WSDOT NPDES Municipal Stormwater Permit
Final Highway Runoff Characterization Report (S7.B)
Water Years 2012-2014

October 2015

Prepared by

Stormwater and Watersheds Program
Washington State Department of Transportation

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Stormwater Monitoring Report

Final Highway Runoff Characterization Report
Water Years 2012-2014

Approved by:

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Megan White, Director, WSDOT Environmental Services Office

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1 Introduction

1.1 Permit Overview

On March 6, 2014, the Washington State Department of Ecology (Ecology) reissued a *National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge Municipal Stormwater General Permit* (permit) (Ecology 2014) to the Washington State Department of Transportation (WSDOT), effective April 5, 2014, to April 5, 2019. Under Special Condition S7 of the permit, WSDOT must continue a monitoring program to establish baseline stormwater discharge information from its existing highway runoff characterization sites. In addition, the department must develop a monitoring program to evaluate best management practices (BMP) effectiveness at its facilities (rest areas, maintenance facilities, or ferry terminals), and continue a monitoring program to evaluate the effectiveness of its highway vegetated filter strip (VFS) and modified-VFS BMPs.

Under Special Conditions S7.B–D of the permit, annual monitoring reports are required for information collected at the department's highway runoff and stormwater BMP effectiveness monitoring sites. The following report helps satisfy these requirements and provides a summary of monitoring activities completed at highway runoff monitoring sites through September 30, 2014. While this report is due during WSDOT's current effective permit term, applicable technical requirements were specified and data collection began during WSDOT's prior permit cycle, effective March 6, 2009, to March 6, 2014 (Ecology 2009a). A separate report covers activities at the department's BMP effectiveness monitoring sites.

1.2 Baseline Monitoring of WSDOT Highways (S7.B)

In accordance with the permit, WSDOT met the following requirements:

1. Water quality and quantity data were collected from the pavement edge at five highway runoff monitoring sites established under the 2009-issued permit (Ecology 2009a) with the following annual average daily traffic (AADT):
    - Two highly urbanized western Washington sites (≥ 100,000 AADT)
    - One urbanized western Washington site (≤ 100,000 and ≥ 30,000 AADT)
    - One rural western Washington site (≤ 30,000 AADT)
    - One urbanized eastern Washington site (≤ 100,000 and ≥ 30,000 AADT)
2. Sediments at highway monitoring sites were collected and analyzed during a single sampling event each year (S7.B.6).

The 2009-issued permit also required toxicity testing from existing highway runoff characterization sites in western Washington. Although toxicity testing is not a requirement under the 2014 permit, this report includes results from toxicity sampling conducted in 2012 and 2013. Samples were collected in accordance with the following condition:

3. Seasonal first flush toxicity samples were collected after July 31 from three untreated highway runoff monitoring locations once each year (ending October 31). Site locations were based on the following AADTs:
    - One highly urbanized site (≥ 100,000 AADT)
    - One urbanized site (≤ 100,000 and ≥ 30,000 AADT)
    - One rural site (≤ 30,000 AADT)

1.3 Monitoring Schedule

WSDOT submitted a *Quality Assurance Project Plan (QAPP) for Baseline Monitoring of WSDOT Highway Runoff* (WSDOT 2011a) to Ecology for approval on September 2, 2011. Ecology sent WSDOT a QAPP approval letter on September 16, 2011. This QAPP describes the objectives of the highway runoff program and the procedures used to assure the quality and integrity of collected data. The QAPP also identifies project timelines and schedules.

Under the 2009 permit, WSDOT was required to fully implement the highway runoff monitoring program no later than September 6, 2011. However, unanticipated challenges, including government hiring and equipment purchase freezes in effect through early summer 2011, delayed implementation of the monitoring program.

On October 20, 2011, as required under the 2009 permit, WSDOT notified Ecology that it would be unable to fully comply with monitoring program implementation timelines and that toxicity sampling would be deferred until August 2012.

In a letter to Ecology on January 13, 2012, WSDOT proposed a revised schedule and phased approach for initiating the highway runoff characterization component of its stormwater monitoring program. The phased approach provided time for the iterative learning and adaptation necessary to fully and successfully implement the program. The letter proposed sampling at one highway monitoring site beginning May 1, 2012, with the remainder of the sites operational by June 15, 2012. Ecology concurred, and WSDOT successfully met the revised timelines and schedule.

In October 2013 and October 2014, WSDOT submitted its first detailed highway runoff monitoring reports (WSDOT 2013 and 2014a). These reports describe the development of the program through the first two years of monitoring. This report updates information from the previous reports and provides a discussion of highway runoff characterization data collected in water years 2013 and 2014 (WY13-WY14).[1]

[1] A water year is the 12-month period beginning October 1 for any given year through September 30 of the following year. The water year is designated by the calendar year in which it ends (USGS 2014).

2 Monitoring Program Implementation

This chapter describes the monitoring site selection strategy, project resource and logistical constraints, site characteristics, and experimental study designs for the highway runoff characterization program.

2.1 Site Selection Strategy

A thorough review of the monitoring program's objectives and permit requirements was the first step in selecting highway runoff characterization sites. WSDOT used the program's objectives and permit requirements to establish the number and types of sites needed for monitoring.

Guidance from the California Department of Transportation (Caltrans 2003a) and the following evaluation criteria were used to screen areas of roadway for monitoring site selection:

- Property ownership
- Site representativeness
- Personnel safety
- Site accessibility
- Equipment security
- Discharge measurement capability

Only properties owned and operated by WSDOT were considered during the site evaluation and selection process.

2.1.2 Site Representativeness

Monitoring was required at a variety of site locations, including freeways and rural highways with different annual average daily traffic (AADT) levels. Screening criteria for site representativeness meant each location had to be minimally influenced by unique contributing sources of pollution. The following factors were important in assessing potential highway monitoring site locations:

- Long-term location – Based on information available during the site selection process, sites with the potential to be developed or redeveloped in the near future were avoided.
- Erosion potential – Extremely steep slopes or cut and fill areas where the land surface had not been stabilized were avoided.
- Illegal discharges – Sites where there were signs of illegal discharges or dumping of wastes were not considered.

- Surrounding land uses – Sites where the surrounding land use heavily influenced the quality of runoff through aerial deposition were avoided.

2.1.3 Personnel Safety

For any WSDOT highway project, staff safety is the highest priority. Hazards from traffic, explosive or toxic gasses, poor footing on slopes, slippery conditions, and poor visibility due to adverse weather or night work were minimized or avoided whenever possible.

The following site attributes expose monitoring field teams to potentially unsafe conditions:

- Sites located along a highway shoulder
- Sites that require traffic diversions
- Sites with poor access
- Sites close to waterways

To minimize these hazards, members of the field team must be capable of performing all tasks required for sample collection and be familiar with WSDOT's *Safety Procedures and Guidelines Manual* (WSDOT 2015) and *Work Zone Traffic Control Guidelines* (WSDOT 2014b). Site-specific Pre-Activity Safety Plans were developed for each monitoring site to further minimize the effect of these hazards.

2.1.4 Site Accessibility

Monitoring sites were selected to provide safe and practical access. Highway shoulder width and site visibility from the roadway had to be sufficient to allow safe access for vehicles leaving and reentering the highway.

Due to the nature of highway runoff characterization monitoring, locating sites away from the highway shoulder was not an option. To improve fieldwork safety, staff sought access to freeway sites from frontage roads or other off-site locations. When sample timing or site retrofit needs made off-site access impracticable, field teams followed WSDOT safety guidelines and minimized time spent working along the highway.

To make sure personnel could quickly locate and access monitoring sites, site-specific Health and Safety Plans were developed to include a description of parking and work zone safety procedures. Information in the Health and Safety Plans included lists of physical and biological hazards, standard emergency procedures, site maps, and driving directions.

2.1.5 Equipment Security

Selected sites had to provide adequate level space for monitoring station installation in areas that did not stand out visually. Data collection equipment was installed in locked metal enclosures on level ground or concrete platforms to reduce the risk of tampering. Locked metal enclosures provided a secure location as well as protection from wind, rain, and snowfall. Signs applied to the outside of the enclosures identified the monitoring stations as WSDOT property, and they appeared to deter site vandalism.

2.1.6 Discharge Measurement Capability

Monitoring sites were located in areas that allowed discharge measurement and automatic sample collection. In order to monitor sheet flow runoff from WSDOT highways, conveyance systems were constructed to collect, direct, and measure stormwater runoff from sections of the roadway. Stormwater monitoring conveyance systems provided suitable water depth for measuring discharge and collecting stormwater samples during storm events.

2.2 Addressing Resource and Logistical Constraints

To maximize resources and address logistical challenges in implementing the highway runoff monitoring program, WSDOT staff developed a strategy to optimize the number of monitoring locations needed to meet permit requirements. To address logistical challenges and reduce mobilization costs, sites were localized to decrease travel time and associated costs. Whenever possible, highway and best management practices (BMP) effectiveness monitoring stations were co-located to further reduce the number of locations and total number of sites required for monitoring.

Figure 1 shows the location of highway runoff characterization and BMP sites across the state.

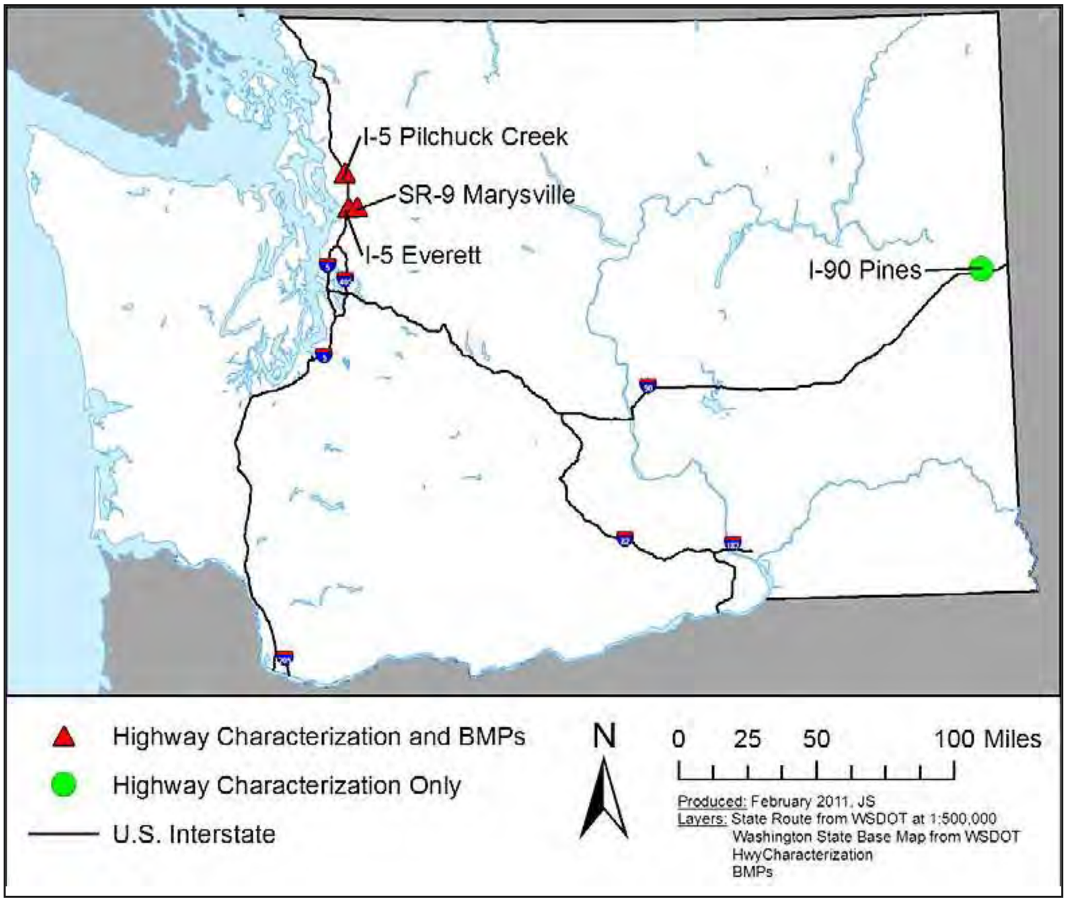

Figure 1 Highway runoff characterization sites selected for monitoring

2.3 Highway Monitoring Sites

Three of five highway monitoring sites served a dual purpose as highway runoff characterization and toxicity testing sites. These sites are in western Washington along northbound Interstate 5 (I-5) north of Everett, southbound I-5 north of Pilchuck Creek, and State Route 9 (SR 9) near Marysville.

The I-5 Everett monitoring site is classified as "highly urbanized" based on annual average daily traffic (AADT). An additional "highly urbanized" highway runoff monitoring site is along northbound I-5 at the Everett location. The I-5 Pilchuck site is classified as "urbanized," and the SR 9 Marysville monitoring site is classified as "rural."

The remaining highway monitoring site is in Spokane on Interstate 90 (I-90). This site represents an "urbanized" highway monitoring location in eastern Washington.

Table 1 shows the selected highway runoff monitoring locations.

Table 1 Highway characterization monitoring sites

Permit Traffic Designation	AADT[1]	Location[2]	Description	Sample Location Code[3]
Highly urbanized	126,000	NB I-5 at MP 197.27 Everett	PE sheetflow collector	Everett 01
Highly urbanized[4]	126,000	NB I-5 at MP 197.35 Everett	PE sheetflow collector	Everett 04
Urbanized	76,000	SB I-5 at MP 210.71 Pilchuck Creek	PE sheetflow collector	Pilchuck 01
Rural[4]	20,000	SR 9 at MP 17.92 Marysville	PE sheetflow collector	SR9 01
Urbanized (eastern WA)	74,000	I-90 at MP 289.55 Spokane Valley	PE curb/sheetflow collector	Pines 01

[1] Annual average daily traffic (AADT). AADT values were obtained from the WSDOT "Annual Traffic Report" (WSDOT 2014c).

[2] Location: northbound (NB); southbound (SB); milepost (MP).

[3] In subsequent chapters, individual highway runoff sampling locations are identified by their sample location code.

[4] Toxicity samples were collected from these sites, and the influent (pavement edge) monitoring station at the BMP effectiveness monitoring site at MP 210.85 (Pilchuck 06) along SB I-5 north of Pilchuck Creek.

2.3.1 I-5 Everett Highway Runoff Monitoring Sites

The Everett highway runoff characterization monitoring sites were just north of the Snohomish River in Snohomish County. Surrounding land uses include industrial and agricultural activities. Both sites satisfied the "highly urbanized" permit criterion, with annual average daily traffic (AADT) values of 126,000. Figure 2 shows the location of these sites along the highway.

For the two highly urbanized monitoring sites on northbound I-5, WSDOT staff installed collectors along roadside embankments at the pavement edge (PE) on the east side of the highway. The collectors were 40-foot-long (12 meters) high-density polyethylene (HDPE) pipes designed to capture stormwater runoff from three lanes of traffic and a paved shoulder. This represents a drainage area of 0.055 acre for each station. Additional details on site set-up and sheetflow collectors are included in Section 2.4.

Monitoring stations along northbound I-5 at milepost 197 (MP 197) served a dual purpose as influent sampling locations for both highway runoff and BMP effectiveness monitoring. Highway runoff characterization and BMP influent data were collected from the monitoring stations at MP 197.27 and MP 197.35. Toxicity sampling data were collected from the station at MP 197.35.

Figure 2 I-5 Everett "highly urbanized" highway runoff monitoring sites

2.3.2 I-5 Pilchuck Creek Highway Runoff Monitoring Site

The I-5 Pilchuck Creek highway monitoring site was north of Pilchuck Creek in Snohomish County. This monitoring site consisted of two monitoring stations. Surrounding land uses include rural residential and agricultural activities. This site satisfied the "urbanized" highway permit criterion with AADT values of 76,000. Figure 3 shows the location of the site (and stations) along the highway.

The Pilchuck Creek highway monitoring stations at MP 210.71 and MP 210.85 included 40 foot-long (12 meters) HDPE pipe collectors installed at the pavement edge (PE) along roadside embankments on the west side of the highway. The PE collectors collected stormwater runoff from two of the three southbound lanes of traffic and the paved westernmost shoulder. This represents drainage areas of 0.031 acre at each location.

The highway runoff monitoring stations at I-5 Pilchuck Creek served a dual purpose as influent sampling locations for both highway and BMP effectiveness monitoring. Highway runoff characterization and BMP influent data were collected from the monitoring station at MP 210.71. Toxicity sampling and BMP influent data were collected from the station at MP 210.85.

Figure 3 I-5 Pilchuck Creek "urbanized" highway runoff monitoring sites

2.3.3 SR 9 Marysville Highway Runoff Monitoring Site

The SR 9 Marysville highway runoff monitoring site was north of Lake Stevens on the eastern edge of the City of Marysville in Snohomish County. The surrounding land uses include rural residential and light industrial activities. The site satisfied the "rural" permit criterion with an AADT value of 20,000. Figure 4 shows the location of the site along the highway.

The SR 9 Marysville highway runoff monitoring site included a 40-foot-long (12 meters) HDPE pipe collector installed at the pavement edge (PE) along a roadside embankment on the west side of the highway at MP 17.92. The PE collector collected stormwater runoff from one and a half lanes of the highway. This represents a drainage area of 0.019 acre. Both toxicity and highway runoff monitoring data were collected from this location.

Figure 4 SR 9 Marysville "rural" highway characterization site

2.3.4 I-90 Pines Highway Runoff Monitoring Site

The I-90 Pines highway runoff monitoring site was established along the westbound lanes of the highway at MP 289.55 in the City of Spokane Valley. Surrounding land uses include urban residential and industrial activities. This site satisfied the eastern Washington "urbanized" permit criterion, with an AADT of 74,000. Figure 5 shows the location of the site and sampling station along the north side of the interstate highway.

An 80-foot-long (24 meters) concrete curb behind a Jersey barrier intercepted stormwater runoff from three lanes of traffic and the westbound highway on-ramp. The monitoring station was established behind the curb and Jersey barrier between the WSDOT Pines Maintenance Facility fence and the highway shoulder. This represents a drainage area of 0.086 acre.

Figure 5 I-90 Pines "urbanized" highway characterization site

2.4 Highway Runoff Monitoring Site Study Design

WSDOT staff installed high-density polyethylene (HDPE) collectors along the pavement edge at the I-5 Everett, I-5 Pilchuck Creek, and SR 9 Marysville highway runoff monitoring sites. Each collector was notched along its length to allow free flow of surface water into the pipes, but prevent rainfall from contributing to discharge volumes.

Staff buried pipes and mortared them to the edge of the pavement. Collector pipes sloped slightly downhill to promote directional flow for measurement. Figure 6 shows the pavement edge collector pipe and highway shoulder in cross section.

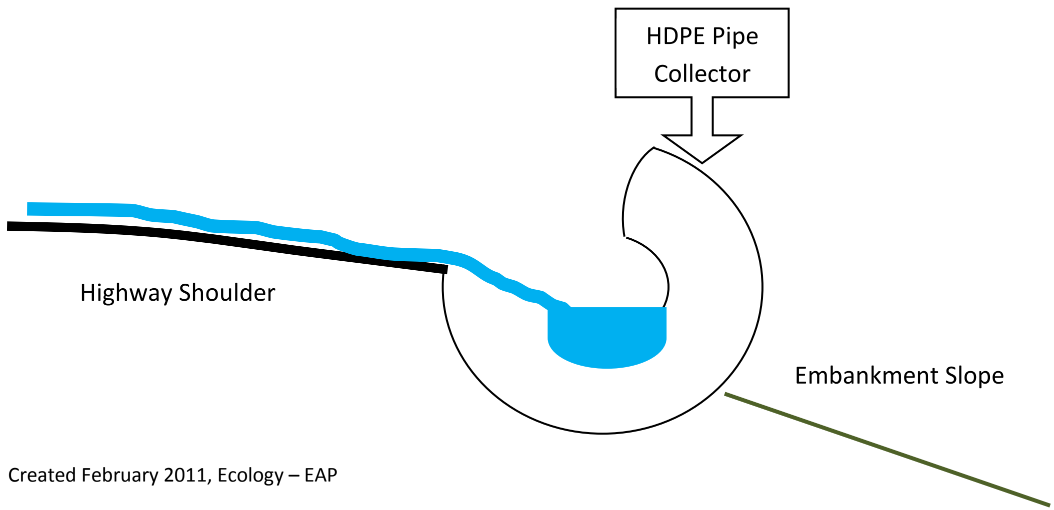

**Figure 6	Cross section of the pavement edge sheetflow collector**

Highway runoff characterization sites at I-5 Everett, I-5 Pilchuck Creek, and SR 9 Marysville consisted of a pavement edge collector that conveyed water through an HDPE pipe in which the water level was measured and water discharged through a sampling point. The stage measuring devices and suction tubing were routed through protective conduit into the data collection platform (DCP). The DCP housed the data logger, autosampler, and cables that were connected to the station instruments. Figure 7 shows a generalized schematic of the highway runoff characterization sites.

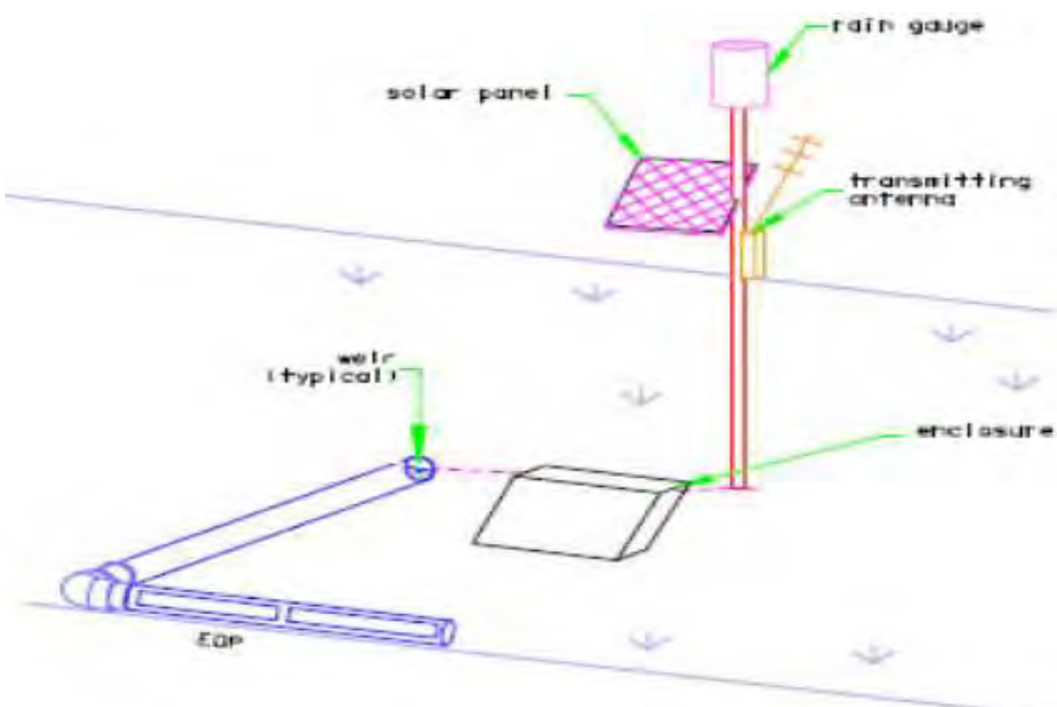

**Figure 7	Highway runoff characterization site**

As described in Section 2.3.4, the I-90 Pines highway runoff monitoring site was constructed differently.

