-2-IP	06/18/09	0.93	0.67	1.85	9.05	379,752
	07/01/09	1.40	1.12	3.25	26.32	1,129,314
	07/07/09	2.32	1.62	3.59	41.07	626,764
	07/23/09	2.23	1.05	3.30	24.94	1,145,352

Notes:
• For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
• Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.

1 Due to "noise," Peak Velocity value is approximated.

AAD = Atlantic Avenue Drainway
in = inches
ft = feet
ft/s = feet per second
cfs = cubic feet per second
cf = cubic feet

Table 3c
Storm Hydrologic Data for SW-3-IP (Boston Edison Co. ROW)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Station	Date	Precipitation (in)	Peak Stage (ft)	Peak Velocity[1] (ft/s)	Peak Flow (cfs)	Total Runoff at 75% Falling Limb (cf)
SW-3-IP	06/18/09	0.94	0.77	1.30	4.63	104,821
	07/01/09	1.46	1.39	1.75	14.97	170,540
	07/07/09	2.35	2.07	2.30	35.13	111,560
	07/23/09	2.37	2.19	1.82	12.14	193,146

Notes:
• For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
• Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.

1 Due to "noise," Peak Velocity value is approximated.

BECO ROW = Boston Edison Company Right-of-Way
in = inches
ft = feet
ft/s = feet per second
cfs = cubic feet per second
cf = cubic feet

Table 3d
Storm Hydrologic Data for SW-02-TT (HBHA Pond Outlet)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Station	Date	Precipitation (in)	Peak Stage (ft)	Peak Velocity[1] (ft/s)	Peak Flow (cfs)	Total Runoff at 75% Falling Limb (cf)
SW-02-TT	06/18/09	1.12	1.87	0.78	17.67	1,743,147
	07/01/09	ERR	2.42	1.43	26.85	3,248,161
	07/07/09	ERR	2.78	1.84	32.84	4,415,681
	07/23/09	2.54	3.27	1.55	40.94	3,948,374

Notes:
• For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
• Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.

1 Due to "noise," Peak Velocity value is approximated.

HBHA = Halls Brook Holding Area
in = inches
ft = feet
ft/s = feet per second
cfs = cubic feet per second
cf = cubic feet
ERR = Equipment malfunction (e.g. obstructed rain gauge)

Table 3e
Storm Hydrologic Data for SW-03-TT (Aberjona)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Station	Date	Precipitation (in)	Peak Stage (ft)	Peak Velocity[1] (ft/s)	Peak Flow (cfs)	Total Runoff at 75% Falling Limb (cf)
SW-03-TT	06/18/09	0.91	1.58	1.78	14.37	1,239,944
	07/01/09	1.64	2.44	2.55	27.96	2,294,982
	07/07/09	2.53	3.10	3.03	38.39	2,499,196
	07/23/09	2.53	3.43	2.76	43.52	4,066,986

Notes:
• For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
• Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.

1 Due to "noise," Peak Velocity value is approximated.

in = inches
ft = feet
ft/s = feet per second
cfs = cubic feet per second
cf = cubic feet

Table 3f
Storm Hydrologic Data for SW-04-TT (HBHA Wetland Outlet)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Station	Date	Precipitation (in)	Peak Stage (ft)	Peak Velocity[1] (ft/s)	Peak Flow (cfs)	Total Runoff at 75% Falling Limb (cf)
SW-04-TT	06/18/09	0.95	1.43	3.92	10.42	1,550,883
	07/01/09	1.60	1.78	5.12	13.23	2,281,206
	07/07/09	2.48	2.20	5.55	17.60	2,441,779
	07/23/09	2.40	2.57	6.84	21.02	2,370,051

Notes:
• For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
• Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.

1 Due to "noise," Peak Velocity value is approximated.

in = inches
ft = feet
ft/s = feet per second
cfs = cubic feet per second
cf = cubic feet

Table 3g
Storm Hydrologic Data for SW-05-TT (Salem Street)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Station	Date	Precipitation (in)	Peak Stage (ft)	Peak Velocity[1] (ft/s)	Peak Flow (cfs)	Total Runoff at 75% Falling Limb (cf)
SW-05-TT	06/18/09	Data Loss due to Isco Failure				
	07/01/09	1.87	2.45	2.24	72.72	9,737,499
	07/07/09	1.35	2.83	2.76	92.22	11,053,420
	07/23/09	3.28	3.05	3.23	102.98	11,611,000

Notes:
• For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
• Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.

1 Due to "noise," Peak Velocity value is approximated.

in = inches
ft = feet
ft/s = feet per second
cfs = cubic feet per second
cf = cubic feet

Table 3h
Storm Hydrologic Data for SW-06-TT (Montvale Avenue)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Station	Date	Precipitation (in)	Peak Stage (ft)	Peak Velocity[1] (ft/s)	Peak Flow (cfs)	Total Runoff at 75% Falling Limb (cf)
SW-06-TT	06/18/09	0.94	2.78	1.40	30.67	4,222,181
	07/01/09	ERR	3.86	2.10	52.56	5,950,627
	07/07/09	ERR	3.99	2.19	55.19	6,953,697
	07/23/09	1.73	4.52	2.47	65.74	8,013,981

Notes:
• For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
• Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.

1 Due to "noise," Peak Velocity value is approximated.

in = inches
ft = feet
ft/s = feet per second
cfs = cubic feet per second
cf = cubic feet

ERR = Equipment malfunction (e.g. obstructed rain gauge)

Table 3i
Storm Hydrologic Data for SW-07-TT (Swanton Street)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Station	Date	Precipitation (in)	Peak Stage (ft)	Peak Velocity[1] (ft/s)	Peak Flow (cfs)	Total Runoff at 75% Falling Limb (cf)
SW-07-TT	06/18/09	1.04	2.15	4.11	82.67	7,087,030
	07/01/09	1.70	3.83	5.40	200.44	16,890,270
	07/07/09	0.77	3.32	4.49	164.87	26,349,860
	07/23/09	Data Loss due to Isco Failure				

Notes:
• For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
• Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.

1 Due to "noise," Peak Velocity value is approximated.

in = inches
ft = feet
ft/s = feet per second
cfs = cubic feet per second
cf = cubic feet

Table 3j
Storm Hydrologic Data for SW-08-TT (USGS / Mystic Avenue)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Station	Date	Precipitation (in)	Peak Stage (ft)	Peak Velocity[1] (ft/s)	Peak Flow (cfs)	Total Runoff at 75% Falling Limb (cf)
SW-08-TT	06/18/09	0.55	3.08	1.05	202.28	39,070,400
	07/01/09	ERR	4.12	2.12	315.40	104,879,300
	07/07/09	ERR	3.62	1.96	261.03	75,114,590
	07/23/09	2.22	4.05	2.65	306.76	41,933,140

Notes:
• For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
• Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.

1 Due to "noise," Peak Velocity value is approximated.

in = inches
ft = feet
ft/s = feet per second
cfs = cubic feet per second
cf = cubic feet
ERR = Equipment malfunction (e.g. obstructed rain gauge)

Table 4a
Ranges of Storm Flow Water Quality Parameters for SW-01-TT (Halls Brook)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Temperature (°C)	Dissolved Oxygen (mg/l)	pH (s.u.)	ORP (mV)	Specific Conductance (µS/cm)	Turbidity (NTU)
Remedial Design "Early Action"							
SW-01-TT	12/15/08	1.2 - 4.6	9.8 - 12.2	6.4 - 6.7	503.4 - 556.6	784 - 1,854	22.6 - 2,874
Surface Water Monitoring Plan							
SW-01-TT	06/20/09	15.4 - 17.3	5.6 - 8.5	6.7 - 6.9	190.1 - 225.9	276 - 650	Data unrecoverable
	07/03/09	15.3 - 17.0	Data unrecoverable	6.6 - 6.9	403.5 - 564.0	170 - 660	20,700 - 364,600
	07/09/09	15.1 - 17.8	Data unrecoverable	6.6 - 7.1	382.4 - 535.8	94 - 516	7,600 - 113,000
	07/26/09	16.8 - 20.5	Data unrecoverable	6.3 - 6.9	392.5 - 471.7	158 - 548	5,300 - 147,300

Notes:
HBHA = Halls Brook Holding Area
°C = Degrees Celsius
mg/l = milligrams per liter
s.u. = standard units
mV = milliVolts
µS/cm = microSiemens per centimeter
NTU = Nephelometric Turbidity Units

Turbidity data for 7/1-2/09 and dissolved oxygen data for 7/1-2/09, 7/7-8/09 and 7/23-24/09 storms unrecoverable due to Isco 6712 transmission errors.

Table 4b
Ranges of Storm Flow Water Quality Parameters for SW-2-IP (AAD)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Temperature (°C)	Dissolved Oxygen (mg/l)	pH (s.u.)	ORP (mV)	Specific Conductance (µS/cm)	Turbidity (NTU)
Remedial Design "Early Action"							
SW-2-IP	12/15/08	0.4 - 1.3	10.7 - 11.5	6.5 - 6.5	470.3 - 480.1	240 - 242	3.6 - 4.4
Surface Water Monitoring Plan							
SW-2-IP	06/20/09	17.6 - 21.8	4.3 - 6.8	6.8 - 7.1	395.1 - 470.1	174 - 536	3,700 - 19,200
	07/03/06	16.8 - 18.8	4.0 - 7.9	6.7 - 6.9	379.0 - 489.0	74 - 546	2,100 - 19,200
	07/09/09	17.3 - 19.8	4.1 - 9.0	6.7 - 7.2	371.3 - 476.1	60 - 518	2,100 - 75,900
	07/26/09	17.8 - 24.9	4.6 - 9.1	6.6 - 7.0	366.8 - 428.3	46 - 430	2,700 - 17,200

Notes:
AAD = Atlantic Avenue Drainway
°C = Degrees Celsius
mg/l = milligrams per liter
s.u. = standard units
mV = milliVolts
µS/cm = microSiemens per centimeter
NTU = Nephelometric Turbidity Units

Table 4c
Ranges of Storm Flow Water Quality Parameters for SW-3-IP (BECO ROW)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Temperature (°C)	Dissolved Oxygen (mg/l)	pH (s.u.)	ORP (mV)	Specific Conductance (µS/cm)	Turbidity (NTU)
Remedial Design "Early Action"							
SW-3-IP	12/15/08	-1.6 - 6.5	NM - 12.5	NM - 4.3	-323.1 - 507.8	-20 - 586	NM - 19.6
Surface Water Monitoring Plan							
SW-3-IP	06/20/09	16.4 - 20.4	2.1 - 3.9	6.4 - 6.7	441.2 - 522.3	22 - 86	5,900 - 31,600
	07/03/06						
	07/09/09			Data rejected			
	07/26/09						

Notes:
BECO ROW = Boston Edison Company right-of-way
°C = Degrees Celsius
mg/l = milligrams per liter
s.u. = standard units
mV = milliVolts
µS/cm = microSiemens per centimeter
NTU = Nephelometric Turbidity Units
NM = Not measured (e.g., insufficient flow and/or due to equipment limitations)

Water quality parameter data for 7/1-2/09, 7/7-8/09 and 7/23-24/09 storms were reviewed and rejected due to problems associated with the dry conditions that existed prior to the storms.

Table 4d
Ranges of Storm Flow Water Quality Parameters for SW-02-TT (HBHA Pond Outlet)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Temperature (°C)	Dissolved Oxygen (mg/l)	pH (s.u.)	ORP (mV)	Specific Conductance (µS/cm)	Turbidity (NTU)
Remedial Design "Early Action"							
SW-02-TT	12/15/08	1.5 - 2.3	10.0 - 10.2	6.3 - 6.4	524.3 - 527.3	416 - 470	22.6 - 23.3
Surface Water Monitoring Plan							
SW-02-TT	06/20/09	16.2 - 21.0	5.4 - 6.8	6.1 - 6.3	360.7 - 423.3	474 - 750	6,800 - 18,500
	07/03/06	16.0 - 17.7	3.4 - 5.7	6.3 - 6.5	248.1 - 532.9	484 - 890	7,200 - 55,100
	07/09/09	15.8 - 17.4	1.2 - 6.2	6.0 - 6.1	190.8 - 499.4	282 - 902	10,400 - 33,800
	07/26/09	17.2 - 20.1	2.6 - 7.5	6.3 - 6.6	182.3 - 471.8	234 - 964	4,400 - 65,600

Notes:
HBHA = Halls Brook Holding Area
°C = Degrees Celsius
mg/l = milligrams per liter
s.u. = standard units
mV = milliVolts
µS/cm = microSiemens per centimeter
NTU = Nephelometric Turbidity Units

Table 4e
Ranges of Storm Flow Water Quality Parameters for SW-03-TT (Aberjona River)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Temperature (°C)	Dissolved Oxygen (mg/l)	pH (s.u.)	ORP (mV)	Specific Conductance (µS/cm)	Turbidity (NTU)
Surface Water Monitoring Plan							
SW-03-TT	06/20/09	16.9 - 19.6	4.1 - 5.4	6.1 - 6.3	315.0 - 410.3	256 - 688	9,300 - 20,800
	07/03/06	16.3 - 18.1	5.4 - 8.3	6.5 - 6.7	391.4 - 549.0	226 - 824	5,000 - 208,900
	07/09/09	15.5 - 18.1	5.4 - 9.5	5.8 - 6.5	412.5 - 550.0	46 - 582	5,800 - 175,000
	07/26/09	17.9 - 21.4	4.1 - 8.6	6.6 - 6.8	425.9 - 509.3	148 - 782	1,300 - 32,400

Notes:
°C = Degrees Celsius
mg/l = milligrams per liter
s.u. = standard units
mV = milliVolts
µS/cm = microSiemens per centimeter
NTU = Nephelometric Turbidity Units

Table 4f
Ranges of Storm Flow Water Quality Parameters for SW-04-TT (HBHA Wetland Outlet)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Temperature (°C)	Dissolved Oxygen (mg/l)	pH (s.u.)	ORP (mV)	Specific Conductance (µS/cm)	Turbidity (NTU)
Remedial Design "Early Action"							
SW-04-TT	12/15/08	1.8 - 2.2	9.7 - 9.8	5.9 - 5.9	373.6 - 374.1	390 - 428	0 - 0
Surface Water Monitoring Plan							
SW-04-TT	06/20/09	16.7 - 21.9	5.1 - 7.9	6.5 - 6.7	218.0 - 317.2	358 - 754	6,700 - 131,600
	07/03/09	16.1 - 18.2	4.6 - 7.8	6.4 - 6.8	237.0 - 347.6	242 - 802	6,800 - 752,300
	07/09/09	15.7 - 19.3	4.9 - 9.4	6.1 - 6.9	231.7 - 418.4	38 - 728	7,400 - 93,500
	07/26/09	Data rejected					

Notes:
HBHA = Halls Brook Holding Area
°C = Degrees Celsius
mg/l = milligrams per liter
s.u. = standard units
mV = milliVolts
µS/cm = microSiemens per centimeter
NTU = Nephelometric Turbidity Units

Table 4g
Ranges of Storm Flow Water Quality Parameters for SW-05-TT (Salem Street)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Temperature (°C)	Dissolved Oxygen (mg/l)	pH (s.u.)	ORP (mV)	Specific Conductance (µS/cm)	Turbidity (NTU)
Surface Water Monitoring Plan							
SW-05-TT	06/20/09	Data lost due to Isco 6712 malfunction					
	07/03/06	16.5 - 17.9	3.3 - 6.7	6.3 - 6.7	441.6 - 530.5	402 - 1,072	7,700 - 63,300
	07/09/09	16.5 - 17.6	4.0 - 6.5	6.1 - 6.4	507.5 - 544.2	292 - 670	12,300 - 45,700
	07/26/09	17.6 - 24.0	2.5 - 7.3	6.2 - 6.6	441.1 - 496.7	264 - 1,022	3,900 - 52,400

Notes:
HBHA = Halls Brook Holding Area
°C = Degrees Celsius
mg/l = milligrams per liter
s.u. = standard units
mV = milliVolts
µS/cm = microSiemens per centimeter
NTU = Nephelometric Turbidity Units

Table 4h
Ranges of Storm Flow Water Quality Parameters for SW-06-TT (Montvale Avenue)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Temperature (°C)	Dissolved Oxygen (mg/l)	pH (s.u.)	ORP (mV)	Specific Conductance (µS/cm)	Turbidity (NTU)
Surface Water Monitoring Plan							
SW-06-TT	06/20/09	16.5 - 18.3	7.0 - 7.3	6.7 - 6.8	429.8 - 454.7	Data unrecoverable	58,000 - 129,900
	07/03/06	16.1 - 17.7	5.8 - 7.5	6.4 - 6.8	401.0 - 525.8	338 - 772	14,600 - 2,697,000
	07/09/09	16.0 - 18.5	6.7 - 8.4	6.5 - 7.0	374.5 - 523.4	178 - 654	8,200 - 111,200
	07/26/09	17.4 - 21.5	5.7 - 7.7	6.5 - 6.8	456.6 - 514.1	174 - 418	200 - 1,633,000

Notes:
°C = Degrees Celsius
mg/l = milligrams per liter
s.u. = standard units
mV = milliVolts
µS/cm = microSiemens per centimeter
NTU = Nephelometric Turbidity Units
ERR = Equipment malfunction (i.e., data transmission errors)

Specific conductance data for 6/18-19/09 storm unrecoverable due Isco 6712 transmission errors.

Table 4i
Ranges of Storm Flow Water Quality Parameters for SW-07-TT (Swanton Street)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Temperature (°C)	Dissolved Oxygen (mg/l)	pH (s.u.)	ORP (mV)	Specific Conductance (µS/cm)	Turbidity (NTU)
Surface Water Monitoring Plan							
SW-07-TT	06/20/09	16.5 - 17.9	6.6 - 7.9	6.5 - 6.8	458.5 - 489.9	432 - 1,402	4,600 - 17,300
	07/03/06	16.4 - 17.7	6.3 - 7.8	5.6 - 5.9	449.1 - 494.8	58 - 928	4,400 - 63,900
	07/09/09	16.2 - 18.0	6.3 - 7.7	6.4 - 6.9	389.6 - 503.9	258 - 1,056	1,500 - 28,200
	07/26/09	17.9 - 20.9	6.0 - 6.7	6.5 - 6.8	482.7 - 506.6	496 - 726	1,400 - 17,400

Notes:
°C = Degrees Celsius
mg/l = milligrams per liter
s.u. = standard units
mV = milliVolts
µS/cm = microSiemens per centimeter
NTU = Nephelometric Turbidity Units

Table 4j
Ranges of Storm Flow Water Quality Parameters for SW-08-TT (USGS / Mystic Avenue)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Temperature (°C)	Dissolved Oxygen (mg/l)	pH (s.u.)	ORP (mV)	Specific Conductance (µS/cm)	Turbidity (NTU)
Surface Water Monitoring Plan							
SW-08-TT	06/20/09	16.9 - 18.7	5.7 - 7.1	6.4 - 6.6	470.9 - 525.3	490 - 976	14,600 - 38,300
	07/03/06	16.8 - 18.3	4.4 - 8.7	6.8 - 7.1	443.1 - 509.7	358 - 938	33,100 - 128,300
	07/11/09	17.7 - 20.9	5.3 - 8.0	7.0 - 7.3	361.4 - 508.1	506 - 1,002	4,400 - 39,700
	07/26/09	18.2 - 22.6	1.8 - 8.1	7.0 - 7.8	360.3 - 488.8	352 - 1,044	3,300 - 155,400

Notes:
USGS = United States Geological Survey
°C = Degrees Celsius
mg/l = milligrams per liter
s.u. = standard units
mV = milliVolts
µS/cm = microSiemens per centimeter
NTU = Nephelometric Turbidity Units

Table 5a
Storm Flow Laboratory Analytical Results for SW-01-TT (Halls Brook)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Benzene[1] (µg/l)	Total Arsenic (mg/l)	Dissolved Arsenic (mg/l)	Total Iron (mg/l)	Dissolved Iron (mg/l)	TSS (mg/l)	Ammonia (mg/l)	Nitrite (mg/l)	Nitrate (mg/l)	TKN (mg/l)	Total Organic Nitrogen (mg/l)
Groundwater & Surface Water Investigation Plan												
SW-1	09/04/00	--	0.0028B	0.002U	--	--	5U	--	--	--	--	--
	09/18/00	--	0.0044B	0.0025U	--	--	5U	--	--	--	--	--
	10/09/00	--	0.0025U	0.0025U	--	--	5U	--	--	--	--	--
	10/19/00	--	0.0062B	0.005U	--	--	25.5	--	--	--	--	--
	12/18/00	--	0.0063B	0.0035U	--	--	13.6	--	--	--	--	--
	03/23/01	--	0.0036J	0.0035U	--	--	62.8	--	--	--	--	--
	03/29/01	--	0.0024U	0.0042U	--	--	5.2	--	--	--	--	--
Multiple Source Groundwater Response Plan												
SW-01-TT	04/26/02	--	0.0051	0.002U	2.76	0.327	31.2J	--	--	--	--	--
	05/15/02	--	0.0018J	0.002U	1.23	0.447	25.8J	--	--	--	--	--
	07/25/02	--	0.0036	0.0013U	1.94	0.226J	22.1J	--	--	--	--	--
	08/31/02	--	0.0057U	0.0039UJ	1.65	0.0573U	15.8J	--	--	--	--	--
	09/25/02	--	0.0022J	0.0025U	1.68	0.203	21.4J	--	--	--	--	--
	10/18/02	--	0.0042J	0.003U	2.06	0.0818U	20.4	--	--	--	--	--
Remedial Design "Early Action"												
SW-01-TT	12/15/08	--	0.005	0.003U	--	--	30	0.61	0.05U	0.71	1.8	1.2
Surface Water Monitoring Plan												
SW-01-TT	06/20/09	0.5U	0.003U	0.003U	1.5	0.34	6.9	0.992	0.12	0.96	1.7	0.71
	06/20/09A	--	0.0028J	0.003U	1.6	0.29	20	1.24	0.11	0.54	2	0.76
	07/03/09	0.5U	0.0027J	0.003U	3.1	0.6	16	1.01	0.05	0.49	0.98	0.3U
	07/09/09	0.5U	0.003U	0.003U	1.4	0.51	23	0.667	0.08	0.53	1.5	0.83
	07/26/09	0.5U	0.0027J	0.003U	1.3	0.31	7.3	0.0654J	0.05U	0.1	0.55	0.55

Notes:

1 For the Surface Water Monitoring Plan, benzene samples are typically collected the day before the date shown.

µg/l = micrograms per liter
mg/l = milligrams per liter
TSS = Total Suspended Solids
TKN = Total Kjeldahl Nitrogen
-- = Sample not analyzed for this compound
U = Compound or sample not detected; value shown is reporting limit
J = Analyte concentration is below quantitation limit, but greater than or equal to 1/2 the laboratory detection limit. Value is estimated
B = Compound detected in laboratory blank

Table 5b
Storm Flow Laboratory Analytical Results for SW-2-IP (Atlantic Avenue Drainway)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Benzene[1] (µg/l)	Total Arsenic (mg/l)	Dissolved Arsenic (mg/l)	Total Iron (mg/l)	Dissolved Iron (mg/l)	TSS (mg/l)	Ammonia (mg/l)	Nitrite (mg/l)	Nitrate (mg/l)	TKN (mg/l)	Total Organic Nitrogen (mg/l)
Groundwater & Surface Wa		--	--	--	--	--	--	--	--	--	--	--
SW-2	09/04/00	--	0.002U	0.002U	--	--	5U	--	--	--	--	--
	09/18/00	--	0.0025U	0.0025U	--	--	5U	--	--	--	--	--
	10/09/00	--	0.0025U	0.0025U	--	--	5U	--	--	--	--	--
	10/19/00	--	0.0036B	0.0025U	--	--	12	--	--	--	--	--
	12/18/00	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	03/23/01	--	0.0035U	0.0035U	--	--	21.6	--	--	--	--	--
	03/29/01	--	0.0025B	0.0042U	--	--	14	--	--	--	--	--
Remedial Design "Early Action"												
SW-2-IP	12/15/08	--	0.003U	0.003U	--	--	5U	0.229	0.05U	0.22U	0.54	0.31
Surface Water Monitoring Plan												
SW-2-IP	06/20/09	0.5U	0.003	0.003	1.3	0.06	6.3	0.086	0.08	0.27	0.76	0.67
	07/03/06	0.5U	0.003U	0.003U	1.8	0.34	14	0.187	0.05U	0.28	0.68	0.49
	07/09/09	0.5U	0.003U	0.003U	1.7	0.28	7.9	0.123	0.06	0.43	0.5	0.38
	07/26/09	0.5U	0.0028J	0.003U	1.2	0.38	12	0.613	0.028J	0.34	1.2	0.59

Notes:

1 For the Surface Water Monitoring Plan, benzene samples are typically collected the day before the date shown.

AAD = Atlantic Avenue Drainway
µg/l = micrograms per liter
mg/l = milligrams per liter
TSS = Total Suspended Solids
TKN = Total Kjeldahl Nitrogen
-- = Sample not analyzed for this compound
U = Compound or sample not detected; value shown is reporting limit
J = Analyte concentration is below quantitation limit, but greater than or equal to 1/2 the laboratory detection limit. Value is estimated
B = Compound detected in laboratory blank
NS = Not Sampled

Table 5c
Storm Flow Laboratory Analytical Results for SW-3-IP (Boston Edison Co. ROW)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Benzene[1] (µg/l)	Total Arsenic (mg/l)	Dissolved Arsenic (mg/l)	Total Iron (mg/l)	Dissolved Iron (mg/l)	TSS (mg/l)	Ammonia (mg/l)	Nitrite (mg/l)	Nitrate (mg/l)	TKN (mg/l)	Total Organic Nitrogen (mg/l)
Groundwater & Surface Water Investigation Plan												
SW-3	09/04/00	--	0.0058B	0.0057B	--	--	5U	--	--	--	--	--
	09/18/00	--	0.0102	0.0037B	--	--	5U	--	--	--	--	--
	10/09/00	--	0.0084B	0.0025U	--	--	5U	--	--	--	--	--
	10/19/00	--	0.0122	0.0093B	--	--	5	--	--	--	--	--
	03/23/01	--	0.022	0.0106	--	--	35.6	--	--	--	--	--
	03/29/01	--	0.0763	--	--	--	55.6	--	--	--	--	--
Remedial Design "Early Action"												
SW-3-IP	12/15/08	--	0.0024J	0.003U	--	--	15	0.246	0.05U	0.16U	0.59	0.34
Surface Water Monitoring Plan												
SW-3-IP	06/20/09	0.5U	0.024	0.004	1.8	0.06	29	0.759	0.1	0.46	1.2	0.44
	07/03/09	0.5U	0.036	0.004	3.6	0.16	58	1.27	0.05U	0.39	1.8	0.53
	07/09/09	0.5U	0.045	0.003U	5.8	0.046J	60	0.22	0.05U	0.32	0.59	0.37
	07/26/09	0.5U	0.004	0.0028J	0.35	0.05	5U	0.231	0.05U	0.1U	0.34	0.3U

Notes:

1 For the Surface Water Monitoring Plan, benzene samples are typically collected the day before the date shown.

BECO ROW = Boston Edison Company Right-of-Way
µg/l = micrograms per liter
mg/l = milligrams per liter
TSS = Total Suspended Solids
TKN = Total Kjeldahl Nitrogen
-- = Sample not analyzed for this compound
U = Compound or sample not detected; value shown is reporting limit
J = Analyte concentration is below quantitation limit, but greater than or equal to 1/2 the laboratory detection limit. Value is estimated
B = Compound detected in laboratory blank
NS = Not Sampled

Table 5d
Storm Flow Laboratory Analytical Results for SW-02-TT (HBHA Pond Outlet)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Benzene[1] (µg/l)	Total Arsenic (mg/l)	Dissolved Arsenic (mg/l)	Total Iron (mg/l)	Dissolved Iron (mg/l)	TSS (mg/l)	Ammonia (mg/l)	Nitrite (mg/l)	Nitrate (mg/l)	TKN (mg/l)	Total Organic Nitrogen (mg/l)
Groundwater & Surface Water Investigation Plan												
SW-4A	09/18/00	--	0.055	0.0034J	5.66	--	20	--	--	--	--	--
SW-4B	09/18/00	--	0.0452	0.0025U	5.01	--	18.5	--	--	--	--	--
SW-4A	10/09/00	--	0.01	0.0025U	0.8	--	5U	--	--	--	--	--
SW-4	10/19/00	--	0.0305	0.0108	2.52	--	7.5	--	--	--	--	--
	03/29/01	--	0.006J	0.0071J	0.881UJ	--	7.2	--	--	--	--	--
Multiple Source Groundwater Response Plan												
SW-02-TT	04/26/02	--	0.0217	0.008	2.24	0.56	8.8J	--	--	--	--	--
	05/15/02	--	0.0815	0.0274	5.28	1.28	15.5J	--	--	--	--	--
	07/25/02	--	0.0205	0.0037	2.06	0.138U	6J	--	--	--	--	--
	08/31/02	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	09/25/02	--	0.037	0.0038J	3.47	0.0391	7.6J	--	--	--	--	--
	10/18/02	--	0.0774	0.0083	6.52	0.297	23.6	--	--	--	--	--
Remedial Design "Early Action"												
SW-02-TT	12/15/08	--	0.012	0.008	--	--	5U	2.95	0.05U	0.58	3.7	0.75
Surface Water Monitoring Plan												
SW-02-TT	06/20/09	0.66	--	--	--	--	--	--	--	--	--	--
	07/03/09	0.5U	0.027	0.011	3.2	1.3	9.2	8.47	0.07	0.51	9.2	0.73
	07/09/09	0.0047	0.019	0.009	2.8	1.3	9.5	4.43	0.1	0.68	5	0.57
	07/26/09	0.0017	0.015	0.009	1.6	0.67	5U	3.15	0.037J	0.3	4	0.85

Notes:

1 For the Surface Water Monitoring Plan, benzene samples are typically collected the day before the date shown.

HBHA = Halls Brook Holding Area
µg/l = micrograms per liter
mg/l = milligrams per liter
TSS = Total Suspended Solids
TKN = Total Kjeldahl Nitrogen
-- = Sample not analyzed for this compound
U = Compound or sample not detected; value shown is reporting limit
J = Analyte concentration is below quantitation limit, but greater than or equal to 1/2 the laboratory detection limit. Value is estimated
NS = Not Sampled

Table 5e
Storm Flow Laboratory Analytical Results for SW-03-TT (Aberjona)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Benzene[1] (µg/l)	Total Arsenic (mg/l)	Dissolved Arsenic (mg/l)	Total Iron (mg/l)	Dissolved Iron (mg/l)	TSS (mg/l)	Ammonia (mg/l)	Nitrite (mg/l)	Nitrate (mg/l)	TKN (mg/l)	Total Organic Nitrogen (mg/l)
Multiple Source Groundwater Response Plan												
SW-03-TT	04/26/02	--	0.0121	0.002U	1.93	0.307	--	--	--	--	--	--
	05/15/02	--	0.0075	0.002U	1.44	0.404	5UJ	--	--	--	--	--
	07/25/02	--	0.0117	0.0041	1.32	0.143	7J	--	--	--	--	--
	08/31/02	--	0.0195	0.0037UJ	1.73	0.14U	8.8J	--	--	--	--	--
	09/25/02	--	0.0122	0.004J	1.44	0.335	5.2J	--	--	--	--	--
	10/18/02	--	0.0284	0.003U	3.14	0.0721U	17.2	--	--	--	--	--
Surface Water Monitoring Plan												
SW-03-TT	06/20/09	0.5U	0.006	0.005	--	--	6.6	0.312	0.12	0.57	0.83	0.52
	07/03/09	0.5U	0.005	0.003U	--	--	18	0.249	0.08	0.58	1	0.75
	07/09/09	0.5U	0.004	0.003U	--	--	22	0.241	0.09	0.6	0.93	0.69
	07/26/09	0.5U	0.004	0.0029J	--	--	5U	0.256	0.07	0.75	0.75	0.49

Notes:
1 For the Surface Water Monitoring Plan, benzene samples are typically collected the day before the date shown

µg/l = micrograms per liter
mg/l = milligrams per liter
TSS = Total Suspended Solids
TKN = Total Kjeldahl Nitrogen
-- = Sample not analyzed for this compound
U = Compound or sample not detected; value shown is reporting limit
J = Analyte concentration is below quantitation limit, but greater than or equal to 1/2 the laboratory detection limit. Value is estimated

Table 5f
Storm Flow Laboratory Analytical Results for SW-04-TT (HBHA Wetland Outlet)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Benzene[1] (µg/l)	Total Arsenic (mg/l)	Dissolved Arsenic (mg/l)	Total Iron (mg/l)	Dissolved Iron (mg/l)	TSS (mg/l)	Ammonia (mg/l)	Nitrite (mg/l)	Nitrate (mg/l)	TKN (mg/l)	Total Organic Nitrogen (mg/l)
Groundwater & Surface Water Investigation Plan												
SW-9	09/18/00	--	0.0215	0.0028J	1.73	--	7	--	--	--	--	--
	10/09/00	--	0.0093	0.0025U	1.14	--	5	--	--	--	--	--
	10/19/00	--	0.0194	0.0108	1.9	--	5U	--	--	--	--	--
	12/18/00	--	0.009	0.0039J	1.5	--	5U	--	--	--	--	--
	03/23/01	--	0.0142	0.0086	1.49	--	7.2	--	--	--	--	--
	03/29/01	--	0.0072	0.0042U	1.18UJ	--	14.4	--	--	--	--	--
SW-9A	03/23/01	--	0.0035U	--	--	--	5	--	--	--	--	--
Multiple Source Groundwater Response Plan												
SW-04-TT	04/26/02	--	0.0117	0.0059	1.49	0.419	6	--	--	--	--	--
	05/16/02	--	0.0115	0.0049	2.28	0.694	7J	--	--	--	--	--
	07/25/02	--	0.0268	0.0059	2.59	--	20.8J	--	--	--	--	--
	08/06/02	--	0.0368	0.009	3.8	0.0791U	13.6J	--	--	--	--	--
	08/31/02	--	0.029	0.0044UJ	3	0.0276U	15.2J	--	--	--	--	--
	09/25/02	--	0.0253	0.0074	3.06	0.569	10.8J	--	--	--	--	--
	10/18/02	--	0.0478	0.0141	4.6	1.14	15.6	--	--	--	--	--
Remedial Design "Early Action"												
SW-04-TT	12/15/08	--	0.011	0.005	--	--	5.5	2.46	0.05U	0.48	3.1	0.64
Surface Water Monitoring Plan												
SW-04-TT	06/20/09	0.36J	0.016	0.003	--	--	5.5	3.95	0.12	0.58	4.5	0.55
	06/20/09A	--	0.014	0.007	1.9	0.72	14	2.74	0.12	0.53	3.3	0.56
	07/03/09	0.5U	0.02	0.008	--	--	9.5	5.84	0.1	0.71	6.9	1.1
	07/09/09	0.5U	0.016	0.008	--	--	7.3	3.55	0.14	0.55	4.2	0.65
	07/26/09	0.5U	0.011	0.005	--	--	5U	2.38	0.06	0.41	3	0.62

Notes:
1 For the Surface Water Monitoring Plan, benzene samples are typically collected the day before the date shown

HBHA = Halls Brook Holding Area
µg/l = micrograms per liter
mg/l = milligrams per liter
TSS = Total Suspended Solids
TKN = Total Kjeldahl Nitrogen
-- = Sample not analyzed for this compound
U = Compound or sample not detected; value shown is reporting limit
J = Analyte concentration is below quantitation limit, but greater than or equal to 1/2 the laboratory detection limit. Value is estimated

Table 5g
Storm Flow Laboratory Analytical Results for SW-05-TT (Salem Street)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Benzene[1] (µg/l)	Total Arsenic (mg/l)	Dissolved Arsenic (mg/l)	Total Iron (mg/l)	Dissolved Iron (mg/l)	TSS (mg/l)	Ammonia (mg/l)	Nitrite (mg/l)	Nitrate (mg/l)	TKN (mg/l)	Total Organic Nitrogen (mg/l)
Multiple Source Groundwater Response Plan												
SW-05-TT	04/26/02	--	0.015	0.0022J	2.09	0.356	15.7	--	--	--	--	--
	05/15/02	--	0.0233	0.0126	2.21	0.968	8J	--	--	--	--	--
	07/25/02	--	0.0175	0.0023J	1.85	0.129	4.4J	--	--	--	--	--
	08/31/02	--	0.0126	0.0025U	1.16	0.0884U	3J	--	--	--	--	--
	09/25/02	--	0.0115	0.0025U	1.15	0.0607	3.6J	--	--	--	--	--
	10/18/02	--	0.012	0.003U	1.46	0.244	6.8	--	--	--	--	--
Surface Water Monitoring Plan												
SW-05-TT	06/20/09	0.5U	0.01	0.004	--	--	8	0.801	0.13	0.67	1.6	0.8
	07/03/09	0.5U	0.008	0.004	--	--	10	1.13	0.11	0.65	1.8	0.67
	07/09/09	0.5U	0.008	0.007	--	--	5U	1.65	0.18	0.76	2.3	0.65
	07/26/09	0.5U	0.006	0.005	--	--	5U	0.423	0.07	0.7	0.93	0.51

Notes:
1 For the Surface Water Monitoring Plan, benzene samples are typically collected the day before the date shown

µg/l = micrograms per liter
mg/l = milligrams per liter
TSS = Total Suspended Solids
TKN = Total Kjeldahl Nitrogen
-- = Sample not analyzed for this compound
U = Compound or sample not detected; value shown is reporting limit
J = Analyte concentration is below quantitation limit, but greater than or equal to 1/2 the laboratory detection limit. Value is estimated

Table 5h
Storm Flow Laboratory Analytical Results for SW-06-TT (Montvale Avenue)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Benzene[1] (µg/l)	Total Arsenic (mg/l)	Dissolved Arsenic (mg/l)	Total Iron (mg/l)	Dissolved Iron (mg/l)	TSS (mg/l)	Ammonia (mg/l)	Nitrite (mg/l)	Nitrate (mg/l)	TKN (mg/l)	Total Organic Nitrogen (mg/l)
Multiple Source Groundwater Response Plan												
SW-06-TT	04/26/02	--	0.0168	0.0034J	3.01	0.595	30.4	--	--	--	--	--
	05/15/02	--	0.0212	0.0118	2.15	0.79	11.5J	--	--	--	--	--
	07/25/02	--	0.0152	0.0025J	1.92	0.116U	8J	--	--	--	--	--
	08/31/02	--	0.0152	0.0025U	1.54	0.0919U	9.2J	--	--	--	--	--
	09/25/02	--	0.0255	0.0038J	2.77	0.211	18.6J	--	--	--	--	--
	10/18/02	--	0.0255	0.0026J	3.4	0.378	27.8	--	--	--	--	--
Surface Water Monitoring Plan												
SW-06-TT	06/20/09	0.5U	0.011	0.004	--	--	9.4	0.993	0.16	0.74	1.5	0.51
	07/03/09	0.5U	0.009	0.0022J	--	--	54	1.2	0.09	1	1.9	0.7
	07/09/09	0.5U	0.009	0.004	--	--	7.5	1.15	0.14	0.82	1.8	0.65
	07/26/09	0.5U	0.007	0.004	--	--	5U	0.695	0.06	0.62	1.2	0.5

Notes:
1 For the Surface Water Monitoring Plan, benzene samples are typically collected the day before the date shown

µg/l = micrograms per liter
mg/l = milligrams per liter
TSS = Total Suspended Solids
TKN = Total Kjeldahl Nitrogen
-- = Sample not analyzed for this compound
U = Compound or sample not detected; value shown is reporting limit
J = Analyte concentration is below quantitation limit, but greater than or equal to 1/2 the laboratory detection limit. Value is estimated

Table 5i
Storm Flow Laboratory Analytical Results for SW-07-TT (Swanton Street)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Benzene[1] (µg/l)	Total Arsenic (mg/l)	Dissolved Arsenic (mg/l)	Total Iron (mg/l)	Dissolved Iron (mg/l)	TSS (mg/l)	Ammonia (mg/l)	Nitrite (mg/l)	Nitrate (mg/l)	TKN (mg/l)	Total Organic Nitrogen (mg/l)
Multiple Source Groundwater Response Plan												
SW-07-TT	04/26/02	--	0.0117	0.002U	2.52	0.165	33.2	--	--	--	--	--
	05/15/02	--	0.0181	0.0077	1.93J	0.722	9J	--	--	--	--	--
	07/25/02	--	0.0053	0.0014J	0.91	0.0742J	6.1J	--	--	--	--	--
	08/31/02	--	0.0048J	0.0025U	0.777	0.0495U	6J	--	--	--	--	--
	09/25/02	--	0.0072	0.0032	0.88	0.206	4J	--	--	--	--	--
	10/18/02	--	0.0112	0.0036J	1.66	0.224	5.4	--	--	--	--	--
Surface Water Monitoring Plan												
SW-07-TT	06/20/09	0.5U	0.009	0.004	--	--	23	0.573	0.15	0.8	1.2	0.63
	07/03/09	0.5U	0.012	0.003U	--	--	130	0.419	0.08	0.83	1.4	0.98
	07/09/09	0.5U	0.009	0.004	--	--	15	0.949	0.13	0.88	1.75	0.75
	07/24/09	0.5U	0.007	0.0026J	--	--	9.5	0.539	0.07	0.71	1.1	0.56

Notes:
1 For the Surface Water Monitoring Plan, benzene samples are typically collected the day before the date shown

µg/l = micrograms per liter
mg/l = milligrams per liter
TSS = Total Suspended Solids
TKN = Total Kjeldahl Nitrogen
-- = Sample not analyzed for this compound
U = Compound or sample not detected; value shown is reporting limit
J = Analyte concentration is below quantitation limit, but greater than or equal to 1/2 the laboratory detection limit. Value is estimated

Table 5j
Storm Flow Laboratory Analytical Results for SW-08-TT (USGS / Mystic Avenue)
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

DRAFT

Sample ID	Date	Benzene[1] (µg/l)	Total Arsenic (mg/l)	Dissolved Arsenic (mg/l)	Total Iron (mg/l)	Dissolved Iron (mg/l)	TSS (mg/l)	Ammonia (mg/l)	Nitrite (mg/l)	Nitrate (mg/l)	TKN (mg/l)	Total Organic Nitrogen (mg/l)
Multiple Source Groundwater Response Plan												
SW-08-TT	04/26/02	--	0.0095	0.002U	1.17	0.24	17.3	--	--	--	--	--
	05/16/02	--	0.0073	0.0031J	6.94	0.364	143J	--	--	--	--	--
	07/25/02	--	0.0046	0.0013U	0.512	0.0087U	15.9J	--	--	--	--	--
	08/31/02	--	0.0055	0.0025U	1.54	0.0655U	16.2J	--	--	--	--	--
	09/25/02	--	0.008	0.0026	4.59	0.226	12.5J	--	--	--	--	--
	10/18/02	--	0.003U	0.003U	1.52	0.469	179	--	--	--	--	--
Surface Water Monitoring Plan												
SW-08-TT	06/20/09	0.5U	0.008	0.004	--	--	18	0.413	0.11	0.79	1	0.59
	07/03/09	0.5U	0.006	0.003U	--	--	29	0.462	0.09	0.82	1.5	1
	07/11/09	0.5U	0.003	0.004	--	--	13	0.229	0.07	0.78	0.98	0.75
	07/26/09	0.5U	0.005	0.0025J	--	--	9.4	0.288	0.05	0.65	1.2	0.91

Notes:
1 For the Surface Water Monitoring Plan, benzene samples are typically collected the day before the date shown

µg/l = micrograms per liter
mg/l = milligrams per liter
TSS = Total Suspended Solids
TKN = Total Kjeldahl Nitrogen
-- = Sample not analyzed for this compound
U = Compound or sample not detected; value shown is reporting limit
J = Analyte concentration is below quantitation limit, but greater than or equal to 1/2 the laboratory detection limit. Value is estimated

Table 6
Summary of Manual Flow Gauging Data
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

Station	Date	Time	Reference Datum	Height of Staff Gauge Base (i.e., 0') above Reference Datum (ft)	Height of sensor above Reference Datum (ft)	Staff Gauge Reading (ft)	Sensor Reading (ft)	Calculated Water Depth Above Reference Datum Based on Staff Gauge (ft)	Measured Flow (cfs)	Recorded By	Notes
SW-01-TT	04/03/09	--	Deepest Point in Channe	0.14	0.39	1.68	1.86	1.82	15.71	Roux	
	05/08/09	--	Deepest Point in Channe	0.14	0.39	1.32	1.09	1.46	6.22	Roux	
	06/01/09	--	Deepest Point in Channe	0.14	0.39	0.98	1.06	1.12	1.46	Roux	
	06/01/09	--	Deepest Point in Channe	0.14	0.39	0.98	1.00	1.12	1.41	Roux	
	06/30/09	11:10 AM	Deepest Point in Channe	0.14	0.36	1.11	0.71	1.25	2.65	Roux	a
	06/30/09	12:15 PM	Deepest Point in Channe	0.14	0.36	1.11	0.71	1.25	2.42	Roux	
	07/17/09	2:30 PM	Deepest Point in Channe	0.14	0.36	1.06	0.74	1.20	1.90	Roux	
	08/03/09	1:25 PM	Deepest Point in Channe	0.14	0.36	1.21	0.95	1.35	3.62	Roux	
	08/31/09	8:51 AM	Deepest Point in Channe	0.14	0.36	1.10	0.85	1.24	2.90	Roux	
	07/01/09	5:04 PM	Deepest Point in Channe	0.14	0.36	1.63	--	1.77	20.89	Geosyntec	
	07/02/09	9:26 AM	Deepest Point in Channe	0.14	0.36	1.88	--	2.02	26.56	Geosyntec	
	07/07/09	6:10 PM	Deepest Point in Channe	0.14	0.36	2.45	--	2.59	50.01	Geosyntec	
	07/09/09	7:25 AM	Deepest Point in Channe	0.14	0.36	1.52	--	1.66	9.82	Geosyntec	
	07/24/09	11:52 AM	Deepest Point in Channe	0.14	0.36	2.56	--	2.70	76.60	Geosyntec	
SW-2-IP	03/30/09	--	Crest of Weir	-0.43	-0.39	0.58	0.54	0.15	0.82	Roux	
	05/08/09	--	Crest of Weir	-0.43	-0.39	0.58	0.54	0.15	0.82	Roux	
	06/01/09	--	Crest of Weir	-0.43	-0.39	0.10	0.02	0.00	0.00	Roux	
	06/30/09	11:45 AM	Crest of Weir	-0.43	-0.39	0.54	0.46	0.11	0.31	Roux	
	07/17/09	3:15 PM	Crest of Weir	-0.43	-0.39	0.49	0.41	0.06	0.16	Roux	
	08/03/09	1:37 PM	Crest of Weir	-0.43	-0.39	0.60	0.54	0.17	0.66	Roux	
	08/31/09	9:10 AM	Crest of Weir	-0.43	-0.39	0.60	0.53	0.17	0.88	Roux	
	07/01/09	3:23 PM	Crest of Weir	-0.43	-0.39	0.55	--	0.12	0.65	Geosyntec	
	07/02/09	9:14 AM	Crest of Weir	-0.43	-0.39	0.60	--	0.17	1.31	Geosyntec	
	07/09/09	8:05 AM	Crest of Weir	-0.43	-0.39	0.66	--	0.23	1.72	Geosyntec	
	07/24/09	11:38 AM	Crest of Weir	-0.43	-0.39	0.78	--	0.35	4.21	Geosyntec	
SW-02-TT	03/30/09	--	Deepest Point in Channe	0.22	0.27	1.60	1.58	1.82	8.70	Roux	
	05/08/09	--	Deepest Point in Channe	0.22	0.27	1.34	1.26	1.56	6.91	Roux	
	05/08/09	--	Deepest Point in Channe	0.22	0.27	1.32	1.27	1.54	7.41	Roux	
	05/11/09	--	Deepest Point in Channe	0.22	0.27	1.08	1.11	1.30	5.08	Roux	
	06/01/09	--	Deepest Point in Channe	0.22	0.27	0.82	0.78	1.04	2.41	Roux	
	06/29/09	1:30 PM	Deepest Point in Channe	0.22	0.27	1.24	1.10	1.46	2.41	Roux	
	07/17/09	1:15 PM	Deepest Point in Channe	0.22	0.27	0.96	0.89	1.18	3.02	Roux	
	08/03/09	1:37 PM	Deepest Point in Channe	0.22	0.27	1.20	1.05	1.42	5.28	Roux	
	09/01/09	9:22 AM	Deepest Point in Channe	0.22	0.27	1.04	0.87	1.26	3.74	Roux	
	09/01/09	9:46 AM	Deepest Point in Channe	0.22	0.27	1.04	0.87	1.26	3.22	Roux	
	07/01/09	5:56 PM	Deepest Point in Channe	0.22	0.27	1.54	--	1.76	13.02	Geosyntec	
	07/02/09	11:33 AM	Deepest Point in Channe	0.22	0.27	1.94	--	2.16	19.97	Geosyntec	
	07/07/09	6:50 PM	Deepest Point in Channe	0.22	0.27	2.86	--	3.08	47.86	Geosyntec	
	07/09/09	9:15 AM	Deepest Point in Channe	0.22	0.27	1.74	--	1.96	13.48	Geosyntec	
	07/24/09	10:53 AM	Deepest Point in Channe	0.22	0.27	3.36	--	3.58	67.81	Geosyntec	
SW-03-TT	03/30/09	--	Deepest Point in Channe	0.77	0.56	1.14	1.70	1.91	13.60	Roux	
	05/08/09	--	Deepest Point in Channe	0.77	0.56	0.88	1.00	1.65	5.65	Roux	
	06/01/09	--	Deepest Point in Channe	0.77	0.56	0.50	0.80	1.27	1.52	Roux	
	06/29/09	1:00 PM	Deepest Point in Channe	0.77	0.56	0.74	0.82	1.51	4.02	Roux	
	07/17/09	2:10 PM	Deepest Point in Channe	0.77	0.56	0.96	0.89	1.73	2.12	Roux	
	08/03/09	12:59 PM	Deepest Point in Channe	0.77	0.56	0.76	0.90	1.53	4.27	Roux	
	08/31/09	8:14 AM	Deepest Point in Channe	0.77	0.56	0.76	0.92	1.53	4.42	Roux	
	07/02/09	12:25 PM	Deepest Point in Channe	0.77	0.56	1.44	--	2.21	10.04	Geosyntec	
	07/09/09	10:05 AM	Deepest Point in Channe	0.77	0.56	1.10	--	1.87	9.06	Geosyntec	
	07/24/09	10:06 AM	Deepest Point in Channe	0.77	0.56	2.68	--	3.45	70.48	Geosyntec	
SW-04-TT	03/30/09	--	Deepest Point in Channe	-0.01	0.00	1.40	1.05	1.39	11.42	Roux	
	04/03/09	--	Deepest Point in Channe	-0.01	0.00	1.24	1.21	1.23	7.30	Roux	
	05/08/09	--	Deepest Point in Channe	-0.01	0.00	1.18	1.02	1.17	8.43	Roux	
	05/11/06	--	Deepest Point in Channe	-0.01	0.00	0.98	0.81	0.97	5.44	Roux	
	06/01/09	--	Deepest Point in Channe	-0.01	0.00	0.72	0.61	0.71	3.74	Roux	
	06/30/09	10:30 AM	Deepest Point in Channe	-0.01	0.00	0.88	0.74	0.87	3.61	Roux	
	07/17/09	1:55 PM	Deepest Point in Channe	-0.01	0.00	0.84	0.68	0.83	4.95	Roux	
	08/03/09	12:40 PM	Deepest Point in Channe	-0.01	0.00	1.05	0.85	1.04	6.56	Roux	
	08/31/09	8:35 AM	Deepest Point in Channe	-0.01	0.00	1.06	0.92	1.05	4.46	Roux	
	07/02/09	12:14 PM	Deepest Point in Channe	-0.01	0.00	1.64	--	1.63	13.41	Geosyntec	
	07/09/09	10:25 AM	Deepest Point in Channe	-0.01	0.00	1.60	--	1.59	16.72	Geosyntec	
	07/24/09	10:28 AM	Deepest Point in Channe	-0.01	0.00	3.78	--	3.77	133.32	Geosyntec	

Table 6
Summary of Manual Flow Gauging Data
Industri-Plex Superfund Site Operable Unit 2
Woburn, Massachusetts