2.4.1 Time of Concentration

WSDOT staff programmed automatic composite samplers to begin sampling as early in a storm runoff event as feasible, and to continue sampling past the longest estimated time of concentration. For highway runoff characterization monitoring sites, time of concentration is the time necessary for surface runoff to reach the pavement edge collector from the hydraulically most distant point of each drainage area. Time of concentration estimates provided a baseline to ensure pacing of the monitoring equipment was set to obtain a representative sample and to evaluate whether contributions from the entire basin are represented.

Each monitoring site's times of concentration was based on a range of rainfall depths typical in Washington State. Flow lengths were estimated from hydraulics reports, field estimates, as-built drawings, aerial photography, or WSDOT's GIS Workbench (WSDOT 2011b). Drainage areas were calculated by multiplying the flow length by the length of the pavement edge collectors.

For further information regarding each site's time of concentration please refer to the *Quality Assurance Project Plan for Baseline Monitoring of WSDOT Highway Runoff* (WSDOT 2011a).

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3 Sampling and Monitoring Procedures

3.1 Monitoring Stations

Monitoring stations at highway runoff characterization sites included an equipment enclosure with lock, Global Positioning System (GPS), antenna, solar panel, and rain gage. The antenna, solar panel, and rain gage were attached to a mounting pole that was installed along the side of the equipment enclosure.

The equipment enclosure housed a data logger; refrigerated automatic sampler; sample tubing; an analog module to run a thermistor (temperature sensor); stage measuring devices, including a depth pressure transducer (PT) and compact bubble sensor (CBS); and a 12-volt battery. Sample tubing ran from the automatic sampler through protective conduit located outside the enclosure to the designated sampling point. The thermistor and PT wires as well as the CBS line run through conduit to a stilling well where stage and temperature were recorded. The locked enclosure provided a secure location for equipment as well as protection from wind, rain, and snowfall.

3.1.1 Precipitation Measurement

At each monitoring station, WSDOT installed a pole-mounted tipping bucket rain gage to capture on-site rainfall measurements. Rain gages were leveled and installed in a secure location where no trees, buildings, overpasses, or other objects obstructed or diverted precipitation prior to entering the rain gage. WSDOT used National Weather Service criteria as guidance for rain gage installation (NWS 2010).

WSDOT collected rain gage data every 15 minutes and stored it in the data logger’s memory. WSDOT used these data, transmitted telemetrically to a WSDOT database, to track and record site-specific precipitation measurements.

3.1.2 Temperature Measurement

Water temperature measurements were recorded to fulfill permit requirements and monitor freezing conditions at each of the highway runoff characterization sites. Sensors were installed at the sampling points for every station to record temperature measurements continuously. These data were recorded by the data logger every 15 minutes and transmitted hourly to WSDOT’s database. If temperatures approached freezing, the data logger discontinued sample collection.

Sample event tables in Appendix A provide minimum and maximum temperature values recorded during sampling events.

3.2 Weather Tracking

WSDOT used weather information—from satellite imagery, prediction models, the National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS), and private forecasters—to forecast potentially qualifying storm events on a daily basis. As candidate storms approached, radar observations and hourly reports from land-based weather stations helped track and evaluate storm potential. Staff used telemetered data transmitted from individual monitoring stations to track the progress of a storm event and the beginning of runoff. The stormwater monitoring team used this information to direct field team deployments for sample collection.

To qualify, storms had to meet rainfall depth and antecedent dry period criteria. Table 2 lists storm event criteria in effect for highway runoff characterization monitoring sites through February 2014.

Table 2 Storm event criteria for highway monitoring

Criteria	Wet Season	Dry Season
Monitoring Period	Western WA (Oct 1 – Apr 30); Eastern WA (Oct 1 – Jun 30)	Western WA (May 1 – Sep 30); Eastern WA (Jul 1 – Sep 30)
Rainfall Depth	0.20” minimum; no fixed maximum	0.20” minimum; no fixed maximum
Rainfall Duration	No fixed minimum or maximum	No fixed minimum or maximum
Antecedent Dry Period	< 0.02” rain or no surface runoff in the previous 24 hours	< 0.02” rain or no surface runoff in the previous 72 hours
Inter-Event Dry Period	6 hours	6 hours

With reissuance of the NPDES municipal stormwater permit in March 2014, storm event criteria changed to align with the *Technical Guidance Manual for Evaluating Emerging Stormwater Treatment Technologies: Technology Assessment Protocol – Ecology* (TAPE) (Ecology 2011) and rainfall conditions more typical of the Pacific Northwest. The following criteria changed and apply to data collected from the permit effective date of April 5, 2014:

- Rainfall depth: 0.15 minimum
- Rainfall duration: Shortest acceptable duration one hour
- Storm start (antecedent dry period): Six hours minimum with less than 0.04-inch of rain.
- Storm end (post storm period): Six hours minimum with less than 0.04-inch of rain.

In accordance with the permit, WSDOT was required to sample 67 percent of forecast storms that resulted in actual qualifying storm events, up to a maximum of 14 storm events each water year. Eleven storms were the required minimum. The department could collect and report data from up to 20 percent of storm events that were forecast as qualifying storms but did not meet the qualifying storm event criterion for rainfall depth. These nonqualifying storm events were collected and counted as part of the required storm events.

Stormwater samples were distributed throughout the year. The goal for western Washington highway monitoring sites was to collect 60 to 80 percent of stormwater samples during the wet season, and 20 to 40 percent during the dry season. For the eastern Washington highway monitoring site, the goal was to collect 80 to 90 percent of the samples in the wet season, and 10 to 20 percent in the dry season.

Through WY13, a one-week antecedent dry period was required prior to seasonal first flush toxicity sampling at the three highway runoff characterization monitoring sites in western Washington. The first flush sampling event had to occur in August or September. If unsuccessful in August or September, a first flush toxicity sample was collected in October, irrespective of the antecedent dry period.

3.3 Sampling Parameters

Sampling requirements listed in S7.B.4, S7.B.7, and S7.C.4 of the 2009 permit specified parameters for baseline highway runoff characterization, annual sediment testing, and seasonal first flush toxicity testing, respectively. With reissuance of the NPDES municipal stormwater permit in March 2014, hardness was added to the list of water quality parameters. Polychlorinated biphenyls (PCBs) and arsenic were added to the list of required sediment sampling parameters.

These parameters are listed in Table 3, in the priority order of analysis. If insufficient sample volume existed, the department processed samples for the highest priority pollutants in accordance with laboratory volume requirements.

Table 3 Water quality and sediment parameters monitored, in order of priority

Baseline Highway Stormwater Monitoring	Annual Sediment Monitoring	Seasonal First Flush Toxicity Testing (Stormwater)[1]
Total recoverable and dissolved metals (Cd, Cu, Zn, Pb)	Particle size (grain size)	*Hyalella azteca* 24-hr acute toxicity test
Polycyclic aromatic hydrocarbons (PAHs)	Total organic carbon (TOC)	Total recoverable and dissolved metals (Cd, Cu, Zn, Pb)
Total suspended solids (TSS)	Total recoverable metals (Cu, Cd, Zn, Pb)	Herbicides (if used in drainage area)[2]
Chlorides	Polycyclic aromatic hydrocarbons (PAHs)	TSS
Phthalates	Total petroleum hydrocarbon: NWTPH-Dx[3]	Chlorides
Herbicides (if used in drainage area)[2]	Visible sheen observation[3]	Hardness
Nutrients: total phosphorus (TP), orthophosphate (OP)	Phenolics	Methylene blue active substances (MBAS)
Hardness	Herbicides (if used in drainage area) [2]	Polycyclic aromatic hydrocarbons (PAHs)
Total petroleum hydrocarbon: NWTPH-Dx and NWTPH-Gx[3]	Phthalates	Phthalates
Fecal coliform[3]	Total solids (%)	Total petroleum hydrocarbon: NWTPH-Dx and NWTPH-Gx [3]
Temperature[3]	Polychlorinated biphenyls (PCBs)[7]	pH[4],[6]
Visible sheen observation[3]	Arsenic[7]	Conductivity[6]
pH[4]		Dissolved oxygen[6]
Nitrate/Nitrite[5]		Total sulfate[6]
TKN[5]		Alkalinity as $CaCO_3$[6]
		Dissolved organic carbon (DOC)[6]
		Cobalt thiocyanate active substances (CTAS)[6]
		Dissolved Ca, Mg, Na, and K[6]

[1] Hardness, conductivity, dissolved oxygen, and pH were measured from seasonal first flush toxicity samples upon receipt by the toxicity laboratory, according to the method.

[2] Limited to the herbicides listed in the permit and used by WSDOT in the drainage area.

[3] Grab samples.

[4] Required for shared highway and best management practices (BMP) monitoring sites for TAPE compliance and/or toxicity sampling.

[5] Not required by the permit but may be collected to support Highway Runoff Manual (WSDOT 2014d) research purposes.

[6] Not required by permit, but may be collected in support of the Biotic Ligand Model, to be used for toxicity follow-up reporting activities.

[7] PCBs and arsenic added for the 2014 permit.

WSDOT was required to sample and analyze herbicides at highway runoff and toxicity monitoring sites where listed herbicides were applied in the monitoring site vicinity. The stormwater monitoring team checked herbicide applications for all monitoring site drainage areas annually.

WSDOT staff used these annual reviews to update the list of herbicides monitored at each site. On the west side of the state, only glyphosate was applied in or near the monitoring study sites. At the highway monitoring site in Spokane Valley (Pines), the following herbicides were applied: glyphosate, dichlobenil, and diuron.

3.4 Sampling Methods

Highway runoff characterization sites were established to measure stormwater quality and quantity. Table 4 lists parameter categories, sampling frequency, and methods.

Table 4 Sampling methods overview

Parameter Category	Sampling Frequency	Sampling Method	Telemetered Data?
Rainfall	Continuous, year round	Rain gage	yes
Stage (flow)	Continuous, year round	Stage measuring device	yes
Temperature	Continuous, year round	In situ probe	yes
Chemical, except grab samples	Discrete storm events	Autosampler	no
TPH, pH, fecal coliform, and visible sheen observation	Discrete storm events	Grab sample	no
Baseline sediment	Annually	Grab-composite sample	no
Toxicity	Annually	Autosampler	no

For further information regarding field work activities, sample processing details, and analytical requirements for highway runoff characterization, baseline sediment characterization, and toxicity water quality sampling, see the *Quality Assurance Project Plan for Baseline Monitoring of WSDOT Highway Runoff* (WSDOT 2011a).

3.5 Station Maintenance

WSDOT staff provided regular station maintenance every six to eight weeks or after sampled storm events. Monitoring staff performed a visual inspection of the monitoring site to identify possible damage to equipment and any new or unsafe conditions. Staff checked equipment enclosures for signs of tampering or forced entry. Unusual odors and the presence of water or debris were noted for the record and addressed through further investigation and site retrofit or rehabilitation, when necessary.

Staff inspected and cleaned outlet pipes, sampling basins, and the conveyance system to ensure the monitoring station was in good condition prior to a sampled storm event. Field staff followed this inspection and cleaning procedure to ensure representative data collected from the system were unaffected by accumulated debris and sensor drift.

Following the *Standard Operating Procedure for Equipment Maintenance and Cleaning* (WSDOT 2011c), field staff conducted station checks that included equipment inventory, inspections, testing, and replacement of worn or missing parts. Monitoring staff inspected internal wires and cables to evaluate wear and ensure cable connections to the data logger were in good condition.

Station antennae declinations and bearings were checked, and solar panels were cleaned to remove accumulated debris. When servicing or calibration of scientific equipment at monitoring stations were required, trained technicians followed manufacturers' specifications and conducted servicing and calibration of equipment on site or in a controlled environment, as appropriate.

3.6 Equipment Decontamination

Unless certified as precleaned from the equipment source, WSDOT staff or a contract lab decontaminated pump tubing, churners, sample containers, filters, or other materials that came into contact with sampled stormwater prior to each use. Intake tubing was cleaned prior to installation and changed once each year.

For more detailed descriptions of decontamination procedures, see the *Quality Assurance Project Plan for Baseline Monitoring of WSDOT Highway Runoff* (WSDOT 2011a).

3.7 Staff Roles and Responsibilities

WSDOT used Stormwater and Watersheds Program staff in the Headquarters (HQ) Environmental Services Office (ESO) and staff from the department's region offices to implement its highway runoff monitoring program. Eight staff from the HQ ESO played key roles in the stormwater monitoring strategy. Staff from field offices in Mount Vernon and Spokane supported ESO efforts on a part-time basis and participated in stormwater monitoring at different levels.

3.8 Monitoring Costs

Implementing a monitoring program to satisfy requirements in Special Condition S7 of the NPDES municipal stormwater permit was a complex and resource intensive endeavor. WSDOT developed several strategies to reduce costs, conserve resources, and address logistical challenges in implementing the monitoring program.

Appendix B provides an overview of the monitoring program implementation plan, and an estimate of labor, equipment, infrastructure, and analytical costs. The discussion begins with development of the monitoring program under the previous NPDES municipal stormwater permit (Ecology 2009a).

4 Quality Assurance and Quality Control

The *Quality Assurance Project Plan for Baseline Monitoring of WSDOT Highway Runoff* (WSDOT 2011a) includes a description of quality assurance and quality control activities.

WSDOT implemented quality control (QC) procedures through all phases of data collection and analyses. Quality control procedures included field collection and laboratory processing for all permit-required samples. Additionally, verification and validation of laboratory-generated data occurred as part of data management activities. The quality of raw, unprocessed, and processed data was subject to review and management, including the following areas of work:

1. **Field quality control**
   - Implementation of standard operating procedures
   - Field instrument inspection, calibration, and maintenance
   - Site conveyance systems inspection and maintenance
   - Collection of field notes and maintenance documentation
   - Collection of composite field duplicate/grab field replicate samples
   - Collection of field equipment blanks
2. **Laboratory quality control**
   - Laboratory instrument maintenance and calibration
   - Analysis of laboratory duplicate/split samples
   - Analysis of laboratory matrix spike and matrix spike duplicate samples
   - Analysis of laboratory blanks and standards
3. **Data management**
   - Hydrology and precipitation data verification and validation
   - Field data verification
   - Correction of data gaps, anomalies, and use qualification for precipitation and hydrology data
   - Laboratory data verification and validation
   - Self-assessment and audit of project processes

WSDOT used third-party data validators to perform validation on the analytical data as part of data management. Additionally, WSDOT's data quality consultant prepared an analytical data quality assessment report (Appendix C). This report provides an overview of the analytical scheme, data verification and validation procedures, and quality of analytical data collected. The quality of data is assessed and discussed in terms of measurement quality objectives (MQOs) (i.e., precision, accuracy, representativeness, comparability, sensitivity, and completeness). The analytical data quality assessment report includes data collected from all WSDOT monitoring sites, including the department's highway runoff characterization and BMP effectiveness monitoring sites.

5 Monitoring Results

This chapter presents stormwater runoff, toxicity, and sediment monitoring data collected from WSDOT highway runoff characterization sites in water years 2012 through 2014 (WY12-WY14). The presentation of these data fulfills monitoring reporting requirements in Special Condition S7.B.7 of the 2014 WSDOT NPDES municipal stormwater permit.

WSDOT notes that staff collecting and processing the data have a familiarity with the nuances of the monitoring sites and conditions in which the data were collected. As such, WSDOT also presents some discussion, analysis, and interpretation of the data based on staff expertise. WSDOT does this to provide information for the agency beyond meeting compliance targets.

This chapter includes:

- Stormwater sampling attempt records
- Stormwater sampling results
- Sediment sampling results
- Toxicity sampling results
- Rain to highway runoff relationships
- Pollutant loading calculations
- Changes to methods and monitoring station infrastructure
- Stormwater management actions taken or planned to reduce pollutants
- Lessons learned

Two additional permit-mandated reporting requirements are presented in Appendix A – Storm Reports. The permit requires the following information for each sampled storm event:

- Antecedent dry period, inter-event period,[2] and total precipitation depth; and
- A graphical representation of the storm's hyetograph and hydrograph, with aliquot collection points spatially located throughout the hydrograph; the sampled time period (percent of hydrograph sampled), total runoff time period, and total runoff volume.

5.1 Stormwater Sampling Attempt Records

In water years 2013 and 2014 (WY13-WY14),[3] WSDOT field staff collected 165 stormwater grab and composite samples from highway runoff monitoring sites. Appendix D provides a sampling attempt record, with respective locations and dates.

[2] The inter-event period is not displayed in the tables in Appendix A. The data loggers used in this monitoring study do not allow sampling to occur unless the inter-event criterion is met. So, it is assumed that this requirement is met for all storm events.

[3] Samples were collected from minimal storm events in WY12. These events are not included in the WY13-WY14 sampling attempt record.

To coincide with laboratory hours of operation, and with agreement from the Washington State Department of Ecology (Ecology) (WSDOT. 2011a), WSDOT collected most of its stormwater samples during a standard work week, from Monday morning through noon on Friday. On occasion, WSDOT used preset automated composite samplers to sample weekend storm events.

For details on the stormwater sampling methods utilized, refer to the *Quality Assurance Project Plan (QAPP) for Baseline Monitoring of WSDOT Highway Runoff* (WSDOT 2011a) and Chapter 3 of this report.

5.1.1 I-5 Pilchuck Creek Monitoring Site (Pilchuck 01)

There were 58 storm events forecast to qualify in WY13-WY14 at the Pilchuck 01 (MP 210.71) monitoring site. Thirty-three events met permit storm criteria, and 24 of those events occurred during the normal work week. WSDOT collected a total of 17 composite samples and 21 grab samples at this site.

5.1.2 I-5 Everett Monitoring Sites (Everett 01 and Everett 04)

At the Everett 01 (MP 197.27) monitoring site, there were 62 storm events forecast to qualify in WY13-14. Thirty-six events met permit storm criteria; 28 of those events occurred during the normal work week. WSDOT collected 14 composite samples and 19 grab samples at this site.

At Everett 04 (MP 197.35), there were also 62 storm events forecast to qualify in WY13-WY14. Thirty-six events met permit storm criteria, and 28 events occurred during the normal work week. WSDOT collected 16 composite samples and 18 grab samples at this site.

5.1.3 SR 9 Marysville Monitoring Site (SR9 01)

At the SR9 01 (MP 17.92) monitoring site, there were 69 storm events forecast to qualify in WY13-WY14. Thirty-three events met permit storm criteria; 27 of those events occurred during the normal work week. WSDOT collected a total of 20 composite samples and 19 grab samples at this site.

5.1.4 I-90 Pines Monitoring Site (Pines 01)

At the Pines 01 (MP 289.55) monitoring site, there were 51 storm events forecast to qualify in WY13-WY14. Seventeen events met permit storm criteria; 15 of those events occurred during the normal work week. WSDOT collected 12 composite samples and 11 grab samples at this site.

5.2 Stormwater Sampling: Results and Discussion

Stormwater samples are discussed by sample parameter type and listed below. Appendix E and Appendix F include a complete list of all sample data and corresponding sample dates.

Many variables affect pollutant concentrations in stormwater runoff including storm intensity, antecedent dry period, adjacent land use, condition of the sample collection area, and others. Previous research found that an analysis of any of these variables individually does not provide strong statistical substantiation (Kayhanian et al., 2003); in part, due to the many conflicting variables at play. Instead multivariate analyses, such as multiple linear regression (MLR), provide better analysis of the factors affecting highway runoff (Caltrans 2003b; Kayhanian et al., 2003). Multivariate analyses simultaneously assess the multiple independent variables that often coincide with analysis of the relationships between the independent variables, such as MLR. Looking at multiple factors may assist in overall analyses and in determining the impacts of individual variables.

WSDOT initially intended to conduct statistical analysis on various independent variables, such as antecedent dry period and storm intensity. However, research demonstrating the ineffectiveness of single variable analysis convinced WSDOT staff to forego this analysis for this report (Kayhanian et al., 2003).

In this report, WSDOT's discussion of stormwater sampling results focuses on observable sample results and a qualitative discussion of factors believed to impact sample results. These observations often apply to variables such as annual average daily traffic (AADT) and seasonality, but are discussed with the caveat that higher-level statistical analysis is not presented.

5.2.1 Guidelines for Understanding Presented Data

Before discussing specific sample results, WSDOT notes general qualifiers that apply to all or most data. This is done to prepare the reader for the discussion as well as reduce the need to repeat these qualifiers when discussing each sample parameter. These notes are:

- "Dry season" and "wet season" apply to the permit designations. For western Washington sites, the wet season occurs from October 1 through April 30, and the dry season is from May 1 through September 30. For the eastern Washington site, the wet season occurs from October 1 through June 30, and the dry season is from July 1 through September 30.
- "Outliers" in the data are determined qualitatively using best professional judgment. Stormwater events are flashy in nature, and stormwater runoff often exhibits high pulses of pollutants that may differ significantly between events due to factors such as antecedent dry periods. Using a standard outlier detection calculation such as the interquartile range (IQR) was found to inaccurately remove some of these legitimate high pulses of pollutants.

Variations on the IQR or utilizing higher-level statistical methods were found impractical at the current level of analysis. Instead, staff utilized observations and knowledge of the monitoring sites, storm event data, and laboratory notes to determine outliers.

For example, nitrate-nitrite samples from one storm event were rejected due to much higher values than the average site samples, and because the laboratory reported potential anomalies in the laboratory analysis. Further examination found higher than average concentrations in nitrate-nitrite for multiple monitoring sites from samples submitted from the same event.

- Data rejected as outliers in this chapter's data summary tables are still reported in Appendix E. As mentioned, outliers are qualitatively assessed and removed so as to not bias the statistical calculations of means, medians, and others. However, further collection of data may warrant inclusion or changes to the interpretation of the outliers. As such, WSDOT retains these outliers as part of the overall data set.
- One exception to determining outliers qualitatively was for fecal coliform (FC) samples. FC exhibited occasionally high sample concentrations in tandem with observed mouse activity in the sample collection and conveyance systems. These qualifiers made staff less willing to accept high sample concentrations as just pulses of a pollutant. As a result, the more conservative IQR was used to determine FC outliers.
- More samples were collected for all sites in the wet seasons than the dry seasons. This skew should be considered when comparing seasonal data.
- Sampling accuracy improved consistently from WY12 through WY14. WSDOT staff used field observations, and adaptive implementation and design to constantly improve methods. For example, staff observations of field mice in the sampling collectors led to increasing the cleanout frequency of the conveyance systems. This learning and improvement does not invalidate earlier collected data but does increase the confidence in subsequently collected data.
- Sample patterns in relation to the variables of seasonality, AADT, and eastern or western Washington site locations are more frequently discussed than other variables, such as antecedent dry periods. This is simply due to these variables being more feasibly observed in relation to the data. Seasonality, AADT, and climate should not be interpreted as "more significant" in affecting highway runoff pollutant concentrations. Other variables, such as storm intensity, require more calculation and processing to determine statistical trends. If higher-level statistical analysis were to be conducted, these other important independent variables could be included.
- Comparisons between water years, for example comparing Everett 01 WY13 and WY14 dry season dissolved copper samples, are impossible due to the overall lower number of samples for those discrete periods. These comparisons do not constitute a significant

portion of the discussion. However, for a few constituents year to year patterns are noted and discussed.

- Coefficient of variation (CV) is referenced heavily in the following sections. The CV represents the ratio of the standard deviation to the mean. Values less than 1.0 indicate data that have less variability and are more stable than data with higher than 1.0 CV. Referencing the CVs for different sample constituents and monitoring sites allows for easier comparisons between those constituents and sites.
- Comparisons between the sample constituent means and medians are frequently made in the following sections. The mean is the calculated average of a group of values, such as the average of the Everett 01 orthophosphate sample concentrations. The median is the “middle number” in a list of values. When means and medians are close in value, it indicates overall symmetry of data. As such, close means and medians are mentioned when observed. However, this should not be misconstrued to say that means and medians must be close, or track together, for data to be reliable. As mentioned previously, stormwater runoff often exhibits high pulses of pollutants and may create a mean sample concentration that does not track well with its median.

5.2.2 Total Suspended Solids

Total suspended solids (TSS) are the measure of suspended solids in a body of water. TSS is directly related to turbidity and conductivity, and can contribute to water quality impacts such as the sedimentation of streambeds and light reduction in water bodies. TSS is often a carrier of other pollutants, such as metals and glyphosate, which adhere to suspended solid particulates.

TSS samples were obtained at all highway runoff monitoring sites. Table 5 displays TSS minimum, median, maximum, mean, standard deviation, coefficient of variation (CV), and sample size (*n*) values. Appendix E provides sample values for discrete storm events.

Table 5 WY12-WY14 TSS Sample Concentrations (mg/L)

Monitoring Site	Minimum	Median	Maximum	Mean	Standard Deviation	CV	*n*
Pilchuck 01 (urbanized)	21	55.5	117	60.33	26.16	0.43	18
Everett 01 (highly urbanized)	23	51.5	132	58.75	34.77	0.59	12
Everett 04 (highly urbanized)	36	58.5	109	64.67	21.89	0.34	18
SR9 01 (rural)[1]	16	44	161	61.50	40.58	0.66	18
Pines 01 (urbanized)	27	54.5	117 J	63.38	30.19	0.48	8

[1] One previously reported TSS value of 288 mg/L was rejected as an outlier. Field notes for this event indicate the sample collection tubing was buried in sediment, which violates standard sample collection methods. The buried sample tubing may have biased TSS collection, resulting in the unusually high TSS value.

J Estimated value

Discussion of WY12-WY14 TSS Results

Site mean TSS concentrations ranged from 58.75 mg/L to 64.67 mg/L, median concentrations ranged from 44 mg/L to 55.5 mg/L, and overall concentrations ranged from 16 mg/L to 161 mg/L.

All site coefficients of variation (CVs) were less than 1.0. Seasonal variations between TSS sample concentrations did not display any clear patterns. For example at Everett 01 the cumulative wet season TSS average of 73 mg/L was higher than the dry season average of 44.5 mg/L. At the adjacent Everett 04 site the wet season average of 65.8 mg/L was roughly equal to the dry season average of 64.1 mg/L. At the nearby Pilchuck 01 site, the wet season average of 49 mg/L was less than the dry season average of 83 mg/L. Yet, at the other nearby SR9 01 study site the wet season average of 75.5 mg/L was higher than the dry season average of 33.5 mg/L. These wide variations between proximate sites suggest that seasonality in the current dataset is not a good indicator of TSS concentrations.

Observable TSS patterns in relation to AADT and eastern or western Washington location were also not detected, despite having dozens of samples for comparison. Whether these variables are generally non-impactful or masked by other variables such as storm intensity may be determined by higher-level statistical analysis. Other studies (Caltrans 2003b, Kahanian et al., 2003) indicate storm intensity and antecedent dry periods are particularly significant in relation to TSS.

Finally, as mentioned earlier, site maintenance and stormwater conveyance system cleanout methods improved from WY12 through WY14. In tandem, WY14 TSS concentrations were lower overall than WY12 and WY13 values. Further analysis is needed to determine whether improved site maintenance and conveyance system cleanout methods reduced TSS concentrations.

5.2.3 Fecal Coliform

Fecal coliform is a bacterium that lives in the digestive tracts of many species of warm-blooded animals and is excreted in their feces. Fecal coliform bacteria are not generally harmful to humans, but often coincide in time and place with other pathogenic species of bacteria. High amounts of fecal coliform are used as indicators of the presence of these other pathogenic species, which are usually more difficult and expensive to detect.

Fecal coliform samples were obtained from all highway monitoring sites. Table 6 displays fecal coliform minimum, median, maximum, mean, standard deviation, coefficient of variation (CV), and sample size (*n*) values. Appendix E shows sample values for discrete storm events.

Table 6 WY12-WY14 Fecal Coliform Sample Concentrations (cfu /100 ml) [1]

Monitoring Site	Minimum	Median	Maximum[3]	Mean	Standard Deviation	CV	*n*
Pilchuck 01 (urbanized)	18	1850	8300	2112	2223	1.05	16
Everett 01 (highly urbanized)	240	3000	9300	3413	2604	0.76	16
Everett 04 (highly urbanized)	100	2600	16000	4661	5011	1.08	15
SR9 01 (rural)	12	460	2900	829	874	1.05	15
Pines 01 (urbanized)[2]	300	600	900	600	424	0.71	2

[1] cfu - "colony forming units."

[2] Pines 01 has too low an *n*-value for interpretation and application of statistical values.

[3] Several samples with extremely high FC values were rejected as outliers. As mentioned previously, staff utilized the interquartile range (IQR) for determining FC outliers.

Discussion of WY12-WY14 Fecal Coliform Results

As measured in colony forming units (cfu), mean fecal coliform (FC) concentrations ranged from 600 cfu/100 ml to 4661 cfu/100 ml, median concentrations ranged from 460 cfu/100 ml to 3,000 cfu/100 ml, and total values ranged from 12 cfu/100 ml to 16,000 cfu/100 ml. These results demonstrate the characteristic variability in FC data.

It is noted that three of the sites had CVs greater than 1.0, indicating high variation of the data. Additionally, WSDOT rejected several FC values as outliers due to probable contamination from mice residing in the sample conveyance systems. These outliers were determined by calculating the data's interquartile range (IQR) and rejecting values 1.5 times the IQR below and above the first and third quartiles. The presence of high variation and many outliers limits the assumptions that can be derived from the FC data. Four of the sites that had both permit-defined wet and dry season samples displayed higher dry season mean concentrations. However, the standard deviations generally exceeded the differences between the wet and dry season means, making evaluation of seasonal trends impossible. One site, Pines 01, did not provide any dry season FC samples.

Definitive analysis and reasons for high FC deviation are beyond the scope of this paper. However, two observations are noted: (1) the sources of FC are often discrete and may create large pulses of FC in stormwater runoff; and (2) as mentioned, sample conveyance systems were systematically inhabited by field mice, with observed mouse excrement in the systems. Field staff regularly cleaned the systems, partially in response to the observed activity, but the mouse activity remained a potential source of FC.

In April 2014, in response to concerns about FC contributions from mice, staff collected reference samples from highway stormwater runoff before it entered the sample conveyance and collection areas. The reference sample values ranged from 600 cfu/100 ml to 2300 cfu/100 ml, falling within the monitoring sites mean and median ranges.

5.2.4 Chloride

Chlorides are easily soluble salt compounds formed when geologic materials are dissolved in water. They occur naturally in marine and groundwater environments, and to a significantly lesser degree, in freshwater. Road salts, agricultural fertilizers, industrial processes, and other human-generated sources may contribute chlorides to receiving land and water, and are often introduced at concentrations harmful to the resident biological community.

Chloride samples were obtained from all highway monitoring sites. Table 7 displays chloride minimum, median, maximum, mean, standard deviation, coefficient of variation (CV), and sample size (*n*) values. Appendix E lists sample values for discrete storm events.

Table 7 WY12-WY14 Chloride Sample Concentrations (mg/L)

Monitoring Site	Minimum	Median	Maximum	Mean	Standard Deviation	CV	*n*
Pilchuck 01 (urbanized)	0.92	4.67	27.6	7.82	8.01	1.02	18
Everett 01 (highly urbanized)	1.34	4.5	56.7	14.52	18.05	1.24	11
Everett 04 (highly urbanized)	2.26	4.095	47.5	10.24	13.29	1.30	16
SR9 01 (rural)	0.46	1.78	6.98[1]	2.64	1.90	0.72	17
Pines 01 (urbanized)	8.87	22.3	38.9[2]	22.88	9.95	0.43	8

[1] A chloride concentration value of 64.3 mg/L was identified as an outlier due to comparison with other SR9 01 values, time of year, and a corresponding outlier hardness value. The chloride concentration value itself is not cause for concern.

[2] A chloride concentration value of 229 mg/L was identified as an outlier because it is five times higher than the next highest value, and the sample was collected during a time of year when there were no road salt applications or other known potential contributors to chlorides concentrations.

Discussion of WY12-WY14 Chloride Results

Mean chloride concentrations ranged from 2.64 mg/L to 22.88 mg/L, median concentrations ranged from 1.78 mg/L to 22.3 mg/L, and total values ranged from 0.46 mg/L to 56.7 mg/L. Chloride CVs were greater than 1.0 at three monitoring sites, indicating high variation of the data.

However, despite the variation, the pulses of high chloride concentrations are presumed to be representative. These pulses are thought to coincide with road salt applications during inclement weather, which may deliver heavy concentrations of chlorides during discrete storm events. For this reason, elevated concentrations which would often be considered outliers in relation to other chlorides measurements are included in the data.

Western Washington seasonal variations between chloride sample concentrations displayed a clear pattern, with the highest values during the winter and early spring. Depending on the site, values steadily increased in winter or early spring, followed by consistent reductions in chloride at all sites into late spring and summer. As mentioned, this pattern is believed to coincide with road salt applications during inclement weather. In comparison to the permit-specified wet and dry seasons, chloride means at western Washington sites ranged as follows:

- Wet Season – 3.34 mg/L to 22.19 mg/L
- Dry Season – 1.34 mg/L to 5.30 mg/L

A few high-chloride events occurred at the western Washington sites during the summer and fall seasons, emphasizing that chloride concentrations may potentially be affected by other factors such as storm intensity or antecedent dry periods.

The single eastern Washington site, Pines 01, displayed the highest consistent chloride concentrations of any monitoring site and exhibited these concentrations without a strong seasonal trend. Pines 01 values ranged from 8.87 mg/L to 38.9 mg/L, with a wet season average of 23.95 mg/L and a dry season average of 19.69 mg/L. Pines 01 also had one chloride value of 229 mg/L, which was rejected as an outlier. The reasons for higher values or lack of seasonal trend at the Pines 01 site are not known. Pines 01 had a relatively low *n* value of eight samples and is subject to significantly different conditions than western Washington. Some of these factors include different snowfall and road salt application patterns, different antecedent dry periods, lower overall precipitation, presence of a concrete curb to guide highway runoff, and proximity to the entrance ramp onto Interstate 90 (I-90).

Finally, the SR9 01 site that has the lowest AADT (20,000 AADT) and is the only rural designation site, had consistently lower chloride concentrations than any other site. The site's lower chloride values were consistent across all monitored years and seasons, though like other western Washington sites, SR9 01 displayed higher wet than dry season concentrations.

5.2.5 Hardness

The hardness of water is determined by its concentration of calcium and magnesium salts, largely combined with bicarbonate and carbonate, and with sulfates, chlorides, and other mineral acids. Hardness is often used as one of the indicators of water quality, as excessive levels of hardness can negatively impact aquatic life and industrial applications.

Hardness also affects the bioavailability of metals in solution. For example, the toxicity of "heavy metals," including copper and zinc, decreases with increasing water hardness. USGS (2013) provides the following general guidelines for classification of water hardness: 0 to 60 mg/L as calcium carbonate (CaO3) is classified as soft; 61 to 120 mg/L as moderately hard; 121 to 180 mg/L as hard; and more than 180 mg/L as very hard. Moderately hard waters are common in many rivers of the Pacific Northwest (USGS 2013).

Hardness samples were obtained from all highway monitoring sites. Table 8 displays hardness minimum, median, maximum, mean, standard deviation, coefficient of variation (CV), and sample size (*n*) values. Appendix E lists sample values for discrete storm events.

Table 8 WY12-WY14 Hardness Sample Concentrations (mg/L)

Monitoring Site	Minimum	Median	Maximum	Mean	Standard Deviation	CV	*n*
Pilchuck 01 (urbanized)	17	31.35	46.5	30.74	7.76	0.25	18
Everett 01 (highly urbanized)	11.5	18.7	56.0	24.26	14.98	0.62	10
Everett 04 (highly urbanized)	8.67	17	50.2	20.05	10.51	0.52	17
SR9 01 (rural)	3.99	6.85	16.7[1]	8.11	3.12	0.38	16
Pines 01 (urbanized)	31.7	37.55	44.0	37.37	4.81	0.13	6

[1] Site had an outlier value of 89.4 mg/L, believed to be an outlier due to comparison with other SR9 01 values and a corresponding outlier chlorides value.

Discussion of WY12-WY14 Hardness Results

Mean hardness concentrations ranged from 8.11 mg/L to 37.37 mg/L, median concentrations ranged from 6.85 mg/L to 37.55 mg/L, and total hardness values ranged from 3.99 mg/L to 56.0 mg/L. It is noted that all site CVs were less than 1.0, and that the means and medians track closely.

Hardness results did not show any strong or clear patterns to seasonality for western or eastern Washington with the exception of an association to sample events with high chloride concentrations. Chloride can be a component of hardness, and high chloride concentrations can increase hardness values. For example, at the Everett 04 site the maximum chloride value of 47.5 mg/L was obtained from the same event as the maximum hardness value of 50.2 mg/L. Other sites demonstrated similar patterns of high chlorides associated with high hardness.

However, in the current dataset hardness did not appear to have the same influence on chlorides. Many sample events with high hardness values did not also show high chloride concentrations.

The eastern Washington site, Pines 01, displayed the highest consistent hardness concentrations of any monitoring site. Pines 01 values ranged from 31.7 mg/L to 44.0 mg/L. However, Pines 01 only had a total *n* value of 6, which limits analysis. Additionally, Pines 01 only had a dry season *n* value of 2, making seasonal comparisons impossible.

The reasons for Pines 01 higher hardness values are not known. Many of the factors contributing to Pines 01 high chloride values may also affect its hardness concentrations, including road salt application patterns, different antecedent dry periods, and lower precipitation than western Washington.

Finally SR9 01, the lowest AADT site monitored, had consistently lower hardness concentrations than the other sites. This site's lower hardness values were consistent across all monitored years and seasons. SR9 01 also had the lowest chlorides values of the monitored sites, and again, many of the factors affecting chlorides may influence hardness.

5.2.6 Nutrients

Nitrogen and phosphorus are often limiting nutrients for plant and algal growth, existing in short supply relative to other nutrients. However, introduction of these nutrients into a lower-nutrient aquatic system can result in increased algal populations. Higher algae populations can create water quality issues such as eutrophication and harmful algal blooms. In addition, heavy concentrations of some nutrients are directly toxic to humans and aquatic life.

WSDOT sampled four forms of nitrogen and phosphorus:

- Total phosphorus – A combination of both organic and inorganic phosphate (phosphorus usually occurs in nature as phosphate).
- Orthophosphate – An inorganic phosphate and the most readily available form to plants.
- Nitrate-nitrite – The total of nitrate and nitrite concentrations. Nitrate is the form of nitrogen most readily available to plants and algae.
- Total Kjeldahl Nitrogen (TKN) – The total of organic nitrogen and ammonia.

Nutrient samples were obtained from all highway monitoring sites.

Tables 9, 10, 11, and 12 display minimum, median, maximum, mean, standard deviation, coefficient of variation (CV), and sample size (*n*) values for total phosphorus, orthophosphate, nitrate-nitrite, and TKN, respectively. Appendix E lists sample values for discrete storm events.

Table 9 WY12-14 Total Phosphorus Sample Concentrations (mg/L)

Monitoring Site	Minimum	Median	Maximum	Mean	Standard Deviation	CV	*n*
Pilchuck 01 (urbanized)	0.0562	0.1014	0.266	0.1148	0.0503	0.44	18
Everett 01 (highly urbanized)	0.0423	0.1120	0.258	0.1148	0.0597	0.52	11
Everett 04 (highly urbanized)	0.0533	0.114	0.268	0.1224	0.0555	0.45	17
SR9 01 (rural)	0.0335	0.076	0.141[1]	0.0841	0.0299	0.36	17
Pines 01 (urbanized)	0.109	0.156	0.272	0.1763	0.0650	0.37	7

[1] Site had an outlier value of 11.10 mg/L, believed to be an outlier due to comparison with other SR9 01 values and other outlier constituents from the same sampling event.

Discussion of WY12-WY14 Total Phosphorus

Table 9 shows mean total phosphorus concentrations ranged from 0.0841 mg/L to 0.1763 mg/L, median concentrations ranged from 0.0760 mg/L to 0.156 mg/L, and total concentrations ranged from 0.0335 mg/L to 0.272 mg/L. All site CV values were less than 1.0, and the means and medians track closely.

Total phosphorus results displayed a slight trend to seasonality, with four of the five sites having higher average sample concentrations in the dry seasons than the wet seasons. The maximum percent difference between the seasonal averages was 55 percent.

The eastern Washington site, Pines 01, displayed the highest consistent total phosphorus concentrations of any monitoring site. Pines 01 generally has greater antecedent dry periods than the western Washington monitoring sites. Antecedent dry period may be an influencing factor, among others.

The SR9 01 site that has the lowest AADT and only rural designation had consistently lower total phosphorus concentrations than any other site.

It is noted that SR9 01 did have one major outlier of 11.10 mg/L early in the sampling period, and noticeably lower sample concentrations in WY14 than WY13. Of all the monitoring sites, SR9 01 had the strongest tendency to accumulate sediment and detritus in the sample collection area. Accumulated debris may be responsible for high total phosphorous concentrations early in the sampling period. Lower concentrations in WY14 may be attributed to improved collection system clean-out methods as part of a continuing learning curve. Further analysis is needed to determine whether improved system clean-out methods reduced total phosphorous concentrations.

Table 10 WY12-14 Orthophosphate Sample Concentrations (mg/L)

Monitoring Site	Minimum	Median	Maximum	Mean	Standard Deviation	CV	*n*
Pilchuck 01 (urbanized)	0.01 U	0.0125	0.0270	NA	NA	NA	11
Everett 01 (highly urbanized)	0.01 U	0.012	0.027[1]	0.016	0.006	0.375	7
Everett 04 (highly urbanized)	0.005 U	0.01 U	0.0183	NA	NA	NA	9
SR9 01 (rural)	0.005 U	0.01 U	0.018	NA	NA	NA	10
Pines 01 (urbanized)	--	--	--	--	--	--	--

[1] Site had an orthophosphate concentration value of 1.12 mg/L that was identified as an outlier because it is 41 times higher than the next highest value. There were no known contributing sources for such a value.

-- Parameter not sampled

U The analyte was not detected at a level greater than or equal to the level of the permit-required reporting limit.
NA Statistical values were not calculated due to the high number (>30%) of non-detect values.

Discussion of WY12-WY14 Orthophosphate

Orthophosphate concentrations ranged from 0.005 U mg/L to 0.0270 mg/L. As noted in Table 10, "U" denotes that a sample concentration was not detected at a level greater than or equal to the permit-required reporting limits. As such, mean, median, standard deviation, and coefficient of variation (CV) calculations are not appropriate for sites with numerous values below the reporting limit, since the actual values for these constituents are unknown.

One site, Everett 01, did display consistent orthophosphate detections, with a mean of 0.016 mg/L and a median of 0.012 mg/L. Why Everett 01 displayed consistent detections is unknown, particularly since these detections were not replicated in the adjacent Everett 04 site. Everett 01 has been observed as a frequent pull off site for large transport trucks. Cargo associated with these trucks may be a vector for introducing orthophosphate to the site. Further analysis is needed to determine whether cargo associated with the truck pull off site increased orthophosphate concentrations.

Orthophosphate displayed a seasonal pattern, with all four sampled monitoring sites exhibiting higher average concentrations in the dry seasons than the wet seasons. The maximum percent difference between Everett 01 seasonal averages was 56 percent.

No orthophosphate samples were collected at Pines 01, the monitoring site in eastern Washington. This was due to a combination of orthophosphate's short 48-hour holding time, extended shipping times to WSDOT's contract laboratory, and limited staff availability. The short orthophosphate holding times, in general, resulted in fewer orthophosphate samples than other highway constituents. The smaller sample size affects the quality of the data set and should be a factor in any analysis and interpretation of the results.

Table 11 WY12-14 Nitrate-Nitrite Sample Concentrations (mg/L)

Monitoring Site	Minimum	Median	Maximum	Mean	Standard Deviation	CV	*n*
Pilchuck 01 (urbanized)	0.042	0.206	0.566	0.2291	0.1564	0.6827	14
Everett 01 (highly urbanized)	0.202	0.4225	0.740[1]	0.4329	0.2015	0.4655	10
Everett 04 (highly urbanized)	0.149	0.3815	0.983	0.4521	0.2601	0.5753	16
SR9 01 (rural)	0.061	0.2200	0.43	0.2271	0.1060	0.4668	16
Pines 01 (urbanized)	0.337 J	0.364	0.62	0.412	0.119	0.2888	5

[1] Site had two samples identified as outliers with values of 2.9 mg/L and 1.3 mg/L. The 1.3 mg/L value was initially rejected by the analyzing laboratory and noted as anomalous. WSDOT's third-party data validator later changed the value from rejected (R-qualified) to an estimate (J-qualified). The combination of a very high relative value along with the qualifier questions prompted staff to reject the value as an outlier. The 2.9 mg/L value was rejected as an outlier because it is approximately four times higher than the next value, differing strongly from the general site data.

J Estimated value.

Discussion of WY12-WY14 Nitrate-Nitrite

Mean total nitrate-nitrite concentrations ranged from 0.2271 mg/L to 0.4521 mg/L, median values ranged from 0.206 mg/L to 0.4225 mg/L, and total values ranged from 0.042 mg/L to 0.983 mg/L. All site coefficients of variations (CVs) were less than 1.0, and the means and medians track closely.

Nitrate-nitrite results displayed a seasonal pattern, with all five monitoring sites having higher average sample concentrations in the dry seasons than the wet seasons. The maximum percent difference between seasonal averages was 42 percent.

Each of the highway runoff characterization sites displayed a slight association in regards to AADT. The highest AADT sites, Everett 01 and Everett 04, exhibited the highest nitrate-nitrite concentrations. These sites show similar mean and median nitrate-nitrite concentrations, which is not surprising since these sites are located close to one another.

Results from the eastern Washington urban designated site, Pines 01, also show relatively high concentrations of nitrate-nitrite. Though only five samples were collected, concentrations ranged to a maximum 0.62 mg/L. These higher concentrations may be due to a combination of factors including higher traffic volumes and longer antecedent dry periods. Further analysis is needed to determine whether high traffic volumes and longer antecedent dry periods increased nitrate-nitrite concentration at this site.