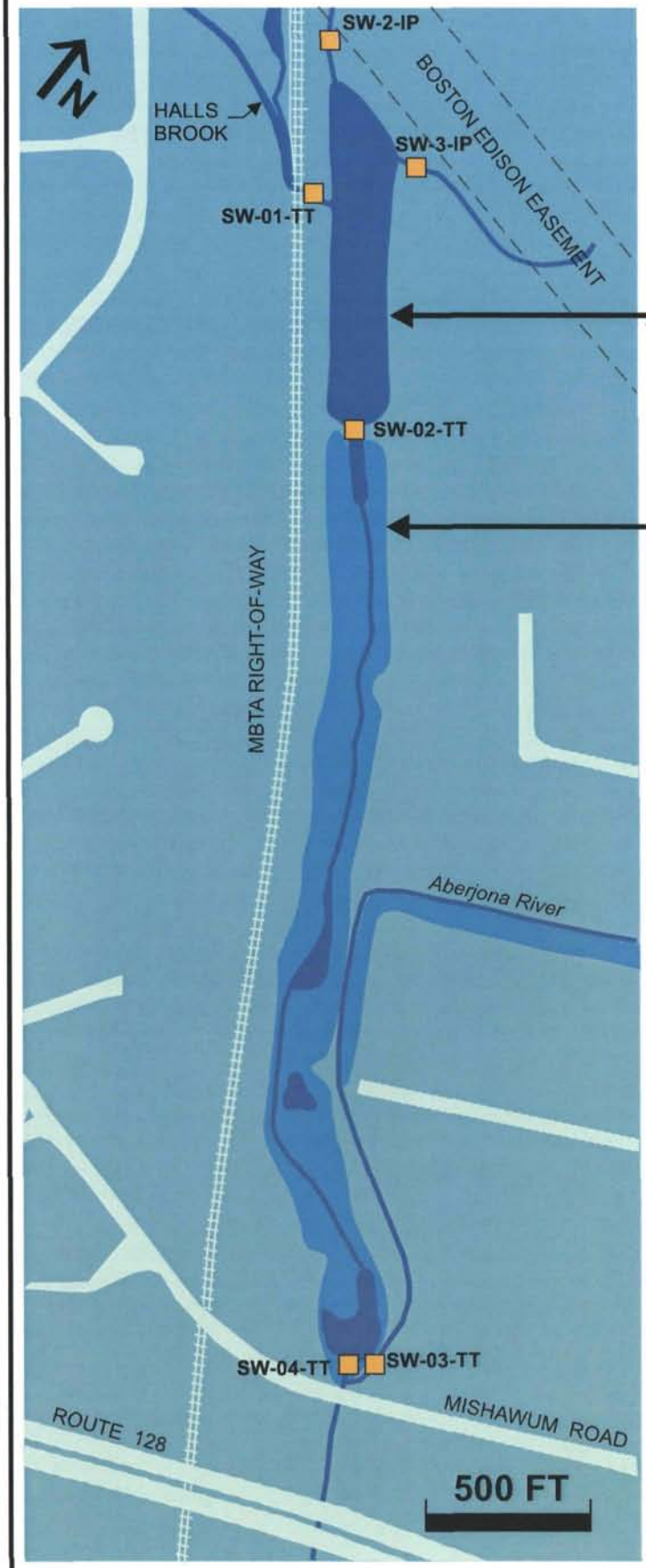
DRAFT

Station	Date	Time	Reference Datum	Height of Staff Gauge Base (i.e., 0') above Reference Datum (ft)	Height of sensor above Reference Datum (ft)	Staff Gauge Reading (ft)	Sensor Reading (ft)	Calculated Water Depth Above Reference Datum Based on Staff Gauge (ft)	Measured Flow (cfs)	Recorded By	Notes
SW-05-TT	04/03/09	--	Deepest Point in Channe	0.56	0.49	1.72	2.08	2.28	17.50	Roux	
	05/08/09	--	Deepest Point in Channe	0.56	0.49	1.66	1.60	2.22	19.11	Roux	
	06/02/09	--	Deepest Point in Channe	0.56	0.49	--	1.60	--	4.53	Roux	b
	06/29/09	12:00 PM	Deepest Point in Channe	0.56	0.49	1.78	1.36	2.34	13.12	Roux	
	07/07/09	2:40 PM	Deepest Point in Channe	0.50	0.49	1.26	1.29	1.76	11.40	Roux	c
	08/04/09	10:30 AM	Deepest Point in Channe	0.50	0.49	1.32	1.32	1.82	10.03	Roux	d
	08/31/09	9:35 AM	Deepest Point in Channe	0.50	0.49	1.43	1.42	1.93	12.94	Roux	
	07/02/09	1:02 PM	Deepest Point in Channe	0.56	0.49	2.12	--	2.68	47.97	Geosyntec	
	07/09/09	11:10 AM	Deepest Point in Channe	0.50	0.49	1.82	--	2.32	36.40	Geosyntec	
	07/24/09	9:29 AM	Deepest Point in Channe	0.50	0.49	3.04	--	3.54	187.24	Geosyntec	
SW-06-TT	04/03/09	--	Deepest Point in Channe	0.65	0.48	1.80	2.02	2.45	17.98	Roux	
	05/11/09	--	Deepest Point in Channe	0.65	0.48	1.98	1.73	2.63	14.17	Roux	
	06/02/09	--	Deepest Point in Channe	0.65	0.48	1.58	1.26	2.23	4.95	Roux	
	06/29/09	9:30 AM	Deepest Point in Channe	0.19	0.48	1.99	1.71	2.18	18.30	Roux	e
	07/07/09	1:30 PM	Deepest Point in Channe	0.19	0.48	1.68	1.41	1.87	14.60	Roux	
	08/04/09	9:53 AM	Deepest Point in Channe	0.19	0.48	1.82	1.47	2.01	11.28	Roux	
	08/31/09	9:57 AM	Deepest Point in Channe	0.19	0.48	1.90	1.56	2.09	14.88	Roux	
	07/02/09	1:33 PM	Deepest Point in Channe	0.19	0.48	Submerged	--	N/A	64.87	Geosyntec	
	07/09/09	11:45 AM	Deepest Point in Channe	0.19	0.48	2.60	--	2.79	41.28	Geosyntec	
SW-07-TT	04/03/09	--	Deepest Point in Channe	0.63	0.44	1.26	1.79	1.89	27.39	Roux	
	05/11/09	--	Deepest Point in Channe	0.63	0.44	1.19	1.25	1.82	18.44	Roux	
	06/02/09	--	Deepest Point in Channe	0.63	0.44	1.00	1.48	1.63	8.47	Roux	
	06/29/09	10:30 AM	Deepest Point in Channe	0.63	0.44	0.86	1.23	1.49	23.62	Roux	
	07/07/09	12:45 PM	Deepest Point in Channe	0.63	0.44	0.76	1.05	1.39	19.00	Roux	
	08/04/09	9:09 AM	Deepest Point in Channe	0.71	0.44	1.12	1.42	1.83	19.61	Roux	f
	09/01/09	8:26 AM	Deepest Point in Channe	0.71	0.44	1.04	1.35	1.75	16.38	Roux	
	07/09/09	12:25 PM	Deepest Point in Channe	0.63	0.44	1.64	--	2.27	48.77	Geosyntec	
SW-08-TT	03/30/09	--	Invert of Weir	-1.83	-1.53	3.28	3.41	1.45	75.50	Roux	g
	05/11/09	--	Invert of Weir	-1.83	-1.53	2.92	2.78	1.09	28.23	Roux	
	06/02/09	--	Invert of Weir	-1.83	-1.53	2.58	2.52	0.75	9.22	Roux	
	06/19/09	9:30 AM	Invert of Weir	-1.83	-1.53	--	2.99	--	81.70	Roux	h
	06/30/09	8:30 AM	Invert of Weir	-1.83	-1.53	3.00	2.66	1.17	35.02	Roux	
	07/07/09	11:00 AM	Invert of Weir	-1.83	-1.53	2.79	2.45	0.96	34.12	Roux	
	08/04/09	8:20 AM	Invert of Weir	-1.87	-1.53	2.99	2.56	1.12	25.47	Roux	i

Notes:
ft = feet
cfs = cubic feet per second
N/A = not available
-- = indicates data not recorded

a. Sensor moved on 6/25/09
b. No staff gage reading recorded
c. Staff gauge moved on 7/6/09
d. Staff gauge relocated on 9/3/09; new height = 0.32 ft above reference datum
e. Staff Gauge Moved on 6/18/2009
f. Staff Gauge Moved on 7/23/2009
g. Staff Gauge has been removed from the station since monitoring was performed on 8/4/2009. Sensor has been relocated to the same elevation as the invert of the weir.
h. No staff gage reading recorded
i. Staff gauge re-set after being dislodged during the previous storm

FIGURES



LEGEND

SW-01-TT ■ APPROXIMATE LOCATION AND DESIGNATION OF SURFACE WATER MONITORING STATION

DRAFT

Title:

SURFACE WATER MONITORING STATIONS NORTH OF ROUTE 128

Prepared for:

INDUSTRI-PLEX OU 2 SETTLING DEFENDANTS

ROUX ASSOCIATES INC. *Environmental consulting & Management*	Compiled by: LM	Date: 7/10/09	FIGURE	
	Prepared by: CRS	Scale: AS SHOWN	1	
	Project Mgr.: LM	Office: MA		
	File No.: IPS0114202	Project No.: 119407M07		

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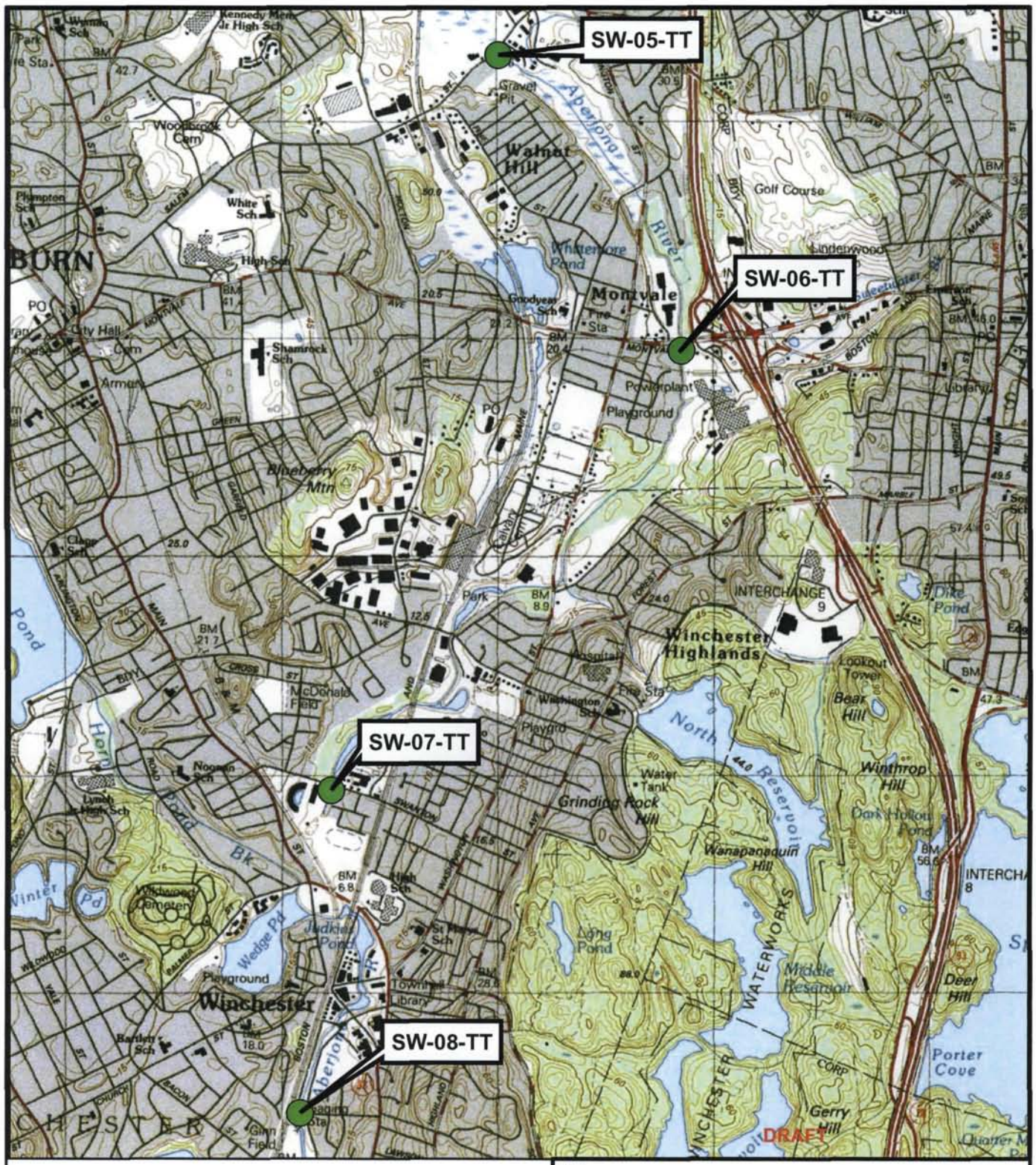

QUADRANGLE LOCATION

N

0 1,000 2,000 Feet

SOURCE:
USGS, 1987.
Reading (Massachusetts) Quadrangle
1:25,000-scale Topographic Map

Title:

SURFACE WATER MONITORING STATIONS SOUTH OF ROUTE 128

Prepared For:

INDUSTRI-PLEX OU 2 SETTLING DEFENDANTS

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled By: LM	Date: 7/10/09	FIGURE	
Prepared By: CRS	Scale: AS SHOWN	2	
Project Mgr.: LM	Office: MA		
File No.: IPS0114201	Project: 119401M		

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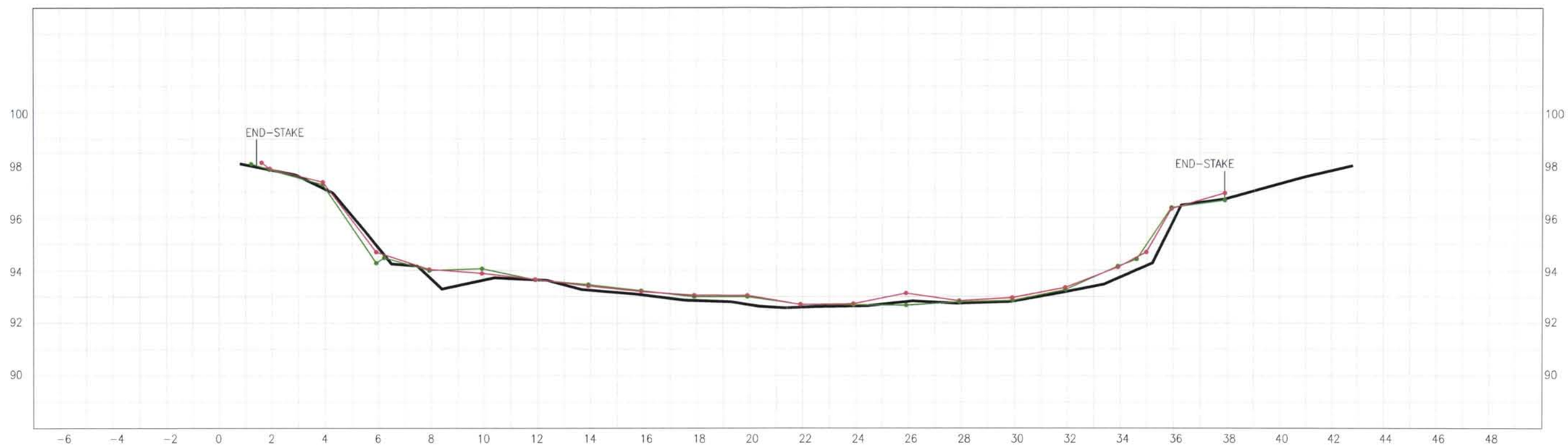

4' 0 4'

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Notes:

1. Profile is drawn looking upstream.

2. Elevations are referenced to an arbitrary benchmark (=100 ft) at the southeast corner of concrete pad.

BASELINE (MARCH 2009) CROSS-SECTION
6-25-09 POST-STORM CROSS-SECTION
7-27-09 POST-STORM CROSS-SECTION

Title:
POST-STORM STREAM CROSS-SECTIONS
STATION SW-06-TT
(MONTVALE AVENUE)

Prepared For:
INDUSTRI-PLEX OU2 SETTLING DEFENDANTS

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: LM	Date: 9/8/09	FIGURE
Prepared by: CRS	Scale: AS SHOWN	3
Project Mgr: LM	Office: MA	
File No: IPS0114607	Project: 119401M07	

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APPENDICES

APPENDIX A

APPENDIX A

Storm Hydrographs including Narrative

- *June 18-19, 2009*
- *July 1-2, 2009*
- *July 7-8, 2009*
- *July 23-24, 2009*

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Storm Narrative

June 18-19, 2009

For this storm, 2x baseflow was used as target for termination of sampling; for all stations, sampling terminated when stream flow had decreased to roughly 2x baseflow.

- SW-01-TT:
  - Initial 48 aliquots inadvertently collected as time-paced samples during the first 4 hours of the rising limb; these aliquots were composited and submitted as a separate sample
  - Subsequent six aliquots collected as flow-paced samples during the falling limb
  - Turbidity data unrecoverable due to Isco 6712 transmission errors
- SW-2-IP:
  - Due to subsequent precipitation not associated with this storm, 2x baseflow was never attained
- SW-3-IP:
  - Rain gauge malfunction
  - Pond backup began at approximately 4:00 am on 6/19. Two aliquots collected after onset of backup are only partially representative due to admixture of pond water with channel flow
  - Due to subsequent precipitation not associated with this storm, 2x baseflow was never attained
- SW-02-TT:
  - No sample collected due to Isco 6712 programming error (activation trigger)
- SW-03-TT:
  - No data available prior to 7:50 pm on 6/18 due to inadvertent overwriting of data during re-programming
- SW-04-TT:
  - Initial 48 aliquots inadvertently collected as time-paced samples during the first 4 hours of the rising limb; these aliquots were composited and submitted as a separate sample
  - Subsequent eight aliquots collected as flow-paced samples during the falling limb
- SW-05-TT:
  - No data available prior to 1:50 pm on 6/19 due to Isco 6712 equipment malfunction
- SW-06-TT:
  - Due to clarity of water resulting in low A/V sensor signal strength, no velocity readings recorded during rising limb of storm
  - Approximately 13 hours of flow data lost during the falling limb due to Isco 6712 data transmission errors
  - Flow at termination of sampling could not be determined due to Isco 6712 data transmission errors; therefore, the first recoverable flow (2 hours following the termination of sampling) was used as a surrogate for flow at termination of sampling
  - Due to subsequent precipitation not associated with this storm, 2x baseflow was never attained
  - Specific conductance data unrecoverable due Isco 6712 transmission errors
- SW-07-TT:
  - Approximately 12 hours of flow data lost during the falling limb due to Isco 6712 data transmission errors
- SW-08-TT:
  - No data available prior to 11:50 pm on 6/18 due to inadvertent overwriting of data during re-programming
  - Due to subsequent precipitation not associated with this storm, 2x baseflow was never attained

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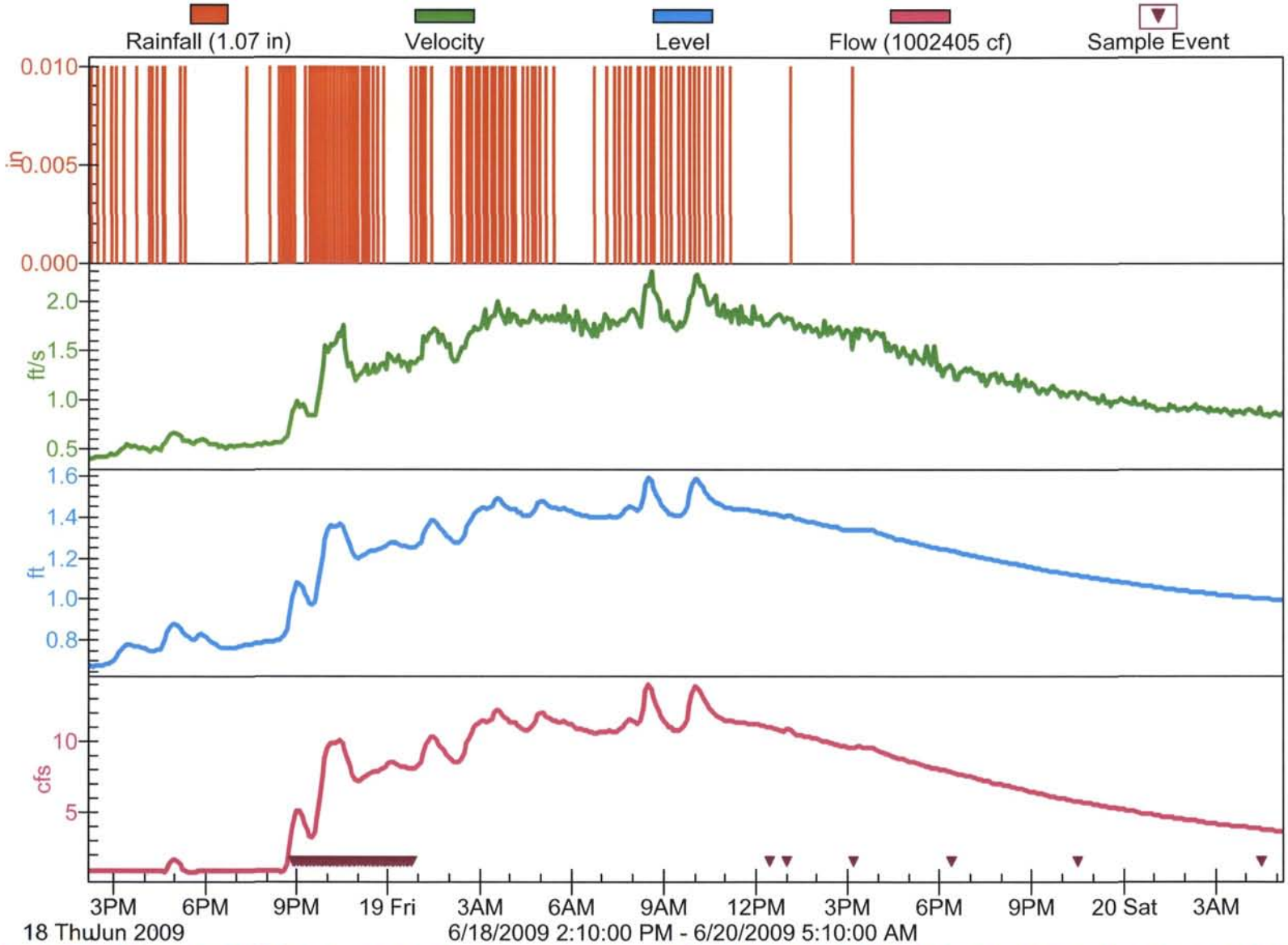
SW-01-TT

Flowlink 5



- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

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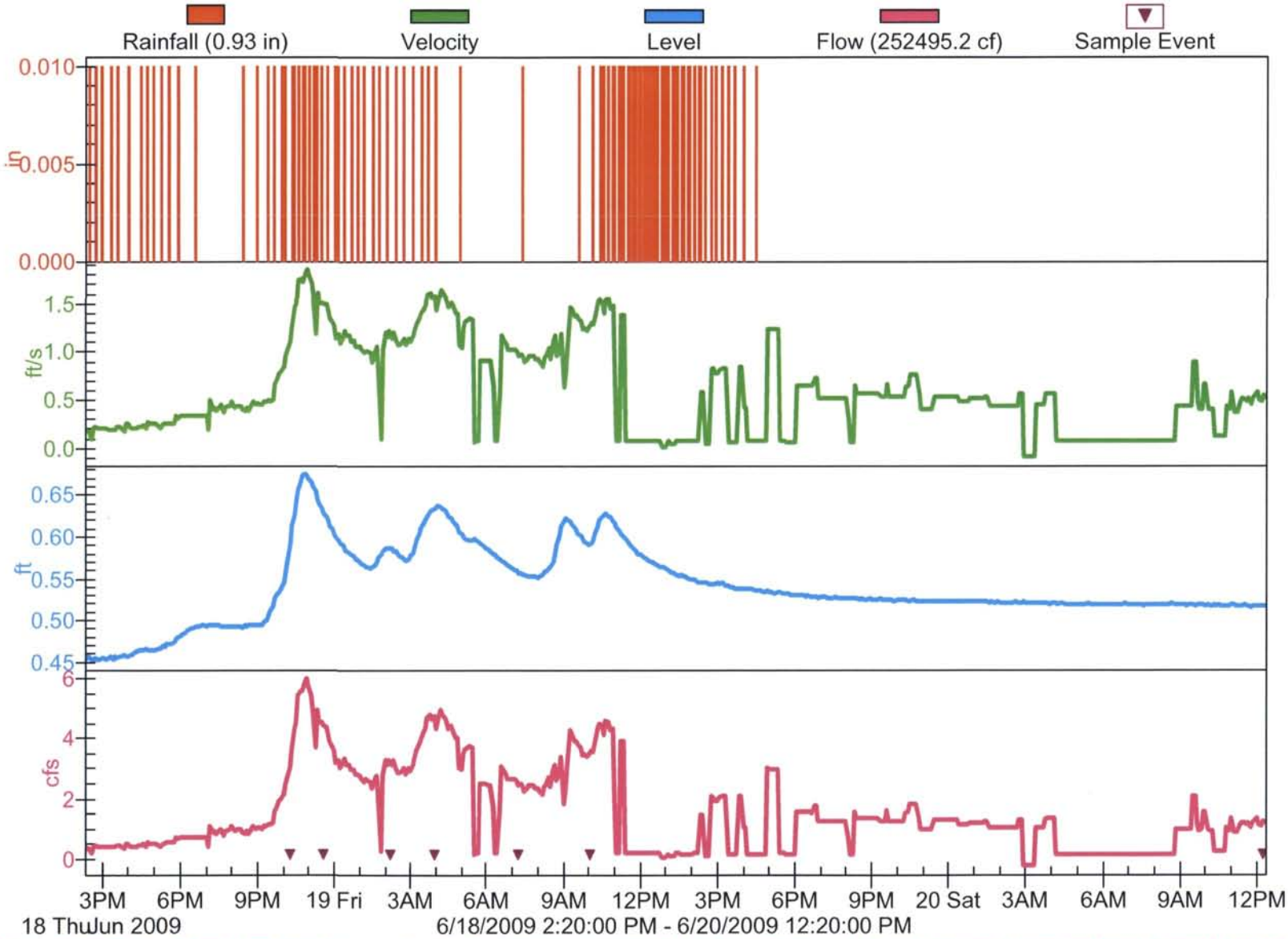
SW-2-IP

Flowlink 5

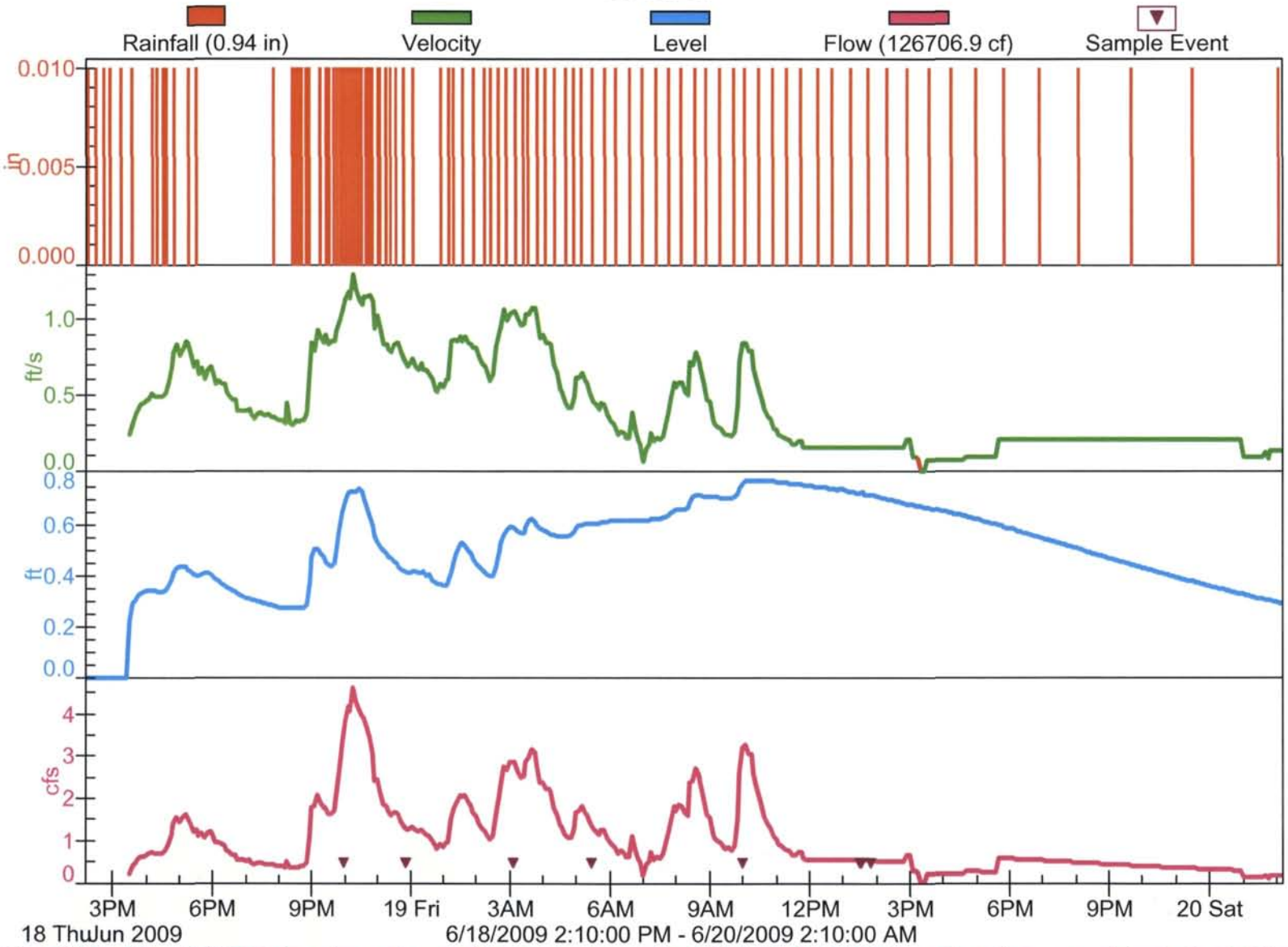


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-3-IP

Flowlink 5

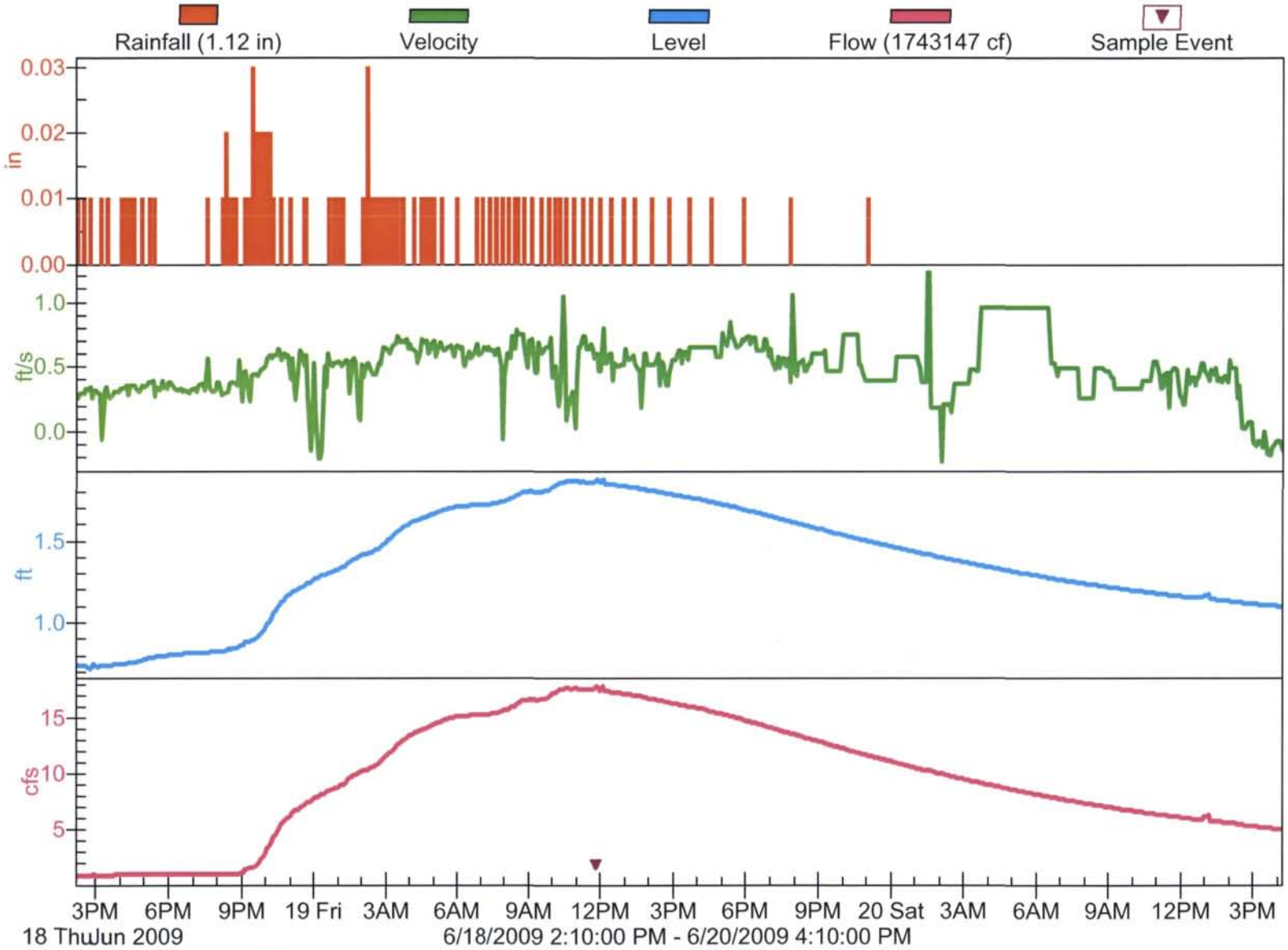


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-02-TT

Flowlink 5

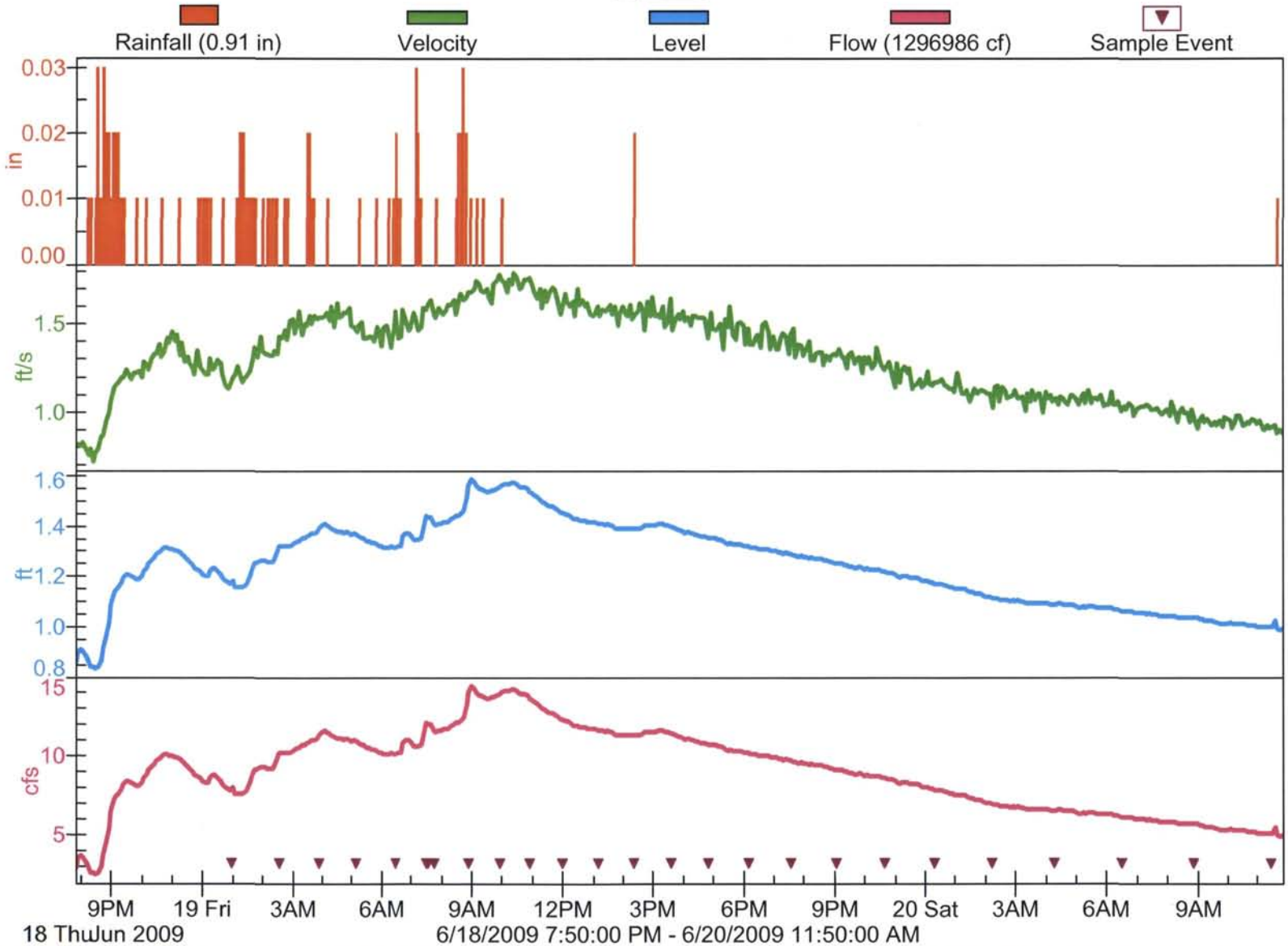


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-03-TT

Flowlink 5

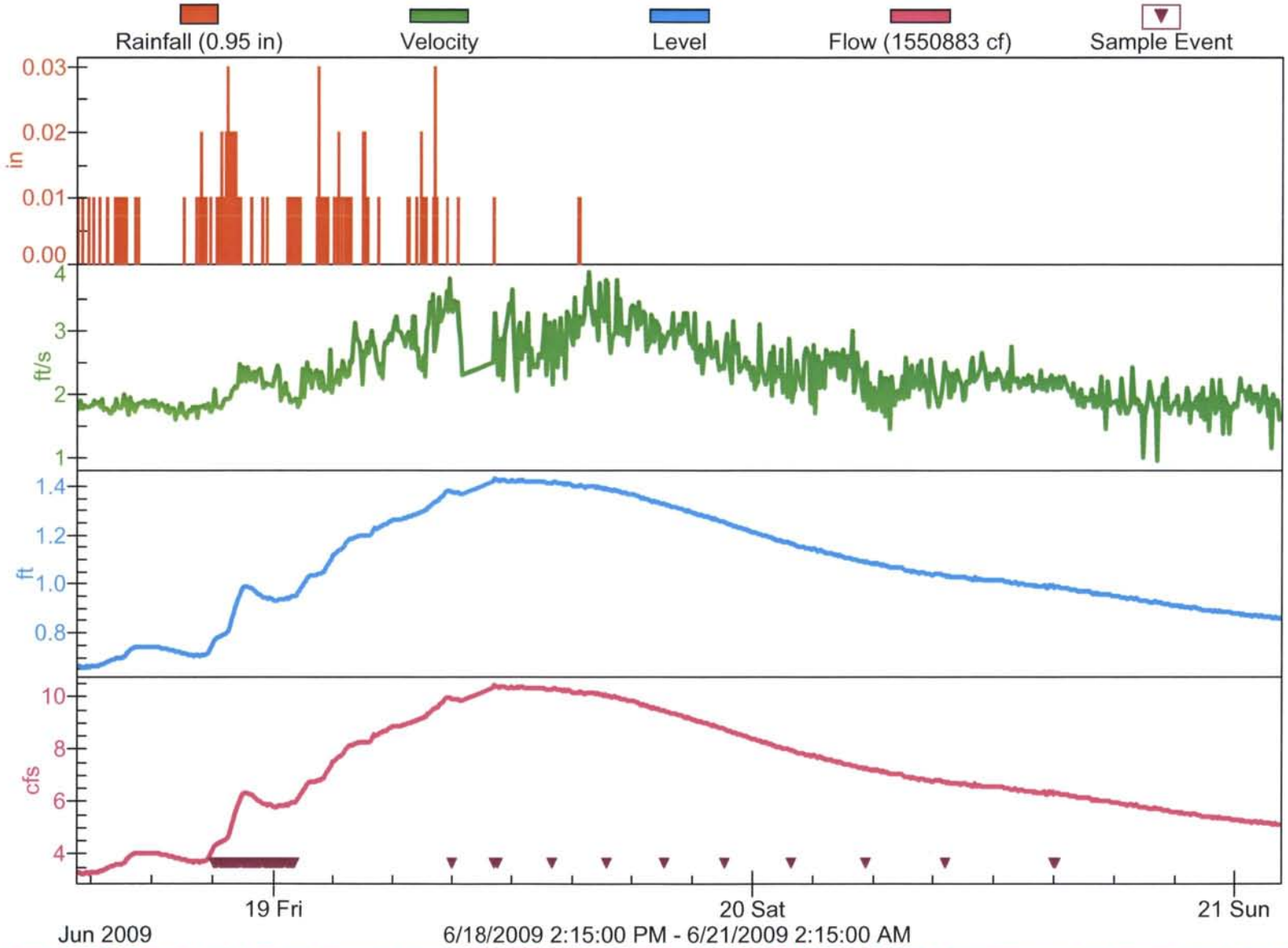


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-04-TT

Flowlink 5

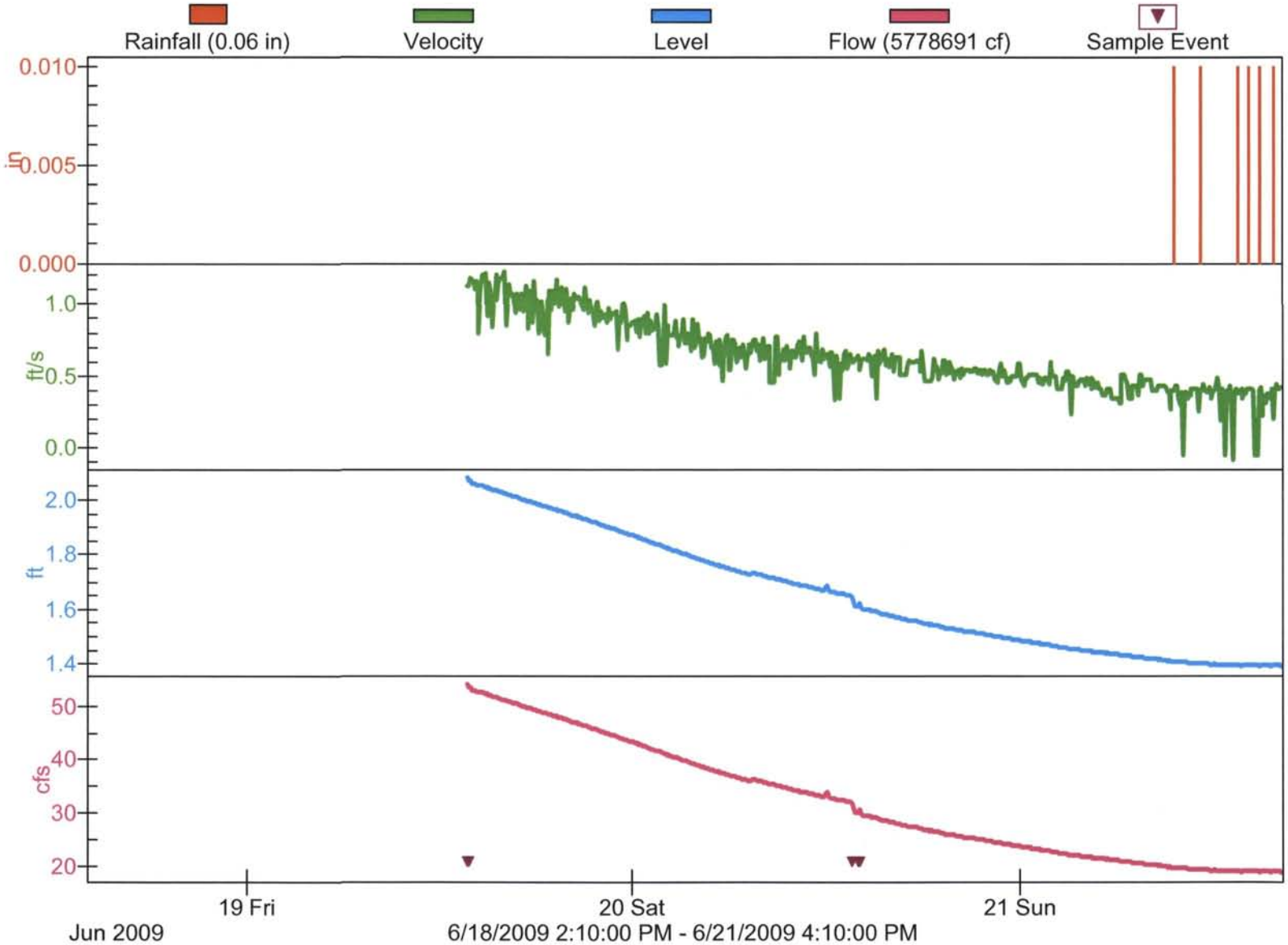


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-05-TT

Flowlink 5



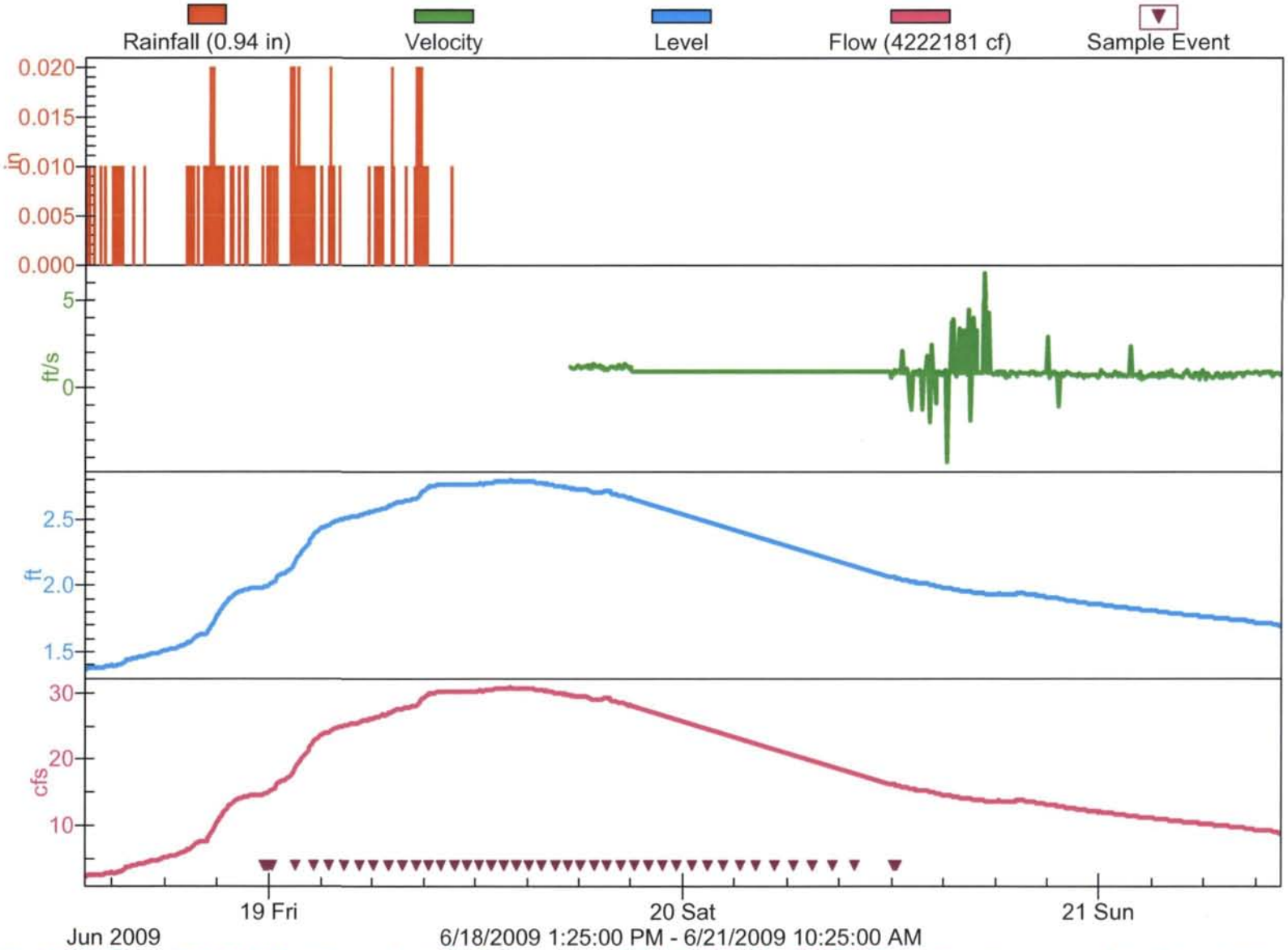
6/18/2009 2:10:00 PM - 6/21/2009 4:10:00 PM

- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-06-TT

Flowlink 5

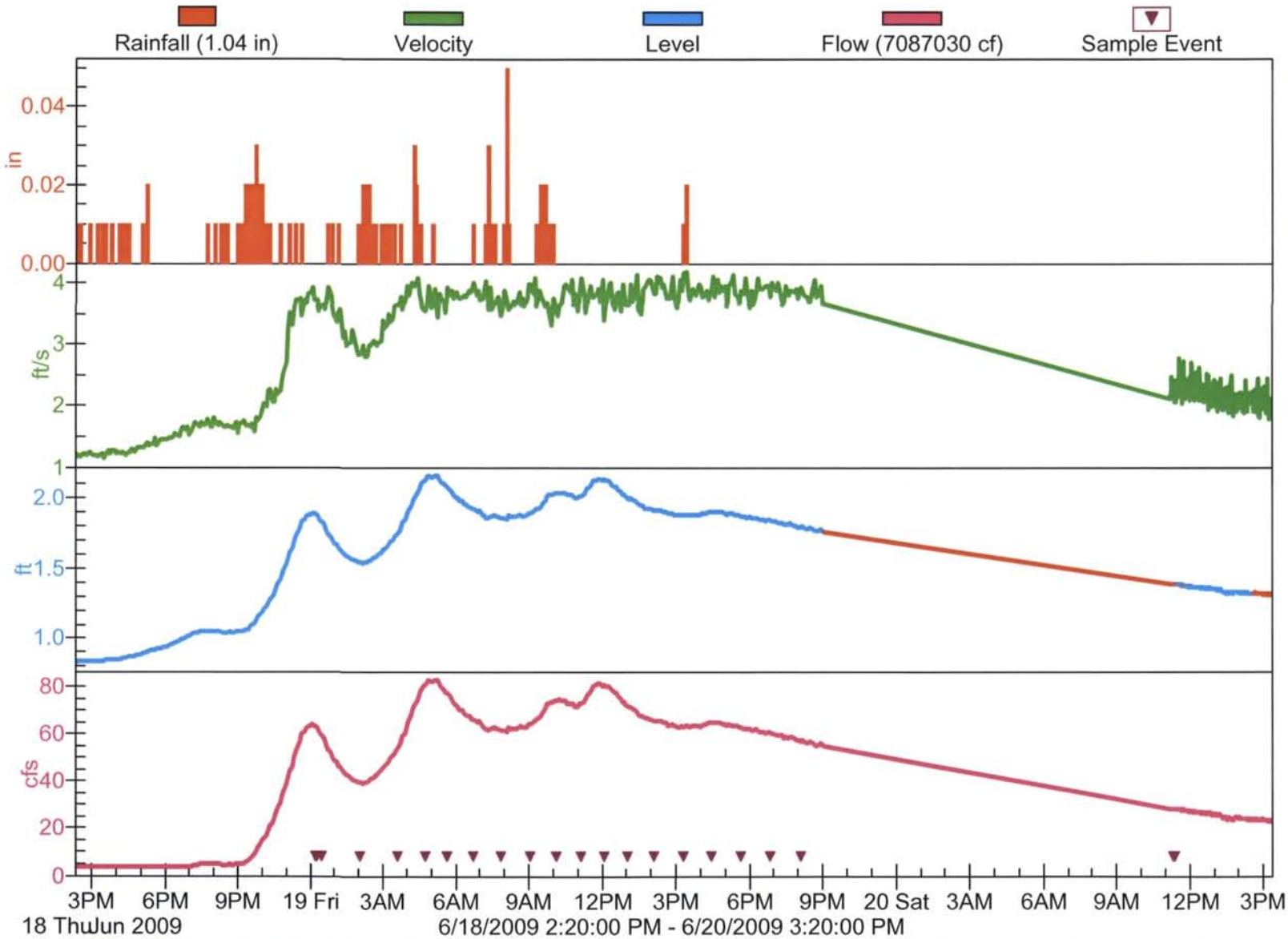


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-07-TT

Flowlink 5

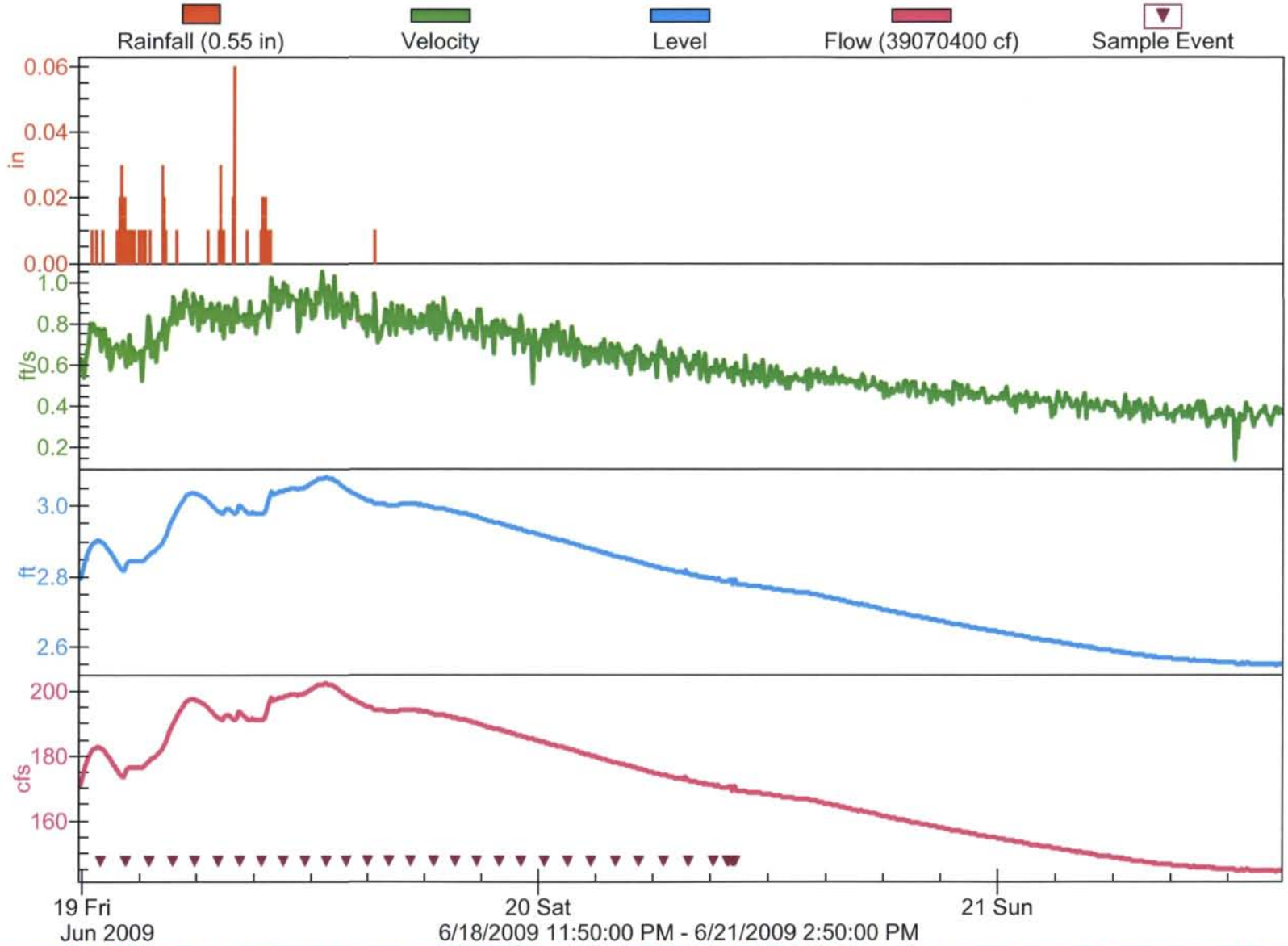


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-08-TT

Flowlink 5



- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

Storm Narrative

July 1-2, 2009

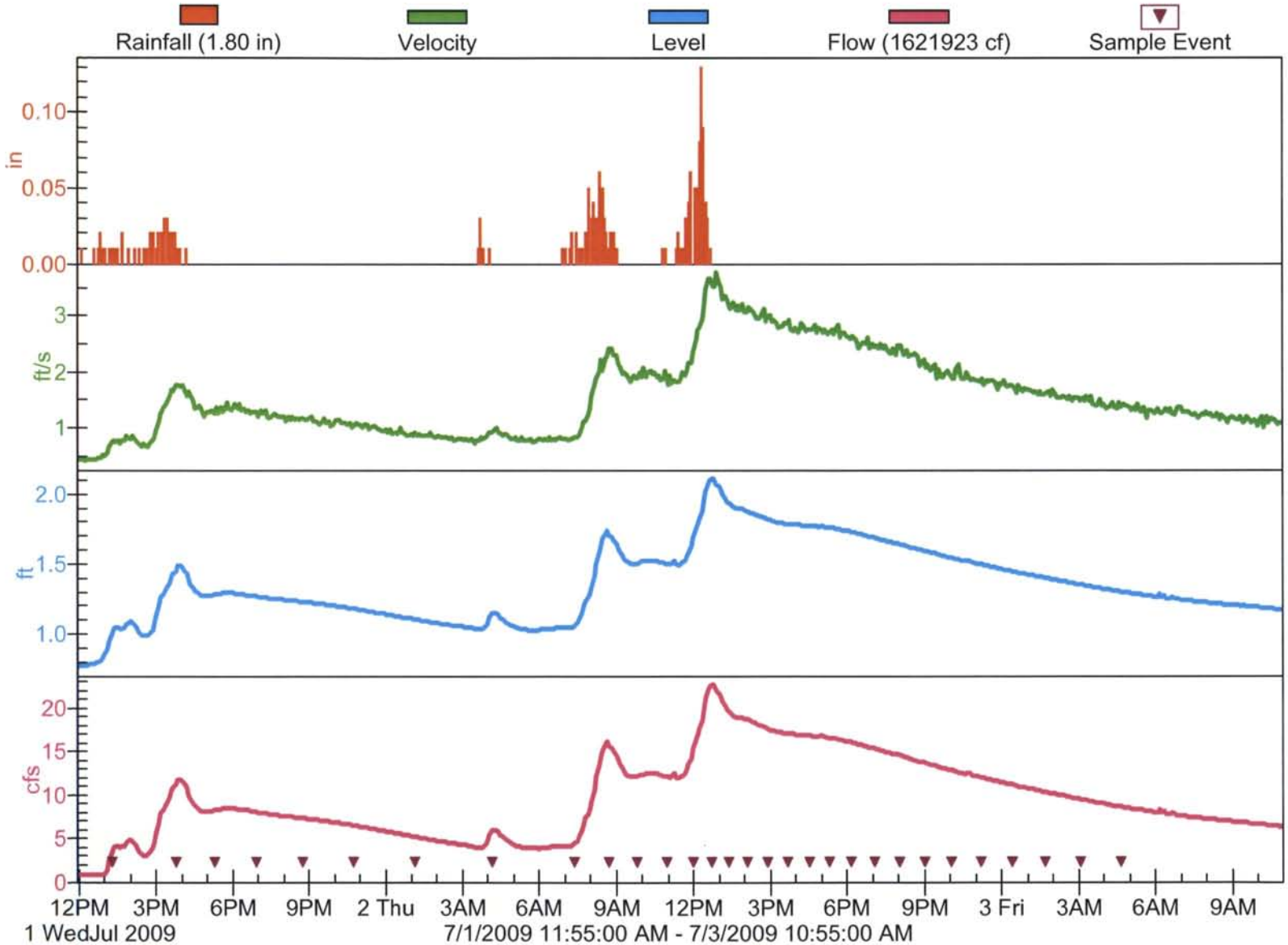
For this storm, 2x baseflow was used as target for termination of sampling; for all stations, sampling terminated when stream flow had decreased to roughly 2x baseflow.

- SW-01-TT:
  - Dissolved oxygen data unrecoverable due to Isco 6712 transmission errors
- SW-2-IP:
  - The hydrograph indicates 48 aliquots were collected; however, 7 of these were collected subsequent to processing of the composite sample
  - Due to subsequent precipitation not associated with this storm, 2x baseflow was never attained
- SW-3-IP:
  - Pond backup began at approximately 5:00 pm on 7/1. Sixteen aliquots collected after onset of backup are only partially representative due to admixture of pond water with channel flow
  - Water quality parameter data were reviewed and rejected due to problems associated with the dry conditions that existed prior to the storm
- SW-02-TT:
  - Rain gauge malfunction
- SW-03-TT:
  - Due to subsequent precipitation not associated with this storm, 2x baseflow was never attained
- SW-04-TT:
  - Aliquots were not collected between approximately 4:15 am and 8:00 am on 7/2 due to rosette change out activities
  - Sample bottles not decanted to lowest volume (several aliquot volumes were inconsistent)
- SW-06-TT:
  - Sample bottles not decanted to lowest volume (last aliquot volume was high)
- SW-08-TT:
  - Rain gauge malfunction
  - Due to subsequent precipitation not associated with this storm, 2x baseflow was never attained
  - Composite included one unrepresentative sample (volume was low in last aliquot)

DRAFT

SW-01-TT

Flowlink 5

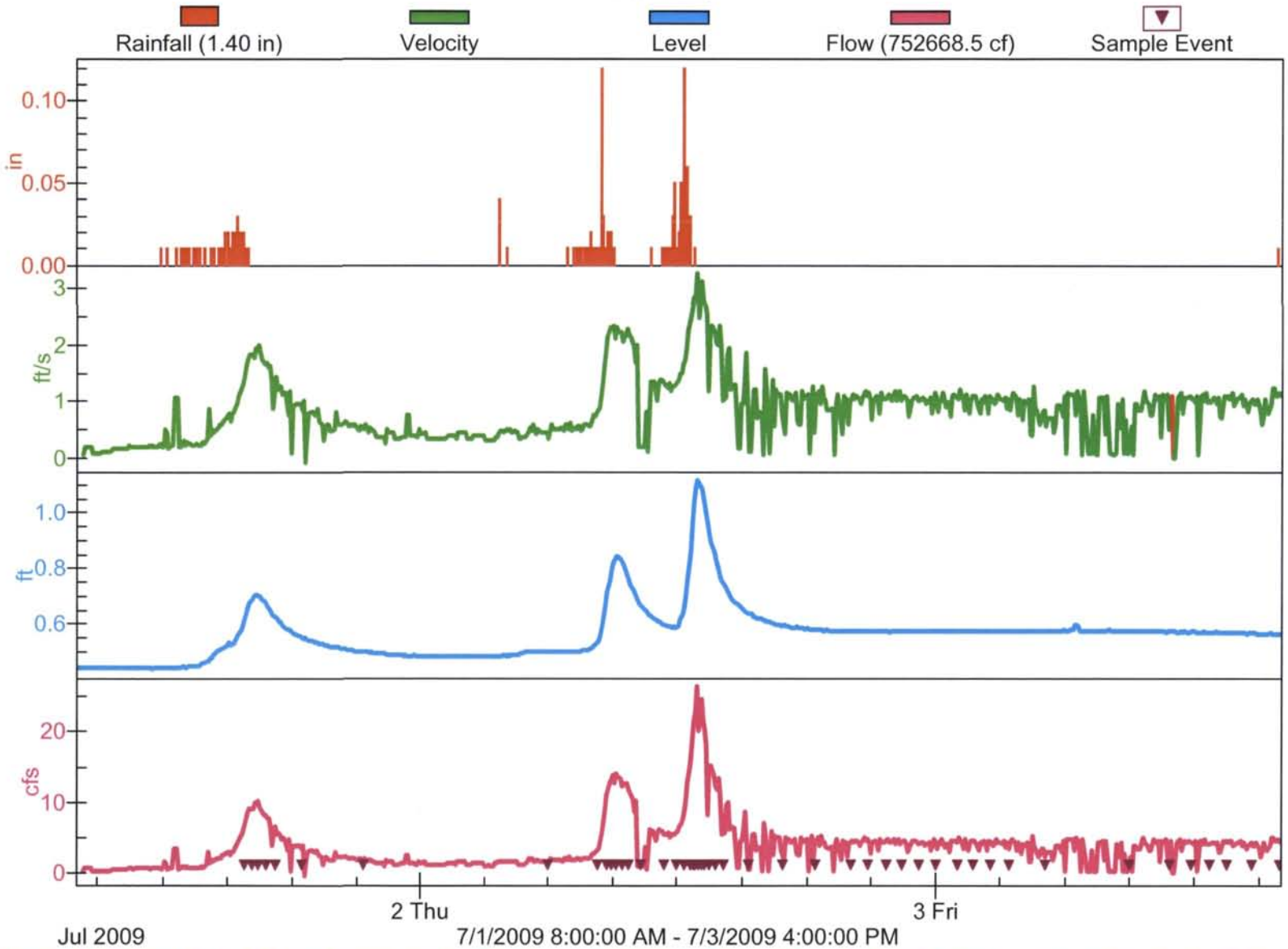


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-2-IP

Flowlink 5

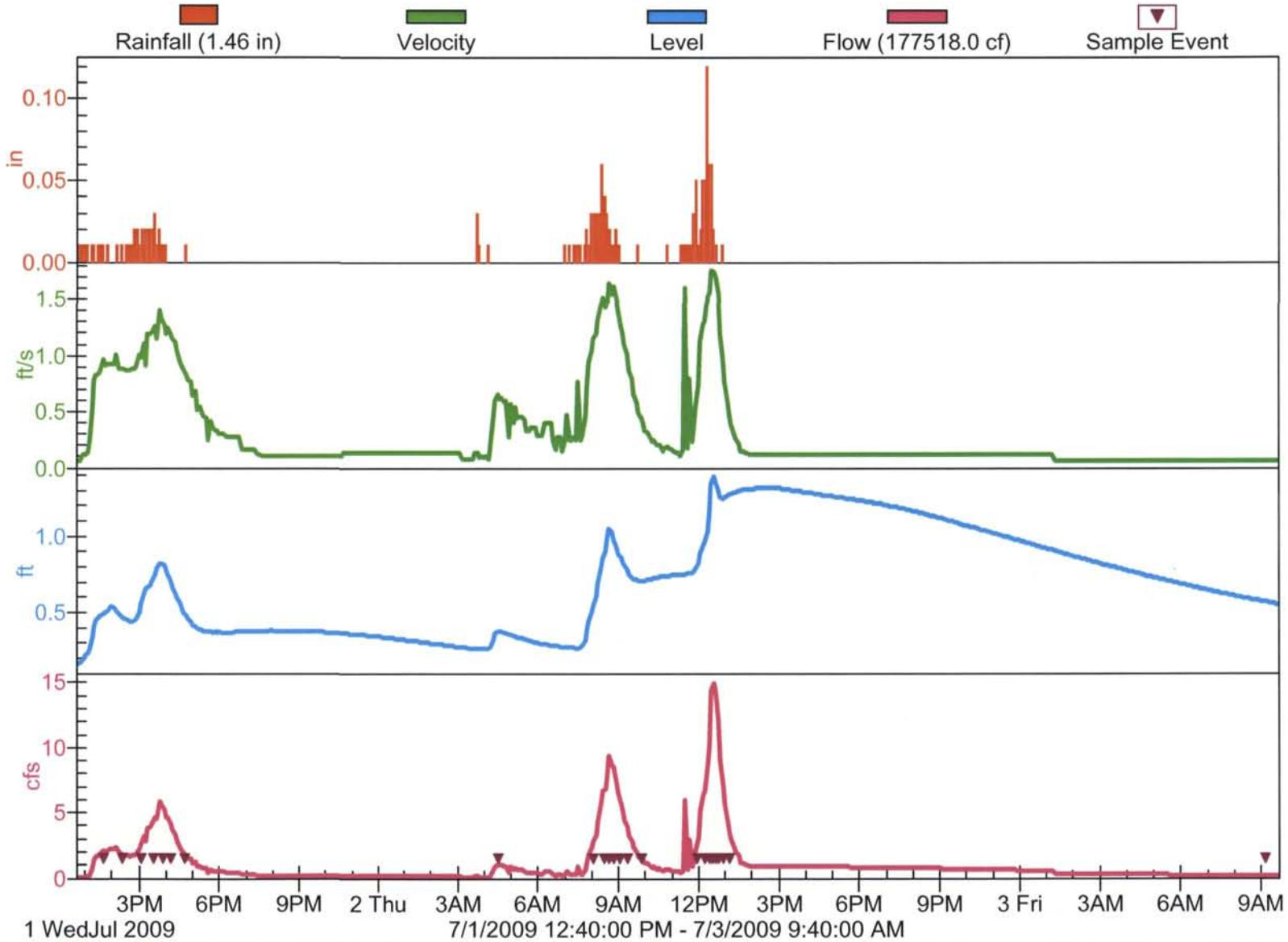


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-3-IP

Flowlink 5

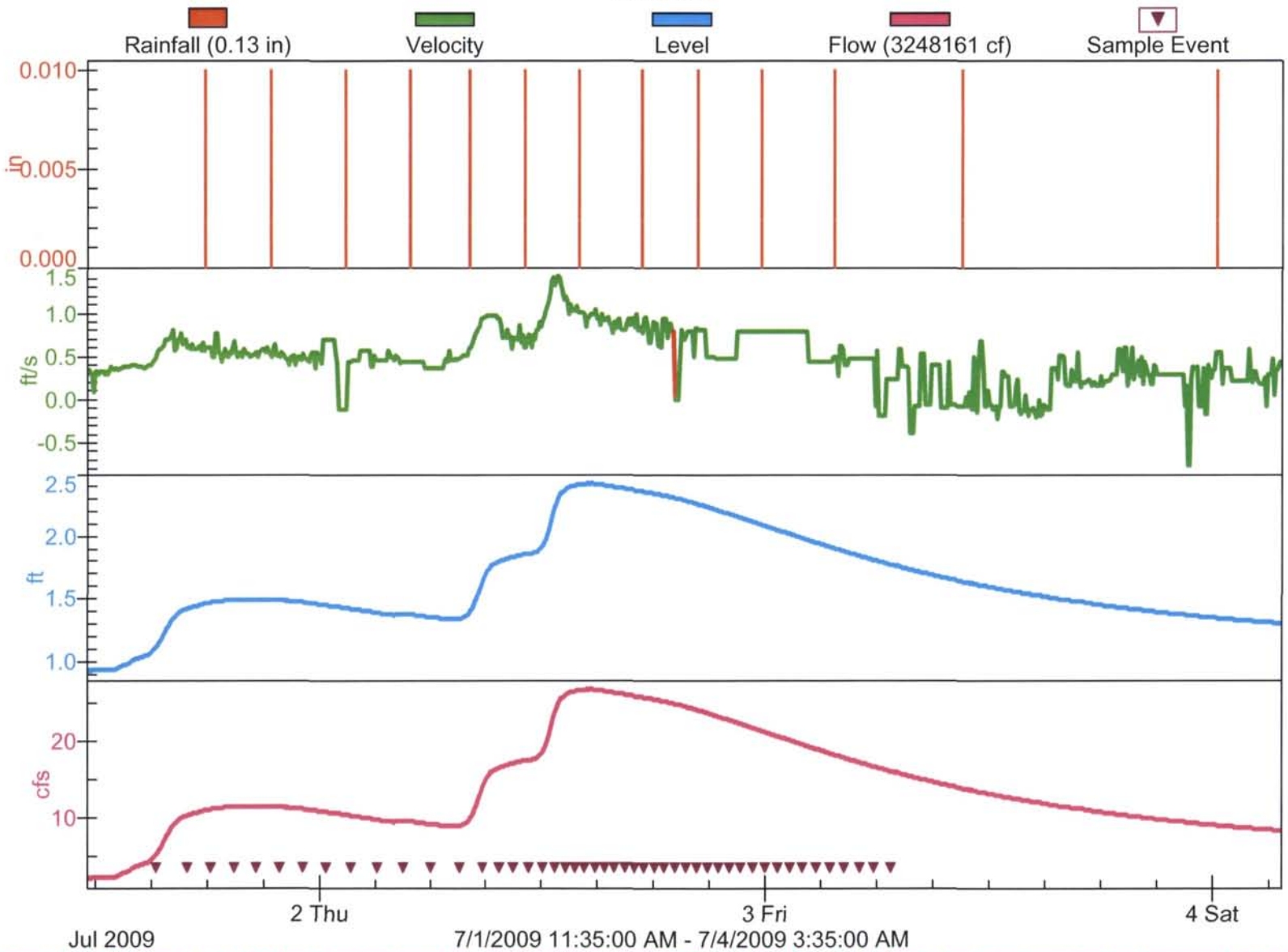


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-02-TT

Flowlink 5



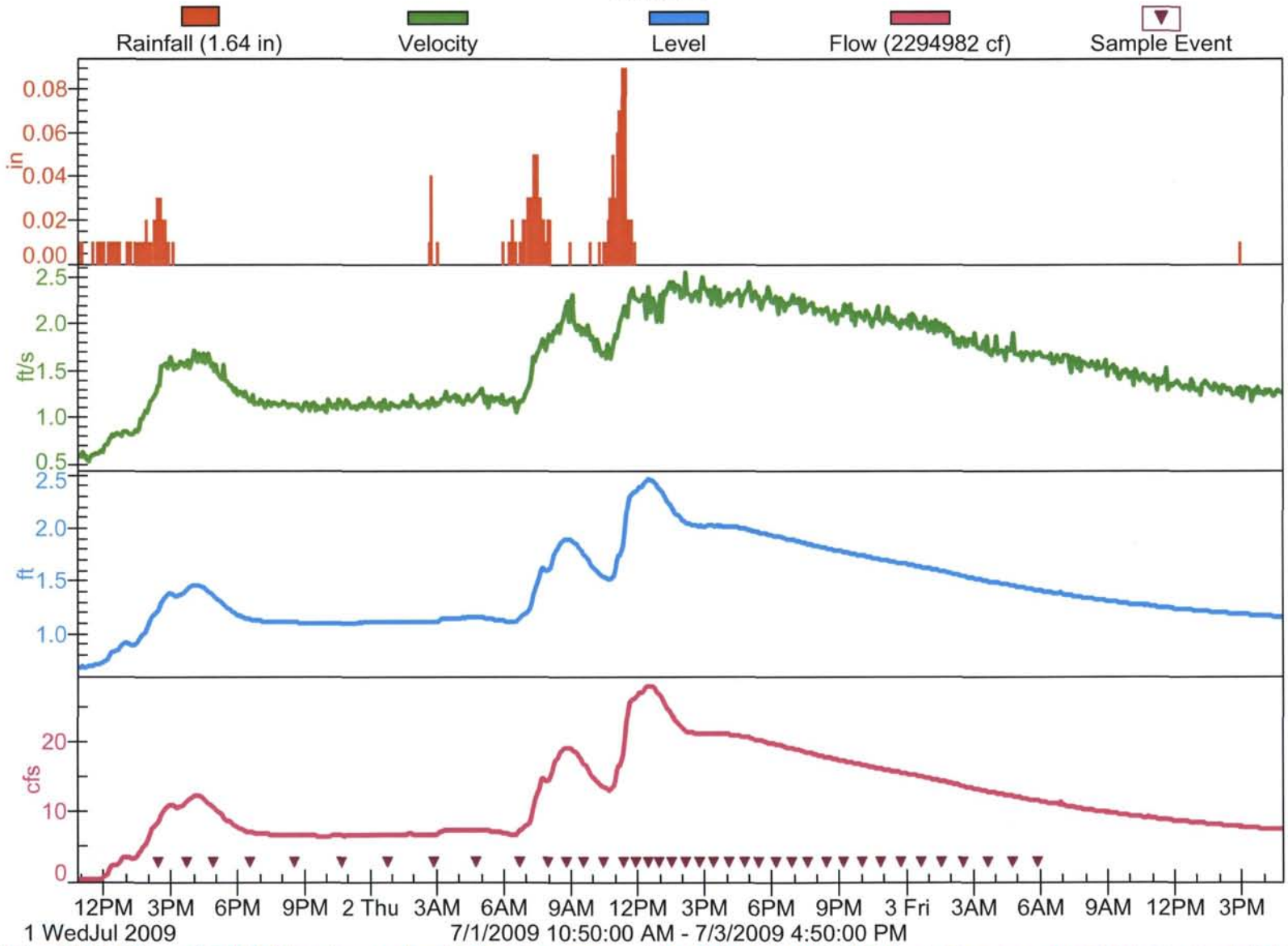
7/1/2009 11:35:00 AM - 7/4/2009 3:35:00 AM

- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-03-TT

Flowlink 5

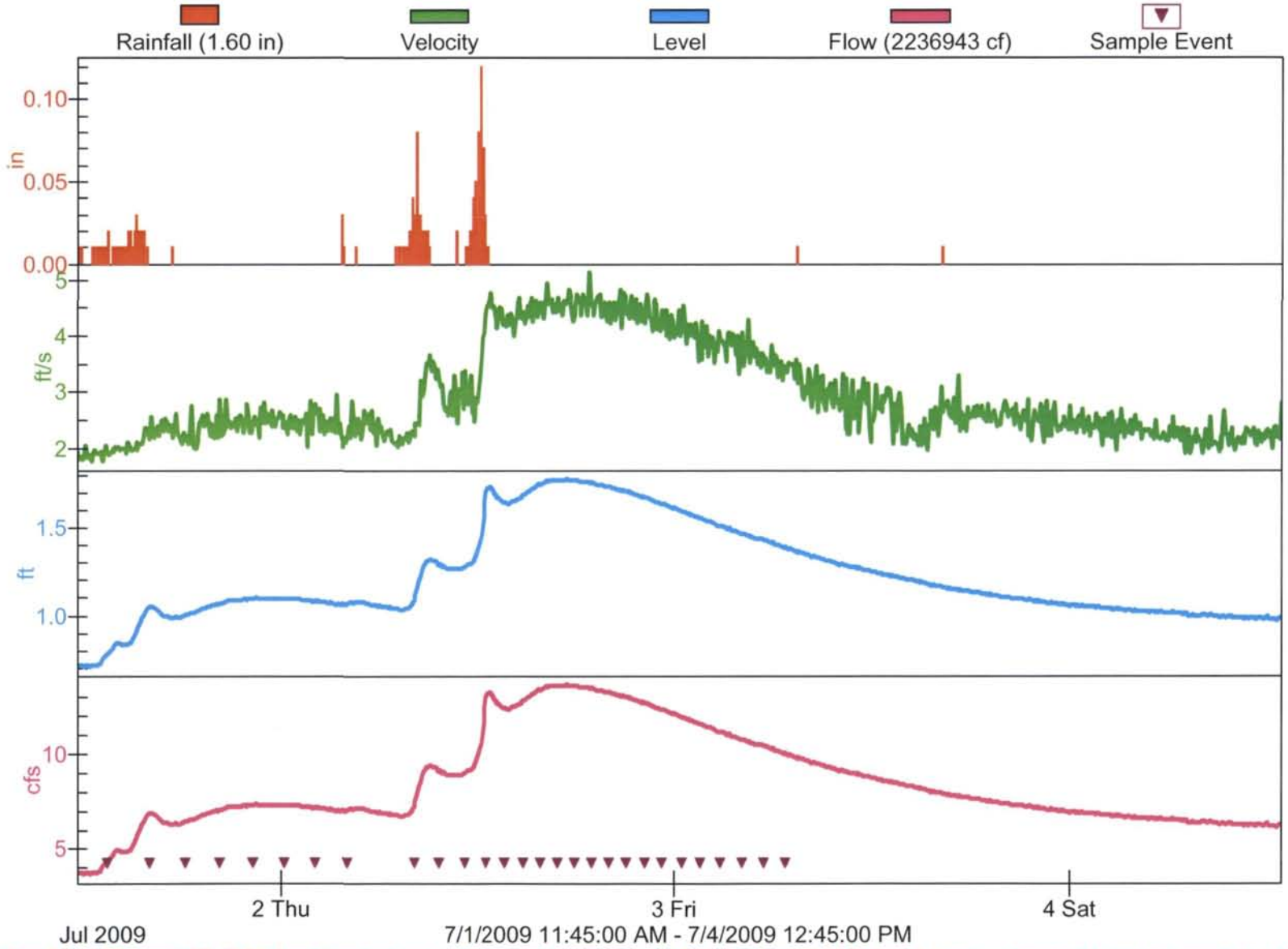


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-04-TT

Flowlink 5



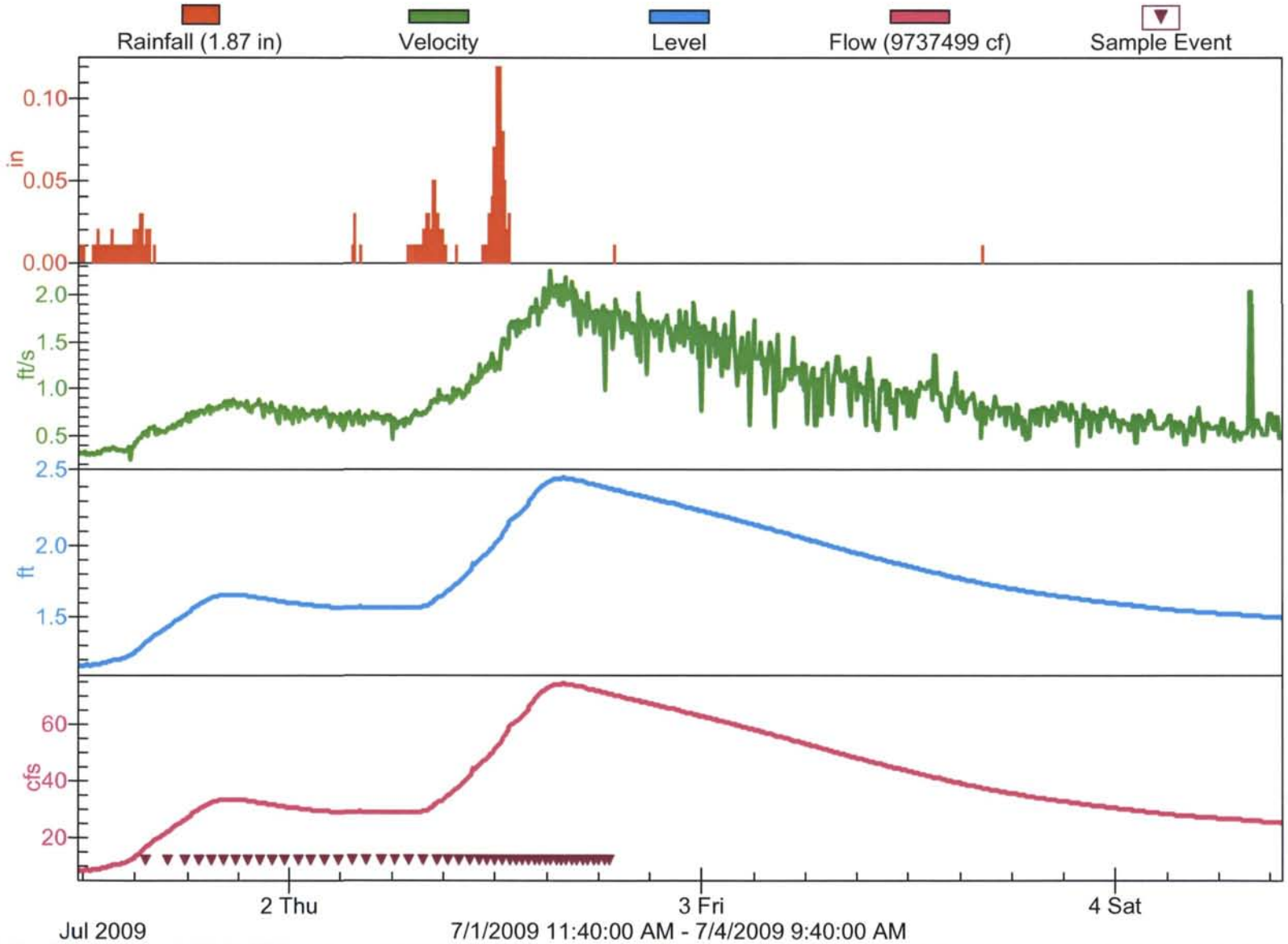
7/1/2009 11:45:00 AM - 7/4/2009 12:45:00 PM

- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-05-TT

Flowlink 5

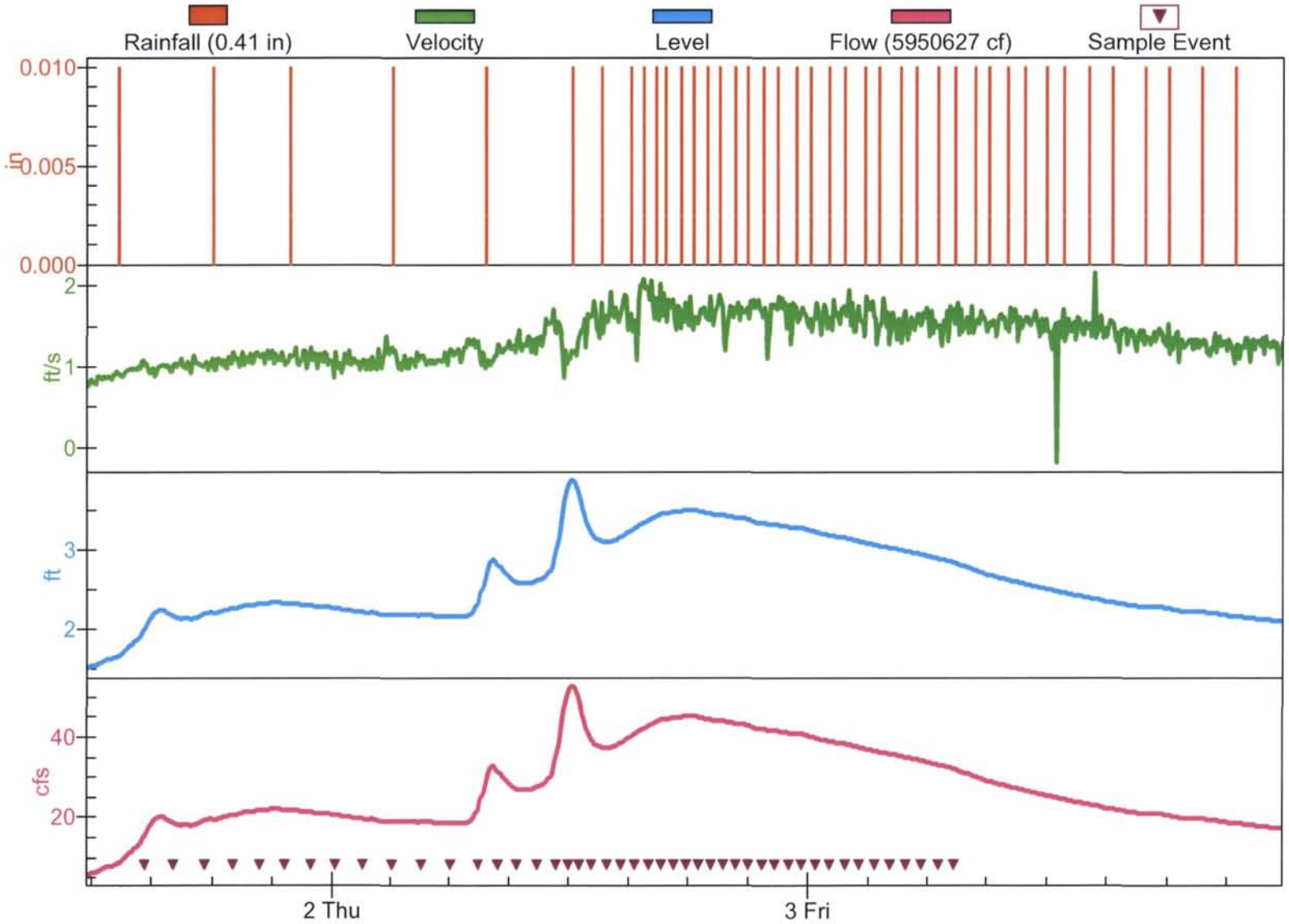


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-06-TT

Flowlink 5



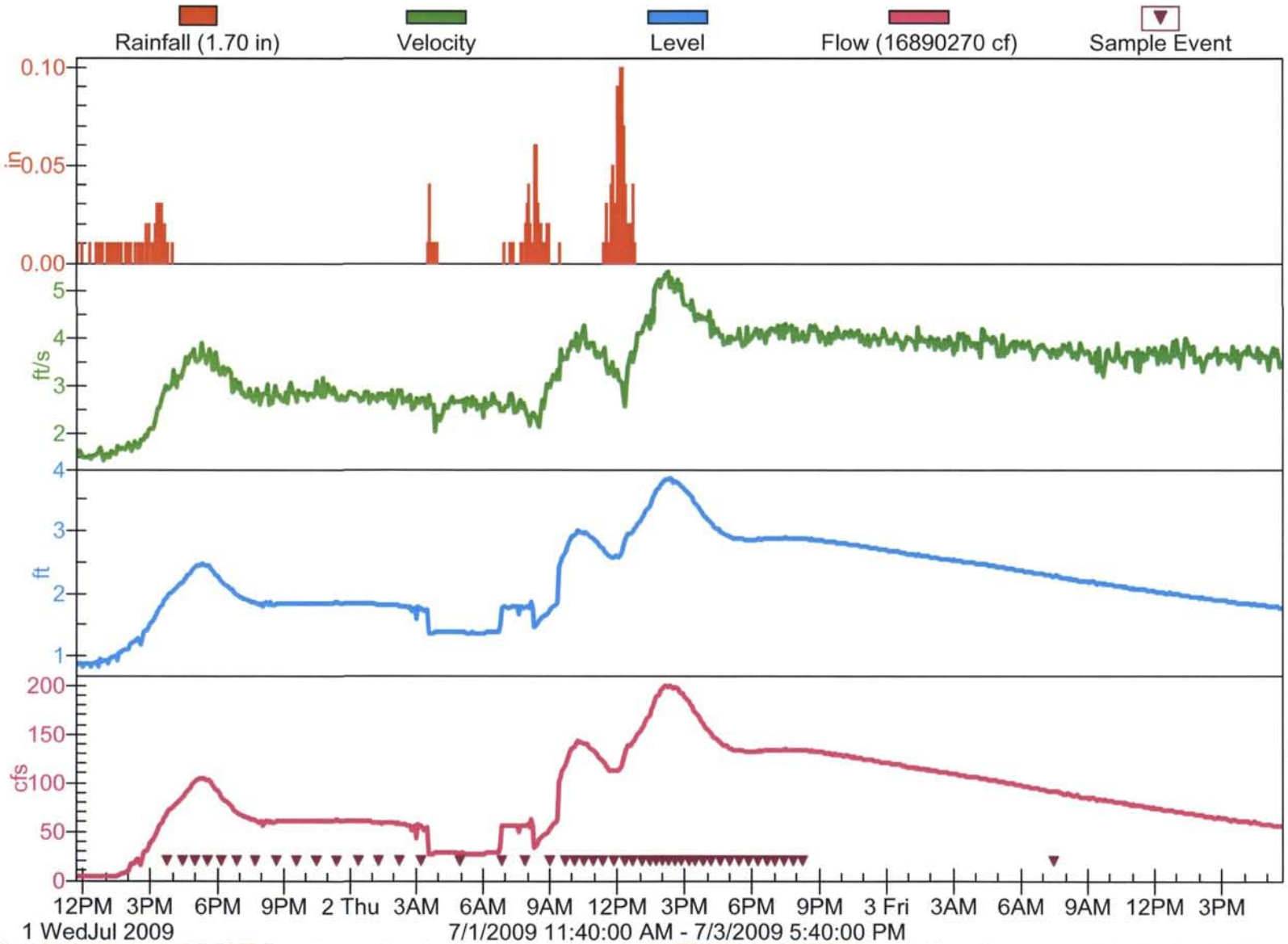
7/1/2009 11:45:00 AM - 7/3/2009 11:45:00 PM

- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-07-TT

Flowlink 5

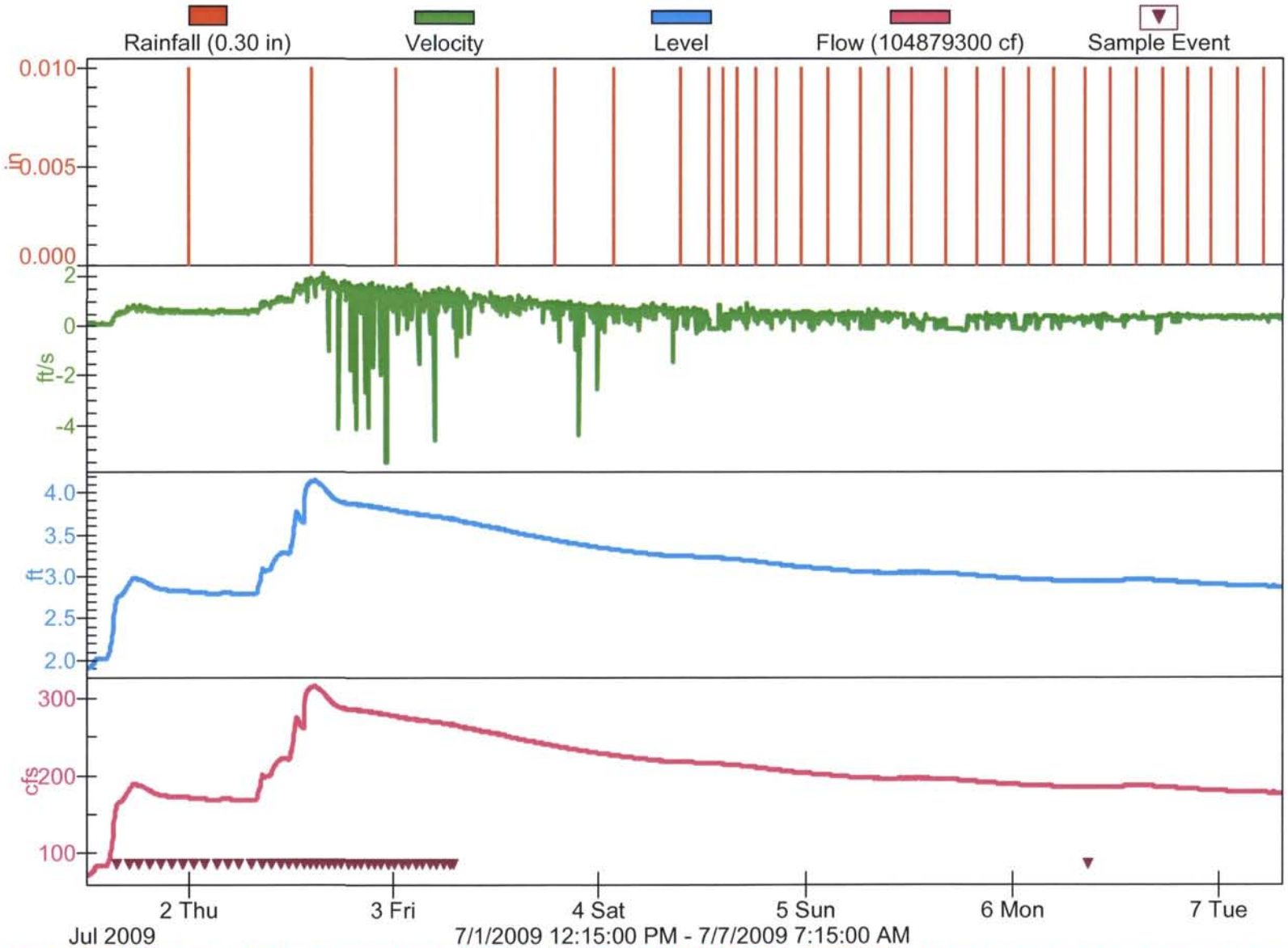


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-08-TT

Flowlink 5



7/1/2009 12:15:00 PM - 7/7/2009 7:15:00 AM

- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

Storm Narrative

July 7-8, 2009

- SW-01-TT:
  - Dissolved oxygen data unrecoverable due to Isco 6712 transmission errors
- SW-2-IP:
  - One aliquot collected prior to stage increase due to the triggering mechanism setting (precipitation only)
  - 50% and 75% falling limb achieved twice due to intermittent nature of storm event – second occasion of the two used as termination of sampling
  - Last 12 aliquots collected after 75% of the falling limb was reached
- SW-3-IP:
  - Pond backup began at approximately 5:00 pm on 7/7 and again at 11:00 am on 7/8. Two aliquots collected after onset of backup are only partially representative due to admixture of pond water with channel flow
  - Initial six aliquots shown on the hydrograph were not successfully collected due to disconnected tubing; composite includes only the subsequent six aliquots
  - Last two aliquots collected after 75% of the falling limb was reached
  - Water quality parameter data were reviewed and rejected due to problems associated with the dry conditions that existed prior to the storm
- SW-02-TT:
  - Rain gauge malfunction
  - Aliquots were not collected between approximately 2:30 pm and 5:00 pm on 7/8 due to rosette change out activities
- SW-03-TT:
  - 50% and 75% falling limb achieved twice due to intermittent nature of storm event – second occasion of the two used as termination of sampling
  - Last four aliquots collected after 75% of the falling limb was reached
- SW-05-TT:
  - Aliquots were not collected between approximately 3:30 pm and 8:00 pm on 7/7 due to an Isco 6712 malfunction
- SW-06-TT:
  - Rain gauge malfunction
- SW-07-TT:
  - Aliquots were not collected between approximately 10:30 am and 12:00 pm on 7/8 due to rosette change out activities
- SW-08-TT:
  - Rain gauge malfunction
  - Due to subsequent precipitation not associated with this storm, 75% of the falling limb was never attained
  - Initial 31 aliquots not included with the composite sample as these aliquots were inadvertently discarded

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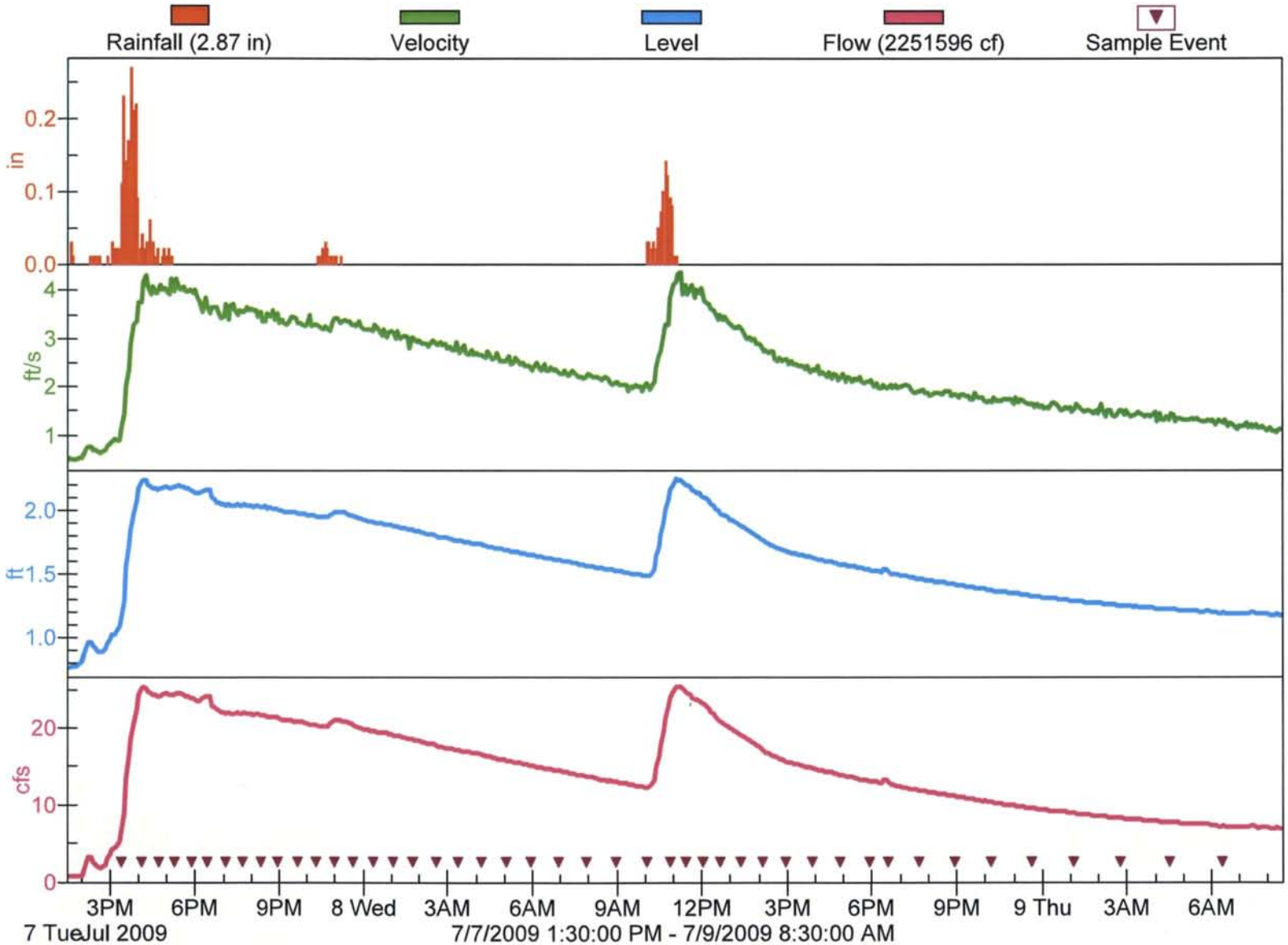
SW-01-TT

Flowlink 5



- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

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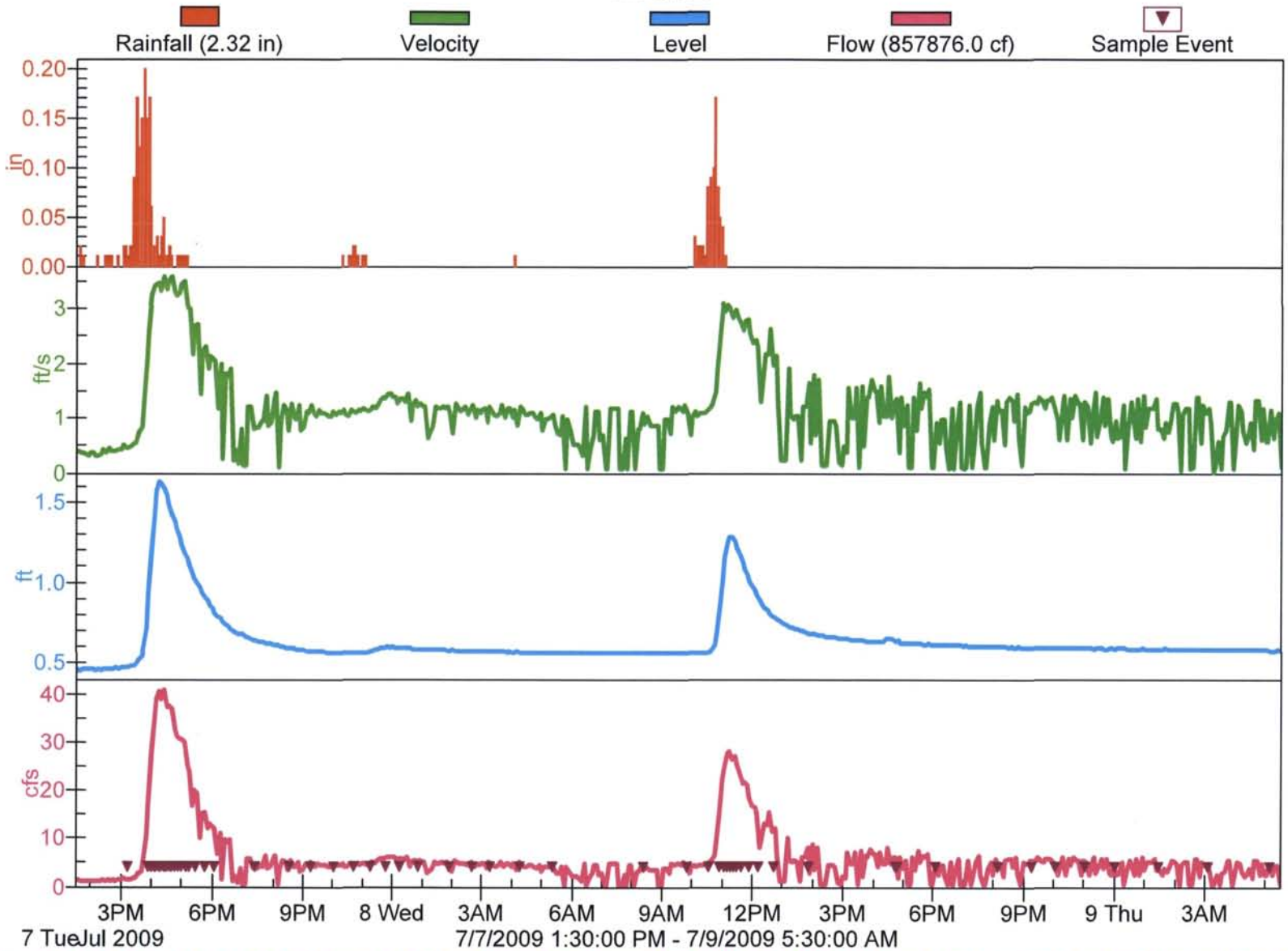
SW-2-IP

Flowlink 5



- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

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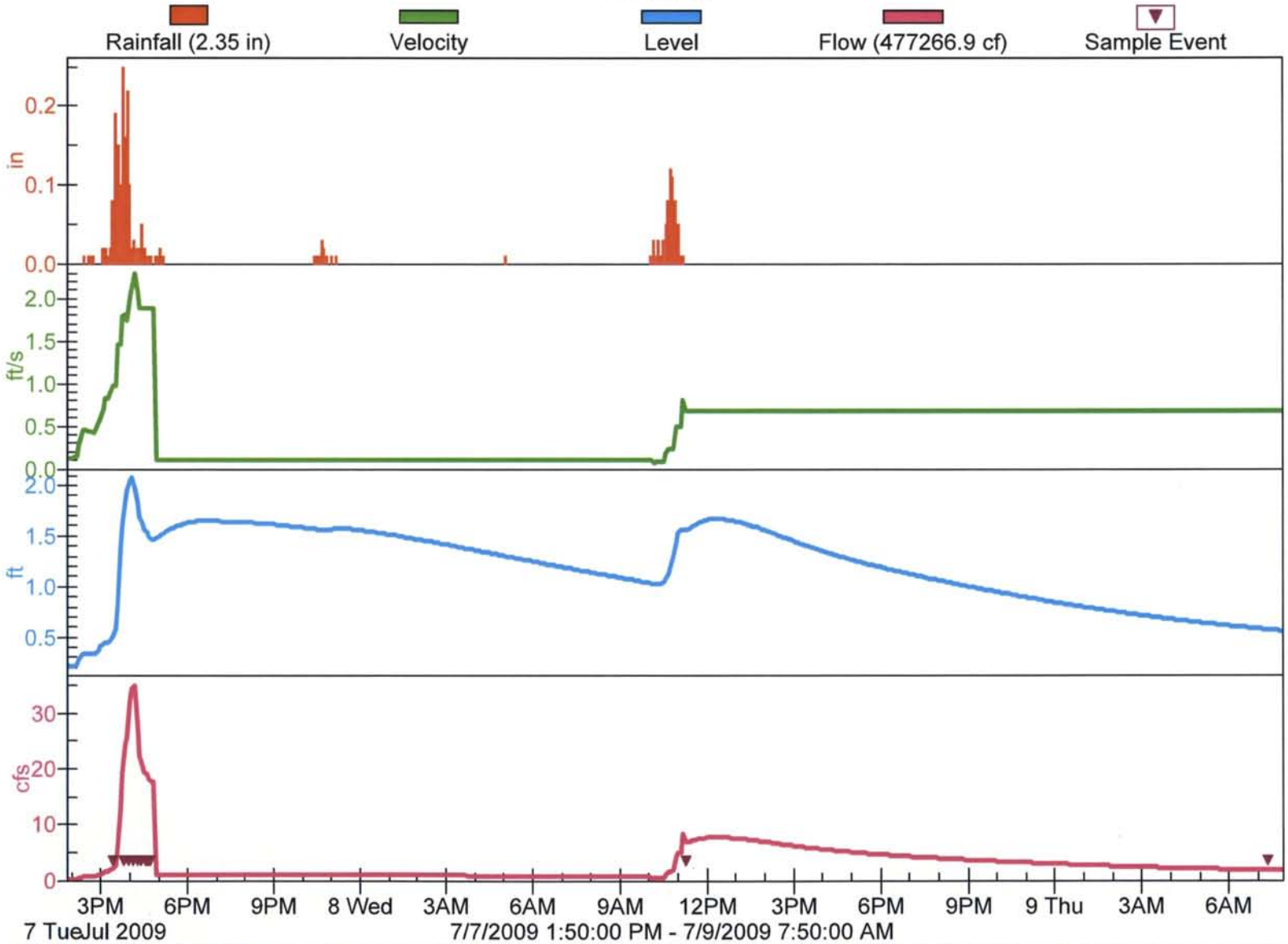
SW-3-IP