The urbanized and rural monitoring sites in western Washington show lower nitrate-nitrite concentrations.

Table 12 WY12-14 Total Kjeldahl Nitrogen Sample Concentrations (mg/L)

Monitoring Site	Minimum	Median	Maximum[1]	Mean	Standard Deviation	CV	*n*
Pilchuck 01 (urbanized)	0.57 J	1	1.96	1.13	0.42	0.37	13
Everett 01 (highly urbanized)	0.85 J	1.6	3.9300	1.94	1.09	0.56	11
Everett 04 (highly urbanized)	0.46 J	1.4	4.29	1.63	1.00	0.61	13
SR9 01 (rural)	0.61	1.2	3.06	1.46	0.79	0.54	14
Pines 01 (urbanized)	0.69	0.96	3.57	1.55	1.37	0.88	4

[1] All 7-23-14 TKN samples were rejected as outliers. Unreasonably high TKN results for this date appear to be laboratory analytical errors (see Appendix E for TKN analytical results).

J Estimated value

Discussion of WY12-WY14 Total Kjeldahl Nitrogen (TKN)

Table 12 shows mean TKN concentrations ranged from 1.13 mg/L to 1.94 mg/L, median concentrations ranged from 0.96 mg/L to 1.6 mg/L, and total values ranged from 0.46 J mg/L to 4.29 mg/L. All site coefficients of variation (CVs) were less than 1.0. With the exception of Pines 01, the means and medians track closely for all sites. The Pines 01 site has a very small sample size, which may contribute to the discrepancy between its mean and median.

TKN values displayed a seasonal pattern, with all five sites having higher average sample concentrations in the dry seasons than the wet seasons. The maximum percent difference between seasonal averages was 82 percent. Additionally, a difference between WY13 and WY14 was noted, with WY14 having higher TKN concentrations. This may be due to the much larger number of dry season samples in WY14.

No significant patterns in relation to AADT or geographic region were observed.

5.2.7 Metals

Metals can have a significant effect on aquatic life, with some being essential and others toxic. Some normally beneficial metals can become toxic at higher concentrations. Many factors influence metals behavior and concentrations in water including temperature, pH, hardness, and alkalinity, among others. Metals can also bind to many organic and inorganic compounds in suspended particulate matter. Dissolved metals are more bioavailable and have a stronger impact on aquatic organisms, though non-dissolved metal particulates may still affect aquatic life.

WSDOT sampled four metals known to be toxic to aquatic life: copper, lead, cadmium, and zinc. Both total recoverable and dissolved phases of the metals were collected.

Tables 13, 14, 15, and 16 display minimum, median, maximum, mean, standard deviation, coefficient of variation (CV), and sample size (*n*) values for total and dissolved copper, zinc, lead, and cadmium, respectively. Appendix E lists sample values for discrete storm events.

Table 13 WY12-WY14 Total and Dissolved Copper Sample Concentrations

***Total Recoverable Copper* (µg/L)**							
Highway Monitoring	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	11.4	22.4	36.1	23.29	6.97	0.30	11
Everett 01 (highly urbanized)	21.7	38.6	51.8	38.48	11.49	0.30	9
Everett 04 (highly urbanized)	19.6	33.1	64.8	37.85	16.77	0.44	10
SR9 01 (rural)	9.43	16.6	26.1	16.38	4.55	0.28	11
Pines 01 (urbanized)	18.6	22.35	37.2	24.68	6.73	0.27	6
***Dissolved Copper* (µg/L)**							
Highway Monitoring	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	3.99	6.3	9.9	6.48	1.85	0.29	11
Everett 01 (highly urbanized)	6.05 J	12.7 J	38.9 H	17.19	10.22	0.59	9
Everett 04 (highly urbanized)	5.48	12.0	37.5	15.14	10.27	0.68	10
SR9 01 (rural)	1.4	5.11	7.62 H	4.87	2.14	0.44	10
Pines 01 (urbanized)	8.8	10.8	15.8	11.11	2.78	0.25	5

J Estimated value

H The preparation or analysis was performed past the technical holding time, but data quality may not be significantly affected.

Discussion of WY12-WY14 Total and Dissolved Copper Results

Table 13 shows mean total copper concentrations range from 16.38 µg/L to 38.48 µg/L, median values from 16.6 µg/L to 38.6 µg/L, and overall values range from 9.43 µg/L to 64.8 µg/L. All site coefficients of variation (CVs) are less than 1.0, and the means and medians track closely. The adjacent Everett 01 and Everett 04 sites, despite having many samples collected during different storm events, display similar total copper means and medians.

Mean dissolved copper concentrations range from 4.87 µg/L to 17.19 µg/L, median values from 5.11 µg/L to 12.7 J µg/L, and overall values range from 1.4 µg/L to 38.9 H µg/L. Coefficients of variation (CVs) for dissolved copper are less than 1.0 for all sites, though variation in the dissolved copper data set is greater than variation in the total copper results. With the exception of the Everett 01 site, mean and median values track closely.

Total and dissolved copper sample values show an association, with higher total copper concentrations in a composite sample usually accompanied by higher dissolved copper concentrations in the same sample.

Total copper concentrations did not display any clear seasonal patterns. Dissolved copper did exhibit a seasonal pattern, with all monitoring sites having higher average dry season values than wet season values. This pattern occurred even at sites with higher wet season total copper averages. The dissolved copper maximum percent difference between seasons was 57.88 percent.

Total and dissolved copper did display a pattern in relation to AADT, with higher AADT sites exhibiting higher sample concentrations. The highest AADT sites, Everett 01 and Everett 04, had the highest means and medians. The urbanized sites with the second highest AADT levels, Pilchuck 01 and Pines 01, had lower means and medians. The rural SR9 01 site with the lowest AADT had the lowest mean and median values.

Table 14 WY12-WY14 Total and Dissolved Zinc Sample Concentrations

Total Recoverable Zinc (µg/L)							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	56 J	98.8	130	97.30	27.82	0.29	11
Everett 01 (highly urbanized)	64.5	92.9	215	115.73	52.77	0.46	9
Everett 04 (highly urbanized)	84.3 J	169	257	165.63	52.89	0.32	10
SR9 01 (rural)	37.3	58.1	133	66.61	27.39	0.41	11
Pines 01 (urbanized)	79.3	99.15	192	110.20	42.14	0.38	6
Dissolved Zinc (µg/L)							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	14.9	19.6 H	32.1	20.06	5.32	0.27	11
Everett 01 (highly urbanized)	27.7 J	40.5	82.5 H	50.17	20.81	0.41	9
Everett 04 (highly urbanized)	40.6[1]	83.3	94.9 H	77.29	16.79	0.22	9
SR9 01 (rural)	17.1	24.6	34 H	24.15	4.72	0.20	10
Pines 01 (urbanized)[2]	15.7	31.3	42.6	30.48	11.39	0.37	5

[1] An outlier value of 16 µg/L was removed because it was 2.5 times lower than the next site value, and field notes show it was associated with an anomalous sampling event. For these reasons, the value was rejected as an outlier.

[2] Laboratory rejected value of 37.9 µg/L was removed

J Estimated value

H The preparation or analysis was performed past the technical holding time, but data quality may not be significantly affected.

Discussion of WY12-WY14 Total and Dissolved Zinc Results

Table 14 shows mean total and dissolved zinc concentrations. Mean total zinc concentrations range from 66.61 µg/L to 165.63 µg/L, median values from 58.1 µg/L to 169 µg/L, and overall total zinc ranges from 37.3 µg/L to 257 µg/L. Mean dissolved zinc concentrations range from 20.06 µg/L to 77.29 µg/L, median values from 19.6 H µg/L to 83.3 µg/L, and overall values range from 14.9 µg/L to 94.9 H µg/L. Coefficients of variation (CVs) for total and dissolved zinc for all sites are less than 1.0, and the means and median values track closely.

Similar to copper, total and dissolved zinc concentrations were associated with higher total concentrations in a composite sample, usually accompanied by higher dissolved concentrations in the same sample.

Seasonal variations between total and dissolved zinc concentrations did not display any clear patterns. Again similar to copper, total and dissolved zinc displayed a pattern in relation to AADT, with higher AADT sites exhibiting higher sample concentrations. The highly urbanized Everett 01 and Everett 04 had the highest means and median values. The urbanized Pines 01 and Pilchuck 01 had lower means and medians, and the rural SR9 01 had the lowest mean and median values.

Finally, Everett 04 displayed the highest zinc concentrations of all sites, noticeably higher than the adjacent Everett 01 site. The Everett 04 site is immediately down gradient of a galvanized guardrail, and may be sampling zinc loads from the guardrail. Further analysis is needed to determine whether the guardrail increased zinc concentrations.

Table 15 WY12-WY14 Total and Dissolved Lead Sample Concentrations

***Total Recoverable Lead* (µg/L)**							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	35.4	35.4	35.4	NA	NA	NA	1
Everett 01 (highly urbanized)	3.05	5.94	8.83	5.94	4.09	0.69	2
Everett 04 (highly urbanized)	4.17	5.77	7.36	5.77	2.26	0.39	2
SR9 01 (rural)	1.92	3.98	7.64	4.67	2.34	0.50	7
Pines 01 (urbanized)	3.97	5.92	12.1	6.74	3.01	0.45	6
Dissolved Lead (µg/L)							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.665	0.665	0.665	NA	NA	NA	1
Everett 01 (highly urbanized)	0.12	0.176	0.232 H	0.176	0.079	0.45	2
Everett 04 (highly urbanized)	0.156 H	0.193	0.23	0.193	0.052	0.27	2
SR9 01 (rural)	0.085 H	0.12	0.136 H	0.115	0.020	0.17	6
Pines 01 (urbanized)	0.1 U	0.28	0.55	0.30	0.18	0.60	5

Table 16 WY12-WY14 Total and Dissolved Cadmium Sample Concentrations

Total Recoverable Cadmium (µg/L)							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	3.26	3.26	3.26	NA	NA	NA	1
Everett 01 (highly urbanized)	0.148	0.344	0.540	0.344	0.277	0.81	2
Everett 04 (highly urbanized)	0.205	0.3575	0.51	0.358	0.216	0.60	2
SR9 01 (rural)	0.064	0.1	0.146	0.107	0.032	0.30	7
Pines 01 (urbanized)	0.11	0.15	0.29	0.17	0.06	0.35	6
Dissolved Cadmium (µg/L)							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.087 H	0.087 H	0.087 H	NA	NA	NA	1
Everett 01 (highly urbanized)	0.08 H	0.127	0.174	0.127	0.066	0.52	2
Everett 04 (highly urbanized)	0.093 H	0.144	0.195	0.144	0.072	0.50	2
SR9 01 (rural)	0.02 U	0.042	0.1 U	NA	NA	NA	6
Pines 01 (urbanized)	0.1 U	0.1 U	0.1 U	NA	NA	NA	5

U The analyte was not detected at a level greater than or equal to the permit-required reporting limit.

H Preparation or analysis was performed past the technical holding time, but data quality may not be affected.

NA Statistical values were not calculated due to the high number (>30%) of non-detect values.

Discussion of WY12-WY14 Total and Dissolved Lead and Cadmium Results

Due to a misunderstanding early in development of the monitoring program, few lead and cadmium samples were collected at the highway monitoring sites. Only one sample was collected at Pilchuck 01, and just two samples were collected at each of the Everett 01 and Everett 04 monitoring sites. Lack of data limits the value of lead and cadmium analyses at these sites. As part of another study, WSDOT currently collects lead and cadmium data at the highway sites and expects to have sufficient samples for analysis in the future.

Although sample sizes (*n*) are still relatively low, enough data were collected from the SR9 01 and Pines 01 sites to allow some limited discussion. This discussion is presented below.

Total and Dissolved Lead:

Table 15 shows that at the SR9 01 and Pines 01 sites mean total lead concentrations range from 4.67 µg/L to 6.74 µg/L, median values range from 3.98 µg/L to 5.92 µg/L and overall values range from 1.92 µg/L to 12.1 µg/L. Mean dissolved lead concentrations range from 0.115 µg to 0.30 µg/L, median values from 0.12 µg/L to 0.28 µg/L, and overall values range from 0.085 H µg/L to 0.55 µg/L. Coefficients of variation (CVs) for total and dissolved lead for the two sites are less than 1.0, and the means and median values track somewhat closely.

Seasonal variations between sample concentrations did not display any clear patterns. The eastern Washington site, Pines 01, did exhibit higher sample concentrations than the western Washington SR9 01 site.

Total and Dissolved Cadmium:

As Table 16 shows, at the SR9 01 and Pines 01 sites mean total cadmium concentrations range from 0.107 µg/L to 0.17 µg/L, median values range 0.1 µg/L to 0.15 µg/L and overall values range 0.064 µg/L to 0.29 µg/L. Coefficients of variation (CVs) for total cadmium are less than 1.0, and the means and median values track closely.

No mean or CV values were calculated for dissolved cadmium, since many of the values were reported at or below permit-required reporting limits. Overall dissolved cadmium values range from 0.02 U µg/L to 0.1 U µg/L.

Some reported dissolved cadmium values are lower than the permit-required reporting limits due to differences in detection limits at WSDOT's analytical laboratories. In 2014, WSDOT established a new analytical laboratory contract for the department's stormwater monitoring program. Many of the values for metals, polycyclic aromatic hydrocarbons (PAHs), phthalates, and glyphosate detected by the Manchester Environmental Laboratory (MEL), WSDOT's former primary laboratory, exceeded permit-required reporting limits and utilized lower detection limits. WSDOT's current laboratory, AmTest, Inc., generally adheres to the permit-required reporting limits. In some instances, this difference limits ability to compare data values.

Cadmium displayed a pattern observed in other WSDOT metals data, that samples with high or low concentrations of one metal usually have correspondingly high or low concentrations of other metals. The reasons for this association are not fully understood. The association may be attributed to factors that affect the transport of metals, such as being attached to suspended solids; sources of metals such as vehicles, which generate multiple tested metals; and others. Further analysis is needed to confirm any particular association.

Seasonal variations between sample concentrations did not display any clear patterns. As with lead, the eastern Washington site, Pines 01, exhibited higher sample concentrations than the western Washington SR9 01 site.

5.2.8 Total Petroleum Hydrocarbons

Total petroleum hydrocarbons (TPHs) include many different chemical constituents, all originating from oil. TPHs have been shown to have adverse effects on aquatic and terrestrial life.

Gasoline and diesel products are common TPHs at highway locations, and were a permit requirement for sampling in WY13-WY14. The term TPH used in this report specifically refers to gasoline and diesel. Diesel is further subdivided into the diesel and lube oil fractions.

TPH samples were obtained from all highway monitoring sites in WY13-WY14. Table 17 displays gasoline, diesel fraction, and lube oil fraction minimum, median, maximum, mean, standard deviation, coefficient of variation (CV), and sample size (*n*) values. Appendix E lists sample values for discrete storm events.

Table 17 WY12-WY14 Total Petroleum Hydrocarbon (TPH) Sample Concentrations

***TPH-Gasoline* (mg/L)**							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.05 U	0.07 U	0.452	NA	NA	NA	21
Everett 01 (highly urbanized)	0.05 U	0.07 U	0.36	NA	NA	NA	19
Everett 04 (highly urbanized)	0.05 U	0.07 U	0.499	NA	NA	NA	19
SR9 01 (rural)	0.014 J	0.07 U	0.456	NA	NA	NA	20
Pines 01 (urbanized)	0.07 U	0.07 U	0.316 J	NA	NA	NA	12
***TPH-Diesel (Diesel Fraction)* (mg/L)**							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.05 U	0.15 U	2.8	NA	NA	NA	21
Everett 01 (highly urbanized)	0.1 U	0.15 U	3.4	NA	NA	NA	20
Everett 04 (highly urbanized)	0.05 U	0.15 U	3.2	NA	NA	NA	19
SR9 01 (rural)	0.05 U	0.15 U	1.6 J	NA	NA	NA	19
Pines 01 (urbanized)	0.05 U	0.16 U	3.3	NA	NA	NA	11
***TPH-Diesel (Lube Oil Fraction)* (mg/L)**							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	1	3.7	8.6	3.96	2.23	0.56	21
Everett 01 (highly urbanized)	1.1 J	5.9	21 J	6.45	4.37	0.68	20
Everett 04 (highly urbanized)	1.1	5.5	10	5.35	2.48	0.46	19
SR9 01 (rural)	0.66	3.7	12	4.12	2.45	0.59	20
Pines 01 (urbanized)	1.3	3.6	4.6	3.35	0.90	0.27	11

U Analyte not detected at a level greater than or equal to the permit-required reporting limit.
J Estimated value.
NA Statistical values were not calculated due to the high number (>30%) of non-detect values.

Discussion of WY12-WY14 TPH- Gasoline and Diesel Fraction Results

Gasoline was only detected in a few highway runoff samples. Gasoline concentrations ranged from 0.014 J mg/L at the SR9 01 rural monitoring site to 0.499 mg/L at the Everett 04 highly urbanized location.

Diesel fraction was minimally detected. Through April 2014, only two highway runoff samples had detectable concentrations. Both of these samples occurred on March 3, 2014, at the adjacent Everett 01 and Everett 04 sites with concentrations of 1.1 mg/L and 2.3 mg/L, respectively. The similarity of the adjacent Everett samples suggests that monitoring may have accurately captured a pulse of diesel fraction runoff at the sites.

Diesel fraction values were detected regularly when WSDOT began submitting samples to the AmTest Laboratory in 2014. These detections never exceeded 3.4 mg/L and are attributed to different, but acceptable methods of preparation and analysis at the laboratory.

The very low gasoline and diesel fraction values are somewhat surprising considering the proximity of vehicles. Gasoline and diesel are highly volatile, particularly gasoline, and it is possible that some of the conditions at highways sites, such as warmth from full sun exposure, contribute to quick volatilization of the constituents. Additionally it is noted that TPH grab samples were collected as early in storm events as feasible, generally after some runoff had occurred at the sites. Samples taken from earlier periods in the storm might yield different concentrations.

Discussion of WY12-WY14 Lube Oil Fraction Results

Lube oil fraction was detected consistently at all monitoring sites, despite the lack of corresponding diesel fraction and gasoline concentrations. Lube oil is less volatile than these other constituents, which might allow for greater persistence and buildup at highways.

Mean lube oil fraction concentrations ranged from 3.35 mg/L to 6.45 mg/L, and median values ranged from 3.6 mg/L to 5.9 mg/L. Overall values ranged from 0.66 mg/L to 21.0 J mg/L. Initially, the maximum 21 J mg/L was assumed to be an outlier, but the field observation of the corresponding monitoring site as a frequent traffic pull off suggests the value may be a high discrete event. As mentioned previously, periodic high pulses of a constituent are not uncommon in stormwater runoff.

Coefficients of variation (CVs) for lube oil were less than 1.0 at all sites, and means and medians tracked closely.

Seasonal variations between lube oil fraction concentrations displayed a slight pattern, with three out of four sites exhibiting higher permit-defined wet season averages. One site, Pines 01, did not have any permit-defined dry season samples. The maximum seasonal percent difference was 43.69 percent. The highest AADT sites, Everett 01 and Everett 04, displayed the highest lube oil means and medians. However, the rural SR9 01 site displayed the second highest lube oil concentrations, despite having the lowest AADT of the five highway runoff study sites.

5.2.9 Polycyclic Aromatic Hydrocarbons

Polycyclic aromatic hydrocarbons (PAHs) are composed of multiple fused aromatic benzene rings. PAHs are found in numerous sources, ranging from fossil fuels to wood smoke. Many PAHs have been shown to have mutagenic and other negative effects on aquatic and terrestrial life, and are a concern for water quality.

Noted anthropogenic sources of PAHs from a highway characterization perspective include vehicular emissions, lubricating oils, asphalt sealant leaching, and tire abrasion. PAHs may be discharged to the atmosphere, water bodies, or terrestrial surfaces and can migrate due to surface runoff or atmospheric deposition. PAHs readily adhere to solids, such as TSS, and may be transported with them.

WSDOT sampled over a dozen different PAH constituents. Table 18 displays PAHs minimum, median, maximum, mean, standard deviation, coefficients of variation (CV), and sample size (*n*) values. Appendix E lists sample values for discrete storm events.

Table 18 WY12-WY14 Polycyclic Aromatic Hydrocarbons Sample Concentrations

***Acenaphthene* (µg/L)**							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.0098 U	0.011	0.1 U	NA	NA	NA	13
Everett 01 (highly urbanized)	0.0099 U	0.02	0.1 U	NA	NA	NA	10
Everett 04 (highly urbanized)	0.0099 U	0.01 U	0.1 U	NA	NA	NA	13
SR9 01 (rural)	0.01 U	0.01 U	0.1 U	NA	NA	NA	17
Pines 01 (urbanized)	0.0099 U	0.011 UJ	0.1 U	NA	NA	NA	9
***Acenaphthylene* (µg/L)**							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.0098 U	0.011 U	0.1 U	NA	NA	NA	13
Everett 01 (highly urbanized)	0.0099 U	0.01 U	0.32	NA	NA	NA	10

Acenaphthylene (µg/L) (cont.)							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Everett 04 (highly urbanized)	0.0099 U	0.01 U	0.1 U	NA	NA	NA	13
SR9 01 (rural)	0.01 U	0.01 U	0.1 U	NA	NA	NA	17
Pines 01 (urbanized)	0.0099 U	0.011 UJ	0.1 U	NA	NA	NA	9
Anthracene **(µg/L)**							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.0078 J	0.011 U	0.1	NA	NA	NA	13
Everett 01 (highly urbanized)	0.0099 U	0.0610	0.19	NA	NA	NA	10
Everett 04 (highly urbanized)	0.0099 U	0.016 NJ	0.19	NA	NA	NA	13
SR9 01 (rural)	0.0082 J	0.011 U	0.1 U	NA	NA	NA	17
Pines 01 (urbanized)	0.0099 U	0.012 U	0.1 U	NA	NA	NA	9
Benzo(a)anthracene **(µg/L)**							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.0098 U	0.023	0.1 J	NA	NA	NA	13
Everett 01 (highly urbanized)	0.014	0.081	0.16	NA	NA	NA	10
Everett 04 (highly urbanized)	0.01 U	0.042	0.16	NA	NA	NA	13
SR9 01 (rural)	0.0088 NJ	0.028 J	0.1 U	NA	NA	NA	17
Pines 01 (urbanized)	0.013	0.026	0.1 U	NA	NA	NA	9
Benzo(a)pyrene **(µg/L)**							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.011 U	0.033	0.1 U	NA	NA	NA	13

Benzo(a)pyrene **(µg/L) (cont.)**							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Everett 01 (highly urbanized)	0.01 U	0.044	0.1 U	NA	NA	NA	10
Everett 04 (highly urbanized)	0.01 U	0.045	0.1 U	NA	NA	NA	13
SR9 01 (rural)	0.012 NJ	0.032	0.1 U	NA	NA	NA	17
Pines 01 (urbanized)	0.019	0.029	0.1 UJ	0.0393	0.0258	0.66	9
Chrysene **(µg/L)**							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.011 U	0.054	0.1 U	NA	NA	NA	13
Everett 01 (highly urbanized)	0.033	0.1 U	0.12	NA	NA	NA	10
Everett 04 (highly urbanized)	0.044	0.1 U	0.12	NA	NA	NA	13
SR9 01 (rural)	0.023	0.089	0.1 U	NA	NA	NA	17
Pines 01 (urbanized)	0.055	0.093	0.16	0.1002	0.0352	0.35	9
Dibenzo(a,h)anthracene **(µg/L)**							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.0098 U	0.011 U	0.1 U	NA	NA	NA	13
Everett 01 (highly urbanized)	0.0099 U	0.0135 U	0.1 U	NA	NA	NA	10
Everett 04 (highly urbanized)	0.0089 J	0.013	0.1 U	NA	NA	NA	13
SR9 01 (rural)	0.0091 J	0.012 U	0.1 U	NA	NA	NA	17
Pines 01 (urbanized)	0.0097 J	0.015	0.1 U	NA	NA	NA	9

Fluoranthene (µg/L)							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.011 U	0.081	0.17	NA	NA	NA	13
Everett 01 (highly urbanized)	0.04	0.1 U	0.25	NA	NA	NA	10
Everett 04 (highly urbanized)	0.056	0.1 U	0.25	NA	NA	NA	13
SR9 01 (rural)	0.031	0.1 U	0.13	NA	NA	NA	17
Pines 01 (urbanized)	0.051	0.095	0.17	0.1016	0.0405	0.40	9
Fluorene (µg/L)							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.0098 U	0.011 U	0.1 U	NA	NA	NA	13
Everett 01 (highly urbanized)	0.0099 U	0.023 U	0.1 U	NA	NA	NA	10
Everett 04 (highly urbanized)	0.0099 U	0.01 U	0.1 U	NA	NA	NA	13
SR9 01 (rural)	0.01 U	0.01 U	0.1 U	NA	NA	NA	17
Pines 01 (urbanized)	0.0099 UJ	0.011	0.1 U	NA	NA	NA	9
Indeno(1,2,3-cd)pyrene (µg/L)							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.011 U	0.031	0.1 U	NA	NA	NA	13
Everett 01 (highly urbanized)	0.01 U	0.047	0.1 U	NA	NA	NA	10
Everett 04 (highly urbanized)	0.01 U	0.043	0.1 U	NA	NA	NA	13
SR9 01 (rural)	0.011	0.041	0.1 U	NA	NA	NA	17
Pines 01 (urbanized)	0.012	0.027 U	0.1 U	0.0380	0.0292	0.77	9

Naphthalene (µg/L)							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.013 U	0.021	0.1 U	NA	NA	NA	13
Everett 01 (highly urbanized)	0.016 J	0.0255	0.11	NA	NA	NA	10
Everett 04 (highly urbanized)	0.014 UJ	0.026	0.1 U	NA	NA	NA	13
SR9 01 (rural)	0.015	0.025	0.1 U	NA	NA	NA	17
Pines 01 (urbanized)	0.02 J	0.032	0.1 U	0.0389	0.0248	0.64	9
Phenanthrene (µg/L)							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.019	0.048	0.1 U	0.061	0.027	0.44	13
Everett 01 (highly urbanized)	0.024	0.1 U	0.15	NA	NA	NA	10
Everett 04 (highly urbanized)	0.029	0.078	0.15	NA	NA	NA	13
SR9 01 (rural)	0.027	0.062	0.1 U	NA	NA	NA	17
Pines 01 (urbanized)	0.037	0.084	0.15	0.0884	0.0355	0.40	9
Pyrene (µg/L)							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.052	0.12	0.2	0.1195	0.0437	0.37	13
Everett 01 (highly urbanized)	0.067	0.11	0.4	NA	NA	NA	10
Everett 04 (highly urbanized)	0.083	0.1 U	0.38	NA	NA	NA	13
SR9 01 (rural)	0.047	0.1 U	0.23	NA	NA	NA	17
Pines 01 (urbanized)	0.092 J	0.13	0.23	0.1484	0.0555	0.37	9

U The analyte was not detected at a level greater than or equal to the permit-required reporting limit.
J Estimated value
UJ Parameter not detected above reported result; reporting limit may be inaccurate.
NJ Indicates presence of an analyte that has been "tentatively identified" with the numerical value representing an approximate concentration.
NA Statistical values were not calculated due to the high number (>30%) of non-detect values.

Discussion of WY12-WY14 PAHs Results

Many of the polycyclic aromatic hydrocarbon (PAH) congeners from the highway runoff samples were either not detected at or above the permit-required reporting limit, or were near their respective laboratory detection limits. Factors that may contribute to reduced PAHs concentrations include low solubility in water with PAHs generally binding to particles, high rates of volatilization, and photo degradation.

Since many PAHs values are below reporting limits, the ability to conduct thorough analyses on factors such as seasonality and AADT is limited. Additionally, the two laboratories that analyzed PAHs samples during the monitoring period utilized different lower detection limits. Many values detected by Manchester Environmental Laboratory (MEL), WSDOT's former primary lab, were under 0.1 µg/L, making subsequent comparisons with AmTest data unreliable at the current level of analysis.

The PAH congeners benzo(ghi)perylene, chrysene, fluoranthene, phenanthrene, and pyrene were more consistently detected. Fluoranthene and pyrene had their highest concentrations at the Everett sites, which have the highest AADT of the monitored sites. Additionally, the Everett sites displayed higher maximum anthracene and benzo(a)anthracene concentrations than the other monitored sites.

5.2.10 Phthalates

Phthalates are esters of phthalic acid added to plastics to increase their flexibility, transparency, durability, and longevity. They exist in a wide variety of products, from plastics to pharmaceuticals, and are easily released into the environment. Phthalates have been implicated in causing negative health effects to many organisms, including humans and aquatic life.

WSDOT sampled multiple phthalates congeners. Table 19 displays phthalates minimum, median, maximum, mean, standard deviation, coefficient of variation (CV), and sample size (*n*) values. Appendix E lists sample values for discrete storm events.

Table 19 WY12-WY14 Phthalates Sample Concentrations

bis(2-Ethylhexl)phthalate (µg/L)							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	1.15	4.06	7.10	4.09	1.28	0.31	13
Everett 01 (highly urbanized)	0.2 U	6.0	9.46	5.46	2.92	0.53	10
Everett 04 (highly urbanized)	0.2 U	6.9 J	13	6.41	3.75	0.59	13
SR9 01 (rural)	0.2 U	3	4.7	2.79	1.22	0.44	17
Pines 01 (urbanized)	1 U	4.4	6 J	4.4	1.48	0.34	9
Butyl benzyl phthalate **(µg/L)**							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.20 U	0.22	1 U	NA	NA	NA	13
Everett 01 (highly urbanized)	0.2 U	0.38 U	1 U	NA	NA	NA	10
Everett 04 (highly urbanized)	0.2 U	0.32 UJ	1 U	NA	NA	NA	13
SR9 01 (rural)	0.2 U	0.27 UJ	1 U	NA	NA	NA	17
Pines 01 (urbanized)	0.2 U	0.35	1 UJ	NA	NA	NA	9
Di-n-butyl phthalate **(µg/L)**							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.21 U	0.34 UJ	1 U	NA	NA	NA	13
Everett 01 (highly urbanized)	0.2 U	0.54	1 U	NA	NA	NA	10
Everett 04 (highly urbanized)	0.2 U	0.47 UJ	1 U	NA	NA	NA	13
SR9 01 (rural)	0.2 U	0.34 U	1 U	NA	NA	NA	17
Pines 01 (urbanized)	0.33 U	0.63 U	1 U	NA	NA	NA	9

Diethyl phthalate (µg/L)							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.11 NJ	0.2 U	1 U	NA	NA	NA	13
Everett 01 (highly urbanized)	0.2 U	0.27 U	1 U	NA	NA	NA	10
Everett 04 (highly urbanized)	0.2 U	0.42	1 U	NA	NA	NA	13
SR9 01 (rural)	0.2 U	0.25 J	1.1	NA	NA	NA	17
Pines 01 (urbanized)	0.15 J	0.21 UJ	1.48	NA	NA	NA	9
Di-n-octyl phthalate (µg/L)							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.2 U	0.75 J	1 U	NA	NA	NA	13
Everett 01 (highly urbanized)	0.2 U	1 U	1.3 J	NA	NA	NA	10
Everett 04 (highly urbanized)	0.2 U	1 U	1.7 J	NA	NA	NA	13
SR9 01 (rural)	0.2 U	0.51 UJ	1 U	NA	NA	NA	17
Pines 01 (urbanized)	0.2 U	1.00	1.3 J	NA	NA	NA	9
Dimethyl phthalate (µg/L)							
Monitoring Site	**Minimum**	**Median**	**Maximum**	**Mean**	**Standard Deviation**	**CV**	***n***
Pilchuck 01 (urbanized)	0.20 U	0.4 J	1 U	NA	NA	NA	13
Everett 01 (highly urbanized)	0.086 J	0.21 U	1 U	NA	NA	NA	10
Everett 04 (highly urbanized)	0.068 J	0.21 U	1 U	NA	NA	NA	13
SR9 01 (rural)	0.2 U	0.21 U	1 U	NA	NA	NA	17
Pines 01 (urbanized)	0.2 U	0.22 UJ	1 U	NA	NA	NA	9

U Parameter not detected above reporting limit
J Estimated value
UJ Parameter not detected above reported result; reporting limit may be inaccurate
NA Statistical values were not calculated due to the high number (>30%) of non-detect values.

Discussion of WY12-WY14 Phthalates Results

Similar to PAHs, the majority of phthalate esters were either not detected or were near laboratory detection limits. Phthalates have a low solubility in water and often breakdown quickly in response to photo degradation, biodegradation, and other environmental factors. These environmental factors may contribute to reducing phthalate detections in sampled highway runoff.

Since many of the phthalate values were below reporting limits, the ability to study factors such as seasonality and storm intensity is limited. Additionally, again as with metals and PAHs, the two respective laboratories that analyzed PAH samples utilized different lower detection limits. Manchester Environmental Laboratory (MEL) typically used a detection limit of approximately 0.20 µg/L, and AmTest Laboratory used the permit-required reporting limit of 1.0 µg/L. Many of the values that were detected by MEL were under 1.0 µg/L, making comparisons with AmTest data difficult.

One phthalate, bis(2-Ethylhexl)phthalate, was consistently detected in highways runoff. Similar to some other observed constituents, the highest AADT sites Everett 01 and Everett 04 exhibited the highest bis(2-Ethylhexl)phthalate concentrations, whereas the lowest AADT site SR9 01 exhibited the lowest concentrations.

5.2.11 Glyphosate

Glyphosate is an organophosphate herbicide with broad-spectrum plant-killing abilities. It is commonly used in roadside weed-spraying applications, such as controlling Himalayan blackberry *(Rubus armeniacus)*, and in agriculture. Some studies have implicated glyphosate as having negative effects on animals and humans.

WSDOT sampled for applicable herbicides at all highway sites. Almost all samples had values below the permit-required reporting limit. Three samples had estimated (denoted J) values, but these concentrations were actually lower than the standard reporting limits. For these reasons statistical values, such as mean and median, are neither meaningful nor presented. Appendix E lists sampling dates and laboratory reporting limits.

Only two samples during the monitoring period exhibited truly detectable concentrations. One sample was at SR9 01 on April 17, 2013, measuring a glyphosate concentration of 58.0 µg/L. WSDOT roadside spray records show that the herbicidal product Ranger Pro® that contains glyphosate was sprayed in the vicinity of SR9 01 on April 11, 2013. This spray date is eight days before the stormwater event with measurable levels of glyphosate.

The second detected sample was at Pines 01 on June 14, 2014, measuring a glyphosate concentration of 53.2 µg/L. Spray records show that Ranger Pro® was applied at Pines 01 on May 28, June 10, and June 11, 2014. These events all occurred within three weeks of detecting glyphosate at the site.

These results suggest that when applied, glyphosate may contribute to pollutant concentrations in the vicinity. However, its residence time in highway runoff may be limited, based on lack of detections apart from near application dates.

5.2.12 Diuron and Dichlobenil

Diuron is a broad spectrum herbicide applied for weed and brush control. It has been shown to have some toxicity to birds and mammals, and elevated toxicity to fish. WSDOT collected stormwater samples for diuron at the monitoring site Pines 01 in WY13 and WY14, in response to spray records documenting the use of diuron in the vicinity. Diuron was not applied at the other monitoring sites.

All stormwater samples submitted for diuron analysis exhibited values below the permit-required reporting limit, denoted by U or UJ. For these reasons statistical values are not presented. Appendix E lists sampling dates and laboratory reporting limits for diuron.

The herbicide dichlobenil was inadvertently sampled at Pines 01, despite lack of correlating spray records. These one dichlobenil samples are presented in Appendix E for reference.

5.2.12 pH

WSDOT obtained pH measurements from grab and composite stormwater samples in WY13 and WY14. Electronic meters were used to record pH at the beginning of WY13, but the particular model of electronic meter proved impractical for field work. These meters required frequent probe replacement and produced inconsistent readings, so staff switched to a pH indicator strip method in the field. All pH measurements in WY13 fell within the 4.0 to 5.5 pH range.

In WY14, a quality assurance consultant for the stormwater monitoring program recommended abandonment of the indicator strip method and a switch back to electronic pH meters. WSDOT purchased new electronic pH meters that proved more functional for use in the field. After switching to the new electronic meters, monitoring staff recorded measurements generally ranging between 6.5 and 7.5 pH.

Following the switch to new electronic pH meters, WSDOT tested indicator strips against calibrated pH buffers, and found the indicator strips measured correctly against the pH buffers. Why the pH indicator strips measured correctly against calibrated buffers but not against highway runoff is unknown.

Based on these findings, WSDOT acknowledges that many of the WY13 pH measurements are rejected. The range of pH measurements collected with the new electronic meters is listed below for each site:

- Pilchuck 01 (urbanized) – 6.30 to 8.21 pH
- Everett 01(highly urbanized) – 6.60 to 7.69 pH
- Everett 04 (highly urbanized) – 6.57 to 7.69 pH
- SR9 01 (rural) – 6.18 to 7.73 pH
- Pines 01 (urbanized) – 6.4 pH (one record)

WSDOT field teams currently use the new electronic meters to record pH measurements, and include pre-deployment equipment calibrations and post deployment drift assessments as part of standard operating procedures. For comparison, the stormwater monitoring program's current analytical laboratory also obtains pH measurements from every stormwater sample.

5.2.13 Temperature

Temperature measurements were recorded continuously for all surface runoff events. Appendix A lists minimum and maximum temperature values for each stormwater sampling event.

5.2.14 Visible Sheen

No visible sheen was observed by field staff during any stormwater sample collection event, either for grab or composite samples.

5.3 Sediment Sampling: Results and Discussion

WSDOT collected sediment samples annually from each of the five highway characterization sites, completing permit requirements in regards to highways sediment collection. Sediment samples were collected for three years beginning in June 2012, and ending in June 2014 (WY12-WY14).

Sample collection occurred in late spring or early summer to allow sufficient dewatering of the sediment after months of higher precipitation. Field teams avoided mid- to late-summer sampling due to the potential photo and heat degradation of sample parameters. For details on the sediment sampling methods, refer to the *Standard Operating Procedures for Estimating Sediment Volumes and Collecting Sediment Samples from Highway Runoff Monitoring Locations* (WSDOT 2014e).

In WY12, staff collected enough sediment from four of the five sites to obtain samples for all permit-specified constituents. For the remaining site, at SR9 01, enough sediment was collected to obtain roughly half of the required constituents. Staff collected from four of the sites in July. The remaining site, Pines 01, was sampled in November due to the accidental loss of the initial late spring and early summer sediment buildup.

For WY13, staff collected sufficient sediment at every site to obtain all permit-specified constituents. Staff collected samples from early May to mid-June, meeting the goal of obtaining the samples in late spring or early summer.

For WY14, staff collected sediment samples at all sites. However, due to a laboratory error, no samples were analyzed for phenols at any site. All the remaining required sample constituents were collected at Everett 01 and Pines 01. All required samples except herbicides, were collected at SR9 01. Herbicides, TPH, and PCBs were missed at Pilchuck 01 due to insufficient sample volumes. Everett 04 possessed minimal sediment quantities, resulting in only collecting samples for total solids, total organic carbon (TOC) and particle size distribution (PSD). Staff collected samples from three sites in May and from two sites in June.

Additionally for WY14, WSDOT notes that arsenic and polychlorinated biphenyls (PCBs) were added to the collected sample parameters, to collaborate with research goals requested by the Washington State Department of Natural Resources.

WY12-WY14 sediment samples had detectable constituent values at all sites in all years. Tables 20, 21, and 22 show sample collection dates and constituent values.

Table 20 Water Year 2012 (WY12) Sediment Sampling Data

STATION		EVERETT-01		EVERETT-04		PILCHUCK-01		PINES-01		SR09-01	
PARAMETER	**UNITS**	**7/12/2012**		**7/12/2012**		**7/12/2012**		**11/6/2012**		**7/12/2012**	
Conventionals											
Total Solids	percent	99.2	--	99.5	--	99.2	--	88[1]	--	99	--
Total Organic Carbon	percent	3.08	--	2.1	--	2.87	--	3.08[1]	--	1.78	--
Metals											
Total Recoverable Copper	mg/Kg dw	76.1	J	71.7	J	99.8	J	128	J	807	J
Total Recoverable Lead	mg/Kg dw	57	J	31.6	J	35.3	J	101	J	26.6	J
Total Recoverable Cadmium	mg/Kg dw	0.626	--	0.526	--	0.831	--	1.16	--	5.26	--
Total Recoverable Zinc	mg/Kg dw	303	--	330	--	292	--	655	--	164	--
PAH Compounds											
Acenaphthene	ug/Kg dw	250	U	250	U	250	U	280	U	--	
Acenaphthylene	ug/Kg dw	250	U	250	U	250	U	280	U	--	
Anthracene	ug/Kg dw	500	U	500	U	500	U	560	U	--	
Benzo(a)anthracene	ug/Kg dw	500	U	500	U	140	J	560	U	--	
Benzo(b)fluoranthene	ug/Kg dw	140	J	130	J	200	J	170	J	--	
Benzo(k)fluoranthene	ug/Kg dw	250	U	250	U	83	J	280	U	--	
Benzo(ghi)perylene	ug/Kg dw	120	J	120	J	240	J	560	U	--	
Benzo(a)pyrene	ug/Kg dw	250	U	250	U	150	J	280	U	--	
Chrysene	ug/Kg dw	130	J	110	J	190	J	260	J	--	
Dibenzo(a,h)anthracene	ug/Kg dw	500	UJ	500	UJ	500	UJ	560	UJ	--	
Fluoranthene	ug/Kg dw	200	J	200	J	320	J	300	J	--	
Fluorene	ug/Kg dw	250	U	250	U	250	U	280	U	--	
Indeno(1,2,3-cd)pyrene	ug/Kg dw	190	J	200	J	250	J	190	J	--	
Naphthalene	ug/Kg dw	500	U	500	U	500	U	130	J	--	
Phenanthrene	ug/Kg dw	100	J	86	J	210	J	240	J	--	
Pyrene	ug/Kg dw	320	J	320	J	460	J	320	J	--	
Phthalates											
bis(2-Ethylhexyl)phthalate	ug/Kg dw	4700	--	5100	J	5000	J	4900	J	--	
Butyl benzyl phthalate	ug/Kg dw	1000	U	1000	U	120	J	280	J	--	
Di-n-butyl phthalate	ug/Kg dw	250	U	250	U	250	U	280	U	--	
Diethyl phthalate	ug/Kg dw	500	U	500	U	500	U	560	U	--	
Dimethyl phthalate	ug/Kg dw	500	U	500	U	500	U	560	U	--	
Di-n-octyl phthalate	ug/Kg dw	5000	UJ	5000	UJ	5000	UJ	5600	UJ	--	
Phenols											
Phenol	ug/Kg dw	1000	U	1000	U	1000	U	1100	U	--	
Benzyl Alcohol	ug/Kg dw	2500	U		R	2500	U		R	--	
2-methylphenol	ug/Kg dw	2500	U	2500	U	2500	U	2800	U	--	
2,4-dimehtylphenol	ug/Kg dw	2500	U	2500	U	2500	U	2800	U	--	
Pentachlorophenol	ug/Kg dw	2500	UJ	2500	UJ	2500	UJ	--	R	--	
Benzoic Acid	ug/Kg dw		R		R		R		R	--	
Herbicides											
Picloram	ug/Kg dw	--	--	--	--	--	--	72	U	--	--
Triclopyr	ug/Kg dw	--	--	--	--	--	--	72	U	--	--
TPH											
TPH-Diesel (NWTPH-Dx)	mg/Kg dw	2299		2097		2097		2128		--	
Diesel	mg/Kg dw	99	U	97	U	97	U	28	U	--	
Lube Oil	mg/Kg dw	2200	--	2000	--	2000	--	2100	--	--	
Particle Size Distribution											
Particle/Grain Size, >2.0 mm	percent	0	--	0.6	--	2.5	--	0	--	0	--
Particle/Grain Size, 850um-2 mm	percent	7.1	--	11	--	10.7	--	0	--	0.1	--
Particle/Grain Size, 250-850 um	percent	30.7	--	30.3	--	28.5	--	26.6	--	42	--
Particle/Grain Size, 75-250 um	percent	43.8	--	41.6	--	35.4	--	60.5	--	48.4	--
Particle/Grain Size, 29.5-63 um	percent	7.7	--	5.9	--	9.2	--	8.5	--	3.2	--
Particle/Grain Size, <29.53 um	percent	10.7	--	10.6	--	13.7	--	4.4	--	6.3	--

Notes:

[1] Values were incorrectly switched in the WY13 Highways Annual Report, with the value of total organic carbon actually being the value for total solids, and vice versa.