Flowlink 5



- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

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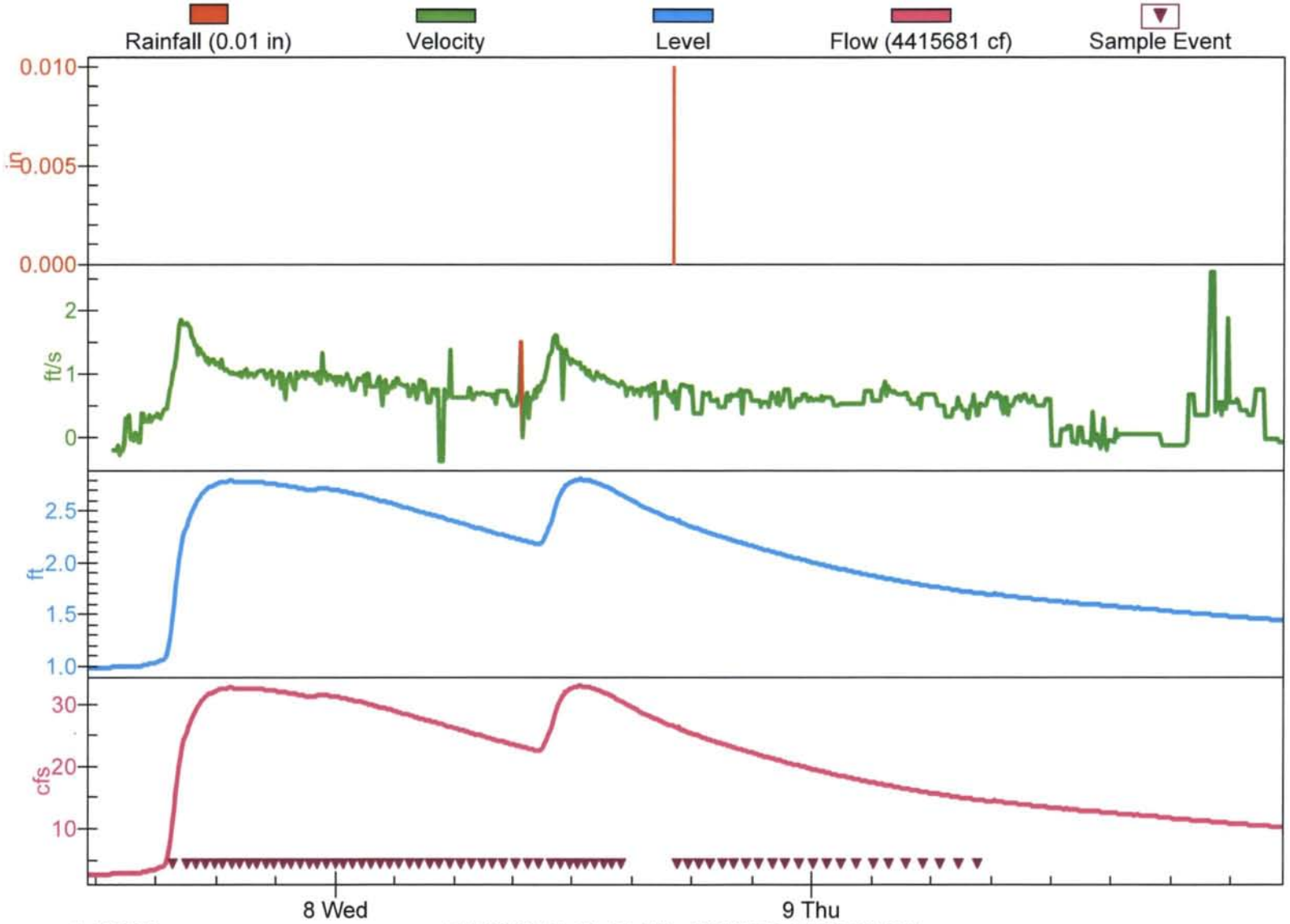
SW-02-TT

Flowlink 5



7/7/2009 11:35:00 AM - 7/9/2009 11:35:00 PM

- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

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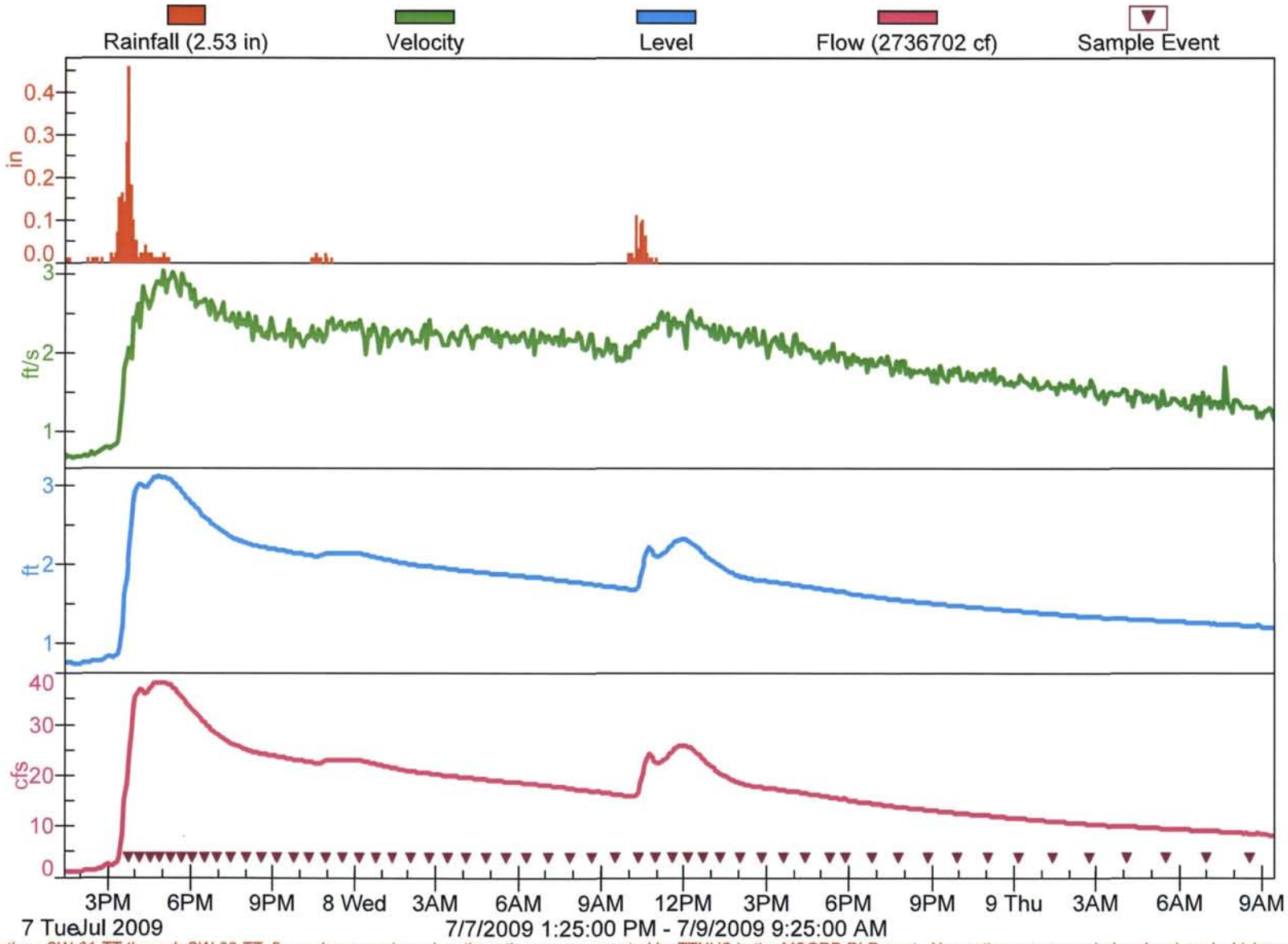
SW-03-TT

Flowlink 5



- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

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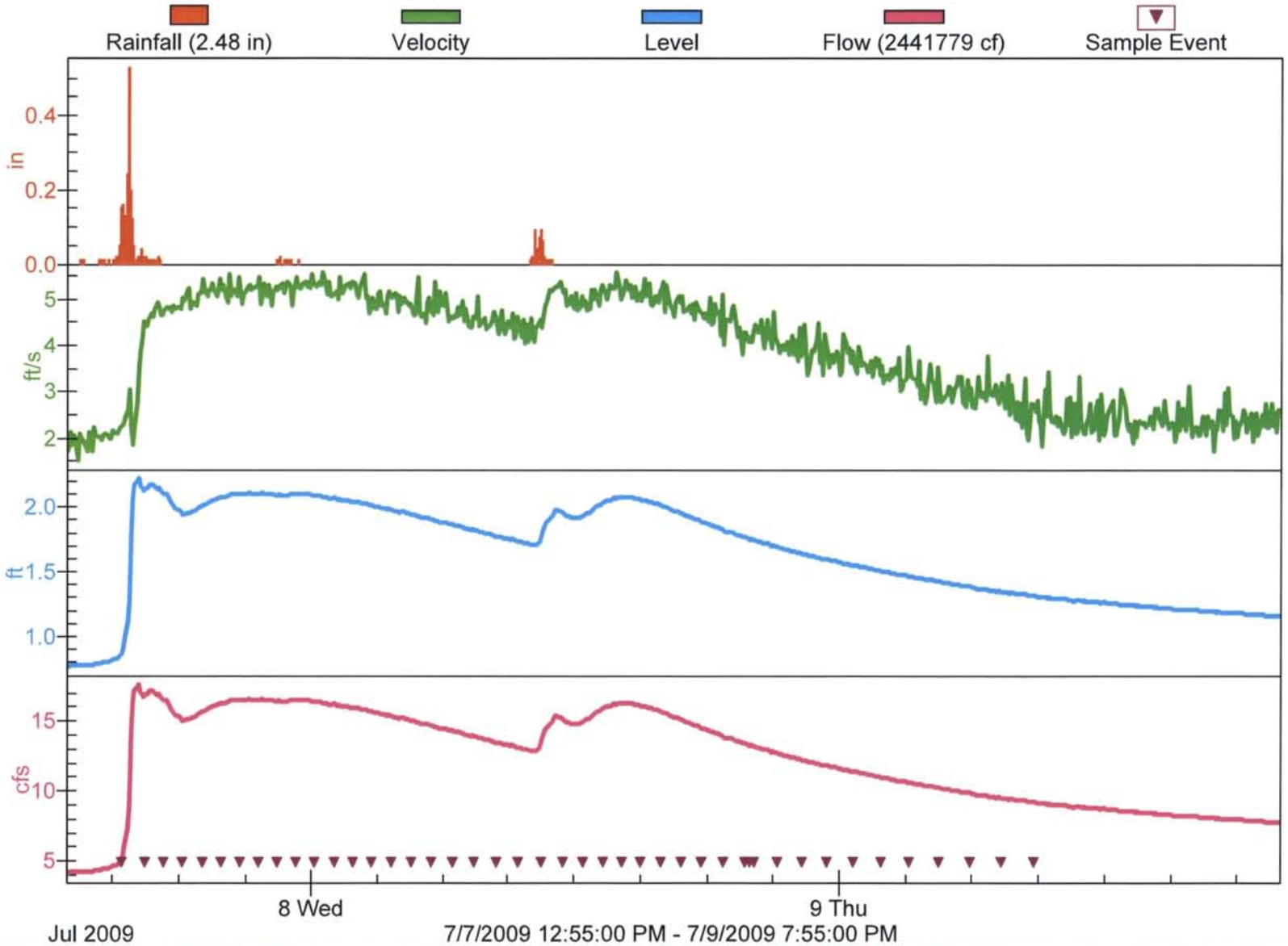
SW-04-TT

Flowlink 5

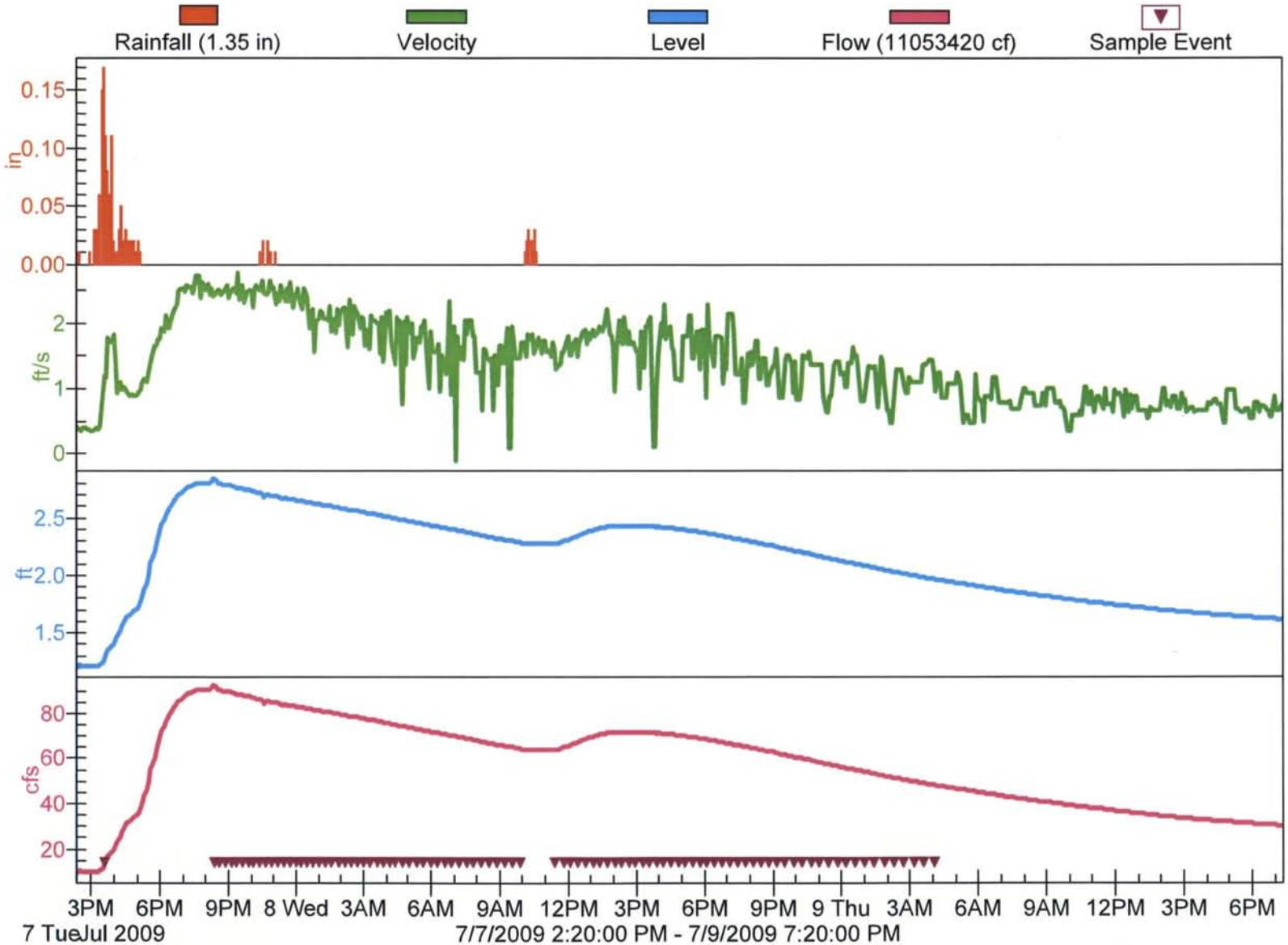


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-05-TT

Flowlink 5

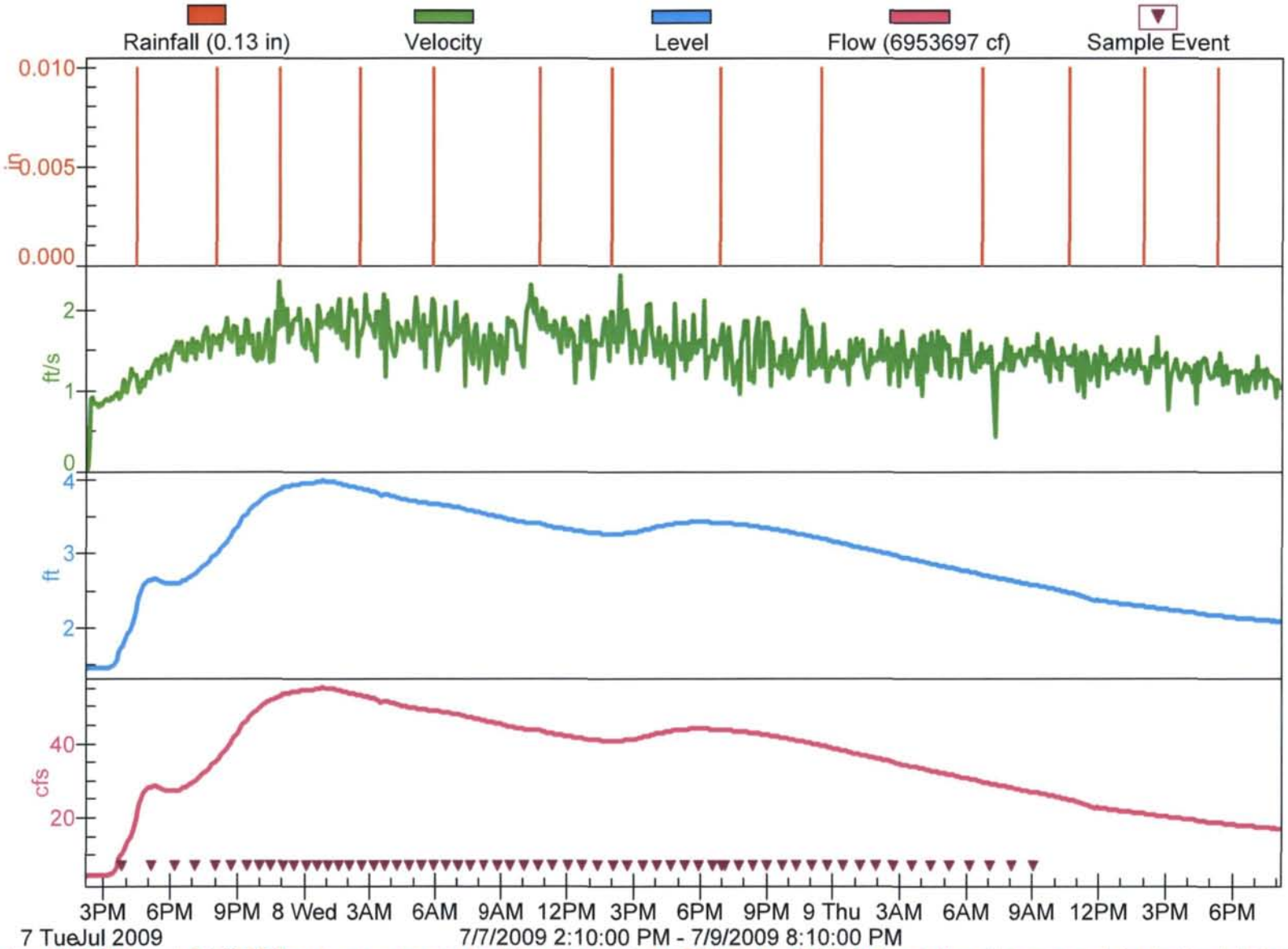


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-06-TT

Flowlink 5

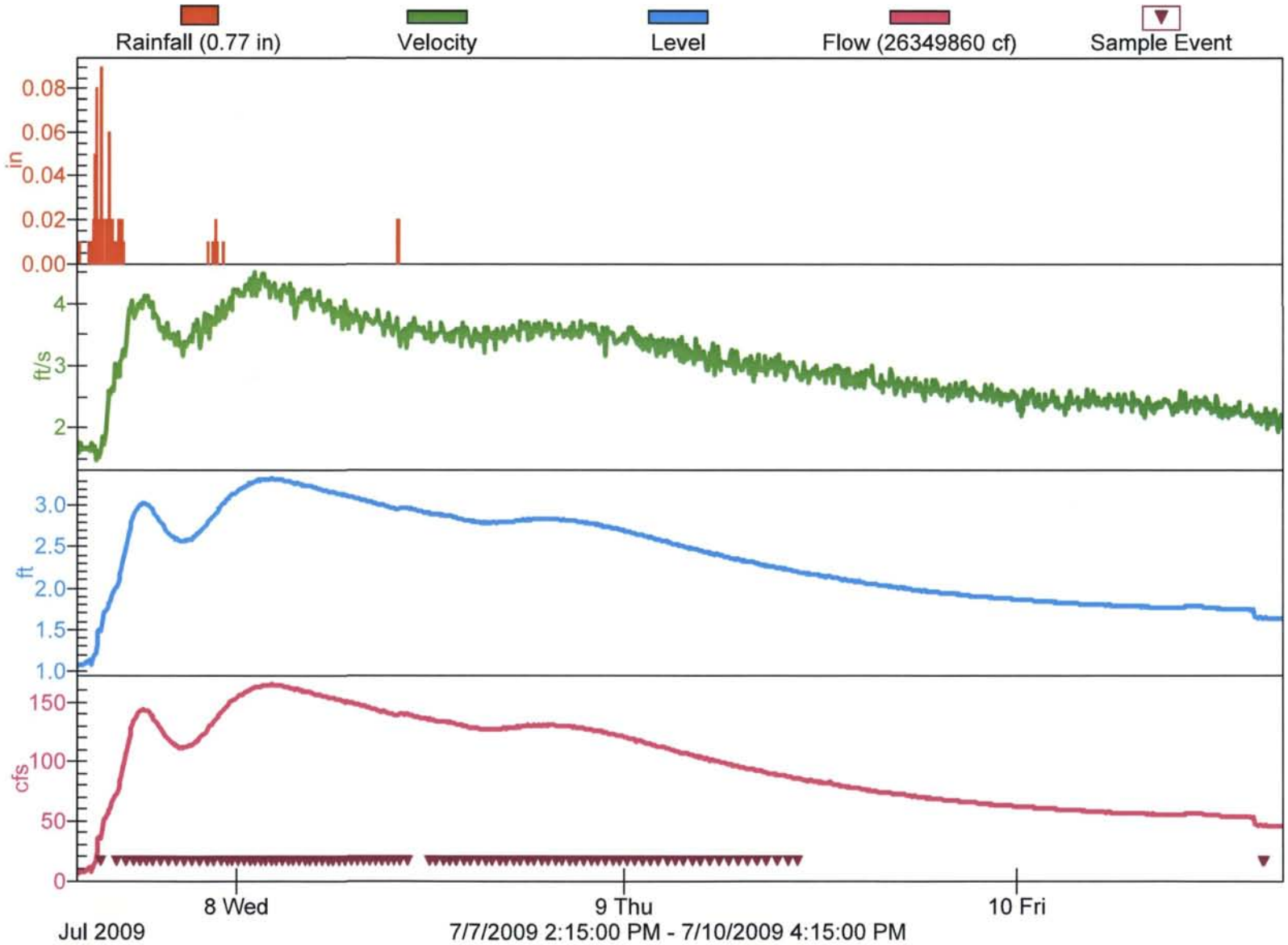


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-07-TT

Flowlink 5

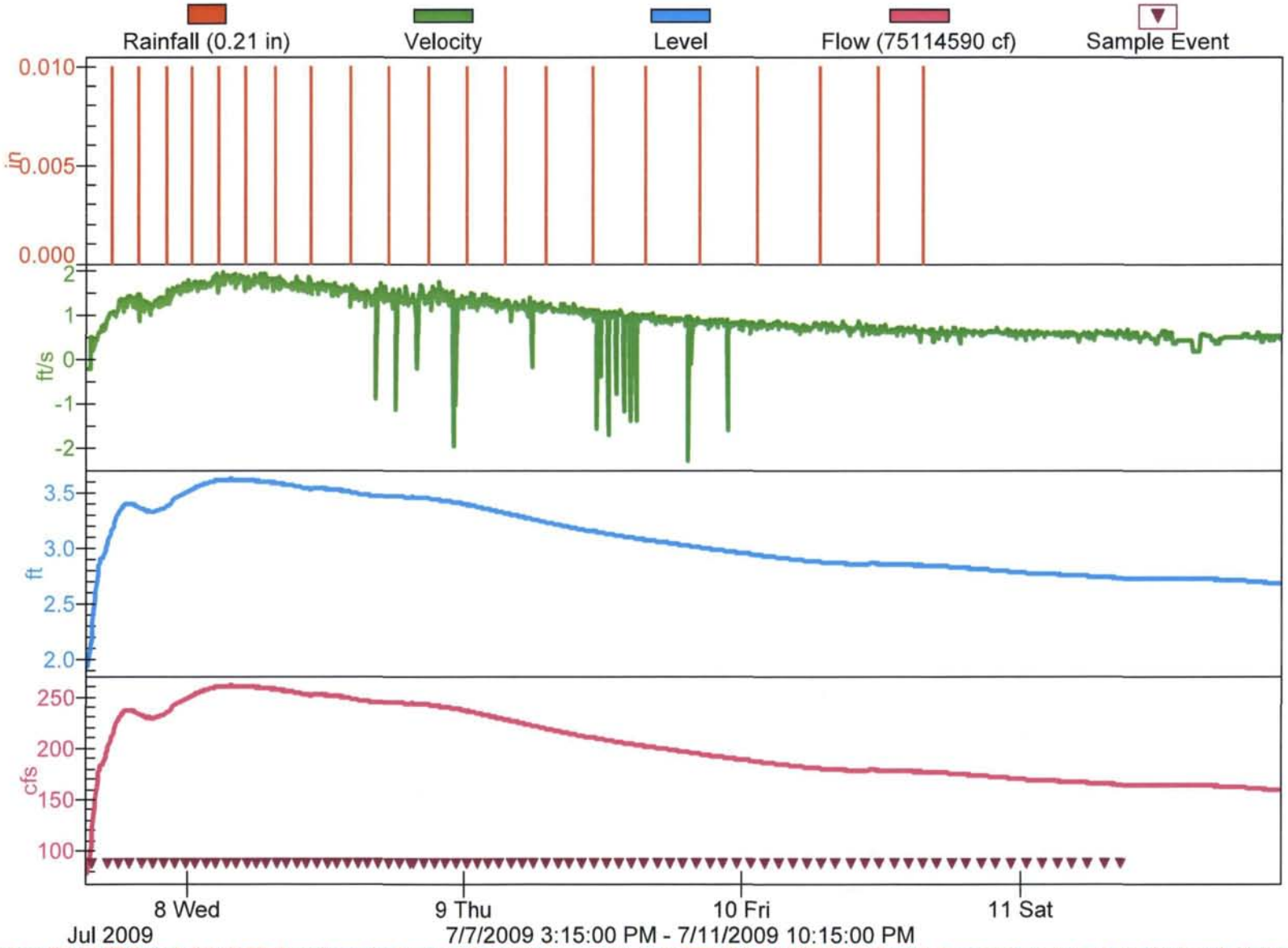


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-08-TT

Flowlink 5



- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

Storm Narrative

July 23-24, 2009

Isco recommended programming changes to reconcile previously experienced problems with the triggering mechanism of the secondary Isco 6712 units. These changes resulted in Isco 6712 malfunctions (program stuck in purge cycle) for some of the monitoring stations.

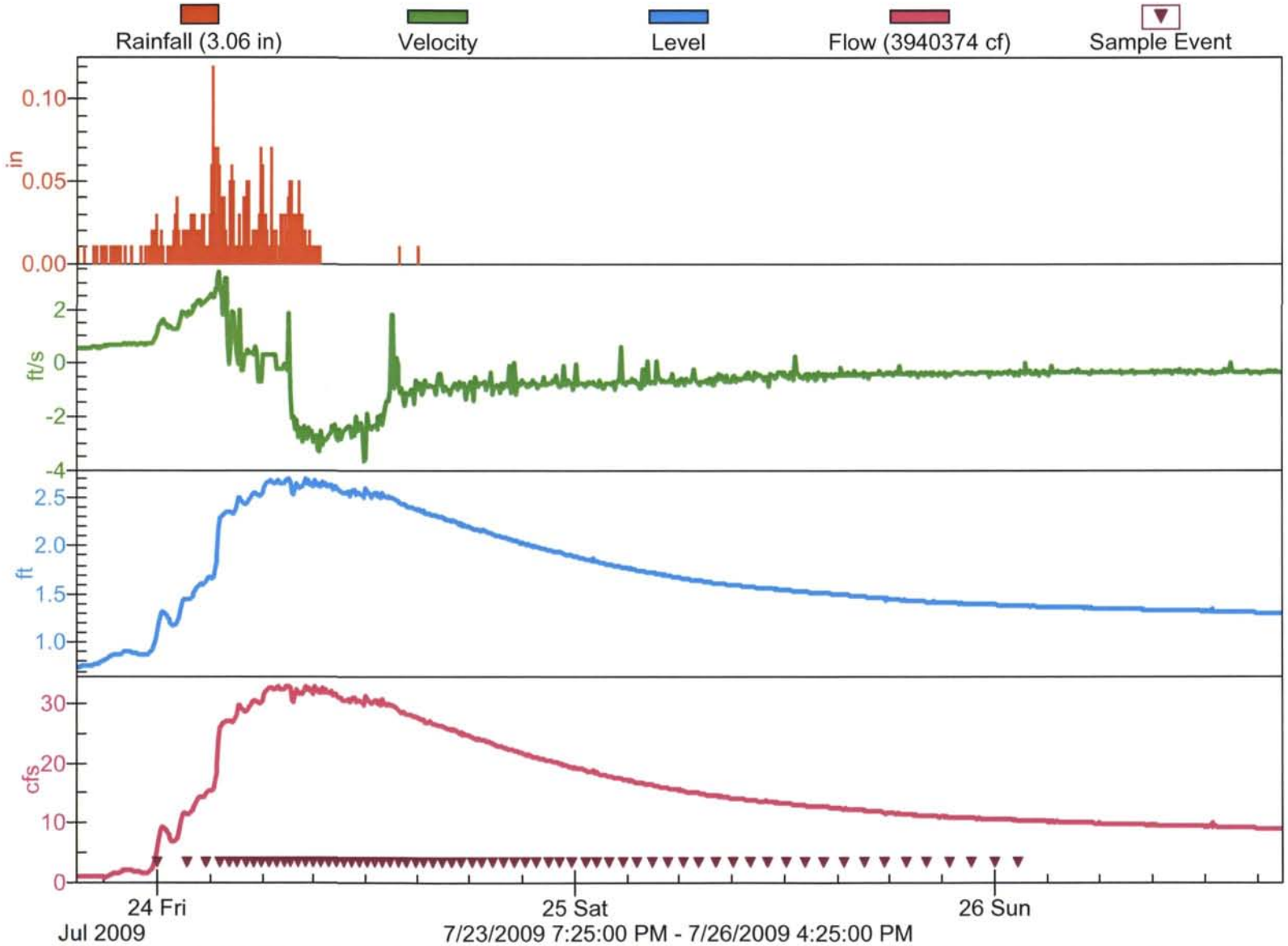
- SW-01-TT:
  - Dissolved oxygen data unrecoverable due to Isco 6712 transmission errors
  - A/V sensor became dislodged at approximately 4:00 am on 7/24; therefore, subsequent velocity and stage (and hence flow) data do not represent actual conditions
- SW-2-IP:
  - Last 12 aliquots collected after 75% of the falling limb was reached
- SW-3-IP:
  - Pond backup began at approximately 4:00 am on 7/24. Approximately 47 aliquots collected after onset of backup are only partially representative due to admixture of pond water with channel flow
  - Aliquots were not collected between approximately 5:30 am and 6:30 am on 7/24 due to rosette change out activities
  - Water quality parameter data were reviewed and rejected due to problems associated with the dry conditions that existed prior to the storm
- SW-02-TT:
  - Composite included one unrepresentative sample (volume was low in last aliquot)
  - Aliquots were not collected between approximately 10:00 pm on 7/24 and 12:00 am on 7/25 due to rosette change out activities
  - Last four aliquots collected after 75% of the falling limb was reached
- SW-03-TT:
  - Isco 6712 malfunction (program stuck in purge cycle) after initial 12 aliquots, which are not shown on the hydrograph due to software error(s)
  - No dial-out alarm sent since malfunction did not register as a sampling error; therefore, no aliquots collected until malfunction was recognized and the sampler was reset. No aliquots were collected between 6:10 am on 7/24 and 12:42 am on 7/25
  - Last 14 aliquots collected after 75% of the falling limb was reached
  - Sample bottles not decanted to lowest volume (one aliquot volume was low)
- SW-04-TT:
  - Last two aliquots collected after 75% of the falling limb was reached
  - Water quality parameter data were reviewed and rejected due to In-Situ sonde programming error
- SW-05-TT:
  - Isco 6712 malfunction (program stuck in purge cycle) after initial 11 aliquots, which are not shown on the hydrograph due to software error(s)
  - No dial-out alarm sent since malfunction did not register as a sampling error; therefore, no aliquots collected until malfunction was recognized and the sampler was reset. No aliquots were collected between 12:10 pm on 7/24 and 2:42 am on 7/25
  - Last six aliquots collected after 75% of the falling limb was reached
  - Sample bottles not decanted to lowest volume (several aliquot volumes were low)
- SW-06-TT:
  - Aliquots were not collected at the onset of the storm due to Isco 6712 malfunction (power failure)
  - Sample bottles not decanted to lowest volume (one aliquot volume was high)
- SW-07-TT:
  - Approximately 23 hours of flow data lost during the rising limb due to Isco 6712 malfunction
  - Isco 6712 malfunction (program stuck in purge cycle) after initial 15 aliquots, which are not shown on the hydrograph due to software error(s)
  - No dial-out alarm sent since Isco 6712 malfunction did not register as a sampling error; therefore, no aliquots collected until malfunction was recognized and the sampler was reset. Time interval in which aliquots were not collected is estimated to be between approximately 7:30 pm on 7/23 and 6:30 pm on 7/24

- SW-08-TT:
  - Isco 6712 malfunction (program stuck in purge cycle) after initial six aliquots, which are not shown on the hydrograph due to software error(s)
  - No dial-out alarm sent since malfunction did not register as a sampling error; therefore, no aliquots collected until malfunction was recognized and the sampler was reset. No aliquots were collected between approximately 2:05 am on 7/24 and 1:55 am on 7/25
  - Last 19 aliquots collected after 75% of the falling limb was reached

DRAFT

SW-01-TT

Flowlink 5

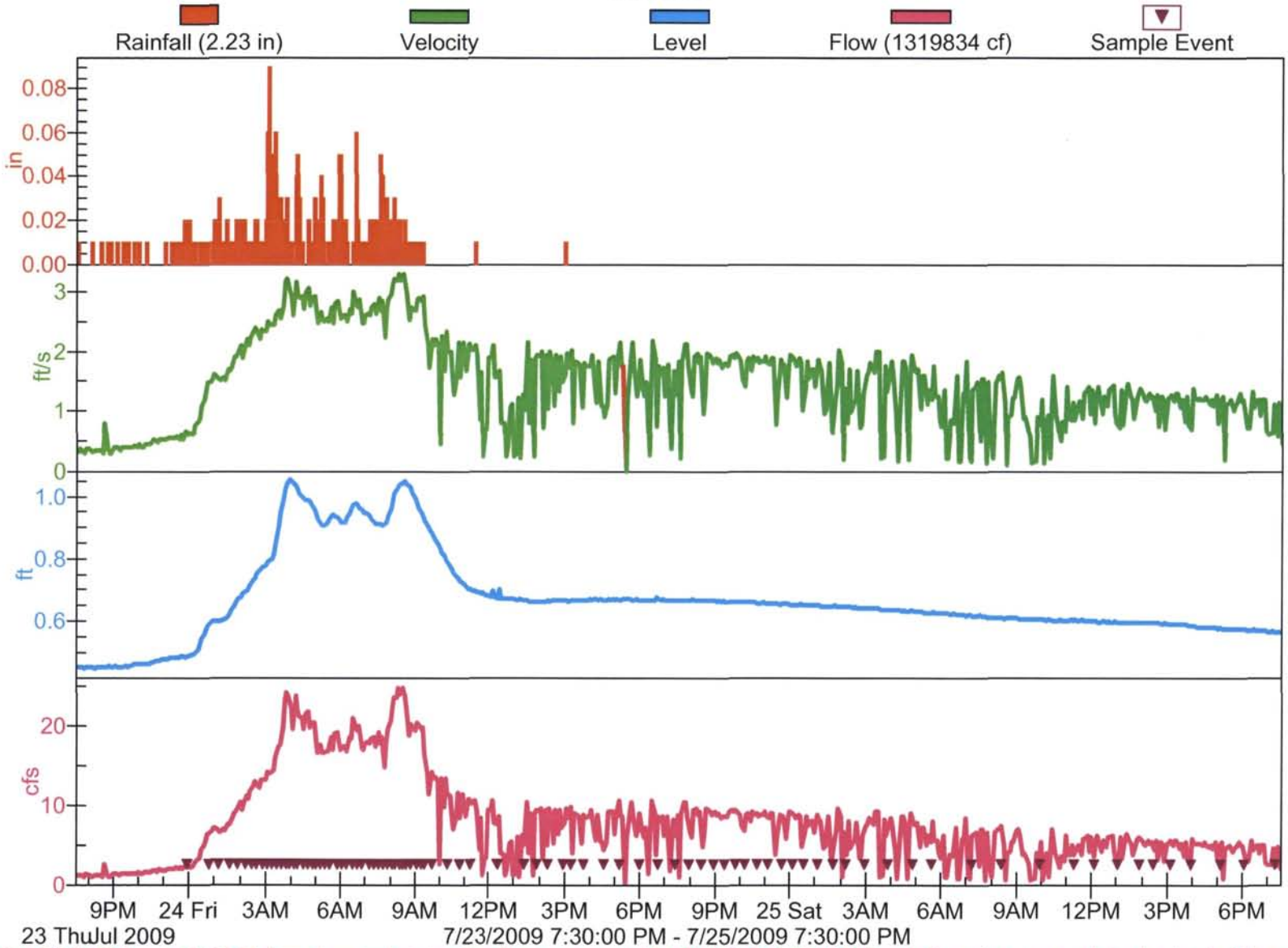


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-2-IP

Flowlink 5



- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

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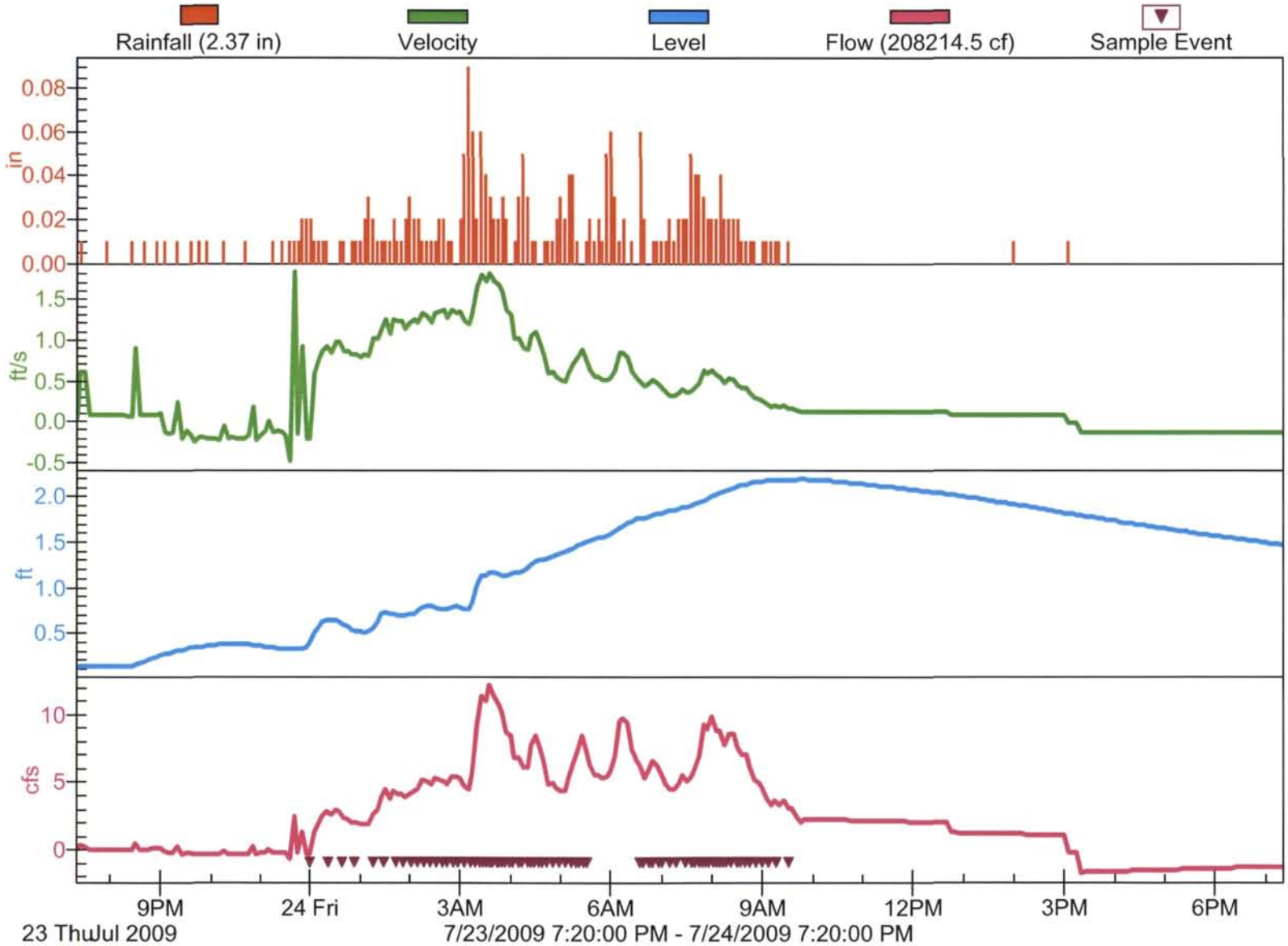
SW-3-IP

Flowlink 5

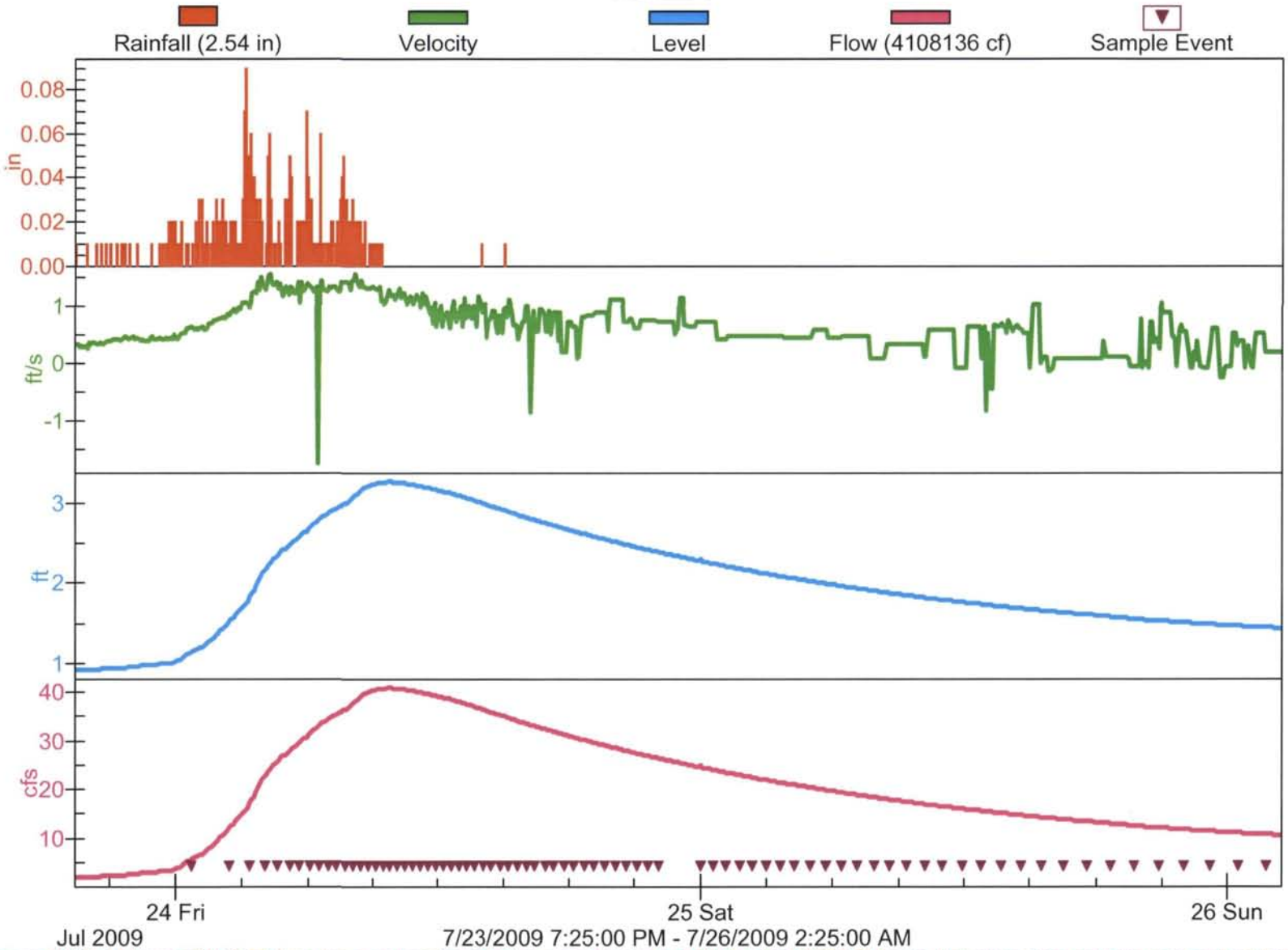


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-02-TT

Flowlink 5



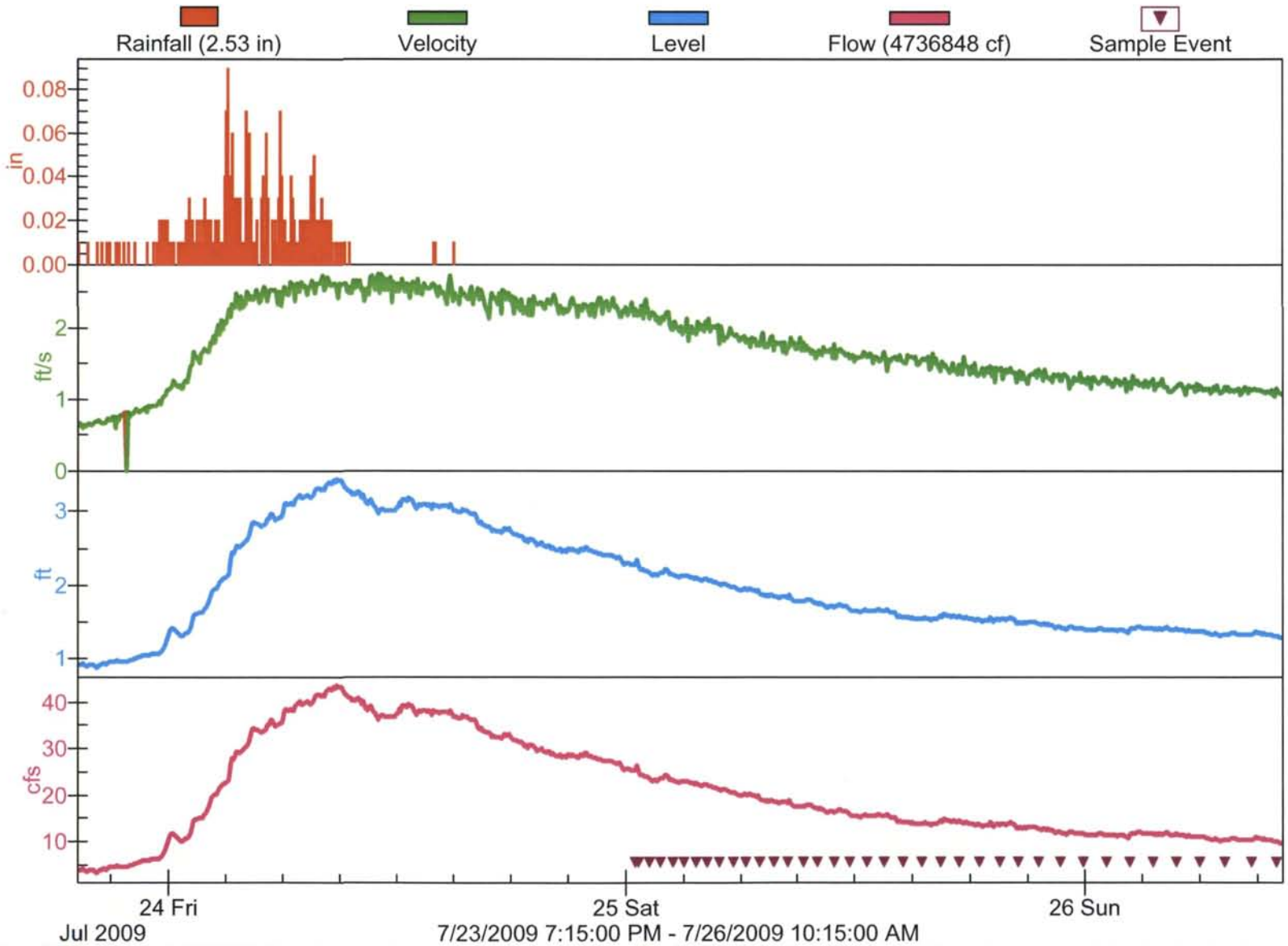
7/23/2009 7:25:00 PM - 7/26/2009 2:25:00 AM

- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-03-TT

Flowlink 5



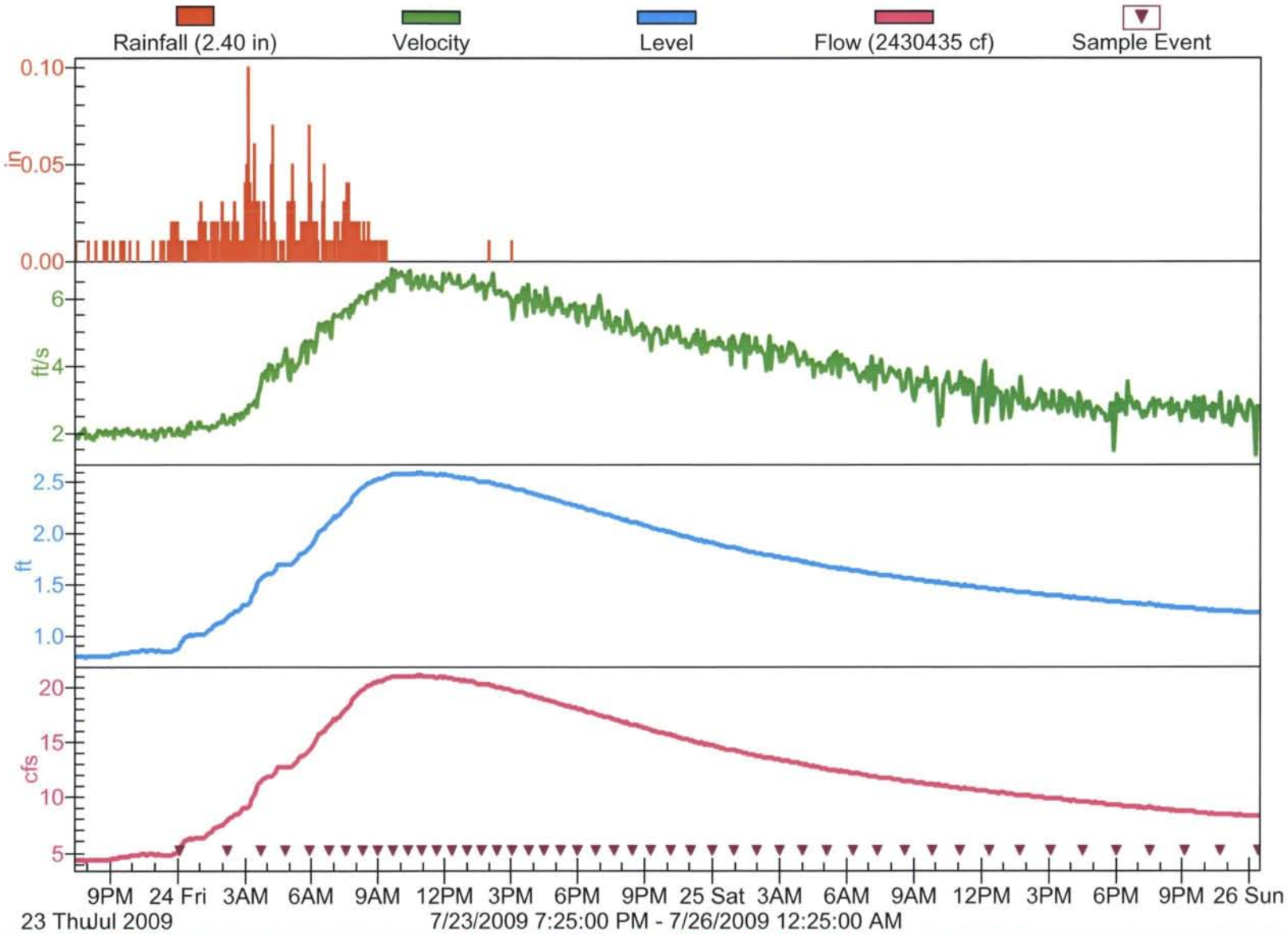
7/23/2009 7:15:00 PM - 7/26/2009 10:15:00 AM

- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-04-TT

Flowlink 5

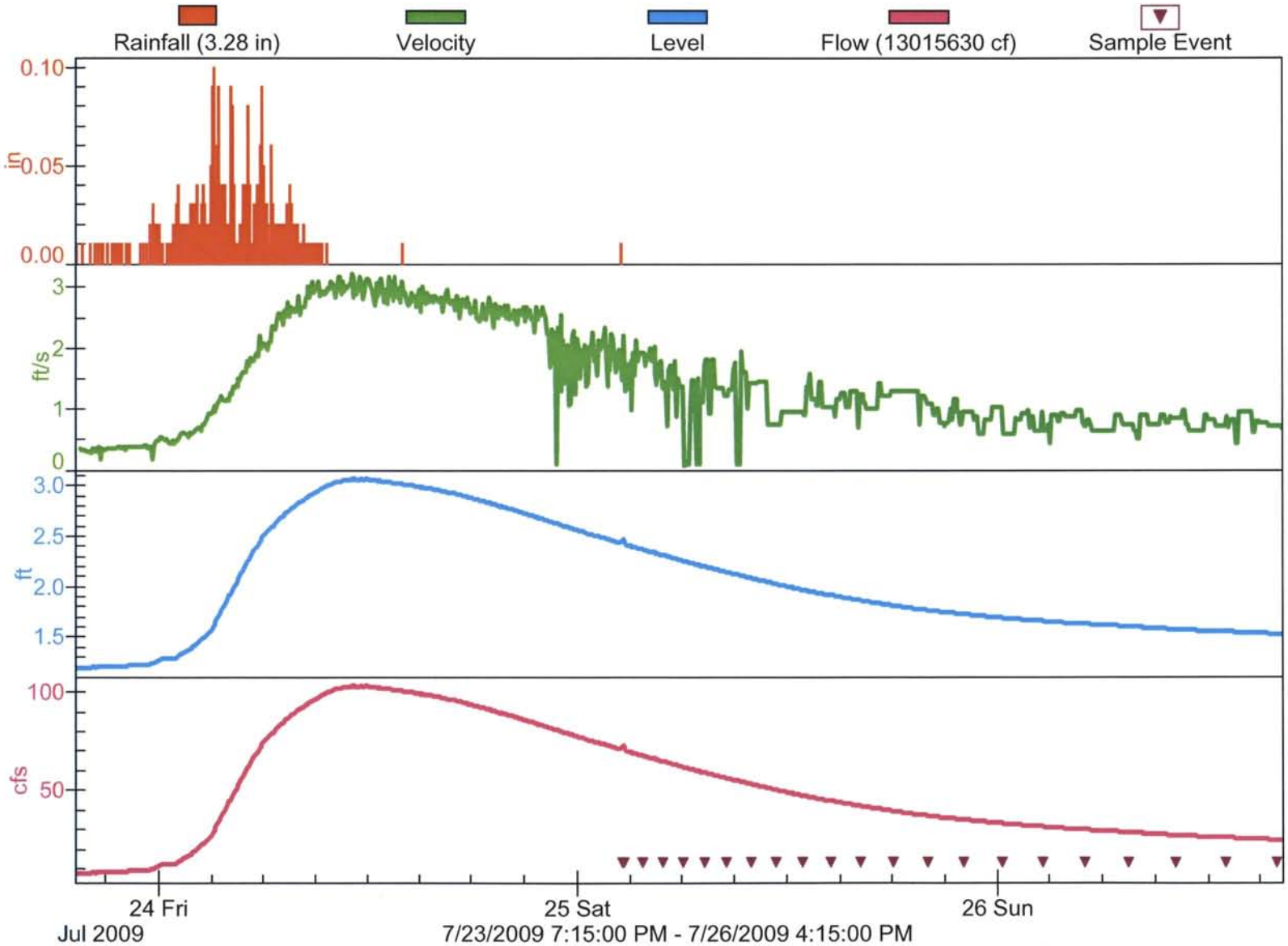


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-05-TT

Flowlink 5

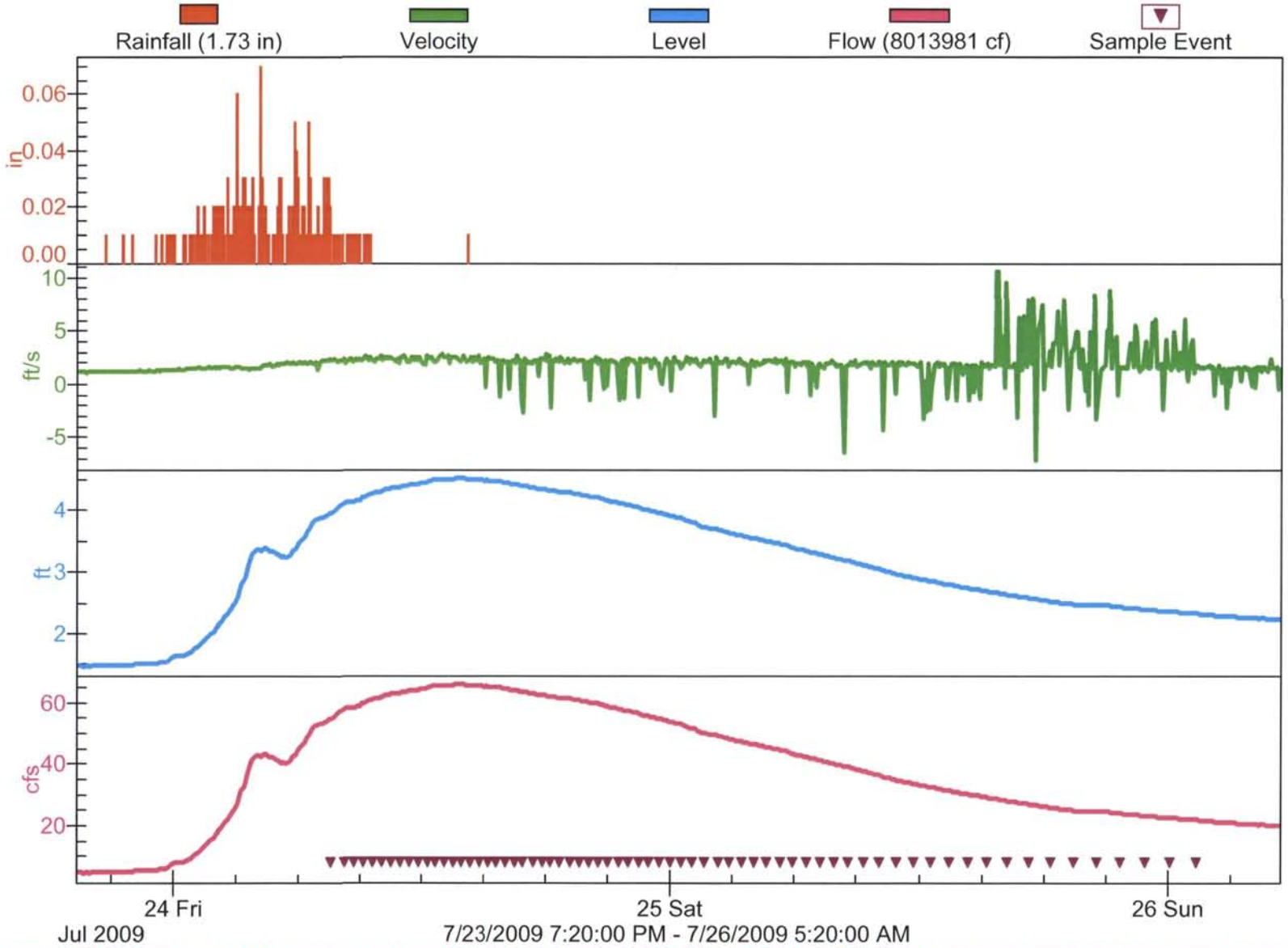


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-06-TT

Flowlink 5



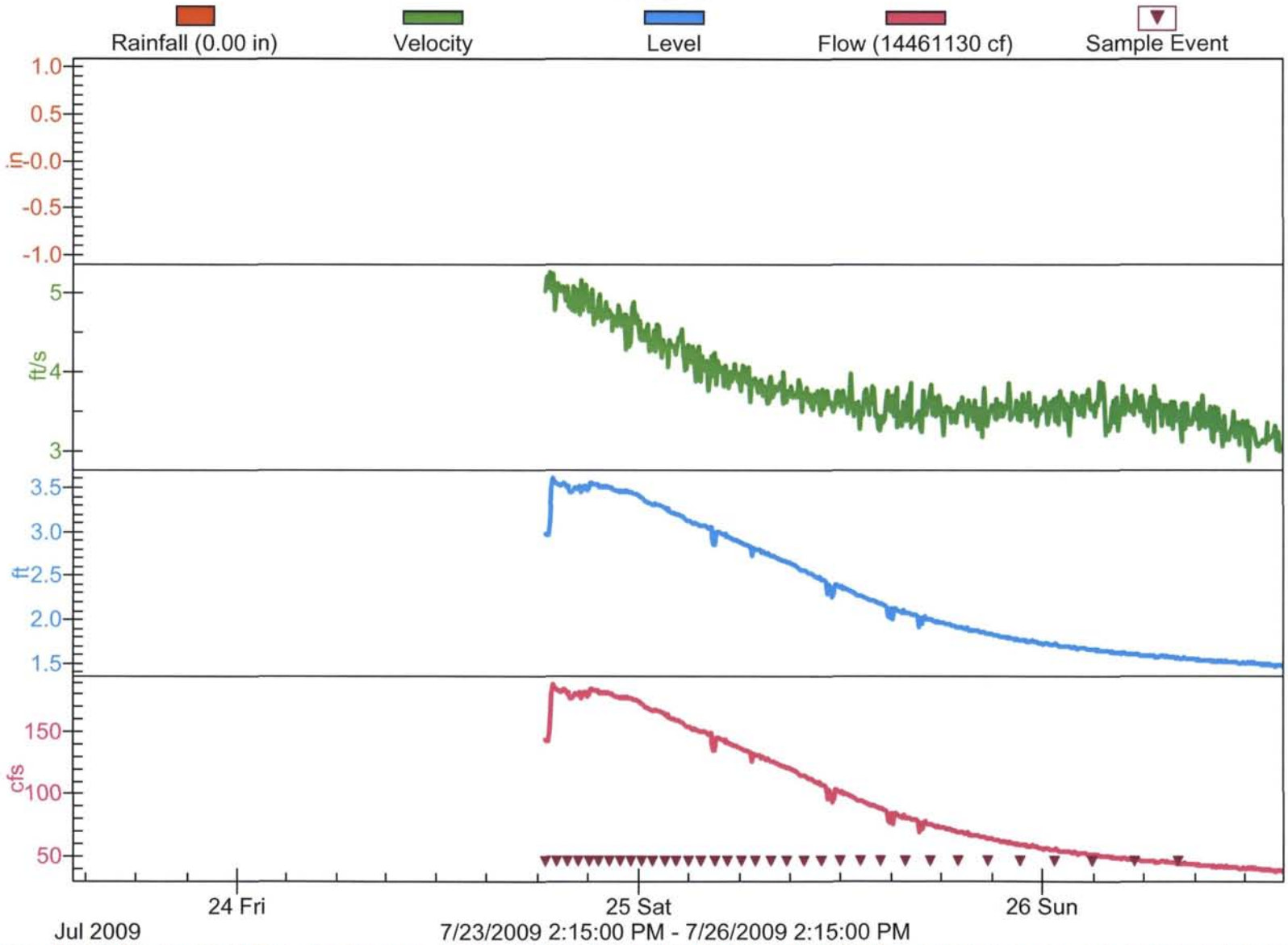
7/23/2009 7:20:00 PM - 7/26/2009 5:20:00 AM

- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

DRAFT

SW-07-TT

Flowlink 5



- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

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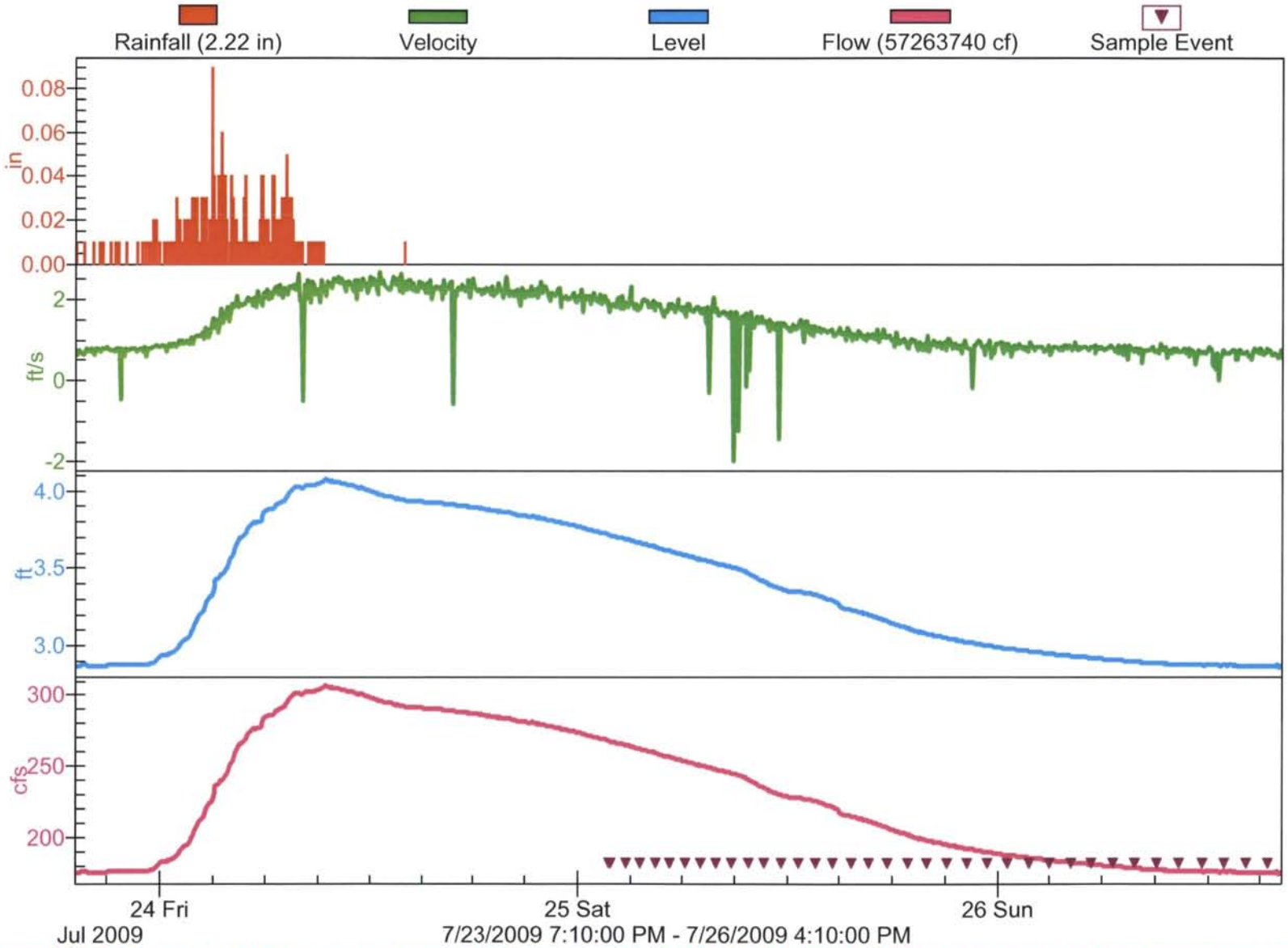
SW-08-TT

Flowlink 5

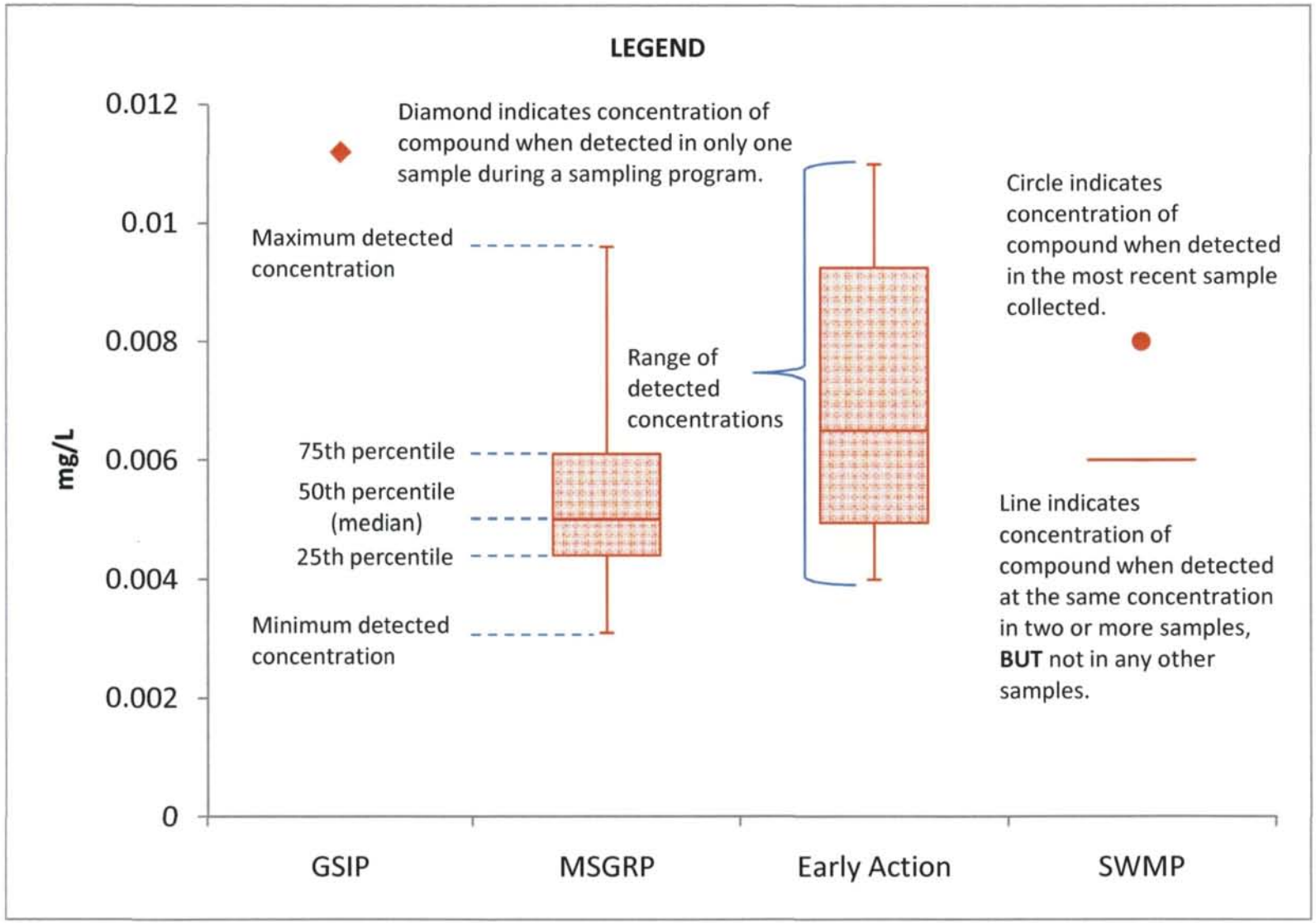


- For Stations SW-01-TT through SW-08-TT, flows shown are based on the rating curves reported by TTNUS in the MSGRP RI Report. New rating curves are being developed which may change the flow estimates for these stations.
- Flows shown for stations SW-2-IP and SW-3-IP were estimated based on level and velocity; a new rating curve is being developed for Station SW-2-IP, which may change the flow estimates for this station.
- Hydrographs are shown through flow at 75% falling limb or termination of sampling, whichever is later.

APPENDIX B

APPENDIX B

Storm Sampling Box-Whisker Plots

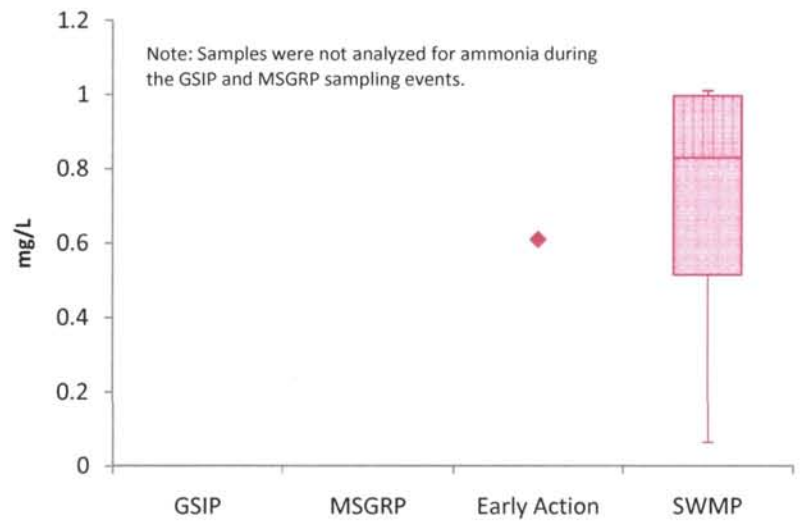

LEGEND
Diamond indicates concentration of compound when detected in only one sample during a sampling program.
Maximum detected concentration
Range of detected concentrations
75th percentile
50th percentile (median)
25th percentile
Minimum detected concentration
Circle indicates concentration of compound when detected in the most recent sample collected.
Line indicates concentration of compound when detected at the same concentration in two or more samples, BUT not in any other samples.
mg/L
0.012
0.01
0.008
0.006
0.004
0.002
0
GSIP
MSGRP
Early Action
SWMP

SW-01-TT

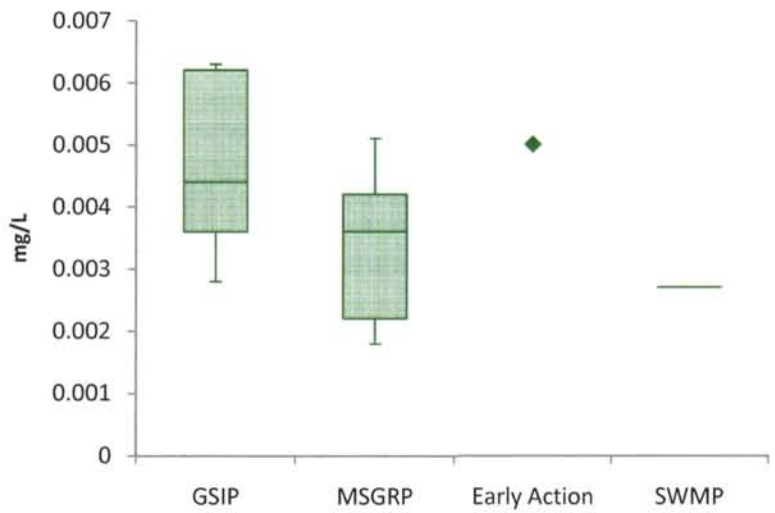
Dissolved Arsenic

Note: Arsenic (dissolved) was not detected in any GSIP, MSGRP, Early Action or SWMP storm flow samples from this station.

Nitrogen, Ammonia



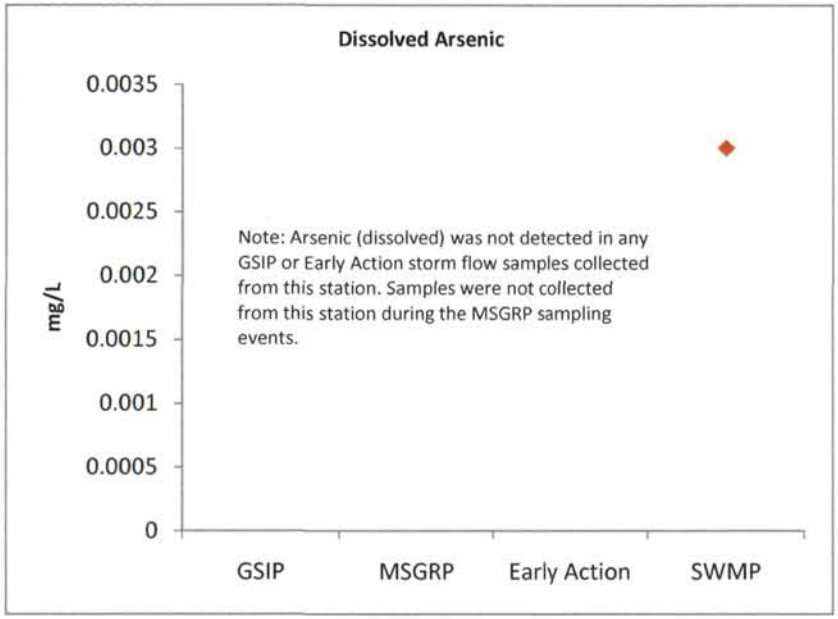
Total Arsenic

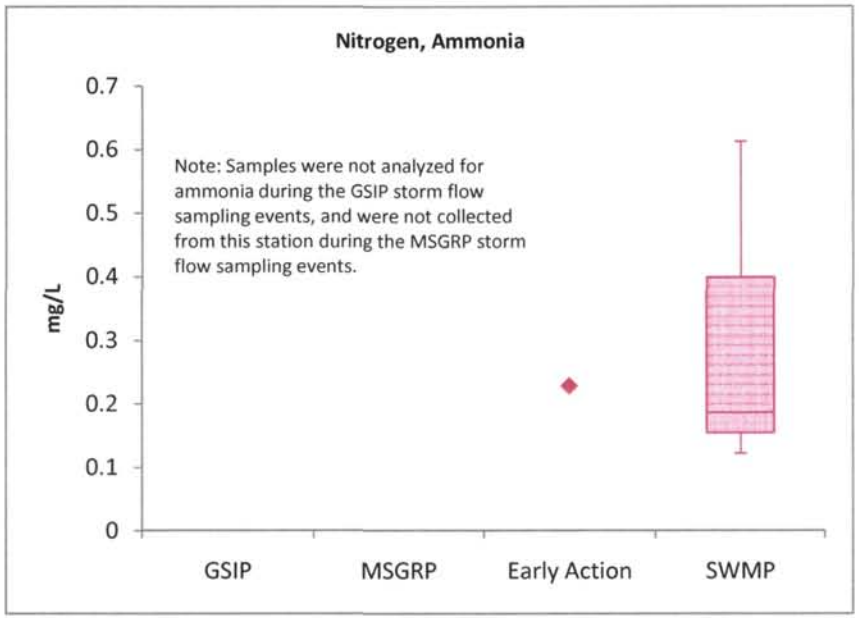


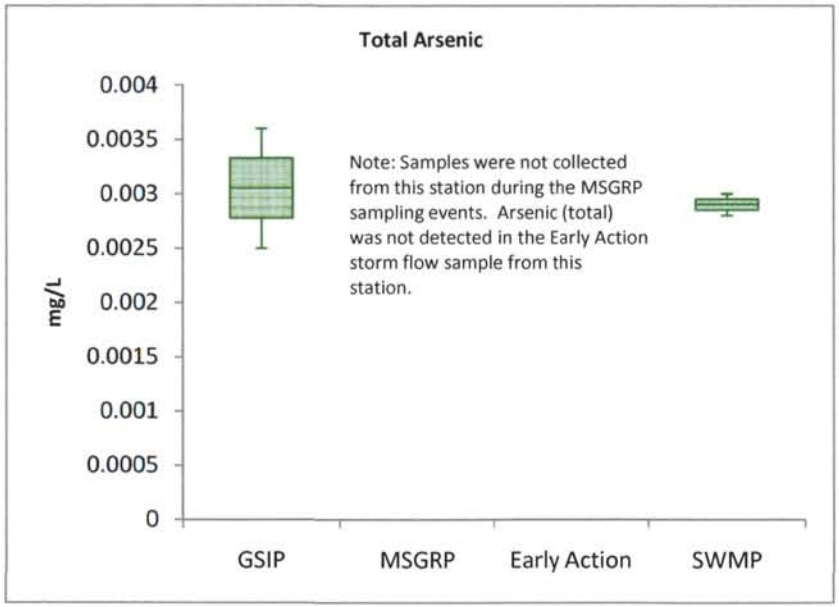
Benzene

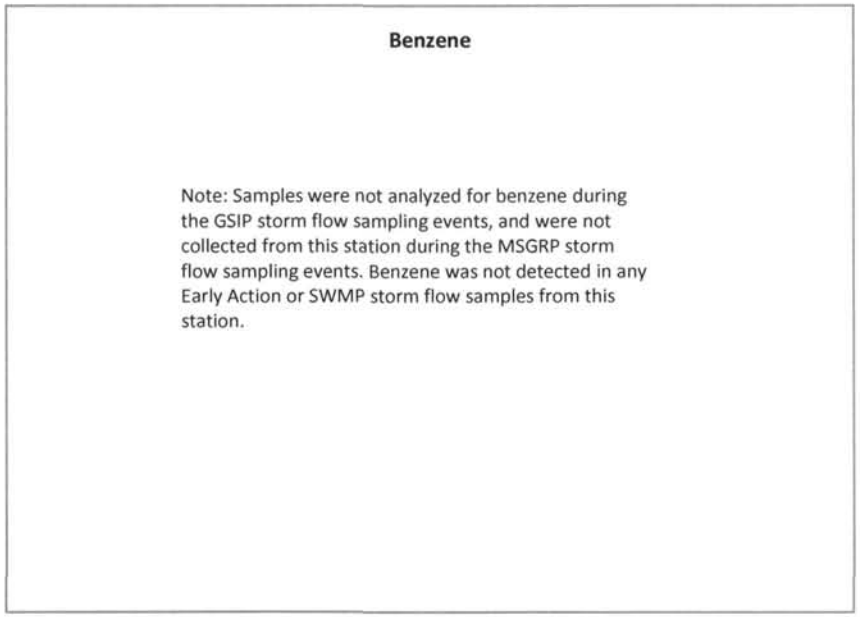
Note: Samples were not analyzed for benzene during the GSIP and MSGRP sampling events, and benzene was not detected in any Early Action or SWMP storm flow samples from this station.

SW-2-IP

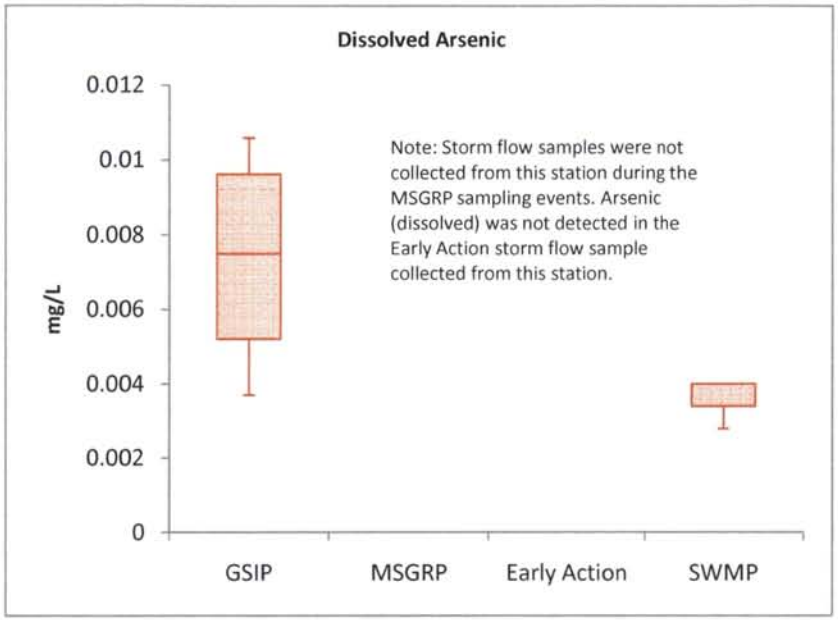

Dissolved Arsenic
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
mg/L
Note: Arsenic (dissolved) was not detected in any GSIP or Early Action storm flow samples collected from this station. Samples were not collected from this station during the MSGRP sampling events.
GSIP
MSGRP
Early Action
SWMP

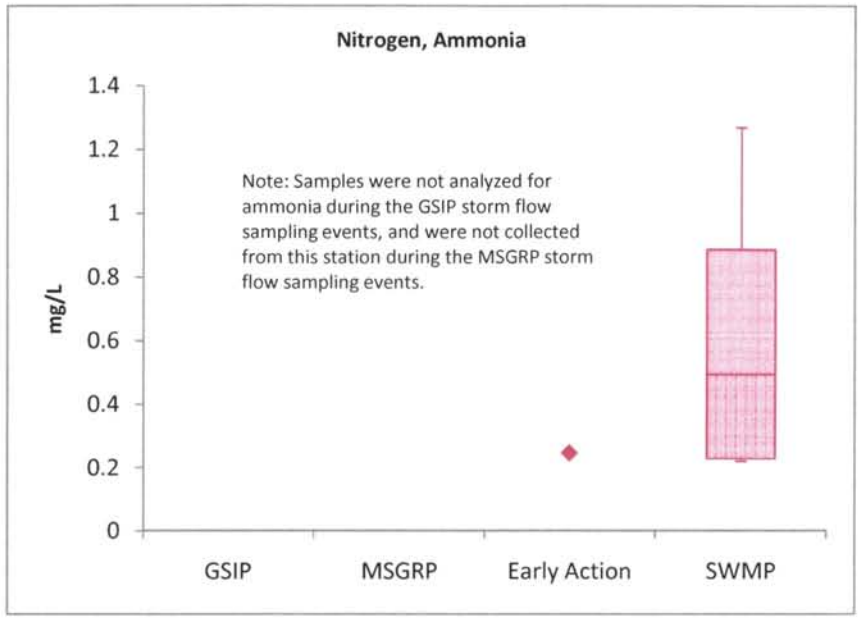

Nitrogen, Ammonia
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
mg/L
Note: Samples were not analyzed for ammonia during the GSIP storm flow sampling events, and were not collected from this station during the MSGRP storm flow sampling events.
GSIP
MSGRP
Early Action
SWMP

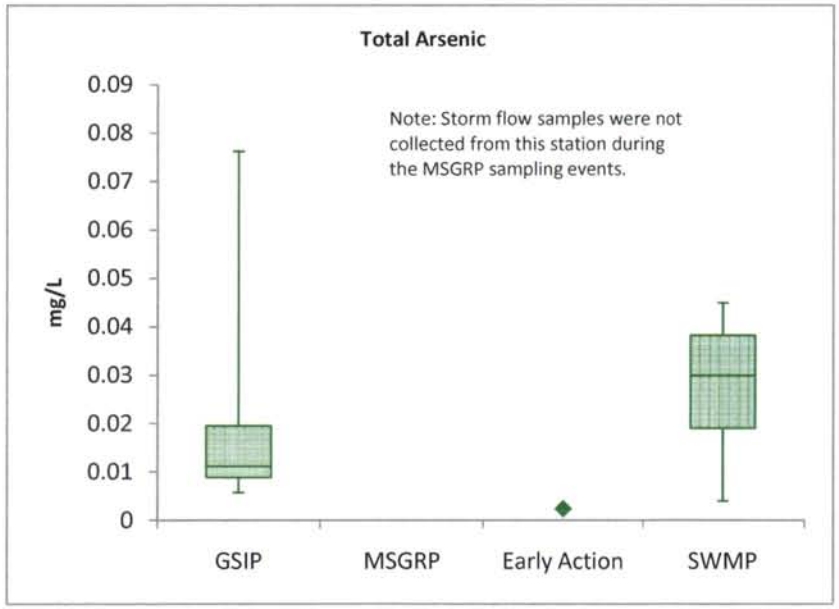

Total Arsenic
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
mg/L
Note: Samples were not collected from this station during the MSGRP sampling events. Arsenic (total) was not detected in the Early Action storm flow sample from this station.
GSIP
MSGRP
Early Action
SWMP

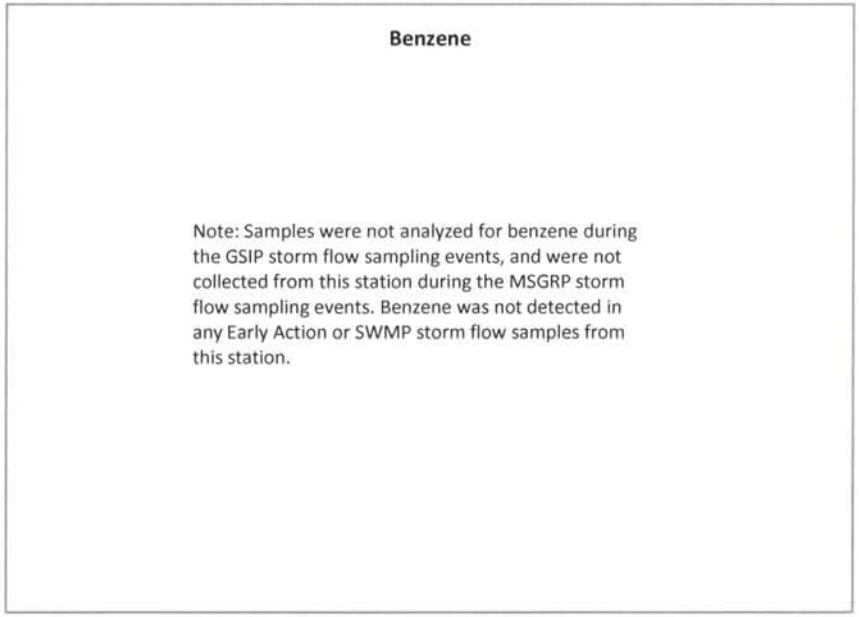

Benzene
Note: Samples were not analyzed for benzene during the GSIP storm flow sampling events, and were not collected from this station during the MSGRP storm flow sampling events. Benzene was not detected in any Early Action or SWMP storm flow samples from this station.

SW-3-IP

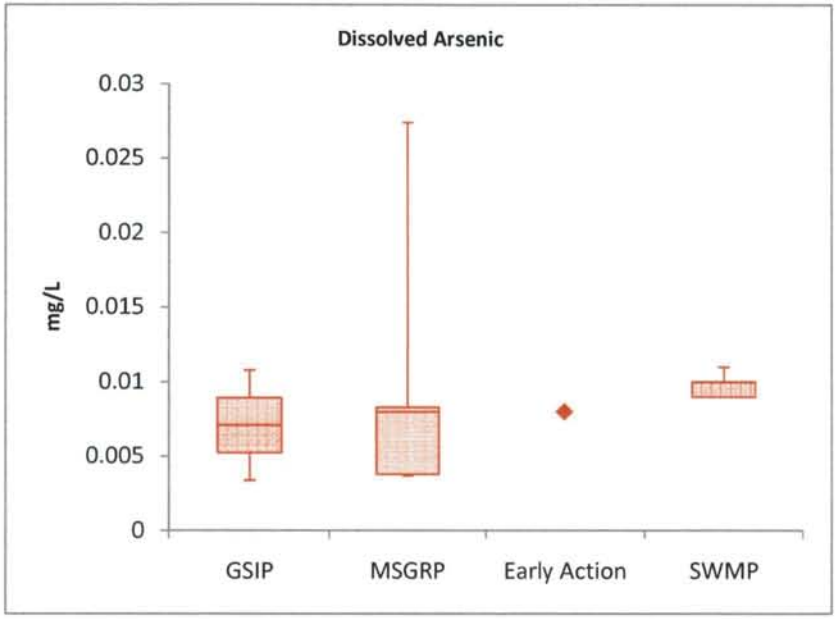

Dissolved Arsenic
0.012
0.01
0.008
0.006
0.004
0.002
0
mg/L
GSIP
MSGRP
Early Action
SWMP
Note: Storm flow samples were not collected from this station during the MSGRP sampling events. Arsenic (dissolved) was not detected in the Early Action storm flow sample collected from this station.

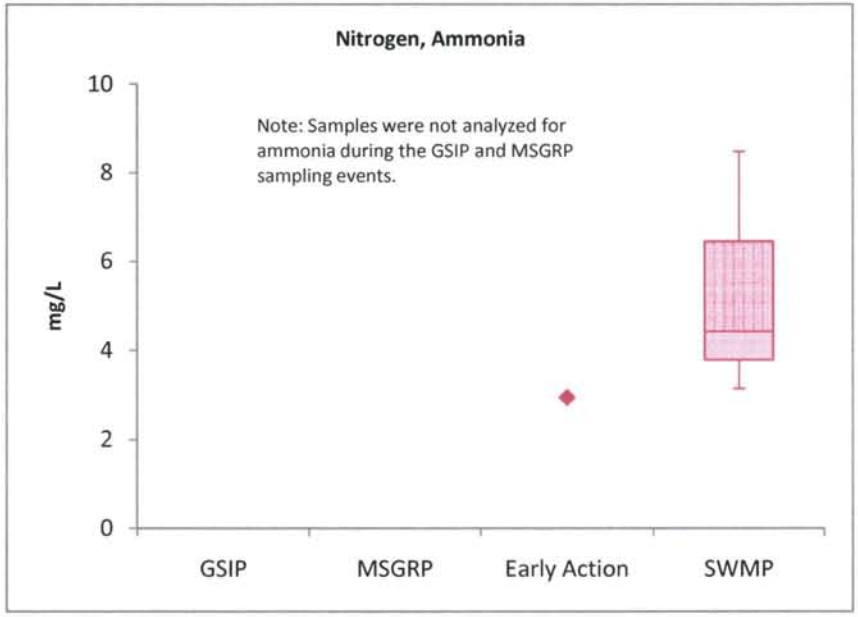

Nitrogen, Ammonia
1.4
1.2
1
0.8
0.6
0.4
0.2
0
mg/L
GSIP
MSGRP
Early Action
SWMP
Note: Samples were not analyzed for ammonia during the GSIP storm flow sampling events, and were not collected from this station during the MSGRP storm flow sampling events.

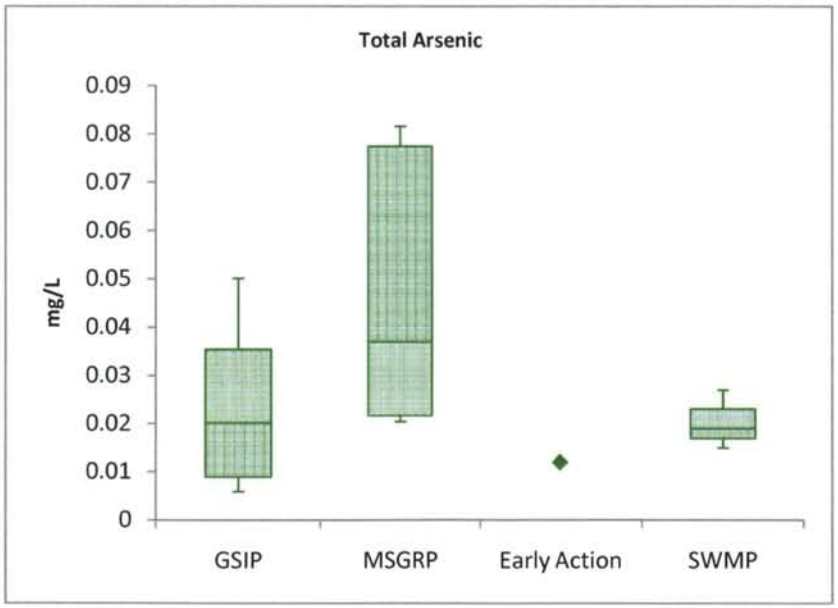

Total Arsenic
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
mg/L
GSIP
MSGRP
Early Action
SWMP
Note: Storm flow samples were not collected from this station during the MSGRP sampling events.

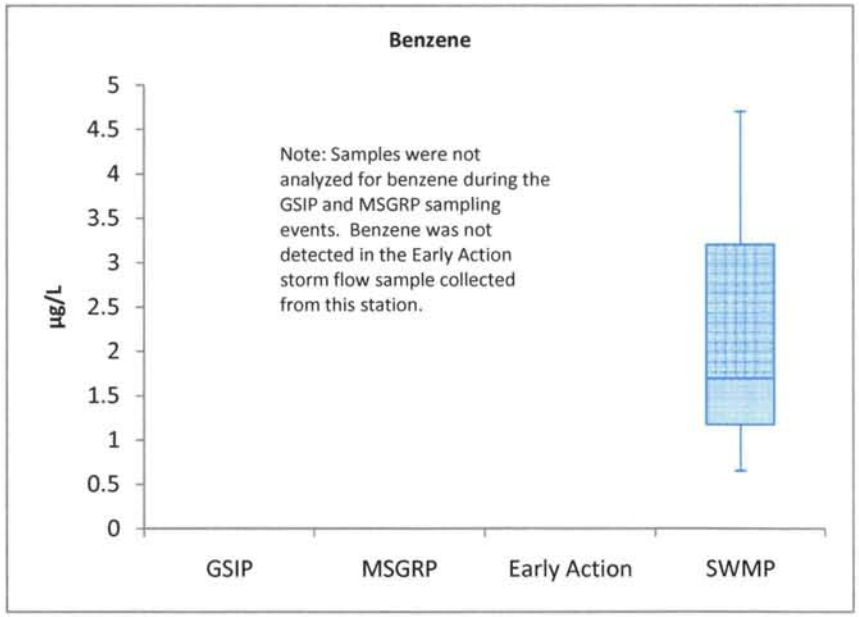

Benzene
Note: Samples were not analyzed for benzene during the GSIP storm flow sampling events, and were not collected from this station during the MSGRP storm flow sampling events. Benzene was not detected in any Early Action or SWMP storm flow samples from this station.

SW-02-TT (GSIP SW-4)

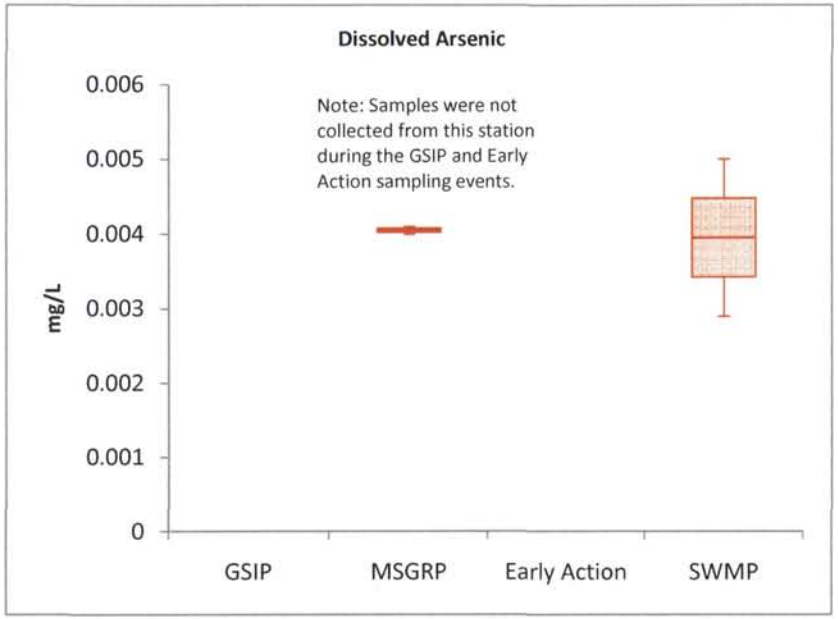


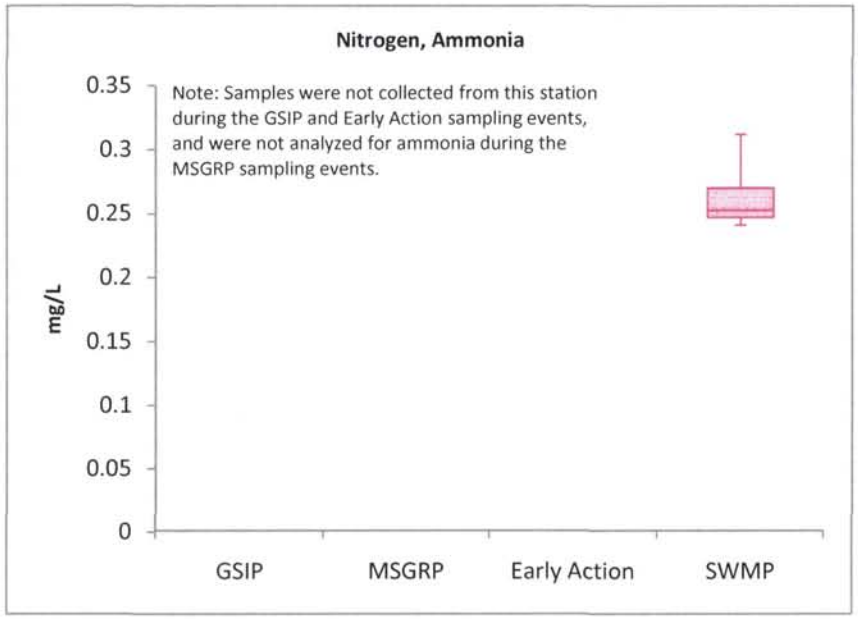


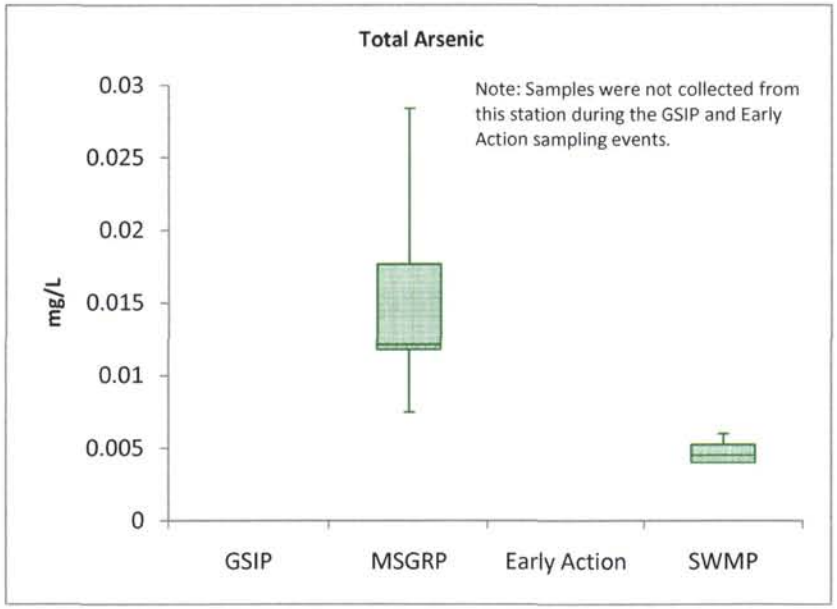




SW-03-TT

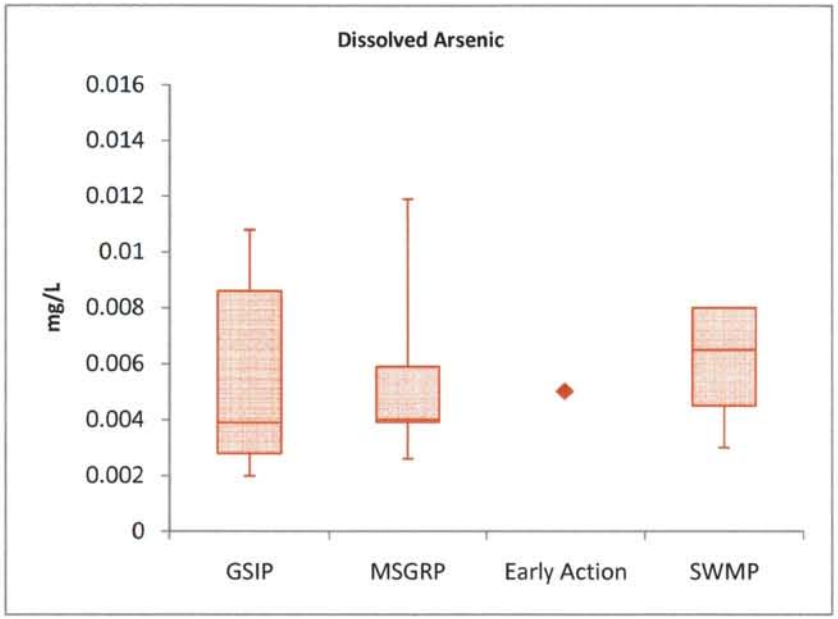


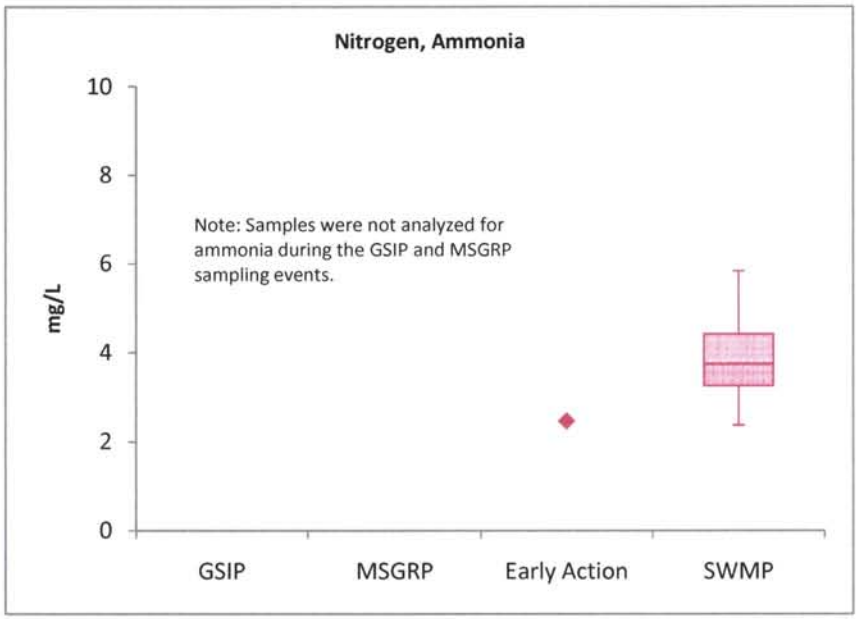


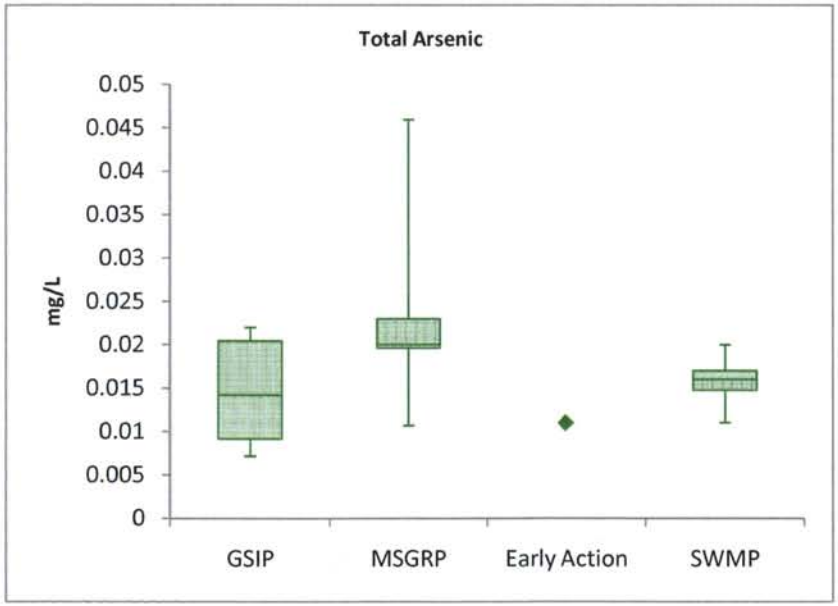


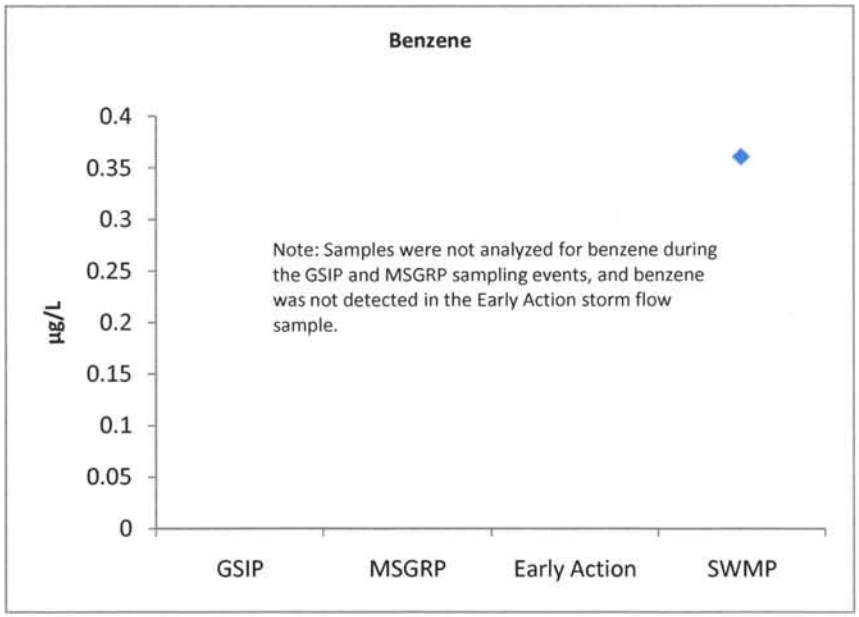
Note: Samples were not collected from this station during the GSIP and Early Action sampling events, and were not analyzed for benzene during the MSGRP sampling events. Benzene was not detected in any SWMP storm flow samples collected from this station.