-- parameter not analyzed

U - Analyte not detected above reported result

J - estimated value

UJ - Analyte not detected above reported result, reported reporting limit may inaccurate

TPH-Diesel (NWTPH-Dx) values are calculated as the sum of the Diesel and Lube Oil concentrations

Table 21 Water Year 2013 (WY13) Sediment Sampling Data

STATION		EVERETT-01		EVERETT-04		PILCHUCK-01		PINES-01		SR09-01	
PARAMETER	**UNITS**	5/20/2013		6/10/2013		6/10/2013		6/4/2013		5/9/2013	
Conventionals											
Total Solids	percent	96.9		99.4		99.1		91		94	
Total Organic Carbon	percent	2.43		2.68		4.1		3.25		1.44	
Metals											
Total Recoverable Copper	mg/Kg dw	249		65.9	J	64.8	J	47.6	J	37.1	J
Total Recoverable Lead	mg/Kg dw	21.4		23.4	J	39.2	J	29.4	J	62.8	J
Total Recoverable Cadmium	mg/Kg dw	0.538		0.73		0.752		1.04		0.161	
Total Recoverable Zinc	mg/Kg dw	280		380		295		318		109	J
PAH Compounds											
Acenaphthene	ug/Kg dw	130	U	120	U	130	U	130	U	130	U
Acenaphthylene	ug/Kg dw	130	U	120	U	130	U	130	U	130	U
Anthracene	ug/Kg dw	130	U	120	U	130	U	66	J	130	U
Benzo(a)anthracene	ug/Kg dw	130	J	140		59	J	220		130	U
Benzo(b)fluoranthene	ug/Kg dw	220		250		130	J	300		99	J
Benzo(k)fluoranthene	ug/Kg dw	190		190		89	J	240		130	U
Benzo(ghi)perylene	ug/Kg dw	220	J	180	J	110	J	220	J	260	U
Benzo(a)pyrene	ug/Kg dw	160		170		93	J	200		130	U
Chrysene	ug/Kg dw	230		230		130	J	340		86	J
Dibenzo(a,h)anthracene	ug/Kg dw	260	U	250	U	250	U	270	U	260	U
Fluoranthene	ug/Kg dw	450		370		160		580		76	J
Fluorene	ug/Kg dw	130	U	120	U	130	U	130	U	130	U
Indeno(1,2,3-cd)pyrene	ug/Kg dw	170	J	250	U	250	U	270	U	260	U
Naphthalene	ug/Kg dw	260	UJ	250	UJ	250	UJ	270	UJ	260	UJ
Phenanthrene	ug/Kg dw	310		220		96	J	370		130	U
Pyrene	ug/Kg dw	450		410		230		520		100	J
Phthalates											
bis(2-Ethylhexyl)phthalate	ug/Kg dw	6200		4900		4400		6000		18000	
Butyl benzyl phthalate	ug/Kg dw	220	J	370		220	J	460		280	
Di-n-butyl phthalate	ug/Kg dw	190		180		150		490		1000	
Diethyl phthalate	ug/Kg dw	130	U	120	U	130	U	130	U	130	U
Dimethyl phthalate	ug/Kg dw	130	U	120	U	130	U	130	U	130	U
Di-n-octyl phthalate	ug/Kg dw	1300	U	1200	U	1300	U	1300	U	1300	U
Phenols											
Phenol	ug/Kg dw	510	UJ	490	UJ	500	UJ	530	UJ	530	UJ
Benzyl Alcohol	ug/Kg dw	1300	UJ	1200	UJ	1300	UJ	1300	UJ	1300	UJ
2-methylphenol	ug/Kg dw	1300	UJ	1200	UJ	1300	UJ	1300	UJ	1300	UJ
2,4-dimehtylphenol	ug/Kg dw	1300	UJ	1200	UJ	1300	UJ	1300	UJ	1300	UJ
Pentachlorophenol	ug/Kg dw	1300	UJ	1200	UJ	1300	UJ	1300	UJ	1300	UJ
Benzoic Acid	ug/Kg dw		R		R		R		R		R
Herbicides											
Picloram	ug/Kg dw	17	UJ	16	UJ	--		17	UJ	17	UJ
Triclopyr	ug/Kg dw	17	U	16	U	--		17	U	17	U
TPH											
TPH-Diesel (NWTPH-Dx)	mg/Kg dw	2415		2215		2515		2216		986	
Diesel	mg/Kg dw	15	U	15	U	15	U	16	U	16	U
Lube Oil	mg/Kg dw	2400		2200		2500	J	2200		970	J
Particle Size Distribution											
Particle/Grain Size, <29.53 um	percent	9.4		10.5		12.6		19.2		6.6	
Particle/Grain Size, >2.0 mm	percent	0		0		0		0		0	
Particle/Grain Size, 850 um-2 mm	percent	0		0.2		0		0		0.3	
Particle/Grain Size, 250-850 um	percent	29.1		27.9		34.3		22.5		55.9	
Particle/Grain Size, 29.5-63 um	percent	4		1.9		4.5		6.9		1.7	
Particle/Grain Size, 75-250 um	percent	57.5		59.5		48.6		51.4		35.5	

Notes:
-- parameter not analyzed
U - Analyte not detected above reported result
J - estimated value
UJ - Analyte not detected above reported result, reported reporting limit may inaccurate
TPH-Diesel (NWTPH-Dx) values are calculated as the sum of the Diesel and Lube Oil concentrations
R - Rejected analyte

Table 22 Water Year 2014 (WY14) Sediment Sampling Data

STATION		EVERETT-01	EVERETT-04	PILCHUCK-01	PINES-01	SR09-01
PARAMETER	**UNITS**	**5/27/2014**	**5/27/2014**	**5/27/2014**	**6/24/2014**	**6/10/2014**
Conventionals						
Total Solids	percent	89.8	99.5	91.2	99.8	95.1 J
Total Organic Carbon	percent	1.7 J	--	4.9 J	2.4	4.4 J
Metals						
Total Recoverable Copper	ug/g	76.9 J	--	59.5 J	41.9	54 J
Total Recoverable Lead	ug/g	31.55	--	19.11	21.48	43.65 J
Total Recoverable Cadmium	ug/g	0.988	--	0.6	0.348	0.226 J
Total Recoverable Zinc	ug/g	362	--	296	246 J	144 J
Arsenic[1]	ug/g	6.09	--	7.4	5.66	3.42 J
PAH Compounds						
Acenaphthene	ug/Kg	18.3 U	--	16.2 U	14.9 U	3.26 UJ
Acenaphthylene	ug/Kg	18.3 U	--	16.2 U	14.9 U	9.77 J
Anthracene	ug/Kg	18.3 UJ	--	19.5	19.4	13.7 J
Benzo(a)anthracene	ug/Kg	75.2	--	50.4	28.4	12.7 J
Benzo(b)fluoranthene	ug/Kg	112	--	47.1	14.9 UJ	3.26 UJ
Benzo(k)fluoranthene	ug/Kg	114 J	--	56.9	14.9 UJ	3.26 UJ
Benzo(ghi)perylene	ug/Kg	71.6	--	63.4	56.7 J	51.8 J
Benzo(a)pyrene	ug/Kg	78.9	--	53.6	14.9 UJ	3.26 UJ
Chrysene	ug/Kg	143	--	97.5	105	39.7 J
Dibenzo(a,h)anthracene	ug/Kg	18.3 U	--	16.2 U	14.9 UJ	3.26 UJ
Fluoranthene	ug/Kg	292	--	133	149	92.2 J
Fluorene	ug/Kg	18.3 U	--	16.2 U	14.9 U	3.26 UJ
Indeno(1,2,3-cd)pyrene	ug/Kg	36.7	--	26	23.9 J	16.6 J
Naphthalene	ug/Kg	18.3 U	--	16.2 U	31.4	20.2 J
Phenanthrene	ug/Kg	171	--	106	103	77.5 J
Pyrene	ug/Kg	394	--	289	181	189 J
Phthalates						
bis(2-Ethylhexyl)phthalate	ug/Kg	9500 J	--	2750	2080	5630 J
Butyl benzyl phthalate	ug/Kg	18.3 U	--	145	14.9 U	154 J
Di-n-butyl phthalate	ug/Kg	18.3 U	--	109	115	145 J
Diethyl phthalate	ug/Kg	18.3 U	--	16.2 U	14.9 U	3.26 UJ
Dimethyl phthalate	ug/Kg	18.3 U	--	16.2 U	14.9 U	3.26 UJ
Di-n-octyl phthalate	ug/Kg	18.3 UJ	--	16.2 U	14.9 UJ	3.26 UJ
Phenols						
Phenol	ug/Kg	--	--	--	--	--
Benzyl Alcohol	ug/Kg	--	--	--	--	--
2-methylphenol	ug/Kg	--	--	--	--	--
2,4-dimehtylphenol	ug/Kg	--	--	--	--	--
Pentachlorophenol	ug/Kg	--	--	--	--	--
Benzoic Acid	ug/Kg	--	--	--	--	--
Herbicides						
Glyphosate	mg/Kg	0.038	--	--	--	--
Diuron	ug/g	--	--	--	0.1 UJ	--
TPH						
TPH-Diesel (NWTPH-Dx)	mg/Kg		--	--		
Diesel	mg/Kg	290	--	--	230	590 J
Lube Oil	mg/Kg	1800	--	--	1600 J	2100 J
Particle Size Distribution						
Grain Size PHI -2.25	percent	4.8	0.1	0.1 U	0.1	1.1 J
Grain Size PHI -2.0	percent	1.1	0.1	0.1 U	0.1 U	0.1 UJ
Grain Size PHI -1.0	percent	5.2	0.8	0.1	0.7	2.1 J
Grain Size PHI 0	percent	9.7	14.2	14.9	15.3	15.1 J
Grain Size PHI +1.0	percent	20.7	22.5	27.9	19	23.3 J
Grain Size PHI +2.0	percent	23.4	28.7	29.3	23.1	34.4 J
Grain Size PHI +3.0	percent	16.1	20.4	11.9	19.9	12.1 J
Grain Size PHI +4.0	percent	5.7	5.2	3.3	4	4.5 J
Grain Size PHI +5.0	percent	4	2.1	4.3	7.5	2.2 J
Grain Size PHI +6.0	percent	2.9	1.8	2.5	8.2	1.5 J
Grain Size PHI +7.0	percent	2.3	1.2	1.8	0.8	0.7 J
Grain Size PHI +8.0	percent	0.2	0.4	0.8	1.1	0.8 J
Grain Size PHI +9.0	percent	1	0.6	0.5	0.3	0.2 J
Grain Size PHI +10.0	percent	0.8	0.4	0.3	0.1 U	0.1 UJ
Grain Size PHI > +10.0	percent	2.2	1.5	2.4	0.1 U	2.1 J
PCBs						
PCB-1016	ug/Kg	1.64 UJ	--	--	1.48 U	1.73 U
PCB-1221	ug/Kg	1.64 UJ	--	--	1.48 U	1.73 U
PCB-1232	ug/Kg	1.64 UJ	--	--	1.48 U	1.73 U
PCB-1242	ug/Kg	1.64 UJ	--	--	1.48 U	1.73 U
PCB-1248	ug/Kg	1.64 UJ	--	--	1.48 U	1.73 U
PCB-1254	ug/Kg	1.64 UJ	--	--	1.48 U	1.73 U
PCB-1260	ug/Kg	1.64 UJ	--	--	10.1	1.73 U

Notes:
[1] arsenic is techincally a metalloid
-- parameter not analyzed
U - Analyte not detected above reported result
J - estimated value
UJ - Analyte not detected above reported result, reported reporting limit may inaccurate
TPH-Diesel (NWTPH-Dx) values are calculated as the sum of the Diesel and Lube Oil concentrations

Discussion of Sediment Sampling Results

Interpretation of sediment results requires a few caveats. First, sediment collection, in accordance with permit requirements, only generated three samples per monitoring location. Such a small sample size limits the analysis that can be conducted on specific site characteristics. Second, sediment collection areas were routinely cleaned so as to not bias stormwater sample collection of related constituents, like TSS, or disrupt monitoring hydrology. Collected sediment was composed of recently deposited sediment, which fails to capture the totality of sediment trends throughout the year. Finally, sediment collection is biased towards larger particles which settle out in the collection area, as opposed to smaller fines which may be transported to a different location.

Caveats noted, sediment sampling from WY12-WY14 generated some observable patterns. Discussion of these findings is presented below:

Conventionals (Total Solids and TOC)

Total organic carbon (TOC) was below five percent, and total solids were above 89 percent for all samples and for all years. However, large amounts of carbonaceous material were often present within the sediment, usually in the form of dead grasses, tree leaves, and small woody debris. Following laboratory sample-submittal protocols, these materials were sieved out of sediment when sampling.

Metals

Detectable values of copper, cadmium, lead, and zinc were present across all sites for all years. These results suggest that the constituents may be commonplace for edge of highway sediment. Metals were consistently detected, and concentrations tended to occur highest in zinc, followed by copper, then lead, and finally cadmium.

Observations regarding each metal:

- **Copper** – With the exception of an outlier at SR9 01, copper values ranged from 37.1 to 249 µg/Kg. No particular patterns were noted in regards to site or sample month.
- **Lead** – Values ranged from 19.11 to 101 µg/Kg. No particular patterns were noted in regards to site or sample month.
- **Cadmium** – With the exception of an outlier at SR9 01, cadmium values ranged from 0.161 to 1.16 µg/Kg. No particular patterns were noted in regards to site or sample month.
- **Zinc** – Values ranged from 109 to 655 µg/Kg. The values at the Everett 04 site that has a galvanized guardrail were higher in sampled years than the adjacent Everett 01 with no guardrail. However, the highest zinc value was collected at the Pines 01 site that has no guardrail. Altogether, no significant patterns were noted in regards to site or sample month.

The outlier copper and cadmium values at the SR9 01 site occurred from the July 12, 2012, sampling event. The area surrounding SR9 01 has been subject to road construction and is at the bottom of a hill. Braking vehicles and road construction activities may have influenced the SR9 01 samples. Further analysis is needed to confirm this observation.

Arsenic, which is technically a metalloid, was only sampled in WY14. Arsenic was detected at all sampled sites, ranging from 3.42 µg/Kg to 7.4 µg/Kg.

Polycyclic aromatic hydrocarbons (PAHs), phthalates, and phenols:

In WY12 and WY13, PAH compounds, phthalates, and phenols were detected below reporting limits or at comparatively lower concentrations at all sites. Detections were higher in WY14, and may be due to a change in contract laboratories and a difference in analytical methods.

For phthalates, bis(2-Ethylhexyl)phthalate was consistently detected and elevated compared to the other phthalates. Phenols were minimally detected in all sampled water years.

Consistently low PAH, phthalate, and phenol values might be attributed to photolysis, volatilization, and/or oxidation. These constituents are known to degrade in response to these forces. The sediment at collection sites is subject to full sun exposure, high temperatures, freezing temperatures, and frequent wetting and drying out. These characteristics may contribute to photolysis, volatilization, and/or oxidation, facilitating constituent breakdown.

TPH-Diesel (Diesel and Lube Oil Fractions):

TPH-Diesel (diesel fraction) samples were consistently detected below the permit-required reporting limits in WY12 and WY13, and between 290 to 590 mg/Kg in WY14. Some difference in diesel fraction values appears due to the different methods used at the analytical laboratories, with Manchester Environmental Laboratory (MEL) having consistent values below reporting limits, and AmTest Laboratory having detected values.

TPH-Diesel (lube oil fraction) was consistently detected in all samples at all sites, ranging from 970 to 2500 mg/Kg. This suggests that lube oil may be a common constituent in edge of highway sediment. The lube oil fraction is a less volatile constituent than the diesel fraction, which may contribute to greater persistence in highway sediments.

Herbicides:

In WY12 and WY13, WSDOT sampled for the herbicides picloram and triclopyr. Neither of these herbicides were detected, facilitating their removal from subsequent sampling by the permit.

In WY14, WSDOT sampled for the herbicides glyphosate and diuron due to their presence in near site spraying applications. Diuron was present, but detected below permit-required reporting limits at one site. One collected glyphosate sample measured at 0.038 mg/Kg.

Polychlorinated biphenyls (PCBs):

PCBs were not detected at a level greater than or equal to permit-required reporting limits at four of the five highway runoff monitoring sites. At the Pines 01 site, the PCB-1260 congener was detected at 10.1 µg/Kg. PCB-1260 is produced from transformers, hydraulic fluids, dedusting agents, polyvinyl chloride, polyester resins, and varnish, and it persists for an extended time in the environment. PCBs are still manufactured as a residual byproduct. Yellow striping paint and some hydroseed mixes contain PCBs.

Particle size distribution (PSD):

For WY12 and WY13, particle size distribution (PSD) measurements displayed a bell curve distribution, with most particles located in the center of the size categories. Specifically, the overwhelming majority of particles fell into the 75–250 µm and 250–850 µm categories, with amounts of either larger or smaller particle sizes diminishing as they moved away from the center.

For WY14, different size categories were employed, but the same bell curve distribution occurred, with the overwhelming majority of particles falling between 63 to 500 µm, and diminishing concentrations of larger or smaller particles moving from the center.

The sampling system did not have a mechanism to capture fines, many of which may have washed through the system instead of being deposited in the sample collection area. Whether sample constituent loads may be biased by the lack of representative fines may deserve further investigation.

5.4 Toxicity Sampling: Results and Discussion

In accordance with Special Condition S7.C in the 2009 NPDES municipal stormwater permit (Ecology 2009a); seasonal first flush toxicity sampling was required from three untreated highway runoff monitoring locations in WY12 and WY13. Site locations were based on the following annual average daily traffic (AADTs):

- One highly urbanized site (≥ 100,000 AADT)
- One urbanized site (≤ 100,000 and ≥ 30,000 AADT)
- One rural site (≤ 30,000 AADT)

In addition, seasonal first flush toxicity sampling was required from three best management practice (BMP) effluent locations. At least one BMP location had to be categorized as enhanced treatment for metals. Again, site locations were based on the following AADTs:

- One highly urbanized site (≥ 100,000 AADT)
- One urbanized site (≤ 100,000 and ≥ 30,000 AADT)
- One rural site (≤ 30,000 AADT)

WSDOT followed standard toxicity testing procedures for the freshwater amphipod, *Hyalella azteca*, 24 hour survival test (ASTM E1192-97).

Sampling results for WY12 and WY13 from both the highway runoff and BMP effluent locations are presented below.

5.4.1 WY 12 Sampling Summary

Two successful attempts were made to collect toxicity samples from each of the required monitoring locations on September 9, 2012, and October 13, 2012. Results show no significant effect and a high survival rate for *Hyalella azteca*. Table 23 provides a summary.

Table 23 WY12 Toxicity Sampling Results

Date	Sample Description	Test Group (% rainwater or stormwater)	Control Water	Average Survival for All Replicates	EC_{50}
9/10/12	I-5 Pilchuck Creek Modified-VFS; pavement edge	0 0 6.25 12.5 25 50 100	dilution water hardness control[1]	100% 98% 100% 100% 100% 100% 98%	≥ 100%
10/13/12	SR-09 Marysville VFS effluent; 13.1-ft interceptor	0 0 6.25 12.5 25 50 100	dilution water hardness control	100% 100% 100% 98% 100% 98% 100%	≥ 100%
9/10/12	I-5 Pilchuck Creek rainwater reference; pH adjusted[2][3]	0 100	dilution water	100% 98%	≥ 100%
9/10/12	I-5 Pilchuck Creek rainwater reference	0 100	dilution water	100% 98%	≥ 100%
9/10/12	I-5 Everett rainwater reference; pH adjusted	0 100	dilution water	100% 100%	≥ 100%
9/10/12	I-5 Everett rainwater reference	0 100	2nd control	98% 100%	≥ 100%

[1] Hardness of the control was adjusted to match the stormwater samples' hardness.

[2] Rainwater reference samples were collected to determine if rainwater alone caused toxicity to *Hyalella azteca*. Rainwater was collected in precleaned stainless steel bowls elevated at least 30cm from the ground and away from sources that may contribute inputs other than rain, such as road spray.

[3] pH was adjusted to neutral, around 7.0.

5.4.2 WY 13 Sampling Summary

Two successful sampling attempts were made to collect toxicity samples from each of the required monitoring locations on September 16, 2013, and October 31, 2013. Consistent with results from WY12, sampling results from WY13 show no significant mortality and a high survival rate for *Hyalella azteca* when exposed to stormwater.

Table 24 summarizes toxicity sampling results. Negative and positive controls associated with the stormwater tests were within acceptable limits. This indicates that the tests were conducted with fit organisms that responded appropriately to known toxicants.

Water quality samples were collected in conjunction with each toxicity sampling event. Appendix E summarizes water quality sampling results from the September and October 2013 sampling events.

Table 24 WY13 Toxicity Sampling Results

Date	Sample Description	Test Group (% rainwater or stormwater)	Control Water	Average Survival for All Replicates	LC_{50} Value
9/16/13	I-5 Pilchuck 08, MP 210.85 (urbanized); BMP effluent	0	dilution water	100%	> 100%
		0	hardness control[1]	100%	
		6.25		95.5%	
		12.5		100%	
		25		97.5%	
		50		100%	
		100		95.0%	
9/16/13	I-5 Everett 04 (highly urbanized); pavement edge	0	dilution water	100%	> 100%
		0	hardness control[1]	97.5%	
		6.25		97.5%	
		12.5		100%	
		25		97.5%	
		50		100%	
		100		97.5%	
9/16/13	I-5 Pilchuck Creek rainwater reference[2][3]	0	dilution water	90.0%	> 100%
		100		95.0%	
9/16/13	I-5 Everett rainwater reference[2][3]	0	dilution water	95.0%	> 100%
		100		87.5%	

[1] Hardness of the control was adjusted to match stormwater sample hardness.

[2] Rainwater reference samples were collected to determine if rainwater alone caused toxicity to *Hyalella azteca*. Rainwater was collected in precleaned stainless steel bowls elevated at least 30cm from the ground and away from sources that may have contributed inputs other than rain, such as road spray.

[3] pH was adjusted close to neutral, between pH 6 and 9, the recommended range for testing *Hyalella azteca*.

Table 24 WY13 Toxicity Sampling Results (cont.)

Date	Sample Description	Test Group (% rainwater or stormwater)	Control Water	Average Survival for All Replicates	LC_{50} Value
10/31/13	I-5 Pilchuck 06, MP 210.85 (urbanized); pavement edge	0	dilution water	100%	> 100%
		0	hardness control[1]	95.0%	
		6.25		100%	
		12.5		95.0%	
		25		100%	
		50		97.5%	
		100		100%	
10/31/13	SR9 02 (rural); BMP effluent	0	dilution water	100%	> 100%
		0	hardness control[1]	97.5%	
		6.25		100%	
		12.5		100%	
		25		97.5%	
		50		92.5%	
		100		97.5%	
10/31/13	I-5 Pilchuck Creek rainwater reference[2][3]	0	dilution water	95.0%	> 100%
		100		92.5%	

[1] Hardness of the control was adjusted to match stormwater sample hardness.

[2] Rainwater reference samples were collected to determine if rainwater alone caused toxicity to *Hyalella azteca*. Rainwater was collected in precleaned stainless steel bowls elevated at least 30cm from the ground and away from sources that may have contributed inputs other than rain, such as road spray.

[3] pH was adjusted close to neutral, between pH 6 and 9, the recommended range for testing *Hyalella azteca*.

5.5 Rainfall-to-Runoff Relationships

Rainfall-to-runoff relationships were established for each WSDOT highway stormwater monitoring site using WY13-WY14 data sets. Figures 8–12 show each required monitoring site's rainfall/runoff relationship. The data tables these relationships are based on can be found in Appendix F. This information can be used to aid the success of future sampling efforts by calculating runoff volumes from forecast rainfall depths.

The sophistication of the monitoring equipment used to measure the site hydrology allowed WSDOT to monitor all permit-qualified storm events throughout the water years. Each event was determined based on the permit antecedent dry period criterion. Events with total precipitation greater than or equal to 0.05-inch were included in the analyses. If data were rejected due to poor quality or a data gap existed, runoff events were calculated and not included in the site's rainfall/runoff relationships. These determinations are noted in the data tables found in Appendix F.

Monitoring station maintenance did not occur prior to every permit-qualified storm event. Frequency of site maintenance could have affected the quality of the runoff data, since the system designs are susceptible to fouling from highway debris and sediment.

The Pines 01 site is more easily and safely accessible, which may have resulted in more storm-based maintenance. This could have contributed to better data quality and thus a higher correlation between rainfall and runoff.

Each of the monitoring sites has similar characteristics; most notably, they are all composed of 100 percent impervious surface. In addition to maintenance, rainfall intensity can affect the hydrologic response at a site. All western Washington highway monitoring sites have similar, yet relatively lower, *r*-squared correlation coefficients in comparison to the east side (Pines 01) monitoring site (Figures 8–12).

Each storm event was assessed for quality and evaluated for its acceptability based on either validation criteria or best professional estimate. These data contributed to the rainfall/runoff relationships shown in the graphs below.

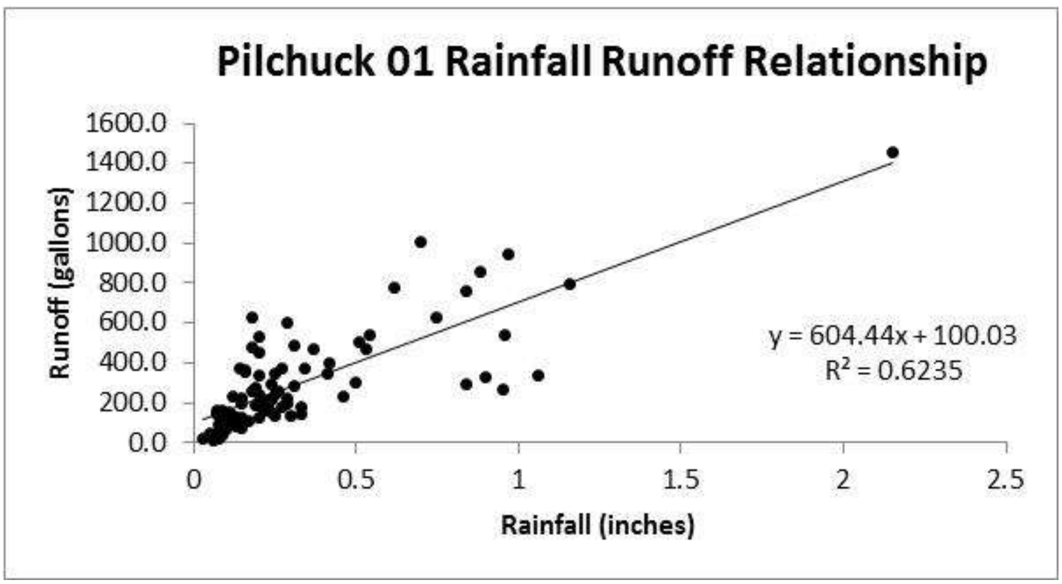

Figure 8 Pilchuck 01 highway runoff monitoring site rainfall/runoff relationship

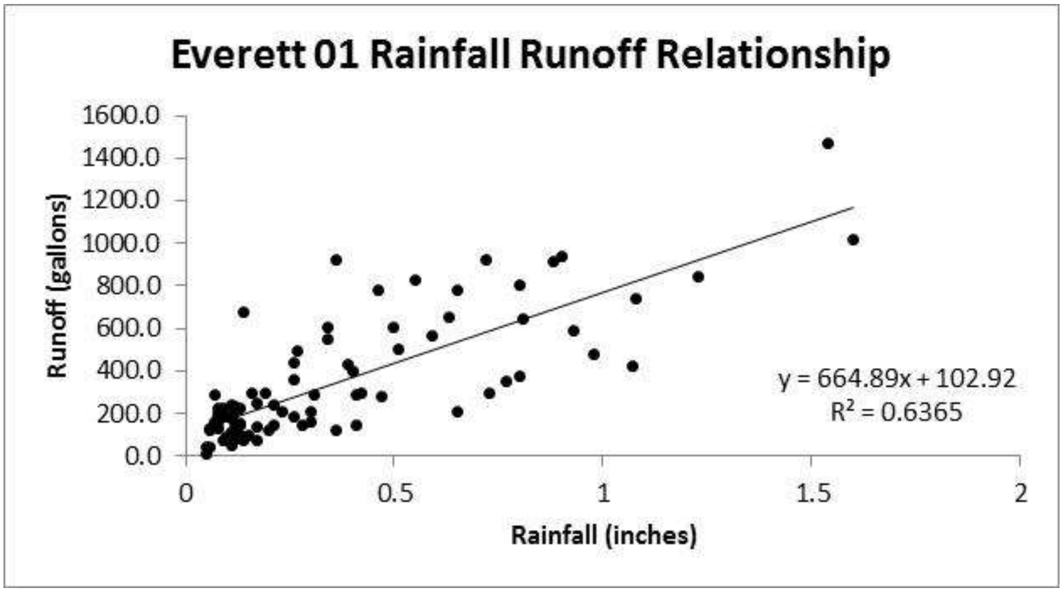

Figure 9 Everett 01 highway runoff monitoring site rainfall/runoff relationship

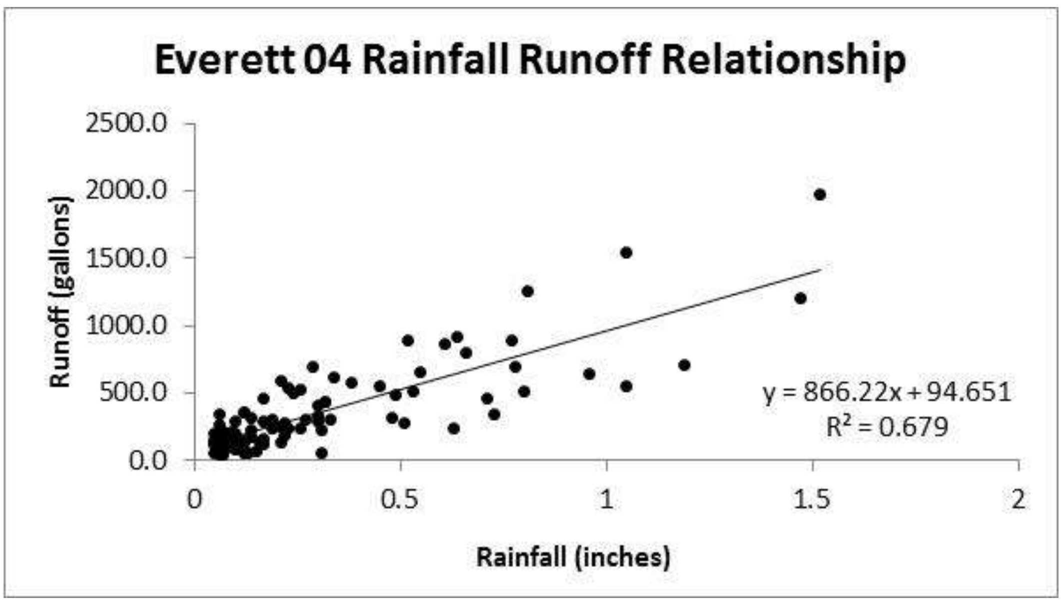

Figure 10 Everett 04 highway runoff monitoring site rainfall/runoff relationship

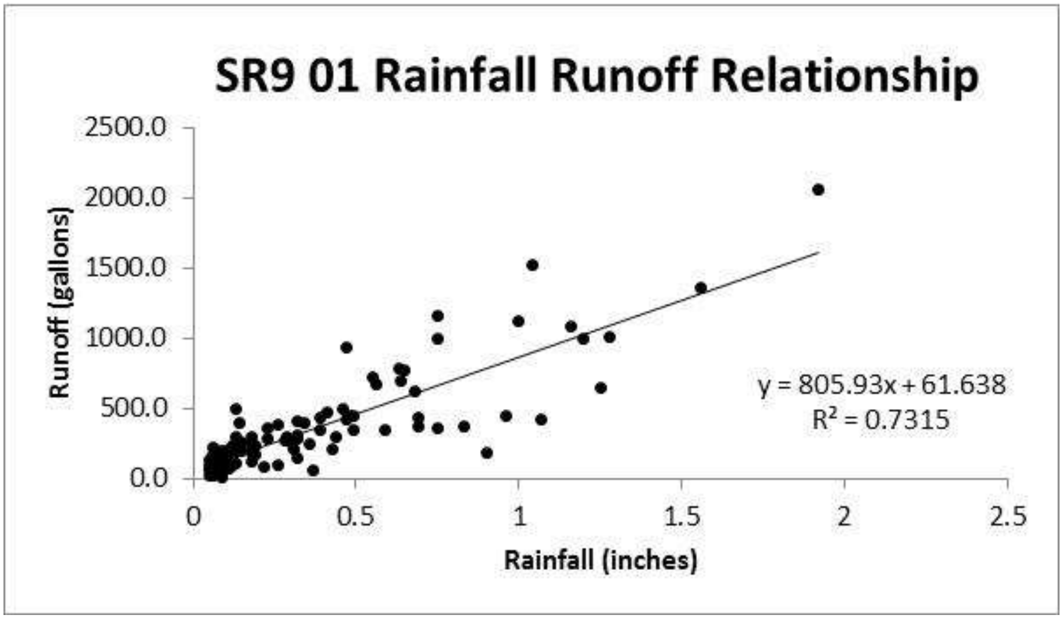

Figure 11 SR9 01 highway runoff monitoring site rainfall/runoff relationship

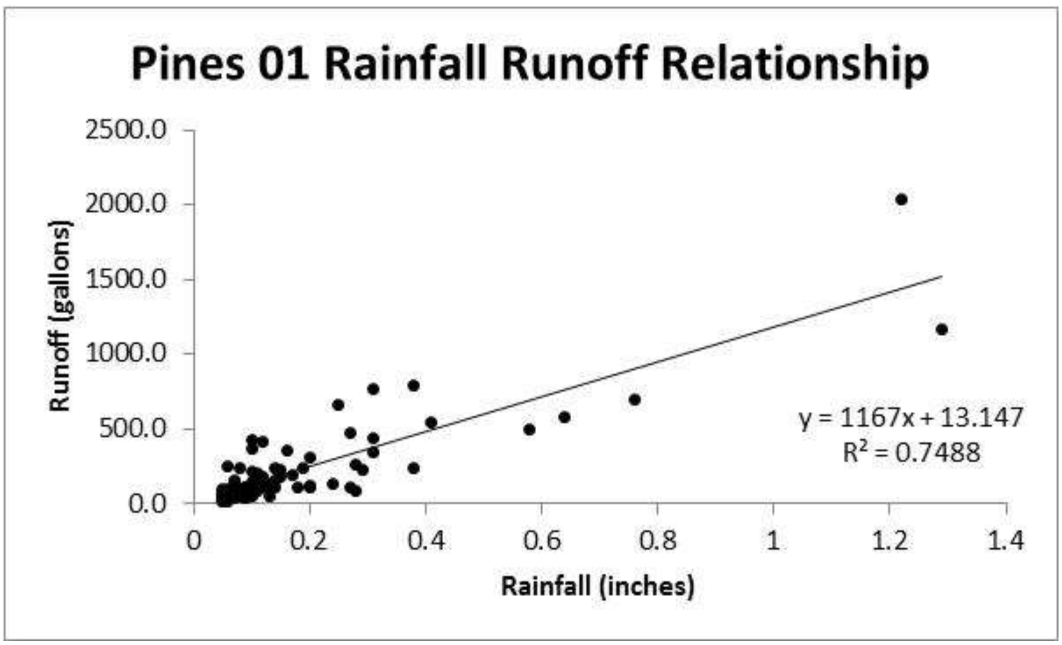

Figure 12 Pines 01 highway runoff monitoring site rainfall/runoff relationship

5.6 Pollutant Loading Calculations

To meet permit requirements, WSDOT calculated total annual, wet season, and dry season pollutant loads for sampled and estimated unsampled storm events for WY13 and WY14. Pollutant loads are calculated for each stormwater sample parameter and presented in Appendix G.

WSDOT calculated pollutant loads by taking the event mean concentrations (EMCs) for each sample parameter at each highway runoff monitoring site, then multiplying the EMCs by their respective storm event volume (in liters). Doing so generated the pollutant loads for each storm event at every site. Seasonal and annual pollutant loads for sampled storm events were calculated for WY13 and WY14.

To obtain non-sampled storm event pollutant loads, WSDOT calculated mean seasonal EMCs for each constituent at each monitoring site. These mean seasonal EMCs were then multiplied by non-sampled storm event volumes, giving seasonal non-sampled storm pollutant loads. These seasonal loads were then added together to provide annual non-sampled pollutant loads.

All of the pollutant concentrations were reported in mg/L or µg/L. In accordance with the permit, WSDOT converted the mg/L and µg/L values to total pounds and pounds per acre.

For sample values that were not detected at a level greater than or equal to permit-required reporting limits, WSDOT reported the values at half the laboratory reporting limit. These values are generally noted by a “U,” for undetected. However, it is not possible to say that the sample parameter does not exist – only that it is lower than the permit-required reporting limit. WSDOT’s approach to reporting these values at half of the reporting limit represents a compromise, neither negating the potential for trace amounts of the sample parameter, nor being overly conservative and reporting the parameter at the full reporting limit. For sample values never detected (non-detects by the relevant analytical procedure), WSDOT reported “ND” (never detected), since the accompanying parameter was likely nonexistent or present at very trace concentrations.

For this report, the term “event mean concentration (EMC)” is synonymous with the term “sample concentration.” WSDOT uses the term sample concentration because it is more consistent with laboratory submittal data and field verbiage. Also note that grab samples are not technically EMCs, but are treated and referred to as such in pollutant loading calculations.

In accordance with permit requirements, the tables in Appendix G show annual pollutant loads for annual, wet, and dry seasons. The tables report pollutant loads in both total pounds and pounds per acre.

5.7 Changes to Monitoring Methods and Infrastructure

WSDOT staff evaluated the effectiveness of monitoring practices and recorded their observations. These observations helped refine existing monitoring methods and procedures. These changes should improve the accuracy and efficiency of data collection, and make more effective use of limited staff time and resources.

The following changes were made in WY13 and WY14:

1. **Frequency of site storm event preparation:** Staff originally prepared sites for sampling immediately before storm events, with the intention of calibrating the systems as close to the start of the sampling events as possible. Unfortunately, short notice prior to many sampled storm events created rushed and potentially inadequate site preparations, occasionally resulting in missed or rejected storm data. Switching storm preparation to a two-week cycle allowed for more thorough sampling conveyance system cleanout and equipment calibration, and better data quality.

2. **Monitoring station maintenance staff:** In WY12 and WY13, the field team lacked sufficient staff to manage the significant site maintenance workload. Most field team time was devoted to obtaining samples, with little time left for maintaining and improving the structural components of the sampling conveyance systems and equipment. Late in WY13, WSDOT hired a staff member whose primary duty was site maintenance. This staff member was able to implement many infrastructure efficiencies in addition to maintaining system operations on a tighter schedule.

3. **WSDOT region staff support:** Staff support from region maintenance and environmental offices was critically important during the initial phase of highway runoff characterization monitoring. However, with recent reductions in work force, most region staff have limited availability for stormwater monitoring due to other work priorities. Shifting the majority of region staff responsibilities to stormwater monitoring staff at WSDOT headquarters helped focus team efforts, eliminated reliance on region staff with limited availability, and improved consistency of work.

4. **Sample naming and labeling:** The original naming and labeling conventions for laboratory samples were complex and non-intuitive, creating problems in often-chaotic field conditions. These sample names were replaced by a simple date-based naming convention that staff could easily generate and follow in the field. This change drastically reduced time in the field and improved sample labeling accuracy.

5. **New forecasting tool:** In WY13, staff deployed a WSDOT Storm Event Reporting and Forecasting (SERF) tool. This tool provided a direct link to NOAA regional forecasts and created a communication email chain to alert staff when a qualifying storm approached. The SERF tool significantly shortened the time needed to generate a daily forecast, making faster and more efficient deployments for storm event sampling possible. To meet permit requirements, SERF also saved a record of all forecasts and deployment decisions.

6. **New laboratory contract:** On June 1, 2014, the Washington State Department of Transportation (WSDOT) established AmTest, Inc., in Kirkland, Washington as the primary analytical laboratory for the department's stormwater monitoring program. AmTest is an accredited analytical laboratory with the Washington State Department of Ecology (Ecology), and has the ability to achieve acceptable limits of detection for the parameters measured as part of the highway runoff monitoring project.

   The AmTest contract replaces the analytical services agreement with Ecology's Manchester Environmental Laboratory. Establishing AmTest as WSDOT's primary analytical laboratory eliminates the need to communicate with multiple laboratories and streamlines the sample delivery process. Other benefits achieved under this contract include reduced costs for analytical services and availability of AmTest laboratory staff for off hours and weekend sample submittal.

5.8 Stormwater Management Actions Taken or Planned to Reduce Pollutants

Information from this report will be used to inform the department's *Highway Runoff Manual* (WSDOT 2014d), and improve stormwater treatment practices along WSDOT's highways and facilities. These data support implementation and development of stormwater management actions and research studies to reduce pollutants in stormwater.

Current research includes the following monitoring studies:

1. **Vegetated filter strip studies:** These studies compare treatment performance of an existing vegetated filter strip (VFS) to a modified, compost-blanket VFS at two locations along Interstate 5 (I-5). A Department of Ecology-approved compost-amended vegetated filter strip (CAVFS), with compost tilled into the top layer of the soil, will be used for further comparison. Stormwater collectors (HDPE half-pipe collectors) that are positioned along each VFS at the edge of pavement (influent samples) and two and four meter downslope collection points (effluent samples) will be evaluated.

   In comparison to CAVFS, the potential advantages of modified, compost-blanket VFSs include reduced costs for construction because compost-blanket applications require minimal ground disturbance, fewer traffic impacts, and less traffic control. In addition, compost blankets can be applied on steeper slopes, over broader areas, and earlier in the construction process as erosion control. Finally, compost-blanket VFSs can be applied in confined spaces, including urban areas, where space for more traditional stormwater treatment facilities is not available.

2. **Bioswale effectiveness studies:** In the first phase of these studies, WSDOT will construct compost-amended biofiltration and bioinfiltration swales to treat stormwater runoff from three maintenance facilities. Monitoring will evaluate the treatment effectiveness of these stormwater management facilities. These studies will also test the hypothesis that compost increases hydraulic residence time, and stormwater treatment goals can be achieved with shorter length swales.

   These bioswale effectiveness studies represent the next step in an adaptive management process that addresses issues identified during the first phase of monitoring under the previous 2009 WSDOT NPDES municipal stormwater permit (Ecology 2009a). If monitoring results indicate these best management practices (BMPs) are effective, similar stormwater treatment facilities and the lessons learned from these studies can be more broadly applied.

5.9 Lessons Learned

Implementation of the stormwater monitoring program brought many opportunities to learn and adapt procedures to more successfully meet NPDES permit requirements. These lessons manifested themselves both in adjustments to monitoring procedures and staff roles, as well as changes to the sampling infrastructure itself.

Some specific lessons learned were:

1. **Establishment of standard operating procedures:** Standard operating procedures (SOPs) help clarify the fundamentals of various monitoring activities allowing for efficient and consistent collection of the most reliable, representative data possible. SOPs are needed to document all steps in the monitoring process from sample collection in the field to data management and validation in the office.

2. **Reassessment of staff roles:** It was determined that with limited staff resources the program was hard-pressed to fulfill the maintenance requirements of the infrastructure. In response, open positions were filled with staff that specialized in infrastructure maintenance. A more robust maintenance schedule was implemented that increased the reliability of the equipment and the accuracy of collected data.

3. **Changes to sampling deployment protocol:** It was found that using a 50 percent likelihood of a qualifying amount of precipitation to trigger sampling deployment resulted in a lot of unsuccessful deployments. To increase sampling success, the minimum likelihood was raised to 75 percent which reduced the chances that deployments would be made for non-qualifying rain events.

4. **Reassessment of the sampling infrastructure and maintenance:** Infrastructure was assessed for improvements and it was found, for example, that the chambers utilized by the bubble pressure sensors were not only difficult to clean and maintain but were also

providing inconsistent measurements. The monitoring program re-designed the bubble chambers and found that after their installation, maintenance requirements were significantly reduced and measurement consistency improved.

Additionally, the team developed some new techniques for maintenance such as a custom sponge set-up that allowed for the cleaning of otherwise inaccessible pipe runs. Taking time to address shortcomings in procedures and infrastructure allowed for some dramatic improvements on both the practical and data-quality fronts.

5. **Cross-training of staff:** Cross-training staff as much as possible proved to be an important factor for the program considering limited personnel resources. Having as many team members as possible able to respond to different aspects of the program was a key part of the program's approach. This was especially true considering that weather phenomena are difficult to predict and do not adhere to a standard work week schedule.

Glossary

accuracy – The degree to which a measured value agrees with the true value of the measured property. EPA recommends that this term not be used, and that the terms *precision* and *bias* be used to convey the information associated with the term *accuracy* (USGS 1999).

analyte – An element, ion, compound, or chemical moiety (pH, alkalinity) that is to be determined. The definition can be expanded to include organisms, such as fecal coliform (Kammin 2010).

annual average daily traffic (AADT) – The average, over a year, of the number of vehicles passing a point on a highway in both directions each day (Mohamad et al., 1998). Counts are estimated using Trip Generation, published by the Institute of Transportation Engineers, or using a traffic study prepared by a professional engineer or transportation specialist with expertise in traffic volume estimation (WSDOT 2014d).

best management practices (BMPs) – The structural devices, maintenance procedures, managerial practices, prohibitions of practices, and schedules of activities that are used singly or in combination to prevent or reduce the detrimental impacts of stormwater, such as pollution of water, degradation of channels, damage to structures, and flooding (WSDOT 2014d).

Clean Water Act (CWA) – A federal act passed in 1972, formerly referred to as the Federal Water Pollution Control Act, which contains provisions to restore and maintain the quality of the nation's waters. Major amendments to the CWA in 1987 addressed stormwater pollution by extending the National Pollutant Discharge Elimination System (NPDES) permit program to include stormwater discharges. Section 402 of the CWA governs the NPDES permit program.

comparability – The degree to which different methods, data sets, and/or decisions agree or can be represented as similar; a data quality indicator (USEPA 1997).

completeness – The amount of valid data obtained from a data collection project compared to the planned amount. Completeness is usually expressed as a percentage; a data quality indicator (USEPA 1997).

data collection platform (DCP) – A collection of instruments or sensors that operate and report to a central data logger. A DCP is collectively housed in a central location or "platform" at the monitoring site.

data validation – An analyte- and sample-specific process that extends the evaluation of data beyond method, procedural, or contractual compliance (i.e., data verification) to determine the analytical quality of a specific data set (Ecology 2004). Data validation criteria are based upon the measurement quality objectives developed in the QA Project Plan or similar planning document, or presented in the sampling or analytical method. Data validation includes a determination, where possible, of the reasons for any failure to meet method, procedural, or contractual requirements, and an evaluation of the impact of such failure on the overall data set. Data validation applies to activities in the field as well as in the analytical laboratory (USEPA 2002). Data validation follows data verification (USEPA 2006). Ecology considers four key criteria to determine whether data validation has actually occurred. These are:

- Use of raw or instrument data for evaluation
- Use of third-party assessors
- Data set is complex
- Use of EPA *Functional Guidelines* or equivalent for review

Examples of data types commonly validated would be:

- Gas Chromatography (GC)
- Gas Chromatography-Mass Spectrometry (GC-MS)
- Inductively Coupled Plasma (ICP)

The end result of a formal validation process is a determination of usability that assigns qualifiers to indicate usability status for every measurement result (Ecology 2004; Kammin 2010).

data verification – The process of evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, or contractual requirements. Again, the goal of data verification is to ensure and document that the data are what they purport to be, that is, that the reported results reflect what was actually done. When deficiencies in the data are identified, then those deficiencies should be documented for the data user's review and, where possible, resolved by corrective action. Data verification applies to activities in the field as well as in the laboratory (USEPA 2002). Data verification precedes data validation (USEPA 2006).

fecal coliform – That portion of the coliform group that is present in the intestinal tracts and feces of warm-blooded animals as detected by the product of acid or gas from lactose in a suitable culture medium within 24 hours at 44.5 plus or minus 0.2 degrees Celsius (WAC 173-201A-020).

first flush – Typically, the first 30 to 60 minutes of runoff from a rainfall event (Caltrans 2003). A first-flush rain event for toxicity is defined in Special Condition S7.C.1 of the 2009 WSDOT NPDES municipal stormwater permit as the first qualifying rain event that occurs after July 31, with a one-week antecedent dry period (or October, irrespective of the antecedent dry period, if unsuccessful in August and September) (Ecology 2009a).

flow-weighted compositing – Samples of equal volume are taken at equal increments of flow volume and composited (Ecology 2009b)

Global Positioning System (GPS) – A satellite navigation system used to determine ground position and velocity (location, speed, and direction).

hydrograph – A graph of flow versus time for a given point (Caltrans 2003).

hyetograph – A graph of rainfall to a monitoring station versus time (Caltrans 2003).