SW-04-TT (GSIP SW-9)

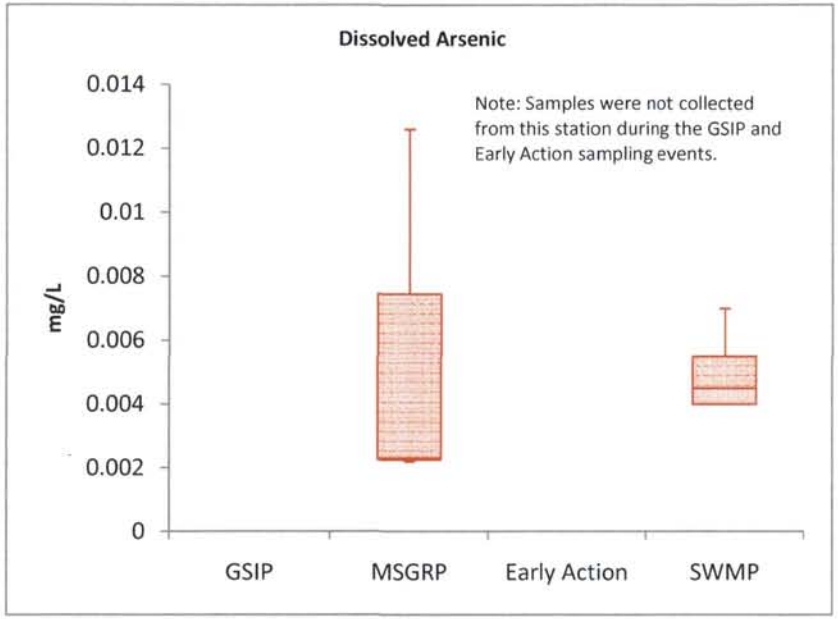


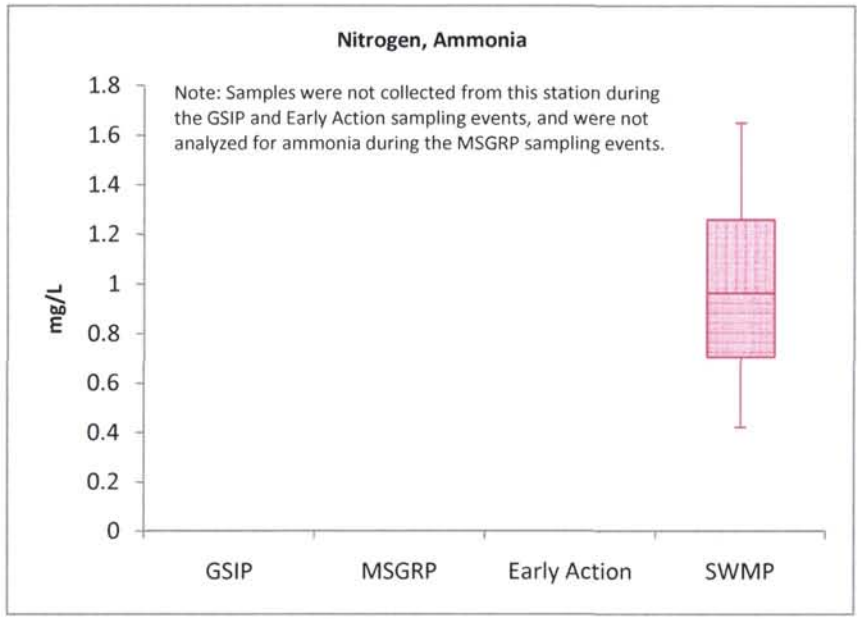


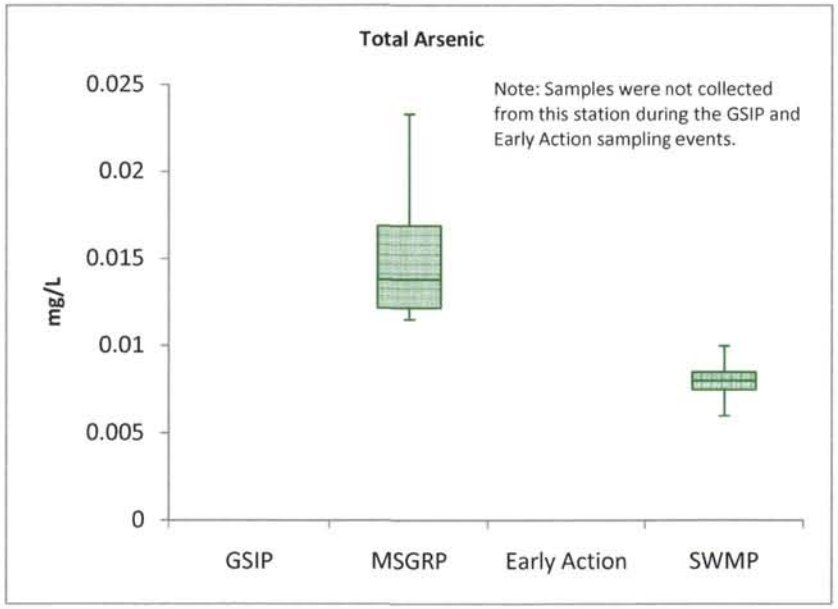




SW-05-TT

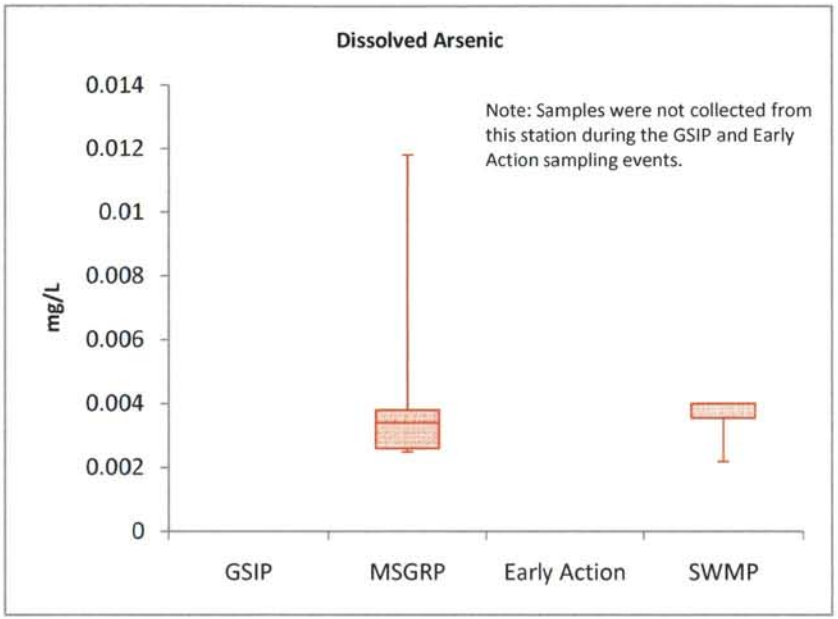


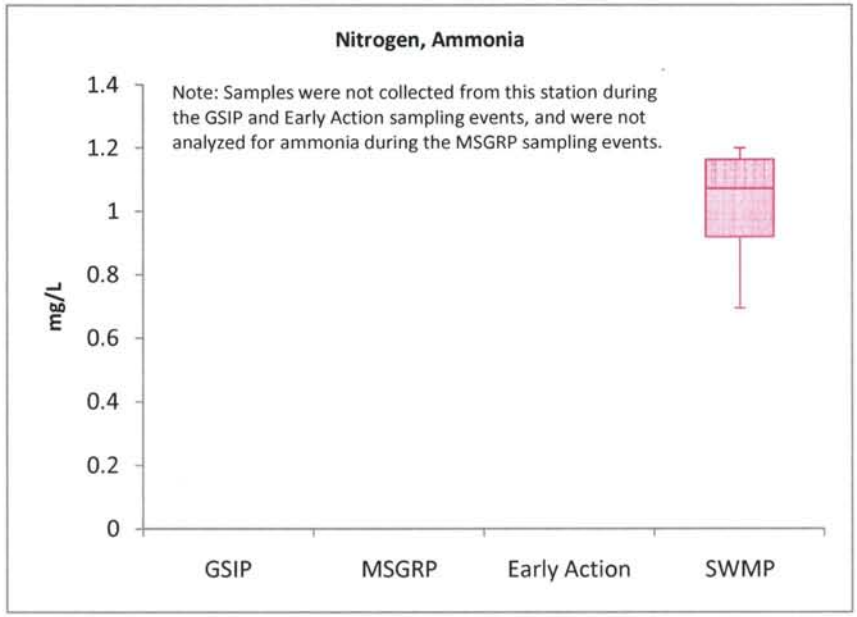


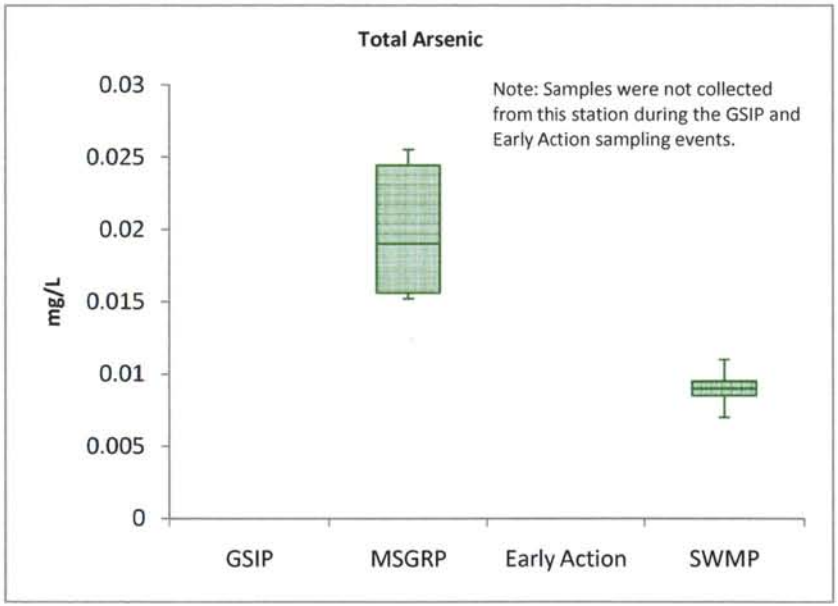


Note: Samples were not collected from this station during the GSIP and Early Action sampling events, and were not analyzed for benzene during the MSGRP sampling events. Benzene was not detected in any SWMP storm flow samples from this station.

SW-06-TT

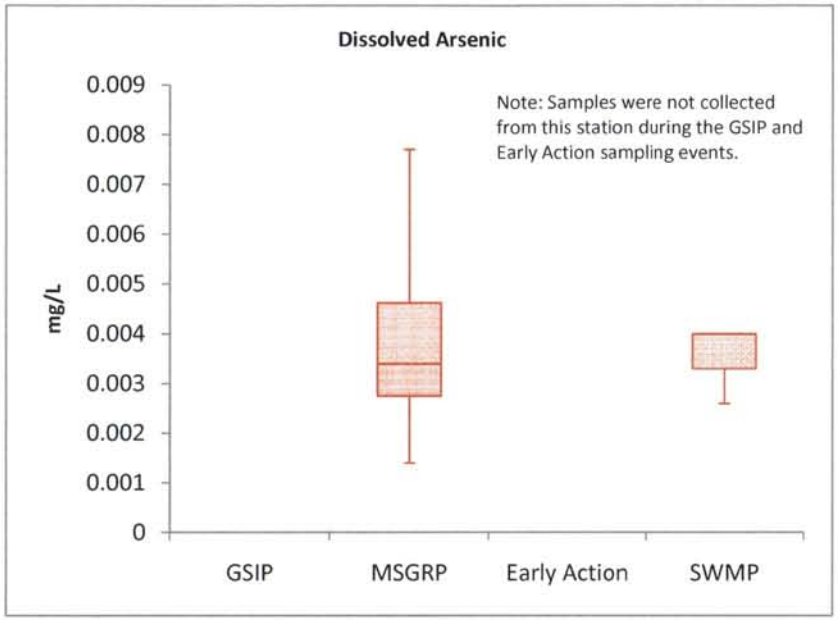


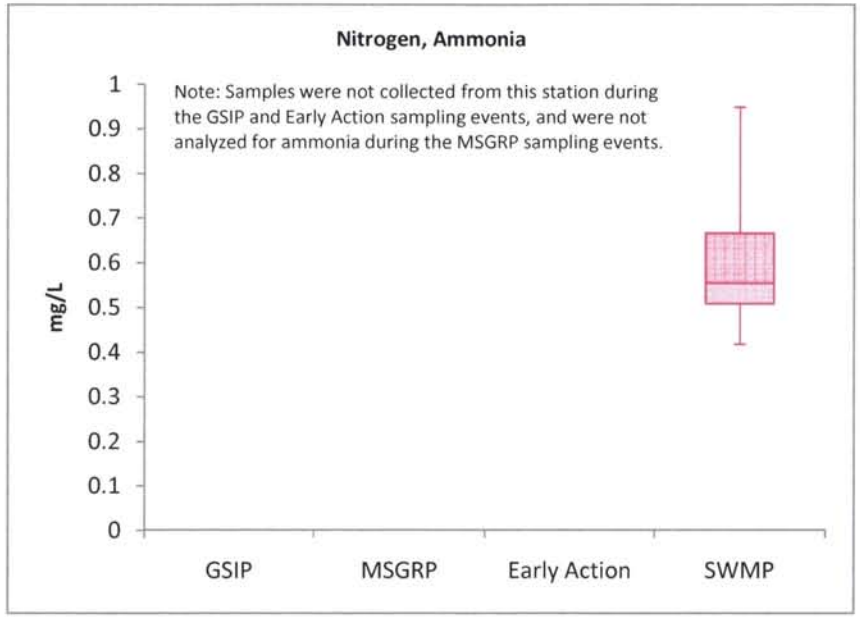


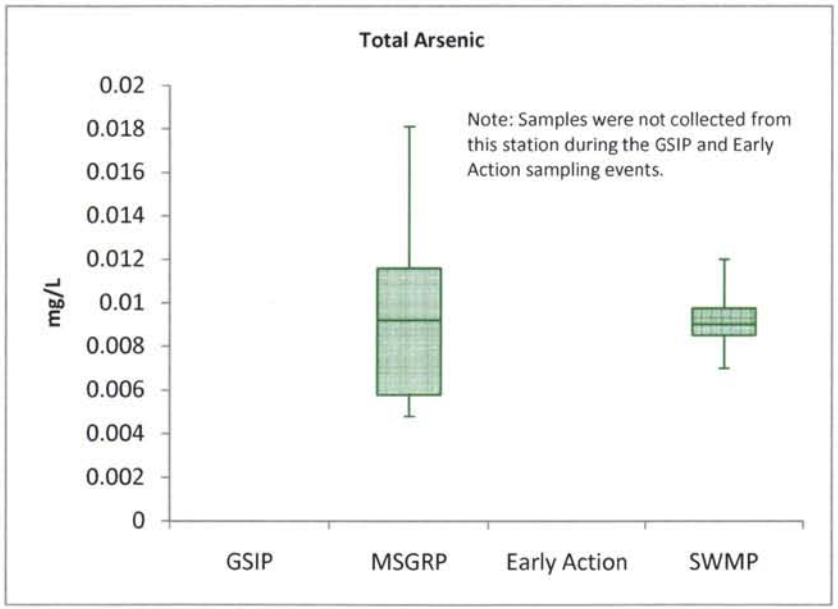


Note: Samples were not collected from this station during the GSIP and Early Action sampling events, and were not analyzed for benzene during the MSGRP sampling events. Benzene was not detected in any SWMP storm flow samples from this station.

SW-07-TT

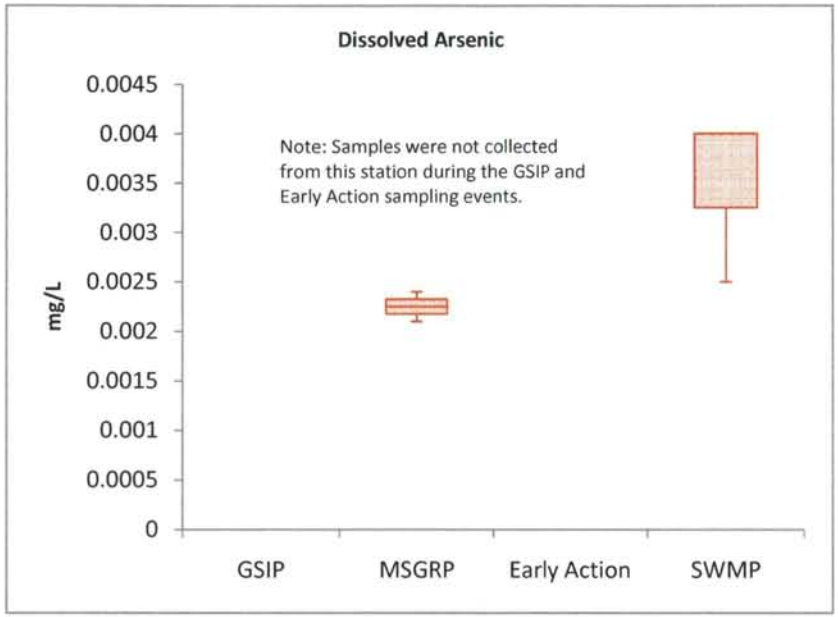


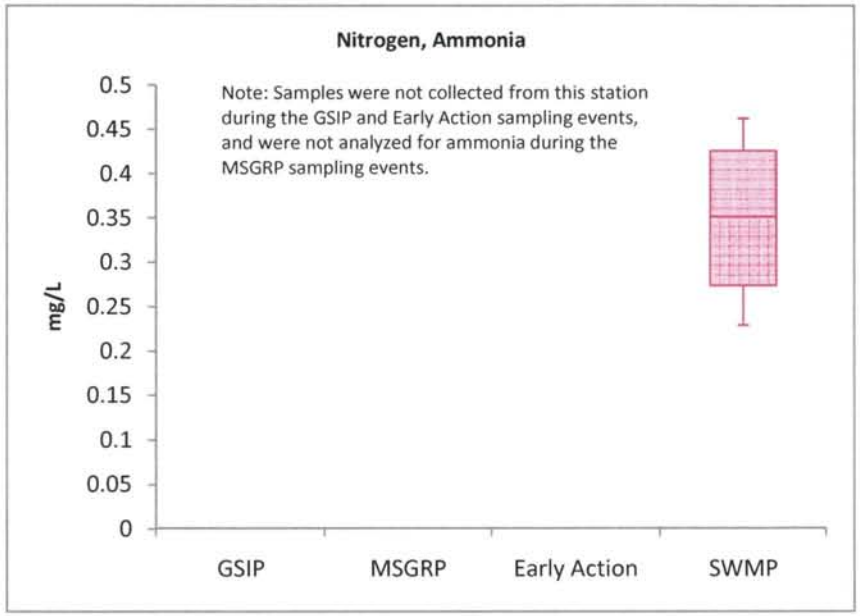


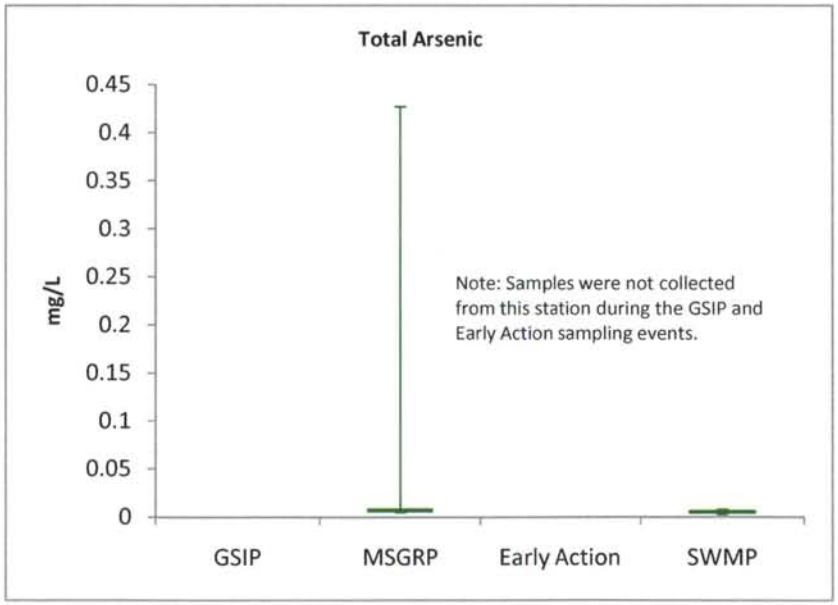


Note: Samples were not collected from this station during the GSIP and Early Action sampling events. Samples were not analyzed for benzene during the MSGRP sampling events. Benzene was not detected in any SWMP storm flow samples from this station.

SW-08-TT



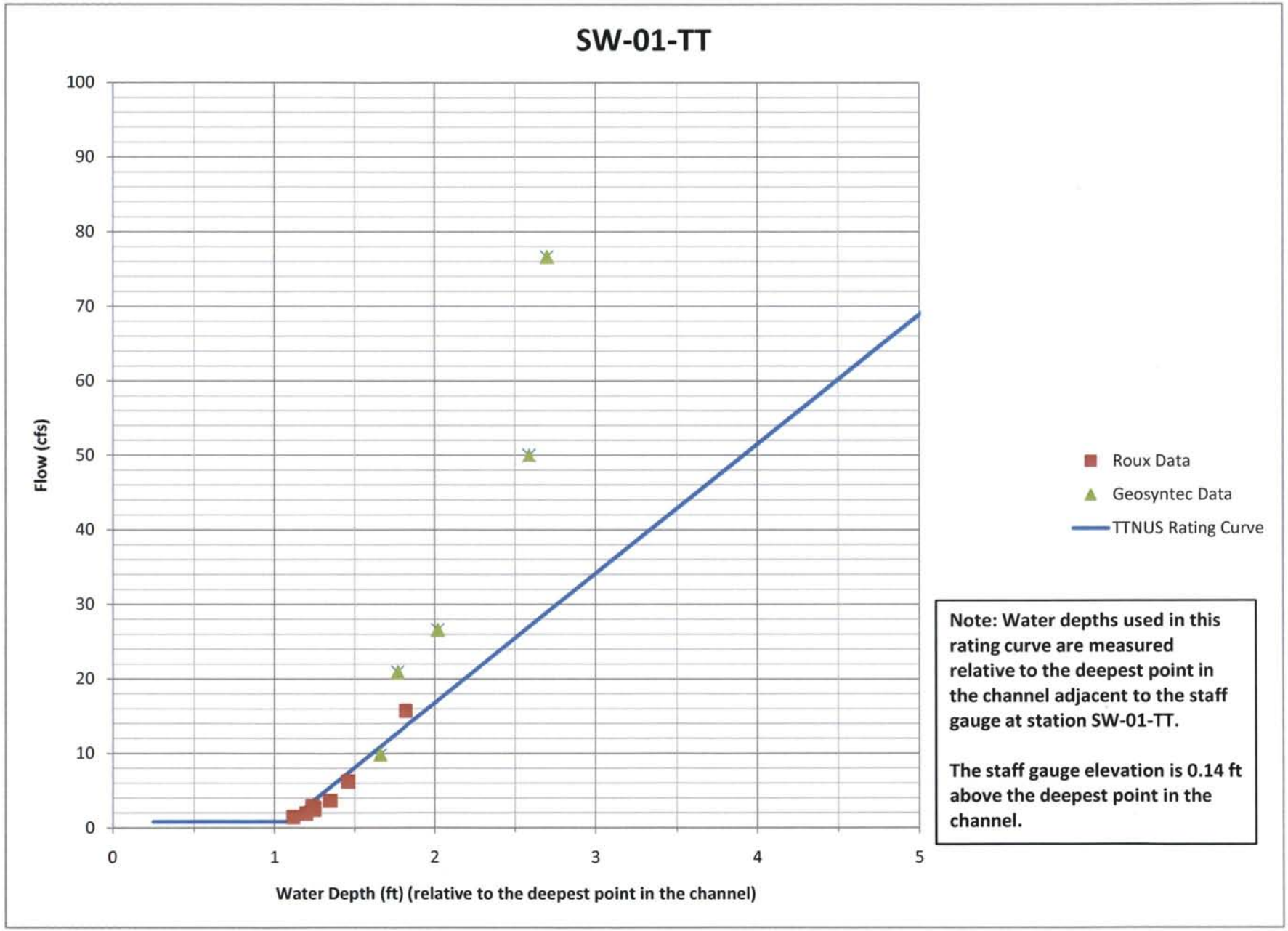


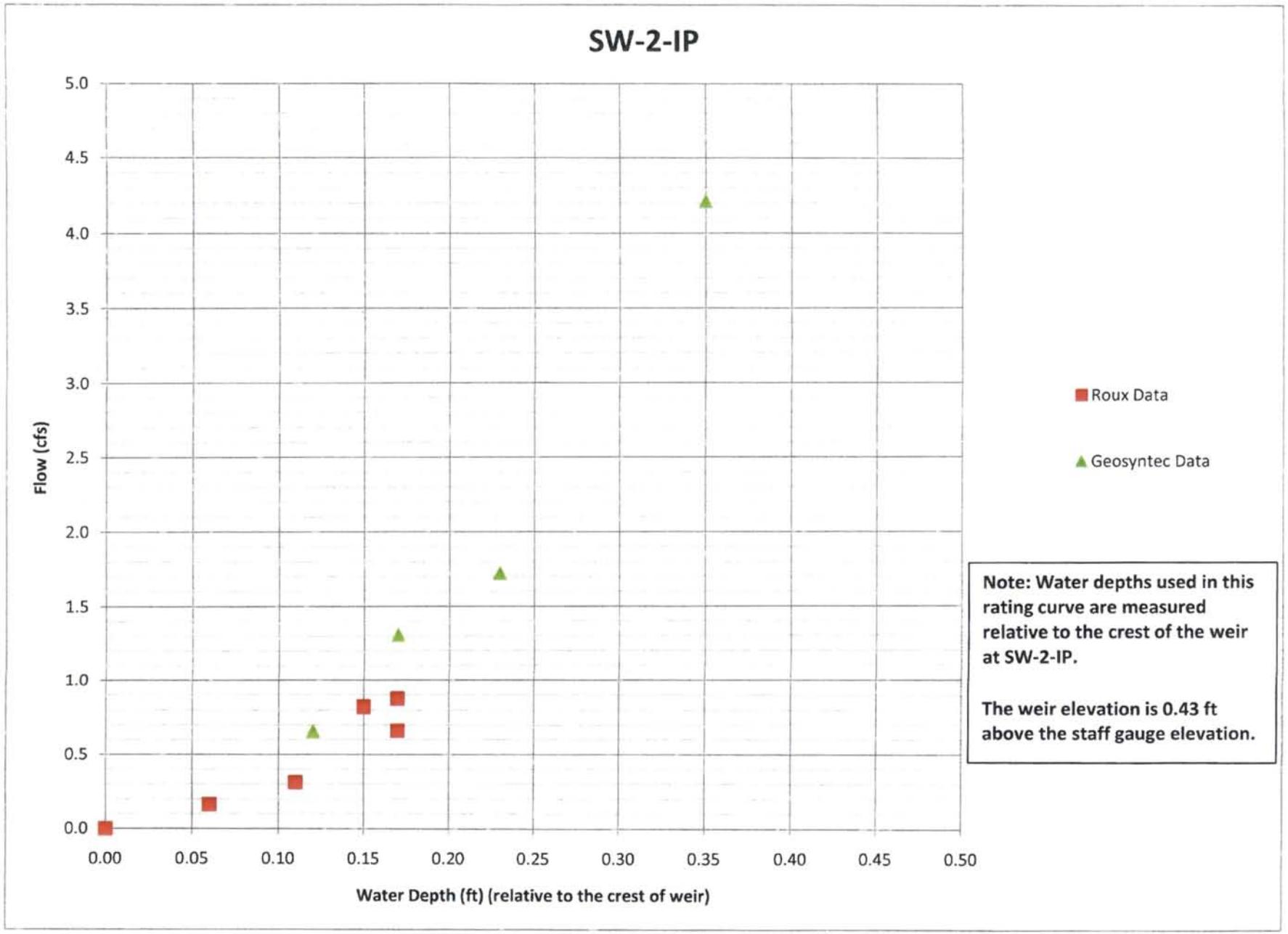


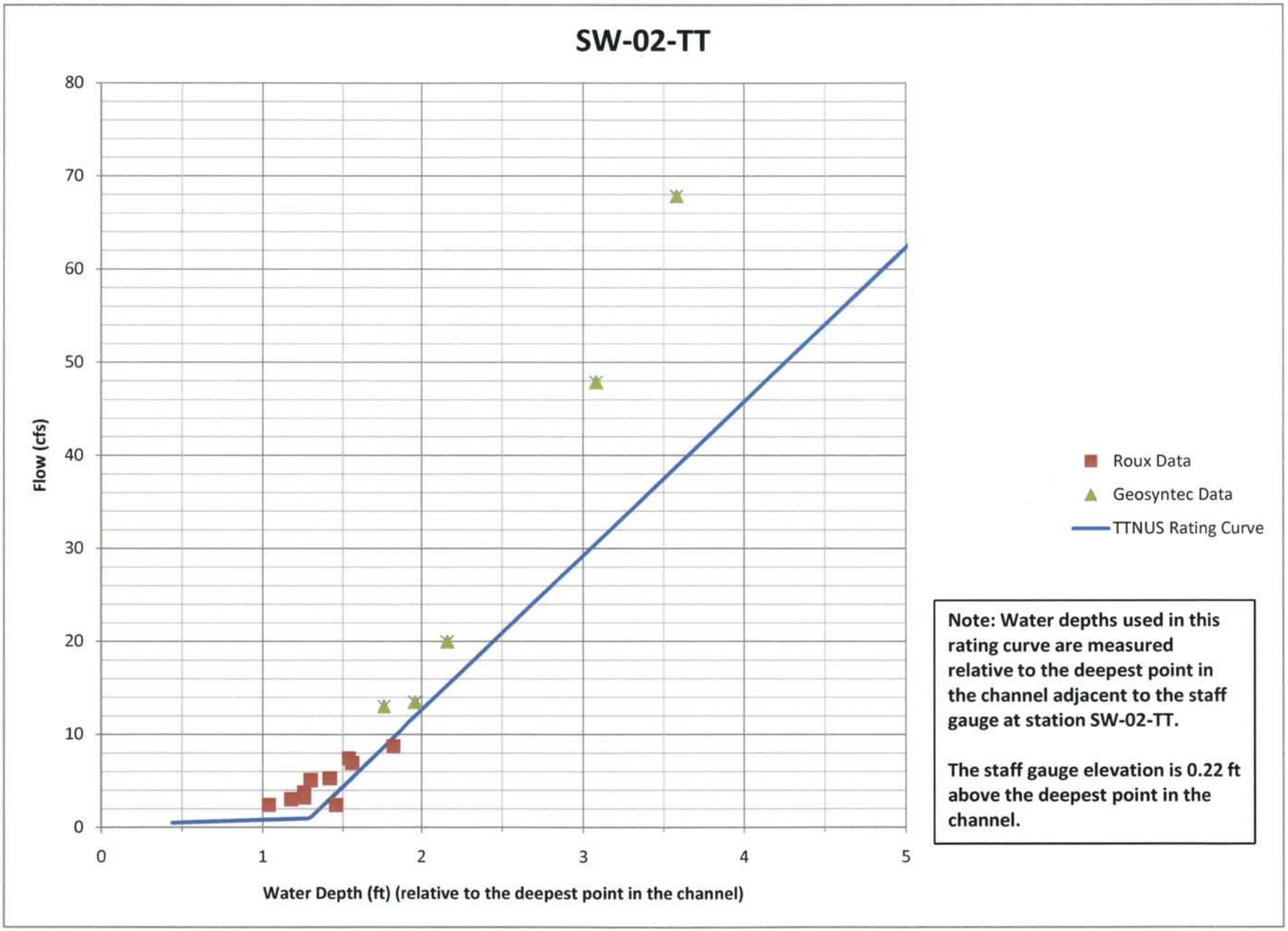
Note: Samples were not collected from this station during the GSIP and Early Action sampling events, and were not analyzed for benzene during the MSGRP sampling events. Benzene was not detected in any SWMP storm flow samples from this station.

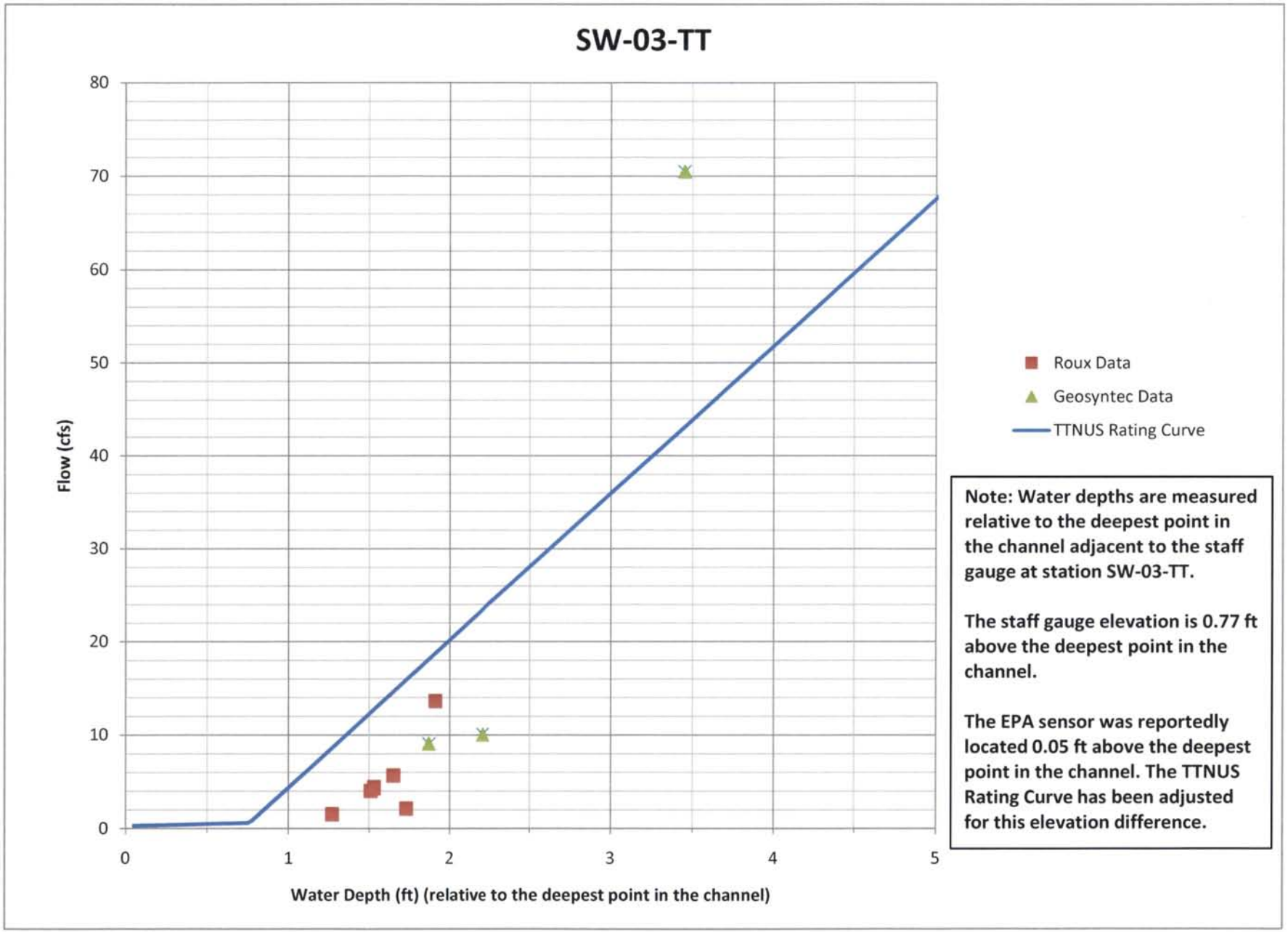
APPENDIX C

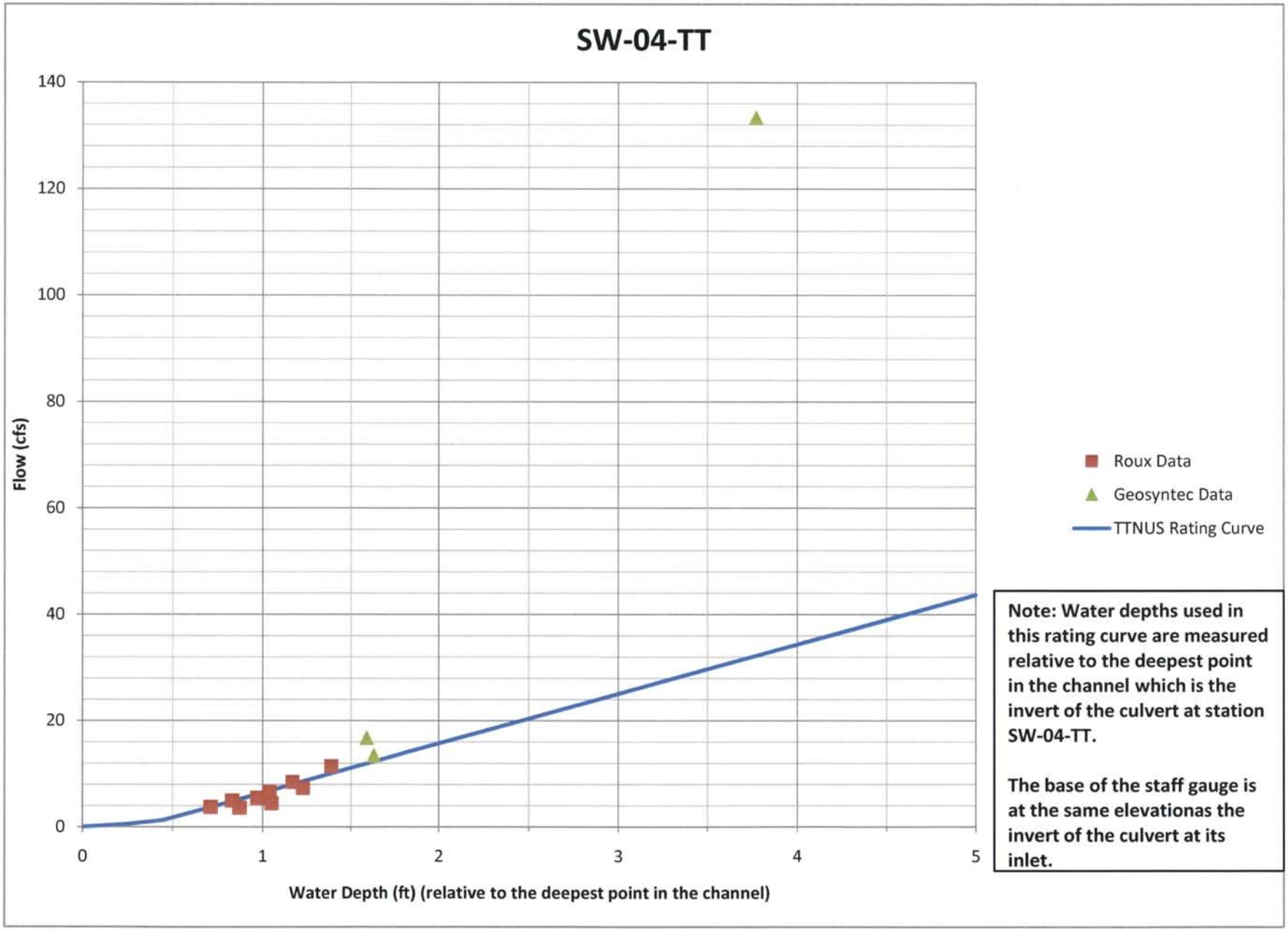
Manual Flow Gauging Data

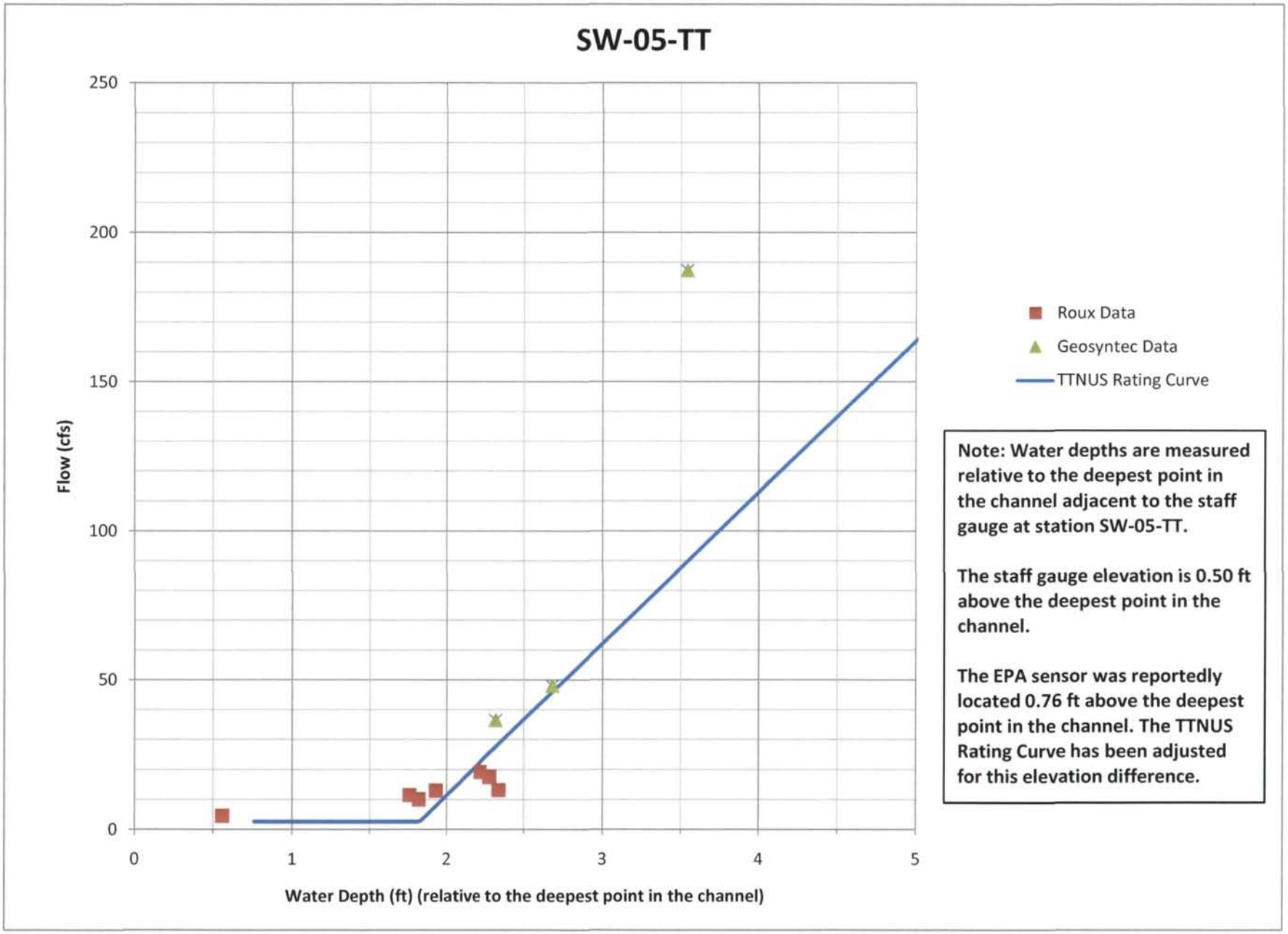

SW-01-TT
Flow (cfs)
100
90
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
Water Depth (ft) (relative to the deepest point in the channel)
Roux Data
Geosyntec Data
TTNUS Rating Curve
Note: Water depths used in this rating curve are measured relative to the deepest point in the channel adjacent to the staff gauge at station SW-01-TT.
The staff gauge elevation is 0.14 ft above the deepest point in the channel.

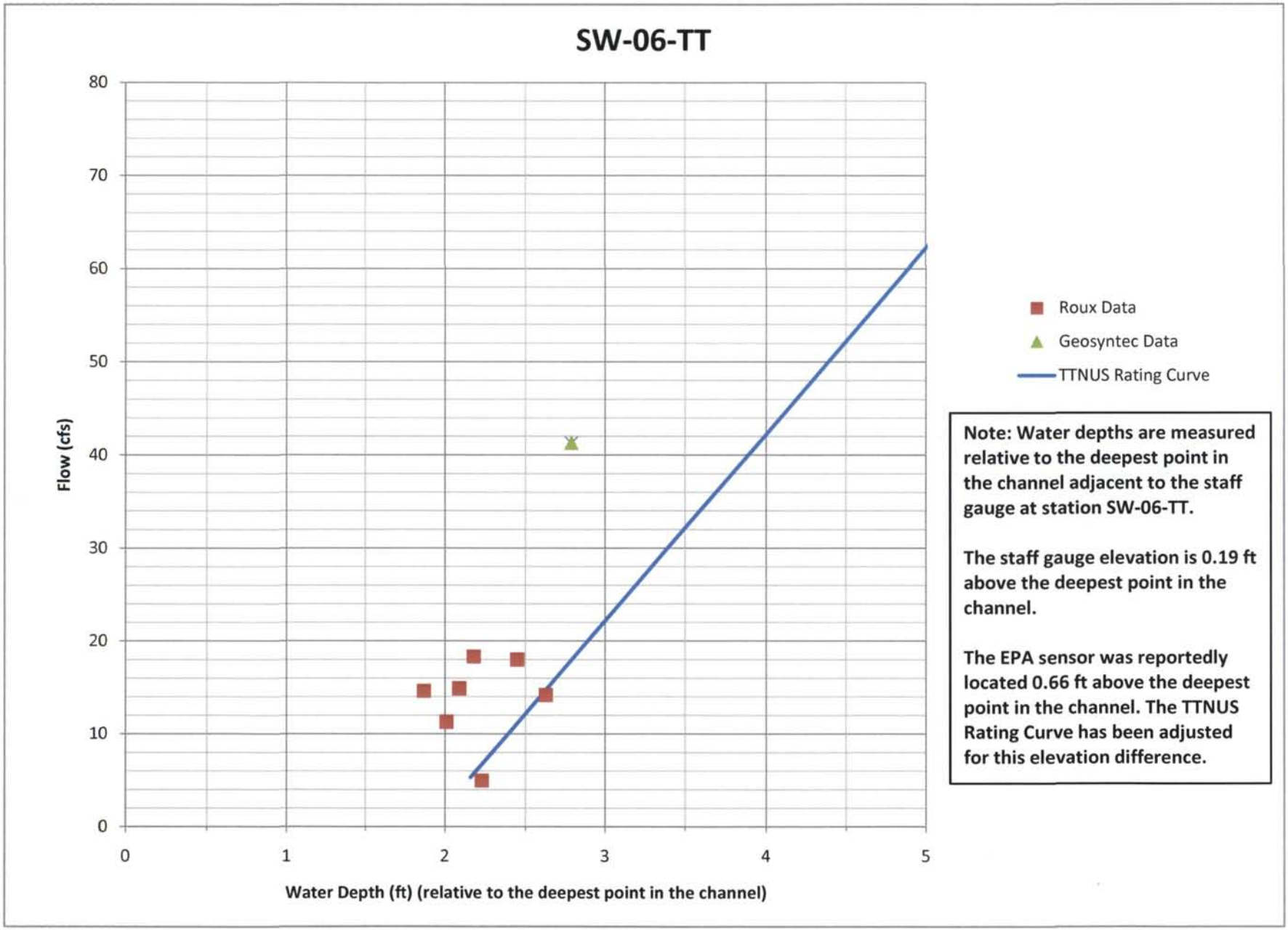

SW-2-IP
Flow (cfs)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.50
Water Depth (ft) (relative to the crest of weir)
Roux Data
Geosyntec Data
Note: Water depths used in this rating curve are measured relative to the crest of the weir at SW-2-IP.
The weir elevation is 0.43 ft above the staff gauge elevation.

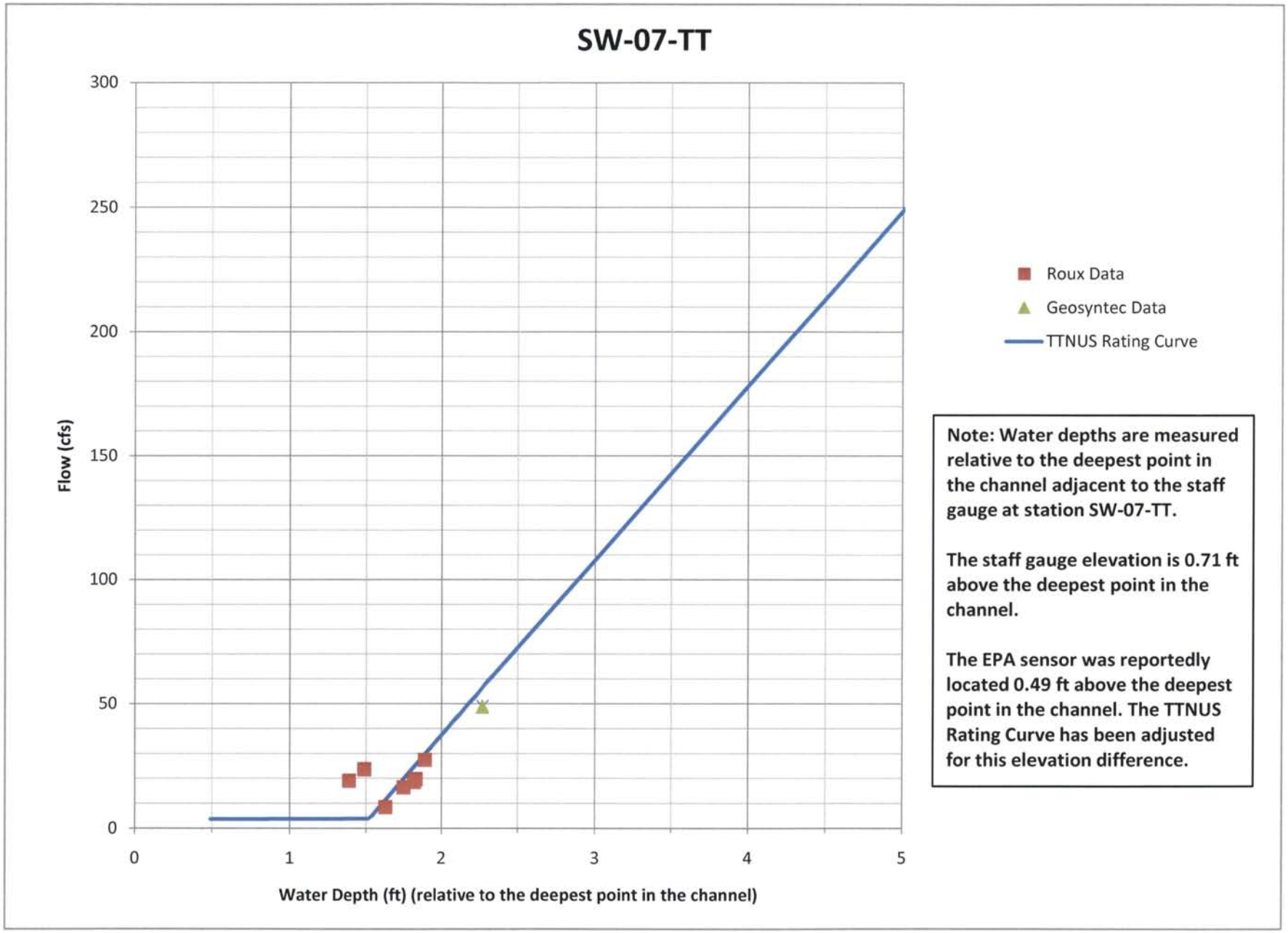

SW-02-TT
Flow (cfs)
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
Water Depth (ft) (relative to the deepest point in the channel)
Roux Data
Geosyntec Data
TTNUS Rating Curve
Note: Water depths used in this rating curve are measured relative to the deepest point in the channel adjacent to the staff gauge at station SW-02-TT.
The staff gauge elevation is 0.22 ft above the deepest point in the channel.


SW-03-TT
Flow (cfs)
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
Water Depth (ft) (relative to the deepest point in the channel)
Roux Data
Geosyntec Data
TTNUS Rating Curve
Note: Water depths are measured relative to the deepest point in the channel adjacent to the staff gauge at station SW-03-TT.
The staff gauge elevation is 0.77 ft above the deepest point in the channel.
The EPA sensor was reportedly located 0.05 ft above the deepest point in the channel. The TTNUS Rating Curve has been adjusted for this elevation difference.


SW-04-TT
Flow (cfs)
140
120
100
80
60
40
20
0
0
1
2
3
4
5
Water Depth (ft) (relative to the deepest point in the channel)
Roux Data
Geosyntec Data
TTNUS Rating Curve
Note: Water depths used in this rating curve are measured relative to the deepest point in the channel which is the invert of the culvert at station SW-04-TT.
The base of the staff gauge is at the same elevationas the invert of the culvert at its inlet.


SW-05-TT
250
200
150
100
50
0
Flow (cfs)
0
1
2
3
4
5
Water Depth (ft) (relative to the deepest point in the channel)
Roux Data
Geosyntec Data
TTNUS Rating Curve
Note: Water depths are measured relative to the deepest point in the channel adjacent to the staff gauge at station SW-05-TT.
The staff gauge elevation is 0.50 ft above the deepest point in the channel.
The EPA sensor was reportedly located 0.76 ft above the deepest point in the channel. The TTNUS Rating Curve has been adjusted for this elevation difference.

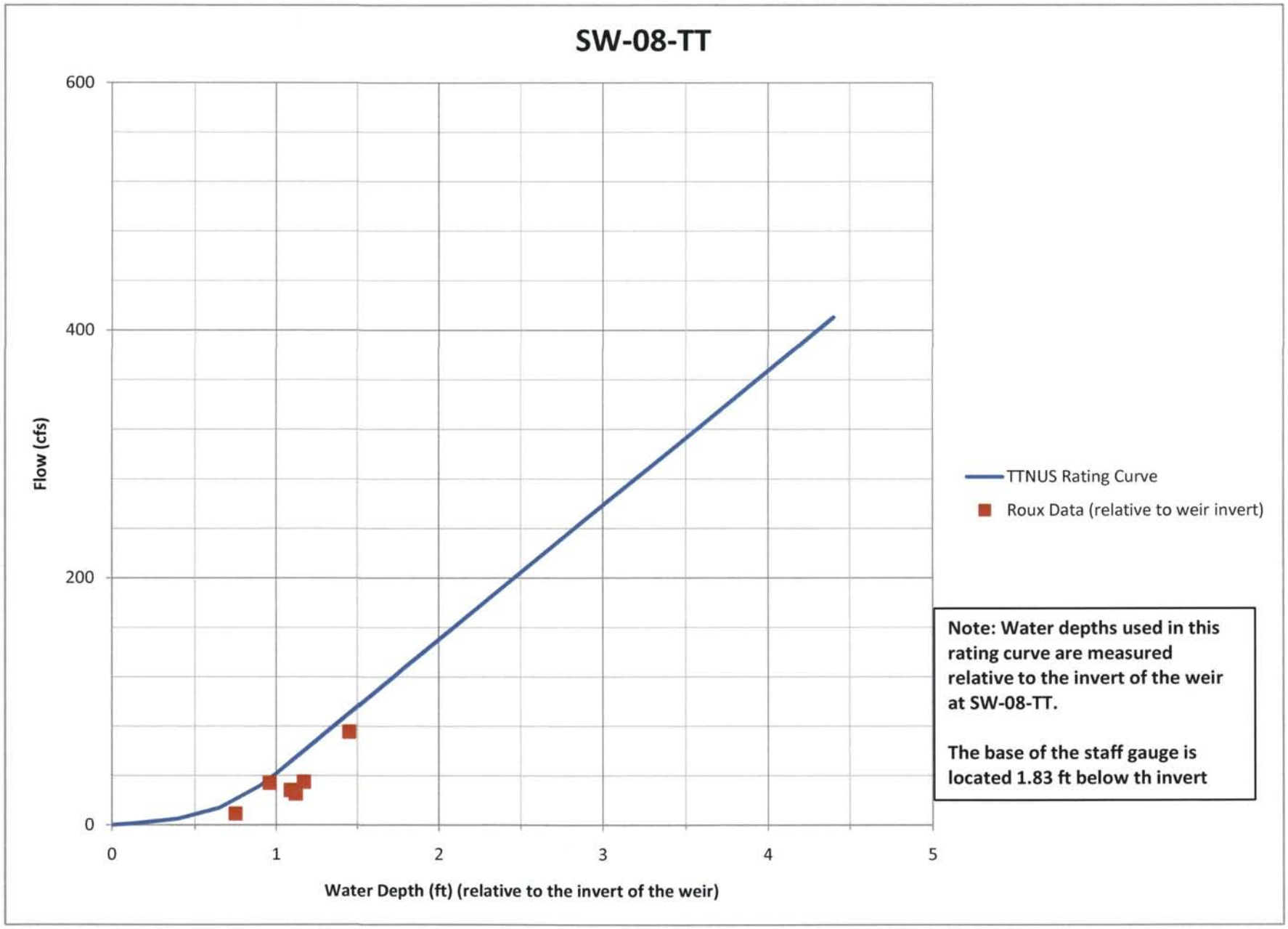

SW-06-TT
Flow (cfs)
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
Water Depth (ft) (relative to the deepest point in the channel)
Roux Data
Geosyntec Data
TTNUS Rating Curve
Note: Water depths are measured relative to the deepest point in the channel adjacent to the staff gauge at station SW-06-TT.
The staff gauge elevation is 0.19 ft above the deepest point in the channel.
The EPA sensor was reportedly located 0.66 ft above the deepest point in the channel. The TTNUS Rating Curve has been adjusted for this elevation difference.



Note: Water depths are measured relative to the deepest point in the channel adjacent to the staff gauge at station SW-07-TT.

The staff gauge elevation is 0.71 ft above the deepest point in the channel.

The EPA sensor was reportedly located 0.49 ft above the deepest point in the channel. The TTNUS Rating Curve has been adjusted for this elevation difference.


SW-08-TT
600
400
200
0
Flow (cfs)
0
1
2
3
4
5
Water Depth (ft) (relative to the invert of the weir)
TTNUS Rating Curve
Roux Data (relative to weir invert)
Note: Water depths used in this rating curve are measured relative to the invert of the weir at SW-08-TT.
The base of the staff gauge is located 1.83 ft below th invert

APPENDIX D

Geosyntec Memorandum re: Rating Curves

Geosyntec consultants

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Memorandum

Date: 30 October 2009

To: Bruce Thompson, de maximis inc.

Copies to: Larry McTiernan, Roux Associates, Inc.

From: Joseph Jeray, Marcus Quigley and Carl Elder, Geosyntec Consultant

Subject: Rating Curves for the Industri-Plex OU2 Superfund Site
Woburn, Massachusetts

This memorandum documents the collection of stream flow and stage data during base flow monitoring events and storms at the above referenced site, provides an evaluation of how well these data fit the existing rating curves, and presents the procedures and assumptions that were used to create updated rating curves for some of the surface water monitoring stations.

Overview:

Flow versus stage data for the surface water gauging stations at the site are being collected during base flow and wet-weather events. These data are provided in Attachment 1. Sufficient data exist at SW-01-TT, SW-2-IP, SW-02-TT, SW-04-TT and SW-08-TT to propose updated rating curves. Insufficient data exist at the remaining stations to propose a change to the rating curves at this time. As more data become available, rating curves will be updated for all stations.

Attachment 2 contains rating curves for the monitoring stations. The rating curves in Attachment 2 present the flow versus stage relationship used by EPA[1], and flow versus water depth observations made by Geosyntec and Roux. Updated rating curves are also presented in Attachment 2 for stations SW-01-TT, SW-2-IP, SW-02-TT, SW-04-TT and SW-08-TT. Rating curves for these stations were developed based on measured stage and flow, existing data and/or theoretical stage-discharge relationships. Rating curves developed by EPA were linear or bilinear, which at some stations does not appear to fit observed data and/or reflect the shape of the rating curve that is expected for the structure (e.g., station SW-01-TT resembles a rectangular weir, which in theory means that flow is expected to be proportional to water depth raised to a power). When evaluating the appropriateness of a rating curve, we considered how well the curve fit the data and the likely shape of the rating curve given the geometry of the station. The procedure used at each location to develop rating curves is described below.

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[1] Flow versus stage data used by EPA are presented in Attachment 4.

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Attachment 3 contains five sets of 50 data points each describing the rating curves at stations where new rating cures are proposed. These data will be programmed into the corresponding ISCO 6712 automated samplers. From 3 to 50 points may be programmed into the ISCO 6712 automated sampler to define a rating curve, so programming 50 points within the expected range of flows at each station will provide the best possible estimates of flow.

Data Collection:

Stage-discharge data were collected at each monitoring station (with the exception of SW-08-TT) according to the following protocol. The resulting data were used in the development of a rating curve for several locations.

- At all stations, discharge was estimated by Roux and Geosyntec using a hand held Acoustic Doppler Velocity (ADV) device (e.g., Flow Tracker) during the period from late March to early September 2009.
- During each stream gauging event, the water depth from the site staff gauge and flow measured using the ADV device were recorded.
- At SW-08-TT, only the stage observed on the staff gauge at the station was recorded during precipitation events, flow was not measured.
- A plot of flow, in cubic feet per second (cfs) versus water depth in feet (ft), was generated for each station except for SW-08-TT using the stream gauging data.

Rating Curve Development:

Specific procedures used in developing rating curve at monitoring station where sufficient data exist, are outlined below:

<u>SW-01-TT (Halls Brook, immediately upstream of the HBHA Pond):</u>

- The rating curve at this station was developed based on 14 data points collected from the stream gauging efforts described above.
- Water depths for the rating curve at this station are relative to the deepest point in the channel along a transect across the channel that includes the staff gauge.
- The curve-fitting tool in Microsoft EXCEL was used to fit a power function[i] to these 14 data points, and the resulting expression was used to estimate the flow for 50 water depths ranging from 0.1 ft to 5 ft. The stage versus flow relationship at this station is included in Attachment 2. Recommended inputs for the ISCO sampler are shown on the figures presented in Attachment 2 and tabulated in Attachment 3.

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SW-2-IP (Atlantic Avenue Drainway):

- A rectangular weir is used to aid flow measurement at this location.
- The rating curve at this station was developed based on the theoretical equation for flow over a suppressed rectangular weir (Equation 1).
- Water depths for the rating curve at this station are relative to the crest of the weir.

$Q = C*L*H^{3/2}$ **[Equation 1]**

where Q = Flow rate (cfs)
C = Discharge coefficient (3.33)
L = weir length (7.2 ft)
H = head (depth of discharge over weir (ft) – site-specific correction factor (0.047))

- Theoretical flow values from Equation 1 were slightly higher than observed flow values, so a site-specific correction factor of approximately 0.047 was applied based on a least-squares fit of the theoretical equation to observed values.
- The theoretical equation, including the site-specific correction factor, was used to determine flow for 50 water depths ranging from 0 ft to 2.4 ft. The stage versus flow relationship included in Attachment 2. Recommended inputs for the ISCO sampler are shown on the figures presented in Attachment 2 and tabulated in Attachment 3.

SW-02-TT (outlet of the HBHA Pond):

- The rating curve at this station was developed based on 15 data points collected from the stream gauging efforts described above.
- Water depths for the rating curve at this station are relative to the deepest point in the channel along a transect across the channel that includes the staff gauge.
- The curve-fitting tool in Microsoft EXCEL was used to fit a power function to these 15 data points, and the resulting expression was used to determine the flow for 50 water depths ranging from 0.1 ft to 5 ft.
- The stage versus flow relationship at this station is included in Attachment 2. Recommended inputs for the ISCO sampler are shown on the figure presented in Attachment 2 and tabulated in Attachment 3.
- Data have not been collected during events where flow overtops the embankment at SW-02-TT, so the rating curve presented in Attachment 2 does not account for out-of-bank flow. As these data become available, the rating curve can be modified to account for this condition.

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SW-04-TT (60" culvert beneath Mishawum Road):

- This monitoring station is located at the entrance to a 60 inch diameter culvert. Therefore, the rating curve at this station was developed based on the theoretical equation for flow into a 60 inch orifice (Equation 2).
- Water depths for this rating curve are relative to the invert of the culvert measured at the staff gauge that is located slightly upstream of the culvert.

$Q = C*A*[(2*g*h)^{1/2}]$ **[Equation 2]**

where Q = Flow rate (cfs)
C = Discharge coefficient**
A = Submerged area (ft^2)
g = Gravitational constant (32.2 ft/s^2)
h = Effective head* (ft)

Note: *Effective head is taken as half of the headwater depth above the invert of the culvert for a partially submerged orifice.
**Discharge coefficient used as a fitting parameter

- In using Equation 2, effective head was taken as half of the headwater depth above the invert of the culvert (partially submerged orifice)[ii].
- The discharge coefficient in Equation 2 (i.e., C) was used as a fitting parameter to fit Equation 2 to observed elevations and flows at this station.
  - A value of 0.37 for C was found to correspond well to the data points collected for water depths less than about 1.6 ft (i.e., lower flow), while a value of 0.76 was found to fit the data point with a flow depth of about 3.8 ft (i.e., higher flow).
  - Linear scaling was then applied to interpolate the discharge coefficient for water depths between 1.6 ft and 3.8 ft based on the available data.
- The results from Equation 2 were then used to determine flow for 50 water depths ranging from 0.1 ft to 4.9 ft. The stage versus flow relationship at this station is included in Attachment 2. Recommended inputs for the ISCO sampler are shown on the figure presented in Attachment 2 and tabulated in Attachment 3.

SW-08-TT (USGS gauging station, Winchester, MA):

- In lieu of developing a new rating curve for this station based on stream gauging data, the rating curve developed by USGS for this station was used.
- Flow versus depth data for this station were provided via e-mail in July 2009 by Ms. Linda Comeau, USGS District Information Officer. These data are provided in Attachment 5.
- Fifty rating curve points were selected from a set of over 700 points provided by the USGS.

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- Points selected for input into the ISCO 6712 were selected as representative values based on the following criteria:
    - Because a linear interpolation scheme is used by the ISCO samplers, more data were included for the segments of the rating curve that exhibit non-linear behavior (i.e., low flow).
    - As the flow increases, the rating curve exhibits more linear behavior, so the data points for high flow regions of the curve are more widely spaced.
- The data points selected from the USGS dataset range in stage from 10.1 ft to 15.5 ft. The invert of the weir is at 10.0 ft on the staff gauge, so the data represent water depths of 0 ft to 5.5 ft above the invert of the weir[2]. The stage versus flow relationship at this station is included in Attachment 2. Recommended inputs for the ISCO sampler are shown on the figure presented in Attachment 2 and tabulated in Attachment 3.

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[i] A power function was selected as the functional form because it is consistent with the form of Manning's equation, the governing equation for steady, uniform flow in open channels.

[ii] *HydroCAD Stormwater Modeling System: Version 7 Owner's Manual: HydroCAD Technical Reference.* HydroCAD, Software Solutions LLC. 2004. p. 89

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[2] USGS' staff gauge corresponds to a datum of mean sea level. The invert of the weir is at 10 ft above mean sea level, resulting in a 10 ft offset for the USGS staff gauge at this station.

ATTACHMENT 1. DATA FOR RATING CURVES

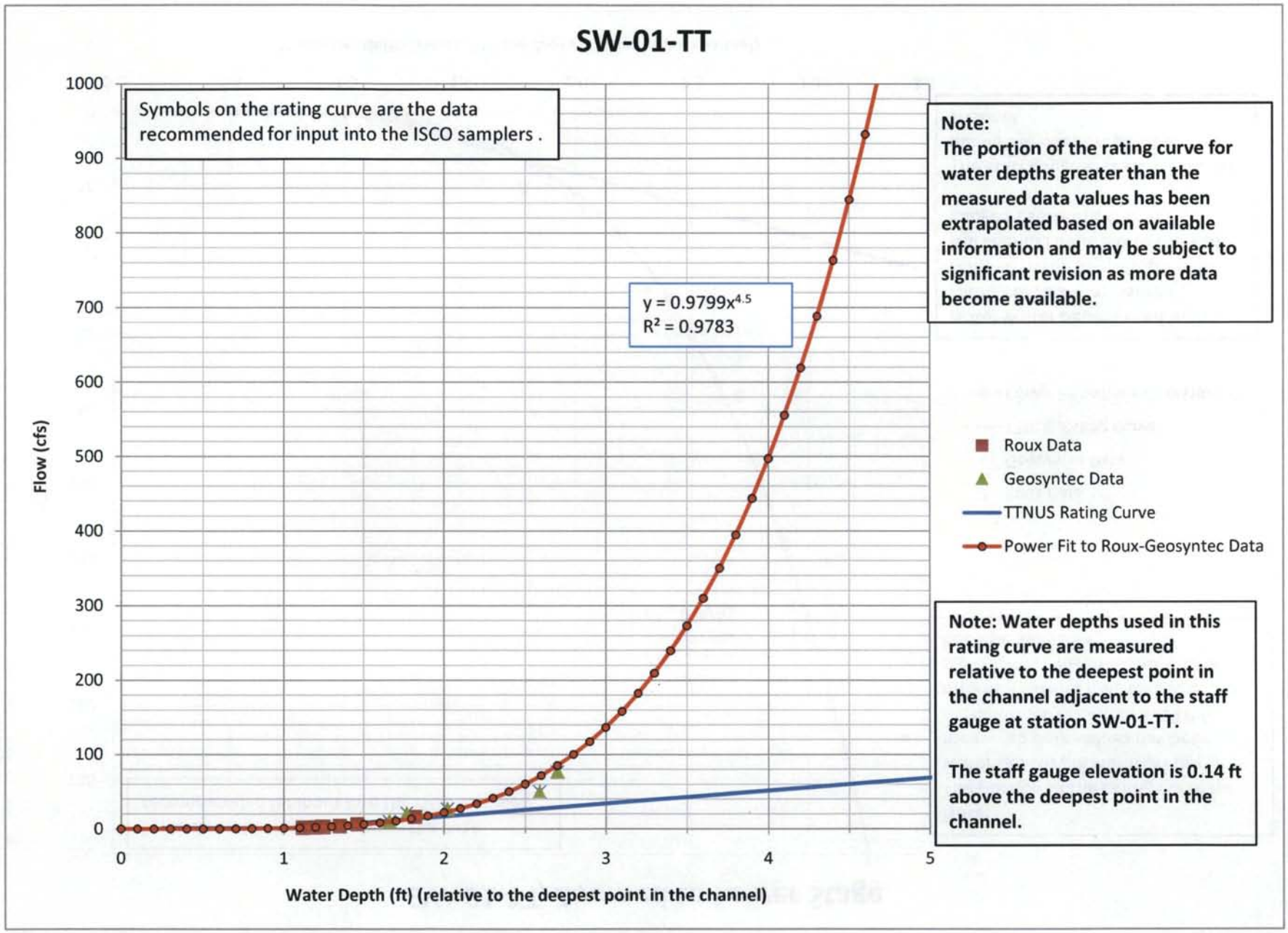
Industri-Plex Site
Woburn, Massachusetts
Rating Curve Data
Roux and Geosyntec Points

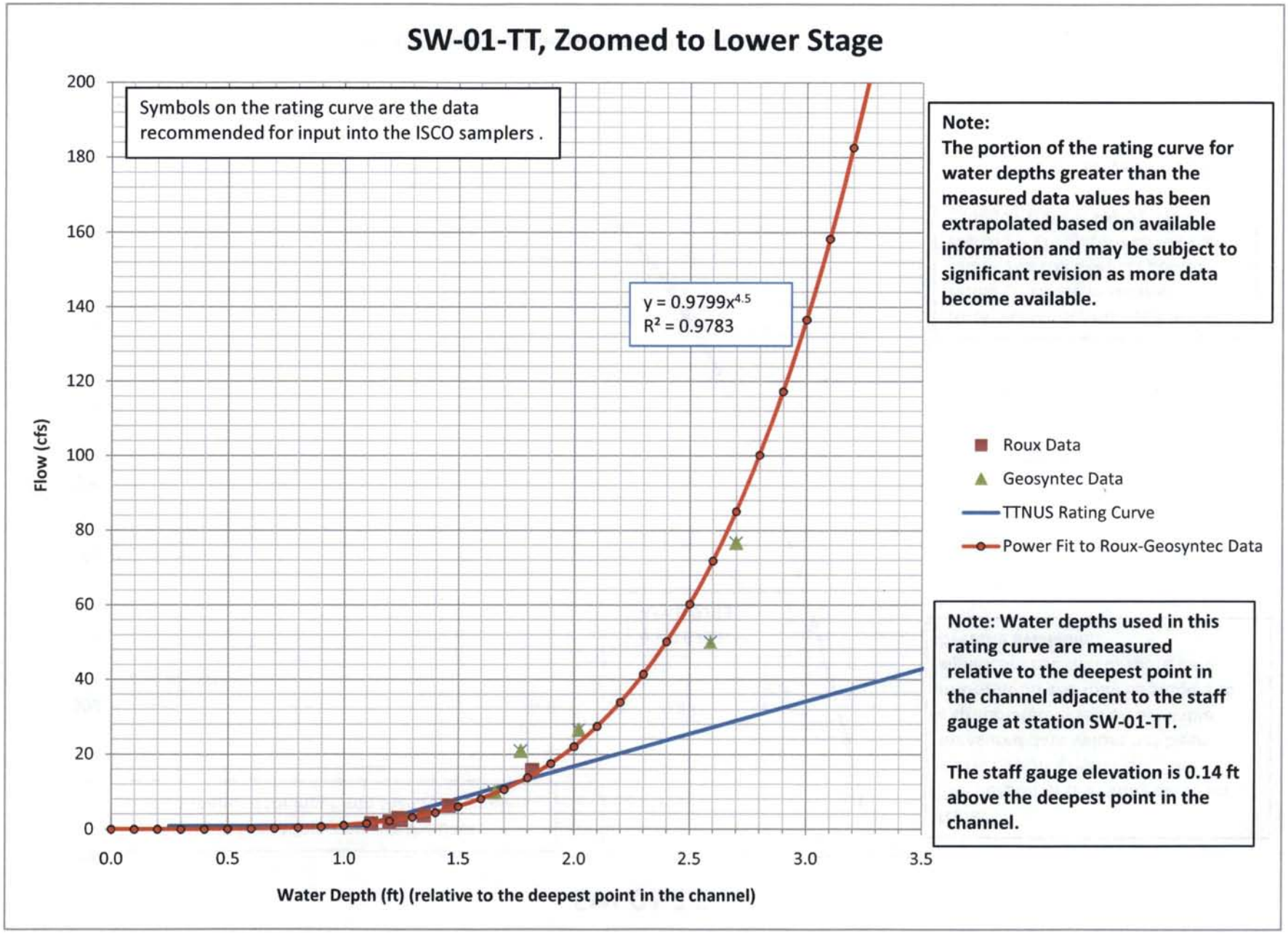
Station	Reference Datum	Height of Staff Gauge Base (i.e., 0') above Reference Datum (ft)	Date Sampled	Time Sampled	Staff Gauge Reading (ft)	Calculated Water Depth Above Reference Datum Based on Staff Gauge (ft)	Measured Flow (cfs)	Recorded By	Notes
SW-01-TT	Deepest Point in Channel	0.14	4/3/2009		1.68	1.82	15.71	Roux	
SW-01-TT	Deepest Point in Channel	0.14	5/8/2009		1.32	1.46	6.22	Roux	
SW-01-TT	Deepest Point in Channel	0.14	6/1/2009		0.98	1.12	1.46	Roux	
SW-01-TT	Deepest Point in Channel	0.14	6/1/2009		0.98	1.12	1.41	Roux	
SW-01-TT	Deepest Point in Channel	0.14	6/30/2009	11:10	1.11	1.25	2.65	Roux	Sensor moved on 6/25/2009
SW-01-TT	Deepest Point in Channel	0.14	6/30/2009	12:15	1.11	1.25	2.42	Roux	
SW-01-TT	Deepest Point in Channel	0.14	7/17/2009	14:30	1.06	1.20	1.90	Roux	
SW-01-TT	Deepest Point in Channel	0.14	8/3/2009	13:25	1.21	1.35	3.62	Roux	
SW-01-TT	Deepest Point in Channel	0.14	8/31/2009	8:51	1.10	1.24	2.90	Roux	
SW-01-TT	Deepest Point in Channel	0.14	7/1/2009	17:04	1.63	1.77	20.89	Geosyntec	
SW-01-TT	Deepest Point in Channel	0.14	7/2/2009	9:26	1.88	2.02	26.56	Geosyntec	
SW-01-TT	Deepest Point in Channel	0.14	7/7/2009	18:10	2.45	2.59	50.01	Geosyntec	
SW-01-TT	Deepest Point in Channel	0.14	7/9/2009	7:25	1.52	1.66	9.82	Geosyntec	
SW-01-TT	Deepest Point in Channel	0.14	7/24/2009	11:52	2.56	2.70	76.60	Geosyntec	
SW-2-IP	Crest of Weir	-0.43	3/30/2009		0.58	0.15	0.82	Roux	
SW-2-IP	Crest of Weir	-0.43	5/8/2009		0.58	0.15	0.82	Roux	
SW-2-IP	Crest of Weir	-0.43	6/1/2009		0.10	0.00	0.00	Roux	
SW-2-IP	Crest of Weir	-0.43	6/30/2009	11:45	0.54	0.11	0.31	Roux	
SW-2-IP	Crest of Weir	-0.43	7/17/2009	15:15	0.49	0.06	0.16	Roux	
SW-2-IP	Crest of Weir	-0.43	8/3/2009	13:37	0.60	0.17	0.66	Roux	
SW-2-IP	Crest of Weir	-0.43	8/31/2009	9:10	0.60	0.17	0.88	Roux	
SW-2-IP	Crest of Weir	-0.43	7/1/2009	15:21	0.55	0.12	0.65	Geosyntec	
SW-2-IP	Crest of Weir	-0.43	7/2/2009	8:14	0.60	0.17	1.31	Geosyntec	
SW-2-IP	Crest of Weir	-0.43	7/9/2009	8:05	0.66	0.23	1.72	Geosyntec	
SW-2-IP	Crest of Weir	-0.43	7/24/2009	11:38	0.78	0.35	4.21	Geosyntec	
SW-02-TT	Deepest Point in Channel	0.22	3/30/2009		1.60	1.82	8.70	Roux	
SW-02-TT	Deepest Point in Channel	0.22	5/8/2009		1.34	1.56	6.91	Roux	
SW-02-TT	Deepest Point in Channel	0.22	5/8/2009		1.32	1.54	7.41	Roux	
SW-02-TT	Deepest Point in Channel	0.22	5/11/2009		1.08	1.30	5.08	Roux	
SW-02-TT	Deepest Point in Channel	0.22	6/1/2009		0.82	1.04	2.41	Roux	
SW-02-TT	Deepest Point in Channel	0.22	6/29/2009	13:30	1.24	1.46	2.41	Roux	
SW-02-TT	Deepest Point in Channel	0.22	7/17/2009	13:15	0.96	1.18	3.02	Roux	
SW-02-TT	Deepest Point in Channel	0.22	8/3/2009	13:37	1.20	1.42	5.28	Roux	
SW-02-TT	Deepest Point in Channel	0.22	9/1/2009	9:22	1.04	1.26	3.74	Roux	
SW-02-TT	Deepest Point in Channel	0.22	9/1/2009	9:46	1.04	1.26	3.22	Roux	
SW-02-TT	Deepest Point in Channel	0.22	7/1/2009	17:56	1.54	1.76	13.02	Geosyntec	
SW-02-TT	Deepest Point in Channel	0.22	7/2/2009	11:33	1.94	2.16	19.97	Geosyntec	
SW-02-TT	Deepest Point in Channel	0.22	7/7/2009	18:50	2.86	3.08	47.86	Geosyntec	
SW-02-TT	Deepest Point in Channel	0.22	7/9/2009	9:15	1.74	1.96	13.48	Geosyntec	
SW-02-TT	Deepest Point in Channel	0.22	7/24/2009	10:53	3.36	3.58	67.81	Geosyntec	
SW-03-TT	Deepest Point in Channel	0.77	3/30/2009		1.14	1.91	15.60	Roux	
SW-03-TT	Deepest Point in Channel	0.77	5/8/2009		0.88	1.65	5.65	Roux	
SW-03-TT	Deepest Point in Channel	0.77	6/1/2009		0.50	1.27	1.52	Roux	
SW-03-TT	Deepest Point in Channel	0.77	6/29/2009	13:00	0.74	1.51	4.02	Roux	
SW-03-TT	Deepest Point in Channel	0.77	7/17/2009	14:10	0.96	1.73	2.12	Roux	
SW-03-TT	Deepest Point in Channel	0.77	8/3/2009	12:59	0.76	1.53	4.27	Roux	
SW-03-TT	Deepest Point in Channel	0.77	8/31/2009	8:14	0.76	1.53	4.42	Roux	
SW-03-TT	Deepest Point in Channel	0.77	7/7/2009	12:25	1.44	2.21	10.04	Geosyntec	
SW-03-TT	Deepest Point in Channel	0.77	7/9/2009	10:05	1.10	1.87	9.06	Geosyntec	
SW-03-TT	Deepest Point in Channel	0.77	7/24/2009	10:06	2.68	3.45	70.48	Geosyntec	
SW-04-TT	Deepest Point in Channel	-0.01	3/30/2009		1.40	1.39	11.42	Roux	
SW-04-TT	Deepest Point in Channel	-0.01	4/3/2009		1.24	1.23	7.30	Roux	
SW-04-TT	Deepest Point in Channel	-0.01	5/8/2009		1.18	1.17	8.43	Roux	
SW-04-TT	Deepest Point in Channel	-0.01	5/11/2006		0.98	0.97	5.44	Roux	
SW-04-TT	Deepest Point in Channel	-0.01	6/1/2009		0.72	0.71	3.74	Roux	
SW-04-TT	Deepest Point in Channel	-0.01	6/30/2009	10:30	0.88	0.87	3.61	Roux	
SW-04-TT	Deepest Point in Channel	-0.01	7/17/2009	13:55	0.84	0.83	4.95	Roux	
SW-04-TT	Deepest Point in Channel	-0.01	8/3/2009	12:40	1.05	1.04	6.56	Roux	
SW-04-TT	Deepest Point in Channel	-0.01	8/31/2009	8:35	1.06	1.05	4.46	Roux	
SW-04-TT	Deepest Point in Channel	-0.01	7/2/2009	12:14	1.64	1.63	13.41	Geosyntec	
SW-04-TT	Deepest Point in Channel	-0.01	7/9/2009	10:25	1.60	1.59	16.72	Geosyntec	
SW-04-TT	Deepest Point in Channel	-0.01	7/24/2009	10:28	3.78	3.77	133.32	Geosyntec	

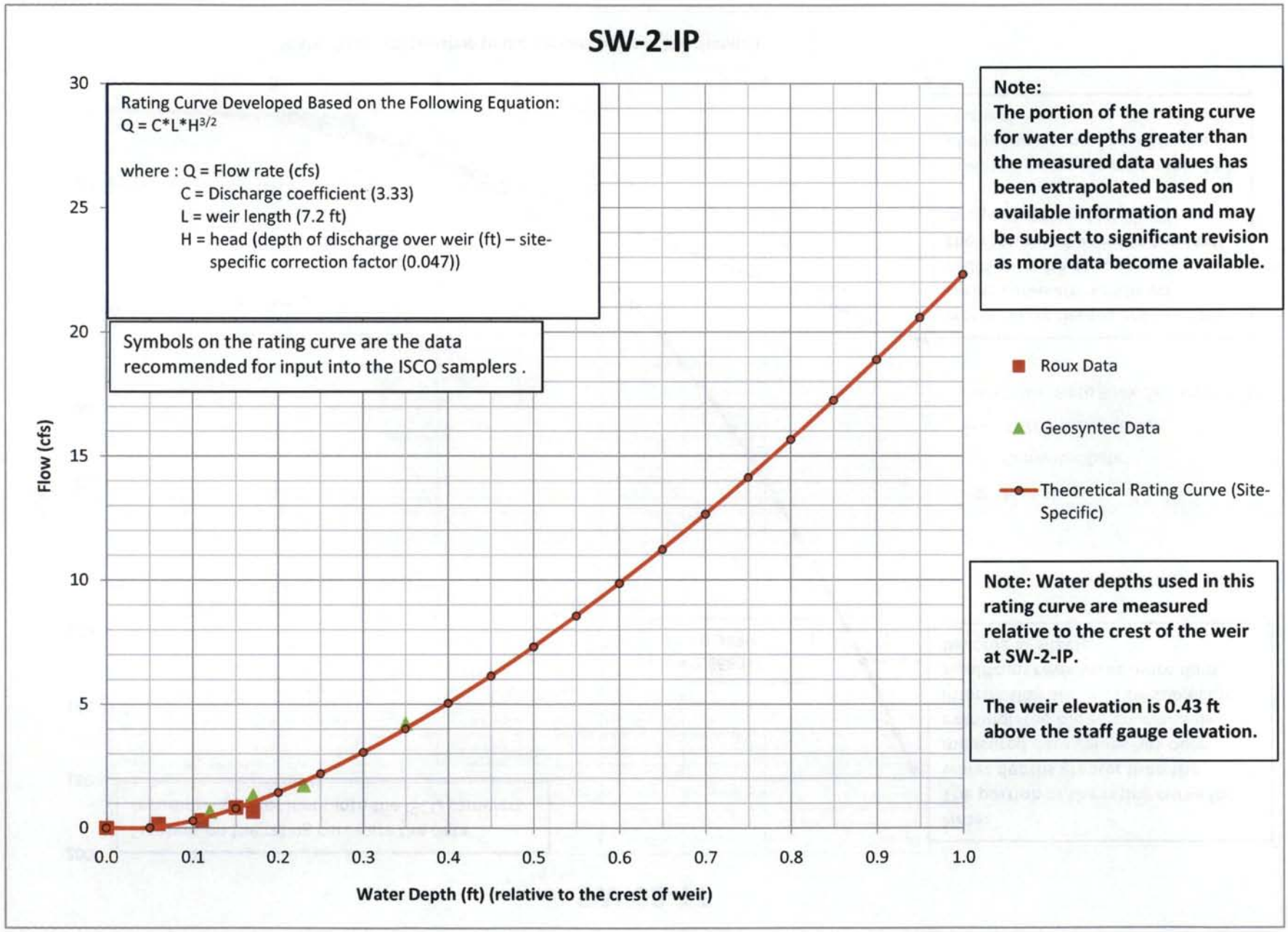
ATTACHMENT 1. DATA FOR RATING CURVES

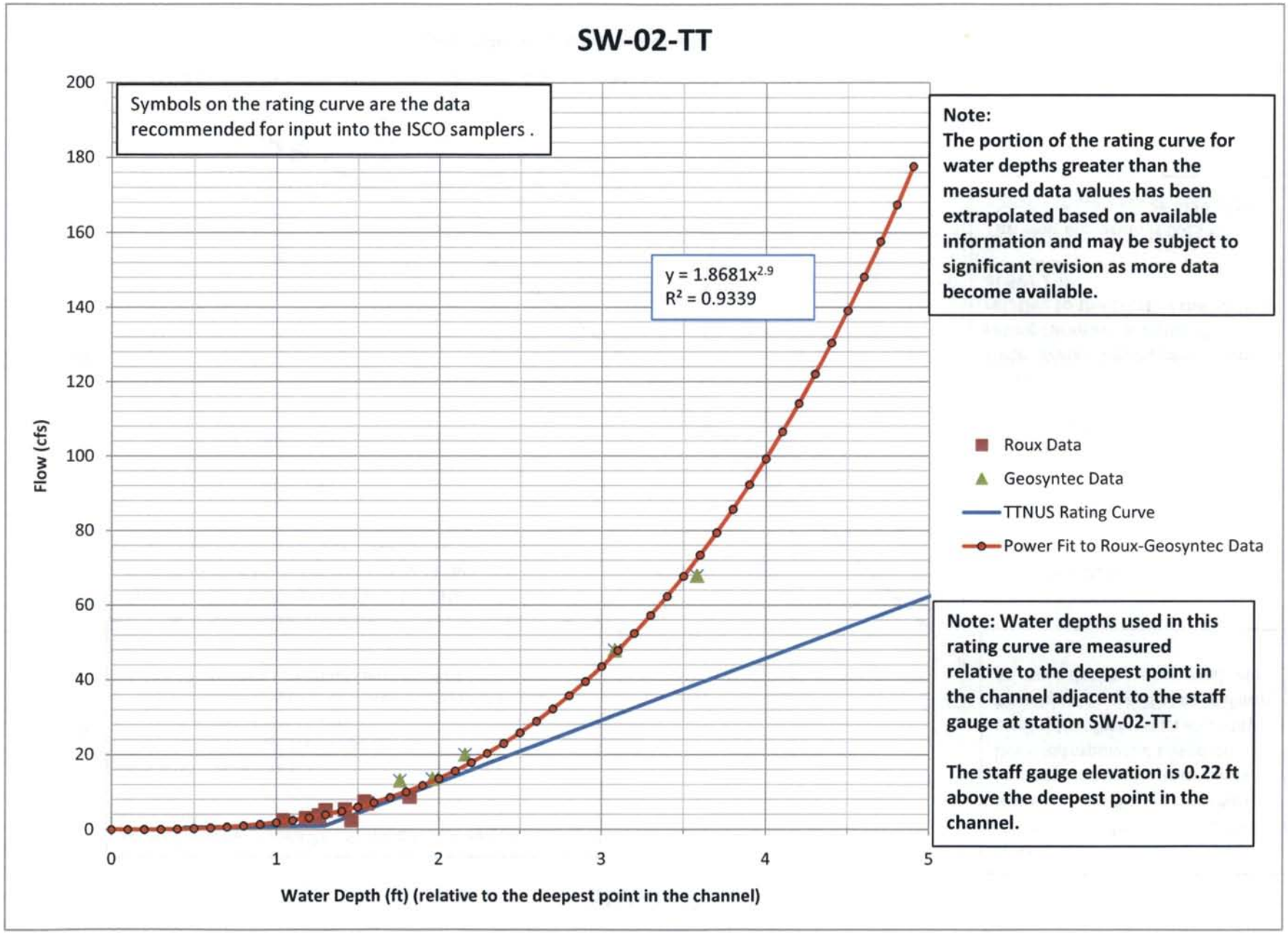
Industri-Plex Site Woburn, Massachusetts Rating Curve Data Roux and Geosyntec Points									
Station	Reference Datum	Height of Staff Gauge Base (i.e., 0') above Reference Datum (ft)	Date Sampled	Time Sampled	Staff Gauge Reading (ft)	Calculated Water Depth Above Reference Datum Based on Staff Gauge (ft)	Measured Flow (cfs)	Recorded By	Notes
SW-05-TT	Deepest Point in Channel	0.56	4/3/2009		1.72	2.28	17.50	Roux	
SW-05-TT	Deepest Point in Channel	0.56	5/8/2009		1.66	2.22	19.11	Roux	
SW-05-TT	Deepest Point in Channel	0.56	6/2/2009				4.53	Roux	No staff gage reading recorded
SW-05-TT	Deepest Point in Channel	0.56	6/29/2009	12:00	1.78	2.34	13.12	Roux	
SW-05-TT	Deepest Point in Channel	0.50	7/7/2009	14:40	1.26	1.76	11.40	Roux	Staff gauge moved on 7/6/2009 NOTE: STAFF GAUGE RE-LOCATED AGAIN ON 9/3/2009, NEW HEIGHT 0.32 ft above reference datum
SW-05-TT	Deepest Point in Channel	0.50	8/4/2009	10:30	1.32	1.82	10.03	Roux	
SW-05-TT	Deepest Point in Channel	0.50	8/31/2009	9:35	1.43	1.93	12.94	Roux	
SW-05-TT	Deepest Point in Channel	0.56	7/1/2009	13:02	2.12	2.68	47.97	Geosyntec	
SW-05-TT	Deepest Point in Channel	0.50	7/9/2009	11:10	1.82	2.32	36.40	Geosyntec	
SW-05-TT	Deepest Point in Channel	0.50	7/14/2009	9:29	3.04	3.54	137.24	Geosyntec	
SW-06-TT	Deepest Point in Channel	0.65	4/3/2009		1.80	2.45	17.98	Roux	
SW-06-TT	Deepest Point in Channel	0.65	5/11/2009		1.98	2.63	14.17	Roux	
SW-06-TT	Deepest Point in Channel	0.65	6/2/2009		1.58	2.23	4.95	Roux	
SW-06-TT	Deepest Point in Channel	0.19	6/29/2009	9:30	1.99	2.18	18.30	Roux	Staff Gauge Moved on 6/18/2009
SW-06-TT	Deepest Point in Channel	0.19	7/7/2009	13:30	1.68	1.87	14.60	Roux	
SW-06-TT	Deepest Point in Channel	0.19	8/4/2009	9:53	1.82	2.01	11.28	Roux	
SW-06-TT	Deepest Point in Channel	0.19	8/31/2009	9:57	1.90	2.09	14.88	Roux	
SW-06-TT	Deepest Point in Channel	0.19	7/2/2009	13:33	Submerged	N/A	64.87	Geosyntec	
SW-06-TT	Deepest Point in Channel	0.19	7/9/2009	11:45	2.60	2.79	41.28	Geosyntec	
SW-07-TT	Deepest Point in Channel	0.63	4/3/2009		1.26	1.89	27.39	Roux	
SW-07-TT	Deepest Point in Channel	0.63	5/11/2009		1.19	1.82	18.44	Roux	
SW-07-TT	Deepest Point in Channel	0.63	6/2/2009		1.00	1.63	8.47	Roux	
SW-07-TT	Deepest Point in Channel	0.63	6/29/2009	10:30	0.86	1.49	23.62	Roux	
SW-07-TT	Deepest Point in Channel	0.63	7/7/2009	12:45	0.76	1.39	19.00	Roux	
SW-07-TT	Deepest Point in Channel	0.71	8/4/2009	9:09	1.12	1.83	19.61	Roux	Staff Gauge Moved on 7/23/2009
SW-07-TT	Deepest Point in Channel	0.71	9/1/2009	8:26	1.04	1.75	16.38	Roux	
SW-07-TT	Deepest Point in Channel	0.63	7/9/2009	12:25	1.64	2.27	48.77	Geosyntec	
SW-08-TT	Invert of Weir	-1.83	3/30/2009		3.28	1.45	75.50	Roux	NOTE: Staff Gauge has been removed from the station since monitoring was performed on 8/4/2009. Sensor has been relocated to the same elevation as the invert of the weir.
SW-08-TT	Invert of Weir	-1.83	5/11/2009		2.92	1.09	28.23	Roux	
SW-08-TT	Invert of Weir	-1.83	6/2/2009		2.58	0.75	9.22	Roux	
SW-08-TT	Invert of Weir	-1.83	6/19/2009	9:30			81.70	Roux	No staff gage reading recorded
SW-08-TT	Invert of Weir	-1.83	6/30/2009	8:30	3.00	1.17	35.02	Roux	
SW-08-TT	Invert of Weir	-1.83	7/7/2009	11:00	2.79	0.96	34.12	Roux	
SW-08-TT	Invert of Weir	-1.87	8/4/2009	8:20	2.99	1.12	25.47	Roux	Staff gauge re-set after being dislodged during the previous storm

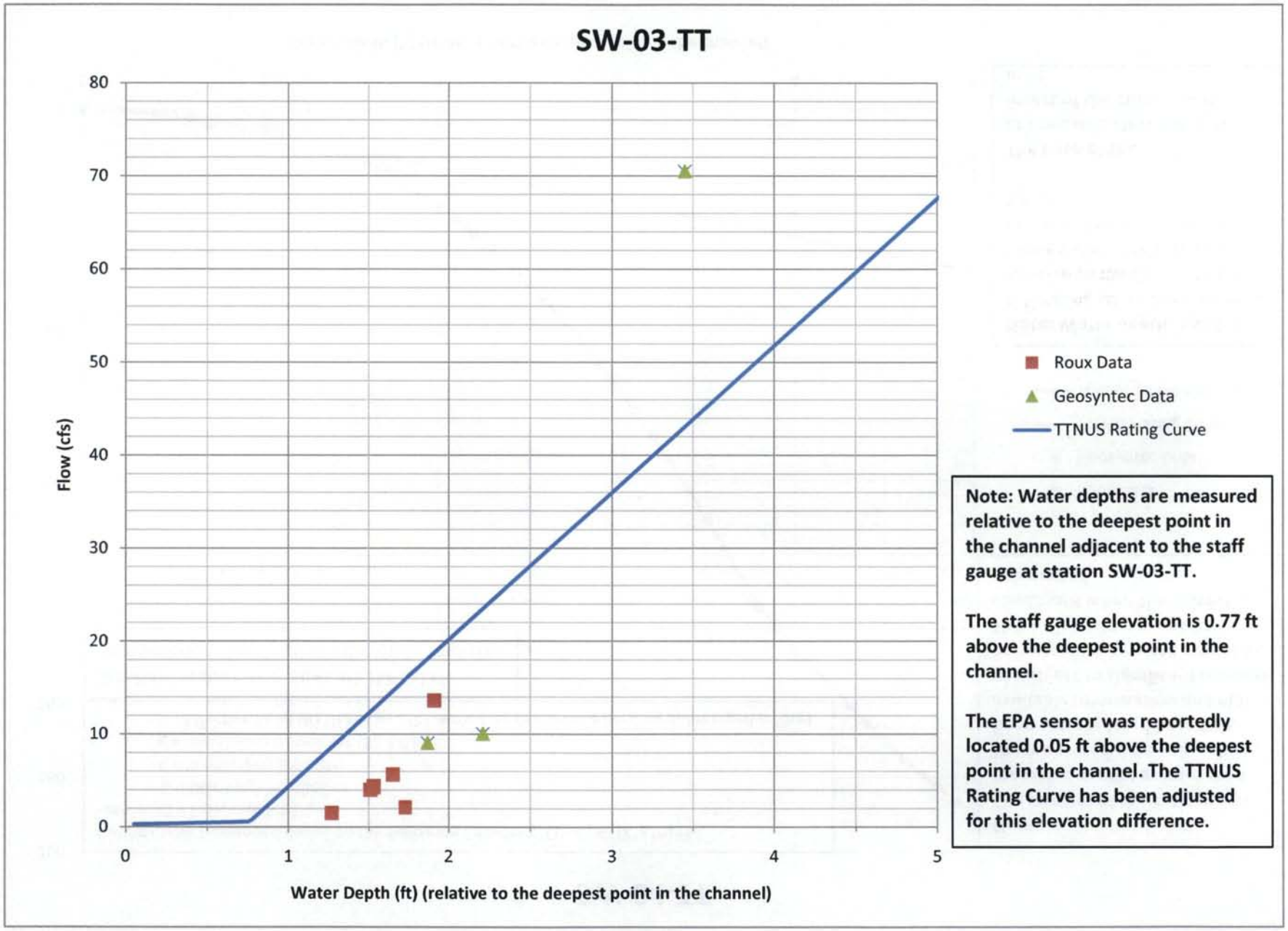
ATTACHMENT 2. RATING CURVES


SW-01-TT
Symbols on the rating curve are the data recommended for input into the ISCO samplers .
y = 0.9799x^4.5
R² = 0.9783
Note:
The portion of the rating curve for water depths greater than the measured data values has been extrapolated based on available information and may be subject to significant revision as more data become available.
Roux Data
Geosyntec Data
TTNUS Rating Curve
Power Fit to Roux-Geosyntec Data
Note: Water depths used in this rating curve are measured relative to the deepest point in the channel adjacent to the staff gauge at station SW-01-TT.
The staff gauge elevation is 0.14 ft above the deepest point in the channel.
Flow (cfs)
1000
900
800
700
600
500
400
300
200
100
0
0
1
2
3
4
5
Water Depth (ft) (relative to the deepest point in the channel)

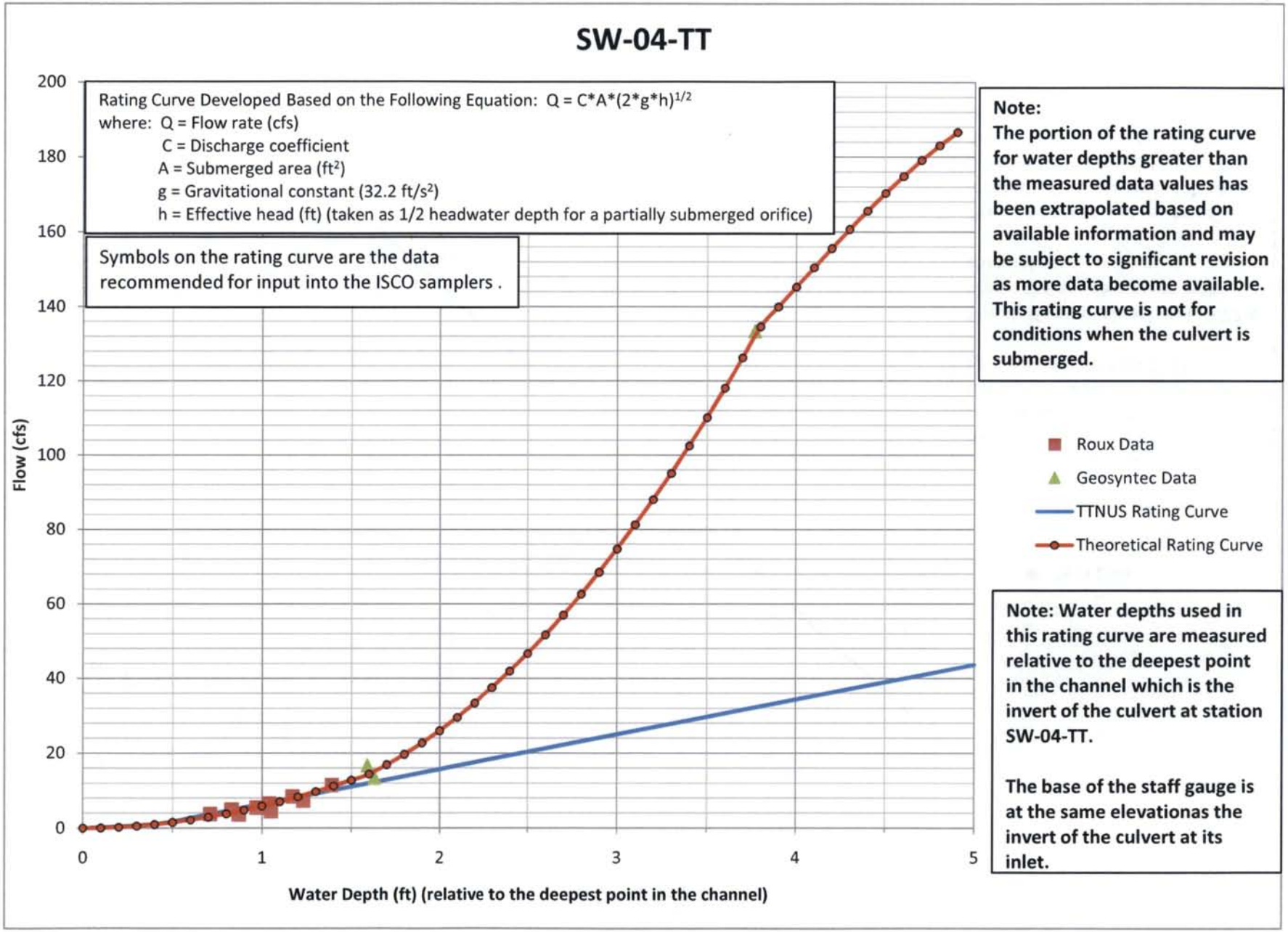

SW-01-TT, Zoomed to Lower Stage
Symbols on the rating curve are the data recommended for input into the ISCO samplers .
y = 0.9799x^4.5
R² = 0.9783
Note:
The portion of the rating curve for water depths greater than the measured data values has been extrapolated based on available information and may be subject to significant revision as more data become available.
Roux Data
Geosyntec Data
TTNUS Rating Curve
Power Fit to Roux-Geosyntec Data
Note: Water depths used in this rating curve are measured relative to the deepest point in the channel adjacent to the staff gauge at station SW-01-TT.
The staff gauge elevation is 0.14 ft above the deepest point in the channel.
Flow (cfs)
0
20
40
60
80
100
120
140
160
180
200
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Water Depth (ft) (relative to the deepest point in the channel)

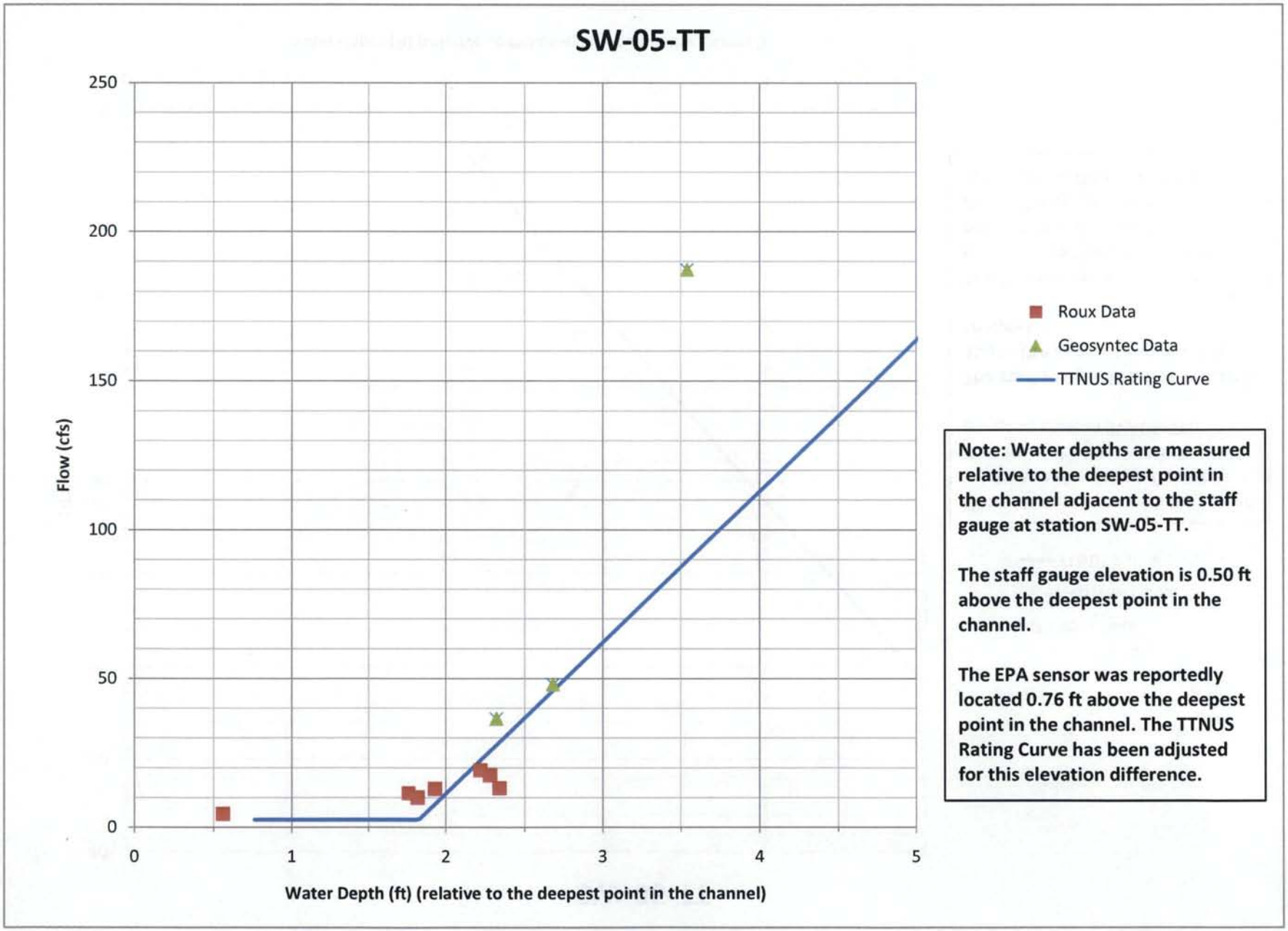

SW-2-IP
Rating Curve Developed Based on the Following Equation:
Q = C*L*H^3/2
where : Q = Flow rate (cfs)
C = Discharge coefficient (3.33)
L = weir length (7.2 ft)
H = head (depth of discharge over weir (ft) – site-specific correction factor (0.047))
Symbols on the rating curve are the data recommended for input into the ISCO samplers .
Note:
The portion of the rating curve for water depths greater than the measured data values has been extrapolated based on available information and may be subject to significant revision as more data become available.
Roux Data
Geosyntec Data
Theoretical Rating Curve (Site-Specific)
Note: Water depths used in this rating curve are measured relative to the crest of the weir at SW-2-IP.
The weir elevation is 0.43 ft above the staff gauge elevation.
Flow (cfs)
0
5
10
15
20
25
30
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Water Depth (ft) (relative to the crest of weir)

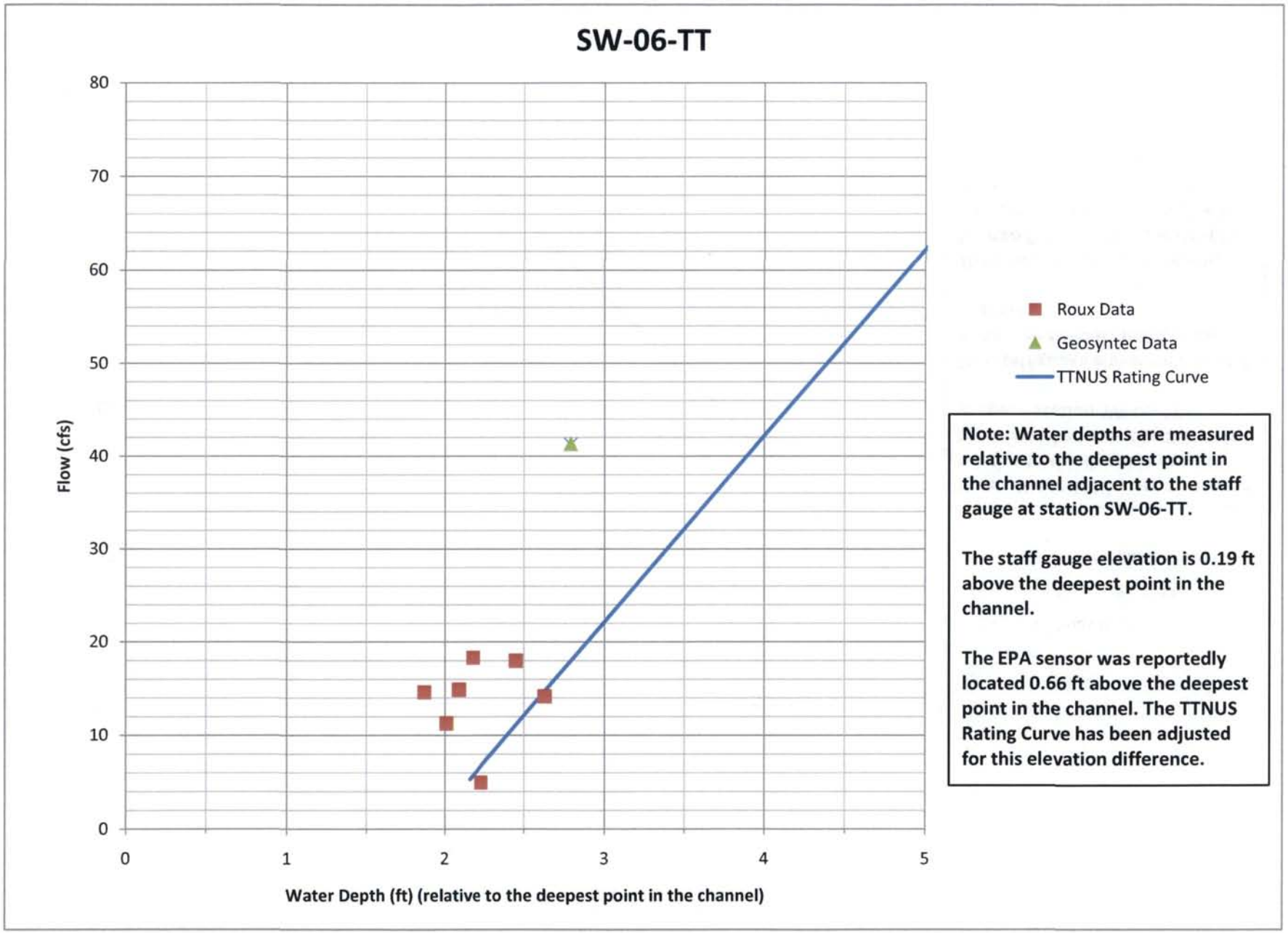

SW-02-TT
Symbols on the rating curve are the data recommended for input into the ISCO samplers .
Note:
The portion of the rating curve for water depths greater than the measured data values has been extrapolated based on available information and may be subject to significant revision as more data become available.
y = 1.8681x^2.9
R² = 0.9339
Roux Data
Geosyntec Data
TTNUS Rating Curve
Power Fit to Roux-Geosyntec Data
Note: Water depths used in this rating curve are measured relative to the deepest point in the channel adjacent to the staff gauge at station SW-02-TT.
The staff gauge elevation is 0.22 ft above the deepest point in the channel.
Flow (cfs)
Water Depth (ft) (relative to the deepest point in the channel)
0
20
40
60
80
100
120
140
160
180
200
0
1
2
3
4
5

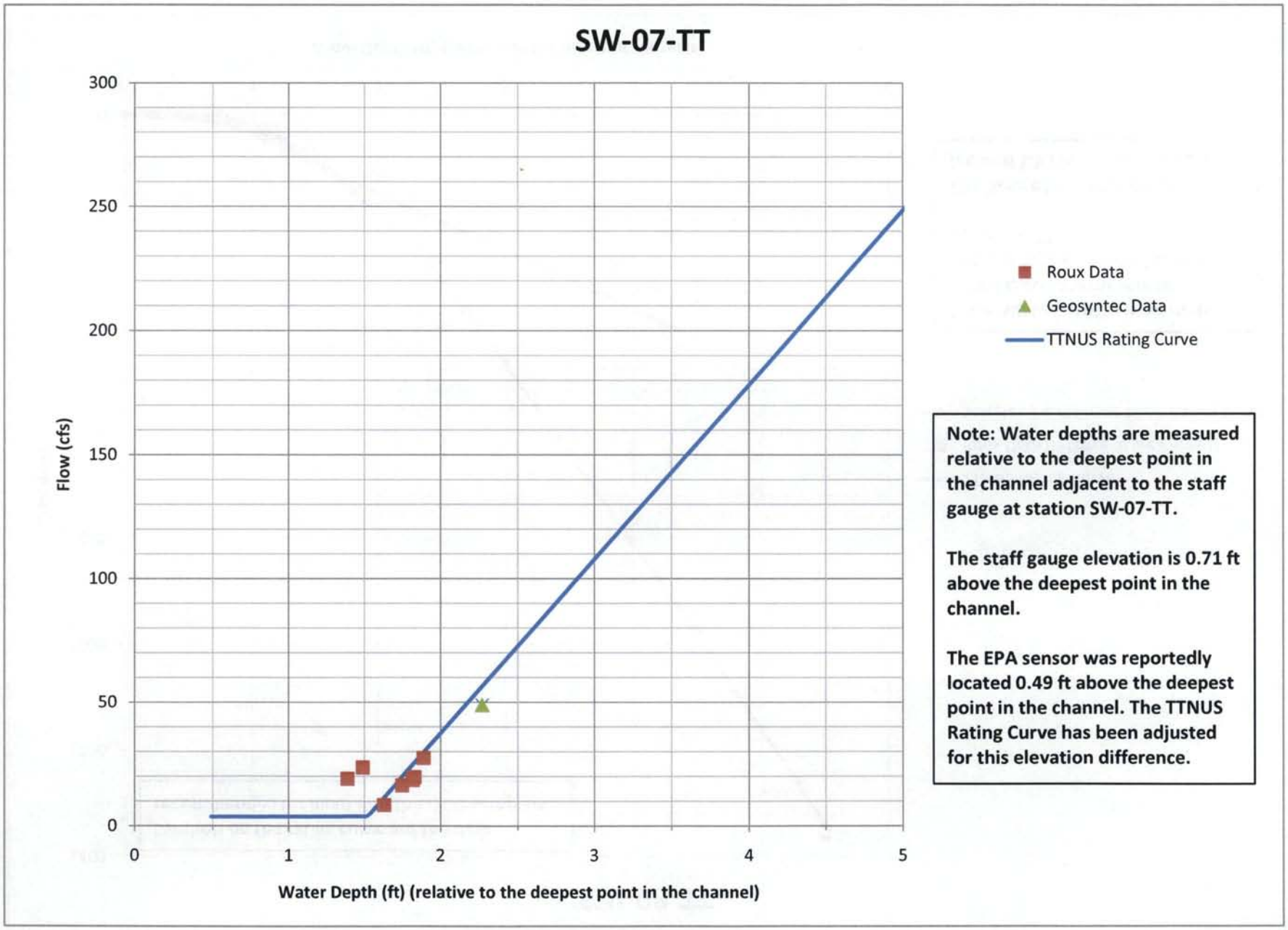

SW-03-TT
Flow (cfs)
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
Water Depth (ft) (relative to the deepest point in the channel)
Roux Data
Geosyntec Data
TTNUS Rating Curve
Note: Water depths are measured relative to the deepest point in the channel adjacent to the staff gauge at station SW-03-TT.
The staff gauge elevation is 0.77 ft above the deepest point in the channel.
The EPA sensor was reportedly located 0.05 ft above the deepest point in the channel. The TTNUS Rating Curve has been adjusted for this elevation difference.

SW-04-TT


Rating Curve Developed Based on the Following Equation: $Q = C*A*(2*g*h)^{1/2}$
where: Q = Flow rate (cfs)
C = Discharge coefficient
A = Submerged area (ft^2)
g = Gravitational constant (32.2 ft/s^2)
h = Effective head (ft) (taken as 1/2 headwater depth for a partially submerged orifice)
Symbols on the rating curve are the data recommended for input into the ISCO samplers .
Note:
The portion of the rating curve for water depths greater than the measured data values has been extrapolated based on available information and may be subject to significant revision as more data become available. This rating curve is not for conditions when the culvert is submerged.
Roux Data
Geosyntec Data
TTNUS Rating Curve
Theoretical Rating Curve
Note: Water depths used in this rating curve are measured relative to the deepest point in the channel which is the invert of the culvert at station SW-04-TT.
The base of the staff gauge is at the same elevationas the invert of the culvert at its inlet.
Flow (cfs)
0
20
40
60
80
100
120
140
160
180
200
0
1
2
3
4
5
Water Depth (ft) (relative to the deepest point in the channel)


SW-05-TT
250
200
150
100
50
0
Flow (cfs)
0
1
2
3
4
5
Water Depth (ft) (relative to the deepest point in the channel)
Roux Data
Geosyntec Data
TTNUS Rating Curve
Note: Water depths are measured relative to the deepest point in the channel adjacent to the staff gauge at station SW-05-TT.
The staff gauge elevation is 0.50 ft above the deepest point in the channel.
The EPA sensor was reportedly located 0.76 ft above the deepest point in the channel. The TTNUS Rating Curve has been adjusted for this elevation difference.

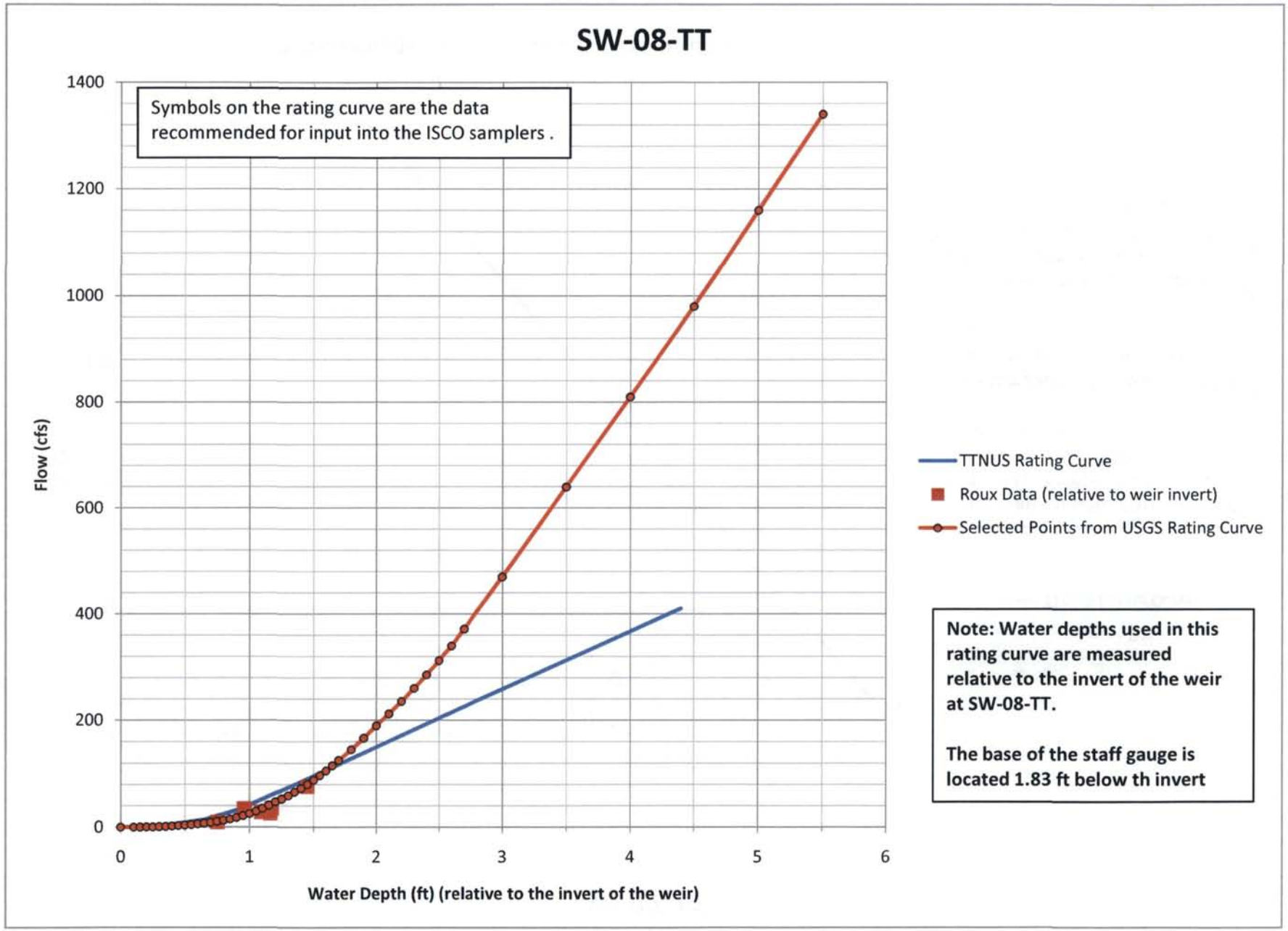

SW-06-TT
Flow (cfs)
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
Water Depth (ft) (relative to the deepest point in the channel)
Roux Data
Geosyntec Data
TTNUS Rating Curve
Note: Water depths are measured relative to the deepest point in the channel adjacent to the staff gauge at station SW-06-TT.
The staff gauge elevation is 0.19 ft above the deepest point in the channel.
The EPA sensor was reportedly located 0.66 ft above the deepest point in the channel. The TTNUS Rating Curve has been adjusted for this elevation difference.



Note: Water depths are measured relative to the deepest point in the channel adjacent to the staff gauge at station SW-07-TT.

The staff gauge elevation is 0.71 ft above the deepest point in the channel.

The EPA sensor was reportedly located 0.49 ft above the deepest point in the channel. The TTNUS Rating Curve has been adjusted for this elevation difference.


SW-08-TT
Symbols on the rating curve are the data recommended for input into the ISCO samplers .
Flow (cfs)
1400
1200
1000
800
600
400
200
0
0
1
2
3
4
5
6
Water Depth (ft) (relative to the invert of the weir)
TTNUS Rating Curve
Roux Data (relative to weir invert)
Selected Points from USGS Rating Curve
Note: Water depths used in this rating curve are measured relative to the invert of the weir at SW-08-TT.
The base of the staff gauge is located 1.83 ft below th invert

ATTACHMENT 3. DATA FOR INPUT INTO ISCO SAMPLERS

SW-01-TT	
Water Depth from Deepest Point in Channel (ft)	Flow (cfs)
0	0.000
0.1	0.000
0.2	0.001
0.3	0.004
0.4	0.016
0.5	0.043
0.6	0.099
0.7	0.197
0.8	0.359
0.9	0.610
1	0.980
1.1	1.504
1.2	2.223
1.3	3.186
1.4	4.445
1.5	6.061
1.6	8.100
1.7	10.636
1.8	13.752
1.9	17.534
2	22.079
2.1	27.492
2.2	33.884
2.3	41.376
2.4	50.097
2.5	60.184
2.6	71.784
2.7	85.053
2.8	100.153
2.9	117.261
3	136.558
3.1	158.238
3.2	182.505
3.3	209.571
3.4	239.660
3.5	273.004
3.6	309.849
3.7	350.448
3.8	395.067
3.9	443.984
4	497.484
4.1	555.867
4.2	619.444
4.3	688.534
4.4	763.473
4.5	844.605
4.6	932.286
4.7	1026.886
4.8	1128.786
4.9	1238.380

SW-2-IP	
Depth of Water Above Weir (ft)	Flow (cfs)
0	0.00
0.05	0.00
0.1	0.29
0.15	0.79
0.2	1.43
0.25	2.19
0.3	3.05
0.35	4.00
0.4	5.03
0.45	6.13
0.5	7.31
0.55	8.55
0.6	9.86
0.65	11.23
0.7	12.65
0.75	14.13
0.8	15.67
0.85	17.25
0.9	18.89
0.95	20.57
1	22.31
1.05	24.08
1.1	25.91
1.15	27.77
1.2	29.68
1.25	31.64
1.3	33.63
1.35	35.66
1.4	37.73
1.45	39.84
1.5	41.99
1.55	44.18
1.6	46.40
1.65	48.66
1.7	50.95
1.75	53.28
1.8	55.65
1.85	58.05
1.9	60.48
1.95	62.94
2	65.44
2.05	67.97
2.1	70.53
2.15	73.12
2.2	75.74
2.25	78.40
2.3	81.08
2.35	83.79
2.4	86.54
2.45	89.31

SW-02-TT	
Water Depth from Deepest Point in Channel (ft)	Flow (cfs)
0	0.000
0.1	0.003
0.2	0.019
0.3	0.059
0.4	0.135
0.5	0.256
0.6	0.432
0.7	0.672
0.8	0.986
0.9	1.381
1	1.868
1.1	2.455
1.2	3.150
1.3	3.962
1.4	4.900
1.5	5.971
1.6	7.184
1.7	8.547
1.8	10.068
1.9	11.755
2	13.616
2.1	15.660
2.2	17.893
2.3	20.324
2.4	22.960
2.5	25.809
2.6	28.879
2.7	32.178
2.8	35.713
2.9	39.491
3	43.520
3.1	47.807
3.2	52.361
3.3	57.188
3.4	62.296
3.5	67.692
3.6	73.383
3.7	79.377
3.8	85.681
3.9	92.303
4	99.248
4.1	106.526
4.2	114.142
4.3	122.104
4.4	130.419
4.5	139.095
4.6	148.138
4.7	157.555
4.8	167.353
4.9	177.540

SW-04-TT	
Water Depth from Deepest Point in Channel (ft)	Flow (cfs)
0	0.000
0.1	0.062
0.2	0.247
0.3	0.553
0.4	0.977
0.5	1.517
0.6	2.171
0.7	2.935
0.8	3.808
0.9	4.787
1	5.870
1.1	7.053
1.2	8.334
1.3	9.711
1.4	11.180
1.5	12.739
1.6	14.385
1.7	16.887
1.8	19.644
1.9	22.662
2	25.951
2.1	29.515
2.2	33.362
2.3	37.497
2.4	41.923
2.5	46.645
2.6	51.664
2.7	56.982
2.8	62.601
2.9	68.520
3	74.737
3.1	81.250
3.2	88.054
3.3	95.145
3.4	102.516
3.5	110.158
3.6	118.062
3.7	126.216
3.8	134.605
3.9	139.948
4	145.244
4.1	150.473
4.2	155.616
4.3	160.650
4.4	165.549
4.5	170.281
4.6	174.808
4.7	179.081
4.8	183.031
4.9	186.548

SW-08-TT	
Depth of Water Above Weir (ft)	Flow (cfs)
0	0.000
0.1	0.027
0.15	0.090
0.2	0.220
0.25	0.440
0.3	0.781
0.35	1.270
0.4	1.930
0.45	2.800
0.5	3.760
0.55	4.810
0.6	6.010
0.65	7.390
0.7	8.930
0.75	10.670
0.8	12.590
0.85	14.940
0.9	17.930
0.95	21.320
1	25.130
1.05	29.730
1.1	35.000
1.15	40.910
1.2	46.950
1.25	52.670
1.3	58.820
1.35	65.410
1.4	72.470
1.45	79.990
1.5	88.000
1.55	96.480
1.6	105.500
1.65	115.000
1.7	125.000
1.8	144.800
1.9	166.500
2	190.000
2.1	212.000
2.2	235.300
2.3	260.000
2.4	285.400
2.5	312.000
2.6	340.000
2.7	371.700
3	469.900
3.5	640.000
4	810.000
4.5	980.000
5	1160.000
5.5	1340.000

Note: SW-08-TT Rating Curve Points are Selected Points from the USGS Aberjona River Rating Curve

ATTACHMENT 4. DATA THAT DEFINE EPA RATING CURVES

EPA Rating Curve Points															
TT Station #1				TT Station #2				TT Station #3				TT Station #4			
Level (ft)	Height of EPA Sensor above Reference Datum (ft)	Calculated Water Depth above Reference Datum Based on Sensor Reading (ft)	Flow (cfs)	Level (ft)	Height of EPA Sensor above Reference Datum (ft)	Calculated Water Depth above Reference Datum Based on Sensor Reading (ft)	Flow (cfs)	Level (ft)	Height of EPA Sensor above Reference Datum (ft)	Calculated Water Depth above Reference Datum Based on Sensor Reading (ft)	Flow (cfs)	Level (ft)	Height of EPA Sensor above Reference Datum (ft)	Calculated Water Depth above Reference Datum Based on Sensor Reading (ft)	Flow (cfs)
0.000	0.250	0.250	0.81	0.000	0.440	0.440	0.47	0.000	0.050	0.050	0.28	0.000	0.000	0.000	0.000
0.250	0.250	0.500	0.81	0.250	0.440	0.690	0.61	0.250	0.050	0.300	0.38	0.250	0.000	0.250	0.563
0.500	0.250	0.750	0.81	0.500	0.440	0.940	0.75	0.500	0.050	0.550	0.49	0.400	0.000	0.400	1.098
0.750	0.250	1.000	0.81	0.750	0.440	1.190	0.89	0.650	0.050	0.700	0.55	0.425	0.000	0.425	1.187
0.800	0.250	1.050	0.81	0.800	0.440	1.240	0.92	0.675	0.050	0.725	0.56	0.450	0.000	0.450	1.300
0.825	0.250	1.075	0.81	0.825	0.440	1.265	0.93	0.700	0.050	0.750	0.57	0.475	0.000	0.475	1.532
0.850	0.250	1.100	1.11	0.850	0.440	1.290	0.95	0.725	0.050	0.775	0.81	0.500	0.000	0.500	1.765
0.875	0.250	1.125	1.55	0.875	0.440	1.315	1.27	0.750	0.050	0.800	1.20	0.650	0.000	0.650	3.162
0.900	0.250	1.150	1.98	0.900	0.440	1.340	1.68	0.900	0.050	0.950	3.57	0.750	0.000	0.750	4.093
1.000	0.250	1.250	3.72	1.000	0.440	1.440	3.34	1.000	0.050	1.050	5.15	1.000	0.000	1.000	6.420
1.250	0.250	1.500	8.07	1.250	0.440	1.690	7.48	1.250	0.050	1.300	9.10	1.250	0.000	1.250	8.748
1.500	0.250	1.750	12.41	1.500	0.440	1.940	11.62	1.500	0.050	1.550	13.05	1.500	0.000	1.500	11.075
1.750	0.250	2.000	16.76	1.750	0.440	2.190	15.76	1.750	0.050	1.800	17.00	1.750	0.000	1.750	13.403
2.000	0.250	2.250	21.10	2.000	0.440	2.440	19.90	2.000	0.050	2.050	20.95	2.000	0.000	2.000	15.730
2.500	0.250	2.750	29.79	2.500	0.440	2.940	28.18	2.500	0.050	2.550	28.85	2.500	0.000	2.500	20.385
3.000	0.250	3.250	38.48	3.000	0.440	3.440	36.46	3.000	0.050	3.050	36.75	3.000	0.000	3.000	25.040
3.500	0.250	3.750	47.17	3.500	0.440	3.940	44.74	3.500	0.050	3.550	44.65	3.500	0.000	3.500	29.695
4.000	0.250	4.250	55.86	4.000	0.440	4.440	53.02	4.000	0.050	4.050	52.55	4.000	0.000	4.000	34.350
4.500	0.250	4.750	64.55	4.500	0.440	4.940	61.30	4.500	0.050	4.550	60.45	4.500	0.000	4.500	39.005
5.000	0.250	5.250	73.24	5.000	0.440	5.440	69.58	5.000	0.050	5.050	68.35	5.000	0.000	5.000	43.660

ATTACHMENT 4. DATA THAT DEFINE EPA RATING CURVES

EPA Rating Curve Points															
TT Station #5				TT Station #6				TT Station #7				TT Station #8			
Level (ft)	Height of EPA Sensor above Reference Datum (ft)	Calculated Water Depth above Reference Datum Based on Sensor Reading (ft)	Flow (cfs)	Level (ft)	Height of EPA Sensor above Reference Datum (ft)	Calculated Water Depth above Reference Datum Based on Sensor Reading (ft)	Flow (cfs)	Level (ft)	Height of EPA Sensor above Reference Datum (ft)	Calculated Water Depth above Reference Datum Based on Sensor Reading (ft)	Flow (cfs)	Level (ft)	Height of EPA Sensor above Reference Datum (ft)	Calculated Water Depth above Reference Datum Based on Sensor Reading (ft)	Flow (cfs)
0.000	0.760	0.760	2.52	0.500	0.660			0.000	0.490	0.490	3.70	0.000	-0.600		
0.250	0.760	1.010	2.52	1.000	0.660			0.250	0.490	0.740	3.75	0.250	-0.600		
0.500	0.760	1.260	2.52	1.500	0.660	2.160	5.31	0.500	0.490	0.990	3.79	0.500	-0.600	0.000	0.00
0.750	0.760	1.510	2.52	2.000	0.660	2.660	15.32	0.750	0.490	1.240	3.84	0.750	-0.600	0.150	1.39
1.000	0.760	1.760	2.52	2.500	0.660	3.160	25.34	1.000	0.490	1.490	3.88	1.000	-0.600	0.400	5.08
1.025	0.760	1.785	2.52	3.000	0.660	3.660	35.35	1.025	0.490	1.515	3.88	1.250	-0.600	0.650	13.90
1.050	0.760	1.810	2.52	3.500	0.660	4.160	45.37	1.050	0.490	1.540	4.98	1.500	-0.600	0.900	31.63
1.075	0.760	1.835	2.92	4.000	0.660	4.660	55.38	1.075	0.490	1.565	6.74	1.525	-0.600	0.925	34.07
1.100	0.760	1.860	4.19	4.500	0.660	5.160	65.40	1.100	0.490	1.590	8.50	1.550	-0.600	0.950	36.67
1.250	0.760	2.010	11.80	5.000	0.660	5.660	75.41	1.250	0.490	1.740	19.05	1.575	-0.600	0.975	38.88
1.500	0.760	2.260	24.49					1.500	0.490	1.990	36.64	1.600	-0.600	1.000	41.59
1.750	0.760	2.510	37.18					1.750	0.490	2.240	54.23	1.750	-0.600	1.150	57.86
2.000	0.760	2.760	49.87					2.000	0.490	2.490	71.82	2.000	-0.600	1.400	84.98
2.250	0.760	3.010	62.56					2.250	0.490	2.740	89.41	2.250	-0.600	1.650	112.10
2.500	0.760	3.260	75.25					2.500	0.490	2.990	107.00	2.500	-0.600	1.900	139.22
3.000	0.760	3.760	100.63					3.000	0.490	3.490	142.18	3.000	-0.600	2.400	193.45
3.500	0.760	4.260	126.01					3.500	0.490	3.990	177.36	3.500	-0.600	2.900	247.69
4.000	0.760	4.760	151.39					4.000	0.490	4.490	212.54	4.000	-0.600	3.400	301.92
4.500	0.760	5.260	176.77					4.500	0.490	4.990	247.72	4.500	-0.600	3.900	356.16
5.000	0.760	5.760	202.15					5.000	0.490	5.490	282.90	5.000	-0.600	4.400	410.39

ATTACHMENT 5. RATING CURVE DATA FOR USGS STATION (STATION 8)
(provided by USGS)

Gage height, feet	Height above weir, feet	Elevation, feet	Discharge (cfs)
10.00	0	91.3	0
10.09	0	91.34	0.02
10.1	0.01	91.35	0.027
10.11	0.02	91.36	0.036
10.12	0.03	91.37	0.047
10.13	0.04	91.38	0.059
10.14	0.05	91.39	0.071
10.15	0.06	91.4	0.09
10.16	0.07	91.41	0.11
10.17	0.08	91.42	0.133
10.18	0.09	91.43	0.159
10.19	0.1	91.44	0.189
10.2	0.11	91.45	0.22
10.21	0.12	91.46	0.256
10.22	0.13	91.47	0.296
10.23	0.14	91.48	0.34
10.24	0.15	91.49	0.388
10.25	0.16	91.5	0.44
10.26	0.17	91.51	0.498
10.27	0.18	91.52	0.561
10.28	0.19	91.53	0.629
10.29	0.2	91.54	0.702
10.3	0.21	91.55	0.781
10.31	0.22	91.56	0.866
10.32	0.23	91.57	0.957
10.33	0.24	91.58	1.05
10.34	0.25	91.59	1.16
10.35	0.26	91.6	1.27
10.36	0.27	91.61	1.39
10.37	0.28	91.62	1.51
10.38	0.29	91.63	1.64
10.39	0.3	91.64	1.78
10.4	0.31	91.65	1.93
10.41	0.32	91.66	2.09
10.42	0.33	91.67	2.25
10.43	0.34	91.68	2.43
10.44	0.35	91.69	2.61
10.45	0.36	91.7	2.8
10.46	0.37	91.71	3
10.47	0.38	91.72	3.21
10.48	0.39	91.73	3.39
10.49	0.4	91.74	3.57
10.5	0.41	91.75	3.76
10.51	0.42	91.76	3.96
10.52	0.43	91.77	4.16
10.53	0.44	91.78	4.37
10.54	0.45	91.79	4.59
10.55	0.46	91.8	4.81
10.56	0.47	91.81	5.04
10.57	0.48	91.82	5.27
10.58	0.49	91.83	5.51
10.59	0.5	91.84	5.76
10.6	0.51	91.85	6.01
10.61	0.52	91.86	6.27
10.62	0.53	91.87	6.54
10.63	0.54	91.88	6.82
10.64	0.55	91.89	7.1
10.65	0.56	91.9	7.39
10.66	0.57	91.91	7.68
10.67	0.58	91.92	7.98
10.68	0.59	91.93	8.29
10.69	0.6	91.94	8.61
10.7	0.61	91.95	8.93
10.71	0.62	91.96	9.27
10.72	0.63	91.97	9.6
10.73	0.64	91.98	9.95
10.74	0.65	91.99	10.31
10.75	0.66	92	10.67
10.76	0.67	92.01	11.04
10.77	0.68	92.02	11.41
10.78	0.69	92.03	11.8
10.79	0.7	92.04	12.19
10.8	0.71	92.05	12.59
10.81	0.72	92.06	13
10.82	0.73	92.07	13.42
10.83	0.74	92.08	13.84
10.84	0.75	92.09	14.38
10.85	0.76	92.1	14.94
10.86	0.77	92.11	15.51
10.87	0.78	92.12	16.09
10.88	0.79	92.13	16.69
10.89	0.8	92.14	17.3
10.9	0.81	92.15	17.91
10.91	0.82	92.16	18.58
10.92	0.83	92.17	19.24
10.93	0.84	92.18	19.92
10.94	0.85	92.19	20.61
10.95	0.86	92.2	21.33

Gage height, feet	Height above weir, feet	Elevation, feet	Discharge (cfs)
10.96	0.87	92.21	22.05
10.97	0.88	92.22	22.79
10.98	0.89	92.23	23.53
10.99	0.9	92.24	24.33
11	0.91	92.25	25.13
11.01	0.92	92.26	25.94
11.02	0.93	92.27	26.85
11.03	0.94	92.28	27.75
11.04	0.95	92.29	28.75
11.05	0.96	92.3	29.73
11.06	0.97	92.31	30.73
11.07	0.98	92.32	31.76
11.08	0.99	92.33	32.82
11.09	1	92.34	33.9
11.1	1.01	92.35	35
11.11	1.02	92.36	36.11
11.12	1.03	92.37	37.29
11.13	1.04	92.38	38.47
11.14	1.05	92.39	39.68
11.15	1.06	92.4	40.91
11.16	1.07	92.41	42.17
11.17	1.08	92.42	43.46
11.18	1.09	92.43	44.78
11.19	1.1	92.44	45.86
11.2	1.11	92.45	46.95
11.21	1.12	92.46	48.06
11.22	1.13	92.47	49.19
11.23	1.14	92.48	50.33
11.24	1.15	92.49	51.49
11.25	1.16	92.5	52.67
11.26	1.17	92.51	53.86
11.27	1.18	92.52	55.08
11.28	1.19	92.53	56.33
11.29	1.2	92.54	57.55
11.3	1.21	92.55	58.82
11.31	1.22	92.56	60.1
11.32	1.23	92.57	61.4
11.33	1.24	92.58	62.72
11.34	1.25	92.59	64.06
11.35	1.26	92.6	65.41
11.36	1.27	92.61	66.79
11.37	1.28	92.62	68.18
11.38	1.29	92.63	69.59
11.39	1.3	92.64	71.02
11.4	1.31	92.65	72.47
11.41	1.32	92.66	73.93
11.42	1.33	92.67	75.42
11.43	1.34	92.68	76.92
11.44	1.35	92.69	78.45
11.45	1.36	92.7	79.99
11.46	1.37	92.71	81.55
11.47	1.38	92.72	83.14
11.48	1.39	92.73	84.74
11.49	1.4	92.74	86.36
11.5	1.41	92.75	88
11.51	1.42	92.76	89.66
11.52	1.43	92.77	91.33
11.53	1.44	92.78	93.01
11.54	1.45	92.79	94.74
11.55	1.46	92.8	96.48
11.56	1.47	92.81	98.23
11.57	1.48	92.82	100
11.58	1.49	92.83	101.8
11.59	1.5	92.84	103.6
11.6	1.51	92.85	105.5
11.61	1.52	92.86	107.3
11.62	1.53	92.87	109.2
11.63	1.54	92.88	111.1
11.64	1.55	92.89	113
11.65	1.56	92.9	115
11.66	1.57	92.91	116.9
11.67	1.58	92.92	118.9
11.68	1.59	92.93	120.9
11.69	1.6	92.94	123
11.7	1.61	92.95	125
11.71	1.62	92.96	126.9
11.72	1.63	92.97	128.8
11.73	1.64	92.98	130.8
11.74	1.65	92.99	132.7
11.75	1.66	93	134.7
11.76	1.67	93.01	136.7
11.77	1.68	93.02	138.7
11.78	1.69	93.03	140.7
11.79	1.7	93.04	142.8
11.8	1.71	93.05	144.8
11.81	1.72	93.06	146.9
11.82	1.73	93.07	149
11.83	1.74	93.08	151.1

Gage height, feet	Height above weir, feet	Elevation, feet	Discharge (cfs)
11.84	1.75	93.09	153.3
11.85	1.76	93.1	155.4
11.86	1.77	93.11	157.6
11.87	1.78	93.12	159.8
11.88	1.79	93.13	162
11.89	1.8	93.14	164.2
11.9	1.81	93.15	166.5
11.91	1.82	93.16	168.7
11.92	1.83	93.17	171
11.93	1.84	93.18	173.3
11.94	1.85	93.19	175.7
11.95	1.86	93.2	178
11.96	1.87	93.21	180.4
11.97	1.88	93.22	182.7
11.98	1.89	93.23	185.1
11.99	1.9	93.24	187.6
12	1.91	93.25	190
12.01	1.92	93.26	192.1
12.02	1.93	93.27	194.3
12.03	1.94	93.28	196.5
12.04	1.95	93.29	198.6
12.05	1.96	93.3	200.8
12.06	1.97	93.31	203
12.07	1.98	93.32	205.3
12.08	1.99	93.33	207.5
12.09	2	93.34	209.7
12.1	2.01	93.35	212
12.11	2.02	93.36	214.3
12.12	2.03	93.37	216.5
12.13	2.04	93.38	218.8
12.14	2.05	93.39	221.2
12.15	2.06	93.4	223.5
12.16	2.07	93.41	225.8
12.17	2.08	93.42	228.2
12.18	2.09	93.43	230.5
12.19	2.1	93.44	232.9
12.2	2.11	93.45	235.3
12.21	2.12	93.46	237.7
12.22	2.13	93.47	240.1
12.23	2.14	93.48	242.6
12.24	2.15	93.49	245
12.25	2.16	93.5	247.5
12.26	2.17	93.51	250
12.27	2.18	93.52	252.5
12.28	2.19	93.53	255
12.29	2.2	93.54	257.5
12.3	2.21	93.55	260
12.31	2.22	93.56	262.5
12.32	2.23	93.57	265
12.33	2.24	93.58	267.5
12.34	2.25	93.59	270
12.35	2.26	93.6	272.5
12.36	2.27	93.61	275.1
12.37	2.28	93.62	277.6
12.38	2.29	93.63	280.2
12.39	2.3	93.64	282.8
12.4	2.31	93.65	285.4
12.41	2.32	93.66	288
12.42	2.33	93.67	290.6
12.43	2.34	93.68	293.2
12.44	2.35	93.69	295.9
12.45	2.36	93.7	298.5
12.46	2.37	93.71	301.2
12.47	2.38	93.72	303.9
12.48	2.39	93.73	306.6
12.49	2.4	93.74	309.3
12.5	2.41	93.75	312
12.51	2.42	93.76	314.8
12.52	2.43	93.77	317.5
12.53	2.44	93.78	320.3
12.54	2.45	93.79	323.1
12.55	2.46	93.8	325.9
12.56	2.47	93.81	328.7
12.57	2.48	93.82	331.5
12.58	2.49	93.83	334.3
12.59	2.5	93.84	337.1
12.6	2.51	93.85	340
12.61	2.52	93.86	342.1
12.62	2.53	93.87	346.2
12.63	2.54	93.88	349.3
12.64	2.55	93.89	352.5
12.65	2.56	93.9	355.6
12.66	2.57	93.91	358.8
12.67	2.58	93.92	362
12.68	2.59	93.93	365.2
12.69	2.6	93.94	368.4
12.7	2.61	93.95	371.7
12.71	2.62	93.96	374.9

Gage height, feet	Height above weir, feet	Elevation, feet	Discharge (cfs)
12.72	2.63	93.97	378.2
12.73	2.64	93.98	381.5
12.74	2.65	93.99	384.8
12.75	2.66	94	388.1
12.76	2.67	94.01	391.5
12.77	2.68	94.02	394.8
12.78	2.69	94.03	398.2
12.79	2.7	94.04	401.6
12.8	2.71	94.05	405
12.81	2.72	94.06	408.1
12.82	2.73	94.07	411.3
12.83	2.74	94.08	414.4
12.84	2.75	94.09	417.6
12.85	2.76	94.1	420.7
12.86	2.77	94.04	423.9
12.87	2.78	94.12	427.1
12.88	2.79	94.13	430.3
12.89	2.8	94.14	433.6
12.9	2.81	94.15	436.8
12.91	2.82	94.16	440.1
12.92	2.83	94.17	443.3
12.93	2.84	94.18	446.6
12.94	2.85	94.19	449.9
12.95	2.86	94.2	453.2
12.96	2.87	94.21	456.5
12.97	2.88	94.22	459.8
12.98	2.89	94.23	463.2
12.99	2.9	94.24	466.5
13	2.91	94.25	469.9
13.01	2.92	94.26	473.3
13.02	2.93	94.27	476.7
13.03	2.94	94.28	480.1
13.04	2.95	94.29	483.5
13.05	2.96	94.3	486.9
13.06	2.97	94.31	490.4
13.07	2.98	94.32	493.8
13.08	2.99	94.33	497.3
13.09	3	94.34	500.8
13.1	3.01	94.35	504.3
13.11	3.02	94.36	507.8
13.12	3.03	94.37	511.3
13.13	3.04	94.38	514.9
13.14	3.05	94.39	518.4
13.15	3.06	94.4	522
13.16	3.07	94.41	525.6
13.17	3.08	94.42	529.2
13.18	3.09	94.43	532.8
13.19	3.1	94.44	536.4
13.2	3.11	94.45	540
13.21	3.12	94.46	543.2
13.22	3.13	94.47	546.4
13.23	3.14	94.48	549.6
13.24	3.15	94.49	552.9
13.25	3.16	94.5	556.1
13.26	3.17	94.51	559.4
13.27	3.18	94.52	562.6
13.28	3.19	94.53	565.9
13.29	3.2	94.54	569.2
13.3	3.21	94.55	572.4
13.31	3.22	94.56	575.7
13.32	3.23	94.57	579
13.33	3.24	94.58	582.4
13.34	3.25	94.59	585.7
13.35	3.26	94.6	589
13.36	3.27	94.61	592.3
13.37	3.28	94.62	595.7
13.38	3.29	94.63	599
13.39	3.3	94.64	602.4
13.4	3.31	94.65	605.8
13.41	3.32	94.66	609.2
13.42	3.33	94.67	612.6
13.43	3.34	94.68	616
13.44	3.35	94.69	619.4
13.45	3.36	94.7	622.8
13.46	3.37	94.71	626.2
13.47	3.38	94.72	629.6
13.48	3.39	94.73	633.1
13.49	3.4	94.74	636.5
13.5	3.41	94.75	640
13.51	3.42	94.76	643.2
13.52	3.43	94.77	646.5
13.53	3.44	94.78	649.7
13.54	3.45	94.79	653
13.55	3.46	94.8	656.2
13.56	3.47	94.81	659.5
13.57	3.48	94.82	662.8
13.58	3.49	94.83	666
13.59	3.5	94.84	669.3

Gage height, feet	Height above weir, feet	Elevation, feet	Discharge (cfs)
13.6	3.51	94.85	672.6
13.61	3.52	94.86	675.9
13.62	3.53	94.87	679.2
13.63	3.54	94.88	682.5
13.64	3.55	94.89	685.9
13.65	3.56	94.9	689.2
13.66	3.57	94.91	692.5
13.67	3.58	94.92	695.9
13.68	3.59	94.93	699.2
13.69	3.6	94.94	702.6
13.7	3.61	94.95	705.9
13.71	3.62	94.96	709.3
13.72	3.63	94.97	712.7
13.73	3.64	94.98	716.1
13.74	3.65	94.99	719.6
13.75	3.66	95	722.8
13.76	3.67	95.01	726.2
13.77	3.68	95.02	729.7
13.78	3.69	95.03	733.1
13.79	3.7	95.04	736.5
13.8	3.71	95.05	739.9
13.81	3.72	95.06	743.4
13.82	3.73	95.07	746.8
13.83	3.74	95.08	750.3
13.84	3.75	95.09	753.7
13.85	3.76	95.1	757.2
13.86	3.77	95.11	760.7
13.87	3.78	95.12	764.1
13.88	3.79	95.13	767.6
13.89	3.8	95.14	771.1
13.9	3.81	95.15	774.6
13.91	3.82	95.16	778.1
13.92	3.83	95.17	781.6
13.93	3.84	95.18	785.2
13.94	3.85	95.19	788.7
13.95	3.86	95.2	792.2
13.96	3.87	95.21	795.8
13.97	3.88	95.22	799.3
13.98	3.89	95.23	802.9
13.99	3.9	95.24	806.4
14	3.91	95.25	810
14.01	3.92	95.26	813.3
14.02	3.93	95.27	816.6
14.03	3.94	95.28	819.9
14.04	3.95	95.29	823.3
14.05	3.96	95.3	826.4
14.06	3.97	95.31	829.7
14.07	3.98	95.32	833.1
14.08	3.99	95.33	836.4
14.09	4	95.34	839.7
14.1	4.01	95.35	843
14.11	4.02	95.36	846.3
14.12	4.03	95.37	849.7
14.13	4.04	95.38	853
14.14	4.05	95.39	856.4
14.15	4.06	95.4	859.7
14.16	4.07	95.41	863.1
14.17	4.08	95.42	866.4
14.18	4.09	95.43	869.8
14.19	4.1	95.44	873.1
14.2	4.11	95.45	876.5
14.21	4.12	95.46	879.9
14.22	4.13	95.47	883.3
14.23	4.14	95.48	886.7
14.24	4.15	95.49	890.1
14.25	4.16	95.5	893.5
14.26	4.17	95.51	896.9
14.27	4.18	95.52	900.3
14.28	4.19	95.53	903.7
14.29	4.2	95.54	907.1
14.3	4.21	95.55	910.5
14.31	4.22	95.56	914
14.32	4.23	95.57	917.4
14.33	4.24	95.58	920.8
14.34	4.25	95.59	924.3
14.35	4.26	95.6	927.7
14.36	4.27	95.61	931.2
14.37	4.28	95.62	934.6
14.38	4.29	95.63	938.1
14.39	4.3	95.64	941.5
14.4	4.31	95.65	945
14.41	4.32	95.66	948.5
14.42	4.33	95.67	952
14.43	4.34	95.68	955.5
14.44	4.35	95.69	959
14.45	4.36	95.7	962.5
14.46	4.37	95.71	966
14.47	4.38	95.72	969.5

ATTACHMENT 5 RATING CURVE DATA FOR USGS STATION (STATION 8)
(provided by USGS)

Gage height, feet	Height above weir, feet	Elevation, feet	Discharge (cfs)
14.48	4.39	95.73	973
14.49	4.4	95.74	976.5
14.5	4.41	95.75	980
14.51	4.42	95.76	983.5
14.52	4.43	95.77	987
14.53	4.44	95.78	990.5
14.54	4.45	95.79	994
14.55	4.46	95.8	997.5
14.56	4.47	95.81	1001
14.57	4.48	95.82	1005
14.58	4.49	95.83	1008
14.59	4.5	95.84	1012
14.6	4.51	95.85	1015
14.61	4.52	95.86	1019
14.62	4.53	95.87	1022
14.63	4.54	95.88	1026
14.64	4.55	95.89	1029
14.65	4.56	95.9	1033
14.66	4.57	95.91	1036
14.67	4.58	95.92	1040
14.68	4.59	95.93	1043
14.69	4.6	95.94	1047
14.7	4.61	95.95	1051
14.71	4.62	95.96	1054
14.72	4.63	95.97	1058
14.73	4.64	95.98	1061
14.74	4.65	95.99	1065
14.75	4.66	96	1069
14.76	4.67	96.01	1072
14.77	4.68	96.02	1076
14.78	4.69	96.03	1079
14.79	4.7	96.04	1083
14.8	4.71	96.05	1087
14.81	4.72	96.06	1090
14.82	4.73	96.07	1094
14.83	4.74	96.08	1098
14.84	4.75	96.09	1101
14.85	4.76	96.1	1105
14.86	4.77	96.11	1108
14.87	4.78	96.12	1112
14.88	4.79	96.13	1116
14.89	4.8	96.14	1119
14.9	4.81	96.15	1123
14.91	4.82	96.16	1127
14.92	4.83	96.17	1130
14.93	4.84	96.18	1134
14.94	4.85	96.19	1138
14.95	4.86	96.2	1141
14.96	4.87	96.21	1145
14.97	4.88	96.22	1149
14.98	4.89	96.23	1153
14.99	4.9	96.24	1156
15	4.91	96.25	1160
15.01	4.92	96.26	1164
15.02	4.93	96.27	1167
15.03	4.94	96.28	1171
15.04	4.95	96.29	1174
15.05	4.96	96.3	1178
15.06	4.97	96.31	1181
15.07	4.98	96.32	1185
15.08	4.99	96.33	1188
15.09	5	96.34	1192
15.1	5.01	96.35	1195
15.11	5.02	96.36	1199
15.12	5.03	96.37	1202
15.13	5.04	96.38	1206
15.14	5.05	96.39	1210
15.15	5.06	96.4	1213
15.16	5.07	96.41	1217
15.17	5.08	96.42	1220
15.18	5.09	96.43	1224
15.19	5.1	96.44	1227
15.2	5.11	96.45	1231
15.21	5.12	96.46	1235
15.22	5.13	96.47	1238
15.23	5.14	96.48	1242
15.24	5.15	96.49	1245
15.25	5.16	96.5	1249
15.26	5.17	96.51	1253
15.27	5.18	96.52	1256
15.28	5.19	96.53	1260
15.29	5.2	96.54	1263
15.3	5.21	96.55	1267
15.31	5.22	96.56	1271
15.32	5.23	96.57	1274
15.33	5.24	96.58	1278
15.34	5.25	96.59	1281
15.35	5.26	96.6	1285

Gage height, feet	Height above weir, feet	Elevation, feet	Discharge (cfs)
15.36	5.27	96.61	1289
15.37	5.28	96.62	1292
15.38	5.29	96.63	1296
15.39	5.3	96.64	1300
15.4	5.31	96.65	1303
15.41	5.32	96.66	1307
15.42	5.33	96.67	1311
15.43	5.34	96.68	1314
15.44	5.35	96.69	1318
15.45	5.36	96.7	1322
15.46	5.37	96.71	1325
15.47	5.38	96.72	1329
15.48	5.39	96.73	1333
15.49	5.4	96.74	1336
15.5	5.41	96.75	1340
15.51	5.42	96.76	1344
15.52	5.43	96.77	1348
15.53	5.44	96.78	1352
15.54	5.45	96.79	1356
15.55	5.46	96.8	1360
15.56	5.47	96.81	1365
15.57	5.48	96.82	1369
15.58	5.49	96.83	1373
15.59	5.5	96.84	1377
15.6	5.51	96.85	1381
15.61	5.52	96.86	1385
15.62	5.53	96.87	1389
15.63	5.54	96.88	1393
15.64	5.55	96.89	1398
15.65	5.56	96.9	1402
15.66	5.57	96.91	1406
15.67	5.58	96.92	1410
15.68	5.59	96.93	1414
15.69	5.6	96.94	1418
15.7	5.61	96.95	1423
15.71	5.62	96.96	1427
15.72	5.63	96.97	1431
15.73	5.64	96.98	1435
15.74	5.65	96.99	1439
15.75	5.66	97	1443
15.76	5.67	97.01	1448
15.77	5.68	97.02	1452
15.78	5.69	97.03	1456
15.79	5.7	97.04	1460
15.8	5.71	97.05	1465
15.81	5.72	97.06	1469
15.82	5.73	97.07	1473
15.83	5.74	97.08	1477
15.84	5.75	97.09	1481
15.85	5.76	97.1	1486
15.86	5.77	97.11	1490
15.87	5.78	97.12	1494
15.88	5.79	97.13	1498
15.89	5.8	97.14	1503
15.9	5.81	97.15	1507
15.91	5.82	97.16	1511
15.92	5.83	97.17	1516
15.93	5.84	97.18	1520
15.94	5.85	97.19	1524
15.95	5.86	97.2	1528
15.96	5.87	97.21	1533
15.97	5.88	97.22	1537
15.98	5.89	97.23	1541
15.99	5.9	97.24	1546
16	5.91	97.25	1550
16.01	5.92	97.26	1554
16.02	5.93	97.27	1558
16.03	5.94	97.28	1562
16.04	5.95	97.29	1565
16.05	5.96	97.3	1569
16.06	5.97	97.31	1573
16.07	5.98	97.32	1577
16.08	5.99	97.33	1581
16.09	6	97.34	1585
16.1	6.01	97.35	1589
16.11	6.02	97.36	1593
16.12	6.03	97.37	1596
16.13	6.04	97.38	1600
16.14	6.05	97.39	1604
16.15	6.06	97.4	1608
16.16	6.07	97.41	1612
16.17	6.08	97.42	1616
16.18	6.09	97.43	1620
16.19	6.1	97.44	1624
16.2	6.11	97.45	1628
16.21	6.12	97.46	1631
16.22	6.13	97.47	1635
16.23	6.14	97.48	1639

Gage height, feet	Height above weir, feet	Elevation, feet	Discharge (cfs)
16.24	6.15	97.49	1643
16.25	6.16	97.5	1647
16.26	6.17	97.51	1651
16.27	6.18	97.52	1655
16.28	6.19	97.53	1659
16.29	6.2	97.54	1663
16.3	6.21	97.55	1667
16.31	6.22	97.56	1671
16.32	6.23	97.57	1675
16.33	6.24	97.58	1679
16.34	6.25	97.59	1683
16.35	6.26	97.6	1687
16.36	6.27	97.61	1691
16.37	6.28	97.62	1694
16.38	6.29	97.63	1698
16.39	6.3	97.64	1702
16.4	6.31	97.65	1706
16.41	6.32	97.66	1710
16.42	6.33	97.67	1714
16.43	6.34	97.68	1718
16.44	6.35	97.69	1722
16.45	6.36	97.7	1726
16.46	6.37	97.71	1730
16.47	6.38	97.72	1734
16.48	6.39	97.73	1738
16.49	6.4	97.74	1742
16.5	6.41	97.75	1746
16.51	6.42	97.76	1750
16.52	6.43	97.77	1754
16.53	6.44	97.78	1758
16.54	6.45	97.79	1762
16.55	6.46	97.8	1766
16.56	6.47	97.81	1770
16.57	6.48	97.82	1774
16.58	6.49	97.83	1778
16.59	6.5	97.84	1782
16.6	6.51	97.85	1786
16.61	6.52	97.86	1790
16.62	6.53	97.87	1794
16.63	6.54	97.88	1799
16.64	6.55	97.89	1803
16.65	6.56	97.9	1807
16.66	6.57	97.91	1811
16.67	6.58	97.92	1815
16.68	6.59	97.93	1819
16.69	6.6	97.94	1823
16.7	6.61	97.95	1827
16.71	6.62	97.96	1831
16.72	6.63	97.97	1835
16.73	6.64	97.98	1839
16.74	6.65	97.99	1843
16.75	6.66	98	1847
16.76	6.67	98.01	1851
16.77	6.68	98.02	1855
16.78	6.69	98.03	1859
16.79	6.7	98.04	1864
16.8	6.71	98.05	1868
16.81	6.72	98.06	1872
16.82	6.73	98.07	1876
16.83	6.74	98.08	1880
16.84	6.75	98.09	1884
16.85	6.76	98.1	1888
16.86	6.77	98.11	1892
16.87	6.78	98.12	1896
16.88	6.79	98.13	1900
16.89	6.8	98.14	1905
16.9	6.81	98.15	1909
16.91	6.82	98.16	1913
16.92	6.83	98.17	1917
16.93	6.84	98.18	1921
16.94	6.85	98.19	1925
16.95	6.86	98.2	1929
16.96	6.87	98.21	1933
16.97	6.88	98.22	1938
16.98	6.89	98.23	1942
16.99	6.9	98.24	1946
17	6.91	98.25	1950