Jersey barrier – A tapered concrete structure installed in the median or along the roadside shoulder to prevent vehicle crossovers.

low-impact development (LID) – An evolving approach to land development and stormwater management that uses a site's natural features and specially designed BMPs to manage stormwater; it involves assessing and understanding the site, protecting native vegetation and soils, and minimizing and managing stormwater at the source. Low-impact development practices are appropriate for a variety of development types (WSDOT 2014d).

measurement quality objectives (MQOs) – A subset of data quality objectives (DQOs) that specify how good the data must be in order to meet the objectives of a project (Ecology 2004). The acceptance thresholds or goals for a project's data usually based on the individual data quality indicators (DQIs) for each matrix and analyte group or analyte. These include bias, precision, accuracy, representativeness, comparability, completeness, and sensitivity (USEPA 2006).

National Pollutant Discharge and Elimination System (NPDES) – The national program for issuing, modifying, revoking and reissuing, terminating, monitoring, and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of the Federal Clean Water Act, for the discharge of pollutants to surface waters of the state from point sources. These permits are referred to as NPDES permits and, in Washington State, are administered by the Washington State Department of Ecology (Ecology 2014).

parameter – A specified characteristic of a population or sample. Also, an analyte or grouping of analytes. Benzene, nitrate+nitrite, and anions are all parameters (Ecology 2004; Kammin 2010).

pavement edge (PE) collector – A 6-inch high-density polyethylene pipe or similar device that is installed to collect runoff from an impervious roadway. PE collectors also act as conveyance systems for stormwater from the road surface to pass through a flow measurement device and allow for composite sample collection.

pH – A measure of the acidity or alkalinity of water. A low pH value (0 to 7) indicates that an acidic condition is present, while a high pH (7 to 14) indicates a basic or alkaline condition. A pH of 7 is considered to be neutral. Since the pH scale is logarithmic, a water sample with a pH of 8 is ten times more basic than one with a pH of 7.

precision – The extent of random variability among replicate measurements of the same property; a data quality indicator (USGS 1999). Usually expressed as relative percent difference (RPD) or relative standard deviation (RSD) (Ecology 2004).

quality assurance (QA) – A set of activities designed to establish and document the reliability and usability of measurement data (Kammin 2010).

Quality Assurance Project Plan (QAPP) – A document that describes the objectives of a monitoring project and the procedures necessary to ensure the quality and integrity of the collected data (Ecology 2004).

quality control (QC) – The routine application of measurement and statistical procedures to assess the accuracy of measurement data (Ecology 2004).

representativeness – The state or quality of being accurately representative of something. Expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at the sampling point, or an environmental condition (USEPA 2006).

sensitivity – In general, denotes the rate at which the analytical response (e.g., absorbance, volume, or meter reading) varies with the concentration of the parameter being determined. In a specialized sense, it has the same meaning as the detection limit (Ecology 2004).

stormwater – That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a stormwater drainage system into a defined surface water body or a constructed infiltration facility (WSDOT 2014d).

thermistor – A temperature-sensing probe that displays large changes in resistance in proportion to small changes in temperature.

stilling well – A well or chamber that is connected to the main flow channel by a small inlet.

time of concentration – The time necessary for surface runoff to reach the edge of pavement collector from the hydraulically most remote point of the drainage area (WSDOT 2014d). Time of concentration provides a measure to ensure time pacing of the monitoring equipment is set to obtain a representative sample and to evaluate whether contributions from the entire basin are represented.

water year (WY) – The 12-month period beginning October 1 for any given year through September 30 of the following year. The water year is designated by the calendar year in which it ends. For example, the water year ending September 30, 2012, is called the "2012" water year (USGS 2014).

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Acronyms, Abbreviations, and Units of Measurement

Acronyms and Abbreviations

AADT	annual average daily traffic
BMP	best management practice
Cd	cadmium
CBS	compact bubble sensor
COC	chain of custody
Cu	copper
DCP	data collection platform
Ecology	Washington State Department of Ecology
EMC	event mean concentration
ESO	Environmental Services Office
GIS	geographical information system
GPS	Global Positioning System
HDPE	high-density polyethylene
HQ	WSDOT Headquarters
I-5	Interstate 5
I-90	Interstate 90
MBAS	methylene blue active substances
MP	milepost
MQO	measurement quality objective
NB	northbound
NPDES	National Pollutant Discharge Elimination System
NOAA	National Oceanic and Atmospheric Association
NWS	National Weather Service
OP	orthophosphate
PAH	polycyclic aromatic hydrocarbons
Pb	lead
PCBs	polychlorinated biphenyls
PE	pavement edge
pH	measure of alkalinity or acidity
PSD	particle size distribution
PT	pressure transducer
QAPP	Quality Assurance Project Plan

QA	quality assurance
QC	quality control
SB	southbound
SOP	standard operating procedure
SR	state route
TAPE	Technology Assessment Protocol – Ecology (TAPE)
TOC	total organic carbon
TP	total phosphorus
TPH	total petroleum hydrocarbon
TSS	total suspended solids
USEPA	United States Environmental Protection Agency
WSDOT	Washington State Department of Transportation
WY	water year
Zn	zinc

Units of Measurement

ac	acre
°C	degrees centigrade
°F	degrees Fahrenheit
ft	feet
g	gram, a unit of mass
in	inch
gal/min	gallons per minute
L/min	liters per minute
mg	milligrams
mg/Kg	milligrams per kilogram (parts per million)
mg/L	milligrams per liter (parts per million)
mL	milliliters
Qp	gallons/minute
Tc	time of concentration
µg/Kg	micrograms per kilogram (parts per billion)
µg/L	micrograms per liter (parts per billion)
µm	micrometer
oz	ounce

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Appendix A:
Storm Reports

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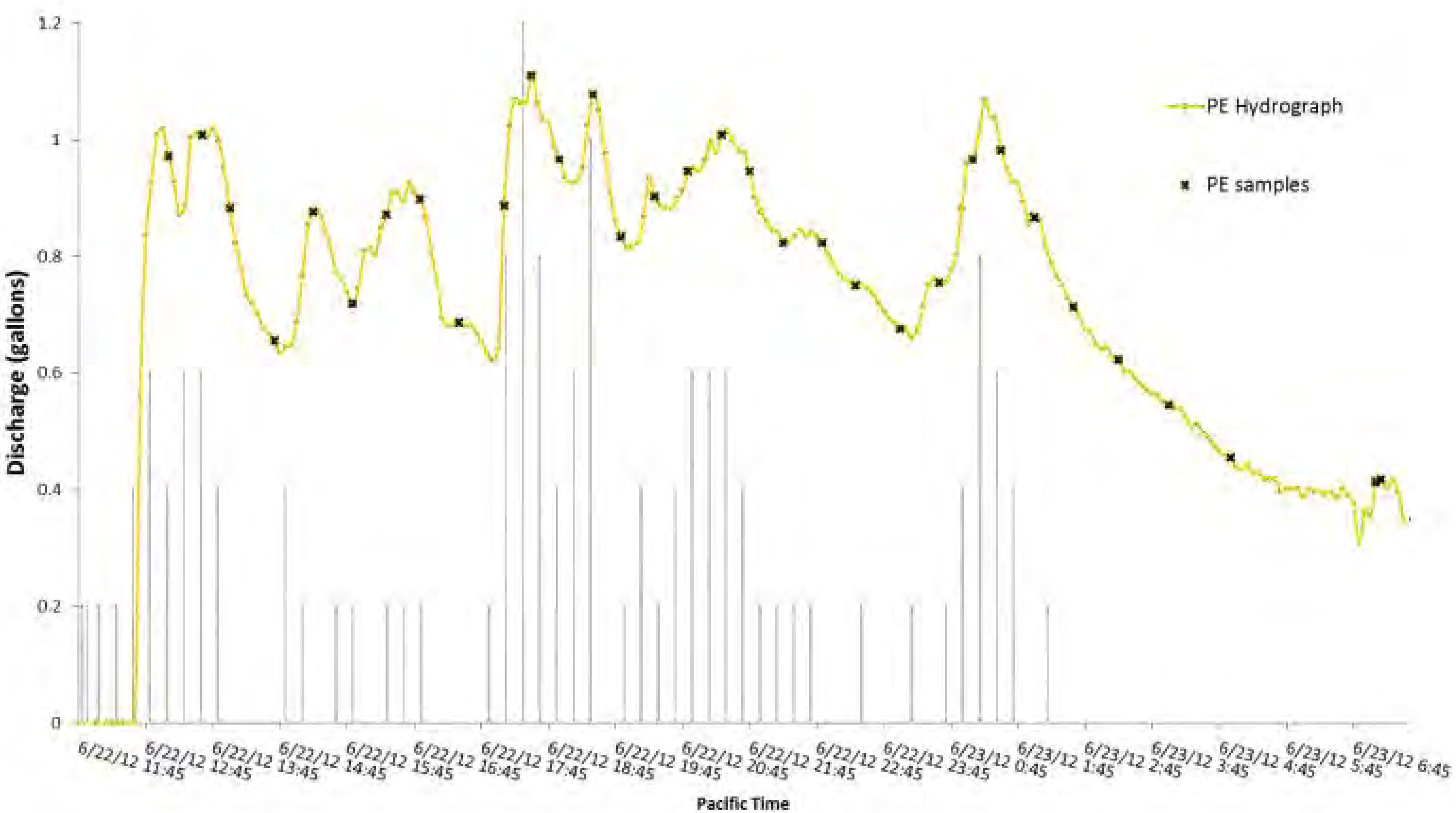
PILCHUCK 01

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.88	06/22/2012 11:45	06/23/2012 02:10	14.4	71.75

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	32	06/22/2012 13:05	06/23/2012 07:10	18.1	700	22,400	12.5	15.3	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	06/22/2012 12:40	06/23/2012 07:45	19.1	859.4	45.0	859.4	859.4	95	1.07	0.74	0.90	N/A

Pilchuck 01 6/22/12 Storm Event

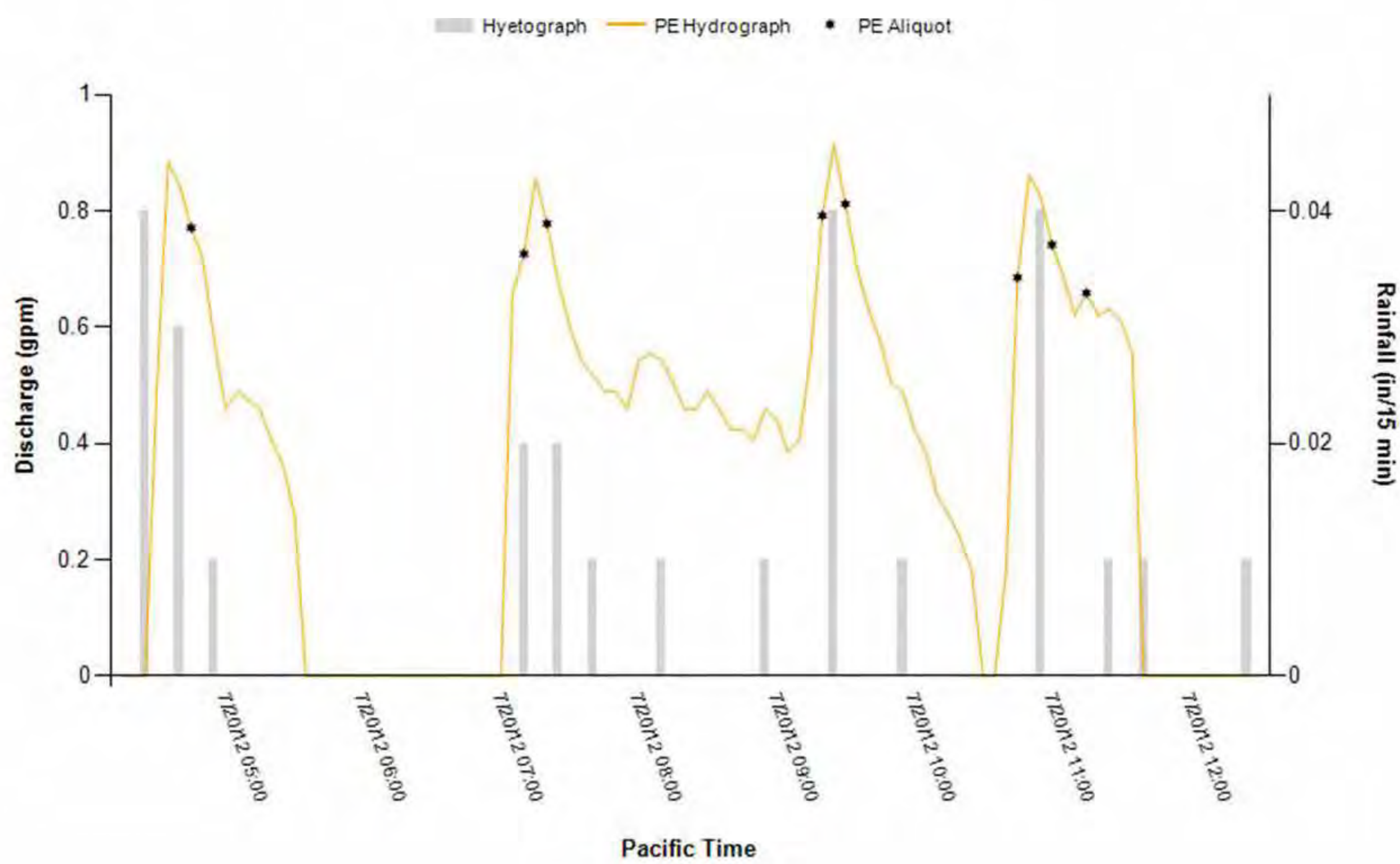


Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.27	07/20/2012 03:00	07/20/2012 12:20	9.3	115.25

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	8	07/20/2012 04:40	07/20/2012 11:15	6.5	700	5,600	15.7	17.6	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	07/20/2012 04:35	07/20/2012 11:35	7	10.9	41.4	76.6	67.6	88	0.81	0.18	0.50	N/A

Pilchuck VFS 7/20/2012 Storm Report



Precipitation												
Total (in)	Start Time		End Time		Duration (hrs)	Antecedent (hrs)						
0.08	10/12/2012 10:20		10/12/2012 12:20		2.00	726.75						
Aliquots								**Water Temp**		**Validation Code**		
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time		Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)			
PE	N/A	N/A	N/A		N/A	N/A	N/A	410.2	11.1			
Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	10/12/2012 11:05	10/12/2012 12:55	1.83	58.10	31.75	58.10	N/A	N/A	0.62	0.39	0.00	0.024

Only grab samples collected.

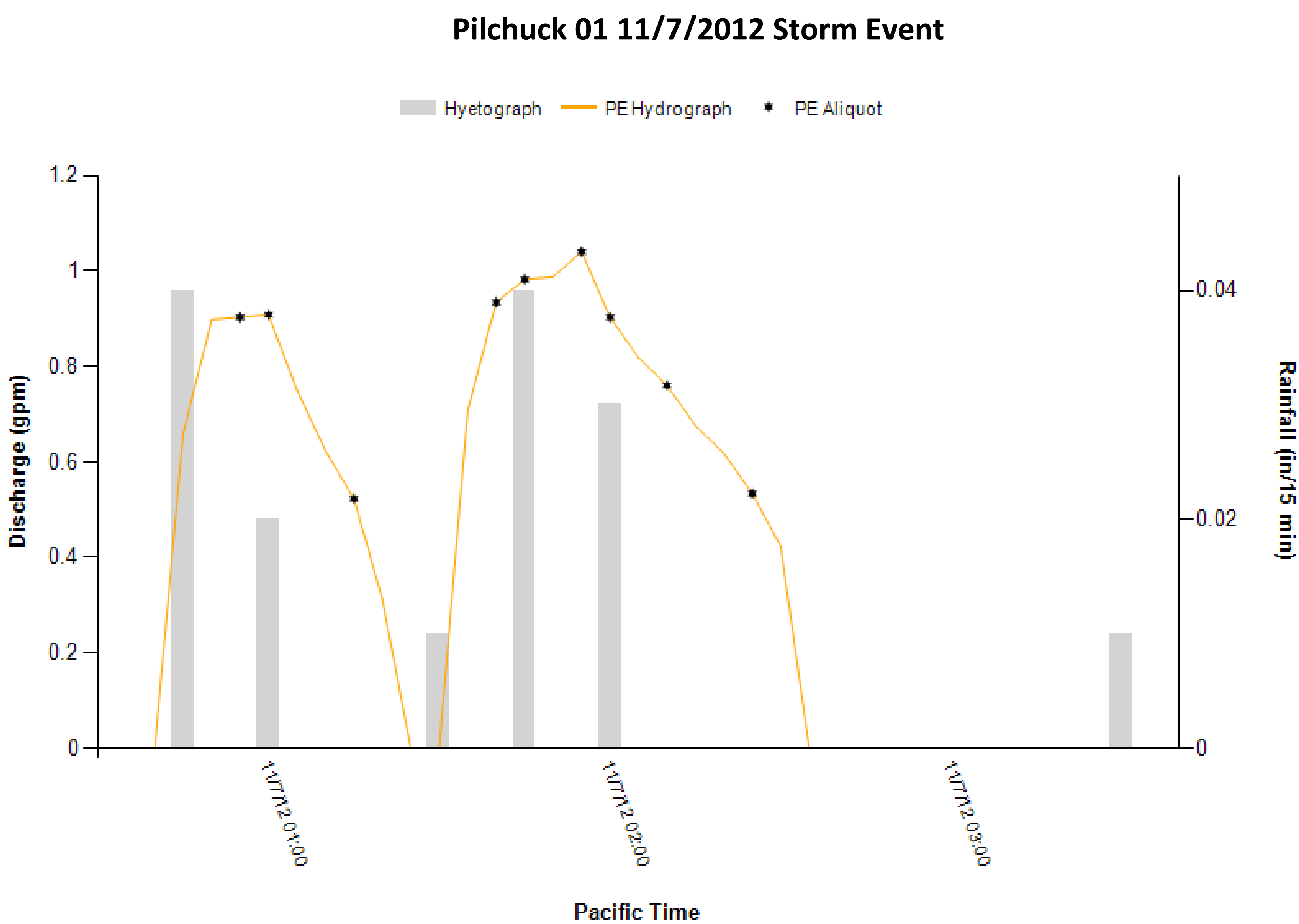
Precipitation												
Total (in)	Start Time		End Time		Duration (hrs)	Antecedent (hrs)						
0.95	10/18/2012 17:35		10/18/2012 21:50		4.25	62.74						
Aliquots								**Water Temp**		**Validation Code**		
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time		Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)			
PE	25	10/18/2012 18:00	10/19/2012 3:20		9.33	250	6,250	11.25	12.98			
Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	10/18/2012 17:40	10/19/2012 3:45	10.08	1,025.60	101.75	1,025.60	992.71	96.79	1.85	1.11	1.70	0.119

Gap in data so no graph available.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.15	11/7/2012 0:35	11/7/2012 3:25	2.83	49.5

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	9	11/7/2012 0:55	11/7/2012 2:25	1.50	250	2,250	9.18	10.56	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	11/7/2012 0:45	11/7/2012 2:30	1.75	74.84	42.77	74.84	72.73	97.18	1.04	0.31	0.75	0.091



Pilchuck 01 11/7/2012 Storm Event
Hyetograph
PE Hydrograph
PE Aliquot
Discharge (gpm)
Rainfall (in/15 min)
1.2
1
0.8
0.6
0.4
0.2
0
0.04
0.02
0
11/7/12 01:00
11/7/12 02:00
11/7/12 03:00
Pacific Time

Precipitation													
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)									
0.62	12/11/2012 9:35	12/12/2012 11:30	25.92	37.25									
Aliquots							Water Temp		Validation Code				
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)					
PE	N/A	N/A	N/A	N/A	N/A	N/A	5.18	6.54					
Runoff / Discharge													
	Runoff Time			Volume			Sampled		Flow			Stage	
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)	
PE	12/11/2012 9:45	12/12/2012 12:40	26.92	779.94	28.97	708.09	N/A	N/A	0.97	0.08	0.52	0.076	

Only grab samples collected.

Precipitation													
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)									
0.14	2/11/2013 9:50	2/11/2013 23:25	13.58	45.99									
Aliquots							Water Temp		Validation Code				
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)					
PE	N/A	N/A	N/A	N/A	N/A	N/A	5.18	6.29					
Runoff / Discharge													
	Runoff Time			Volume			Sampled		Flow			Stage	
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)	
PE	2/11/2013 10:30	2/12/2013 2:00	15.50	374.07	24.13	374.07	N/A	N/A	0.72	0.06	0.40	0.035	

Only grab samples collected.

Precipitation				
Total (in)	**Start Time**	**End Time**	**Duration (hrs)**	**Antecedent (hrs)**
0.24	2/16/2013 7:15	2/16/2013 13:45	6.50	47.5

Aliquots							Water Temp		Validation Code
Sample Point (m)	**Aliquots Collected**	**First Aliquot Time**	**Last Aliquot Time**	**Sampling Duration (hrs)**	**Volume (mL)**	**Total Sample Volume (mL)**	**Min (C°)**	**Max (C°)**	
PE	29	2/16/2013 7:25	2/16/2013 12:00	4.75	250	7,250	3.40	8.00	J

Runoff / Discharge												
	Runoff Time			**Volume**			**Sampled**		**Flow**			**Stage**
Sample Point (m)	**Start Time**	**End Time**	**Duration (hrs)**	**Total (gal)**	**Intensity (gal/hr)**	**First 24Hrs (gal)**	**Discharge Total Volume Sampled (gal)**	**% Hydrograph Sampled**	**Peak (gpm)**	**Min (gpm)**	**Mean (gpm)**	**Max (ft)**
PE	2/16/2013 7:25	2/16/2013 15:10	7.75	216.91	27.99	216.91	182.20	84.00	0.99	0.00	0.46	N/A

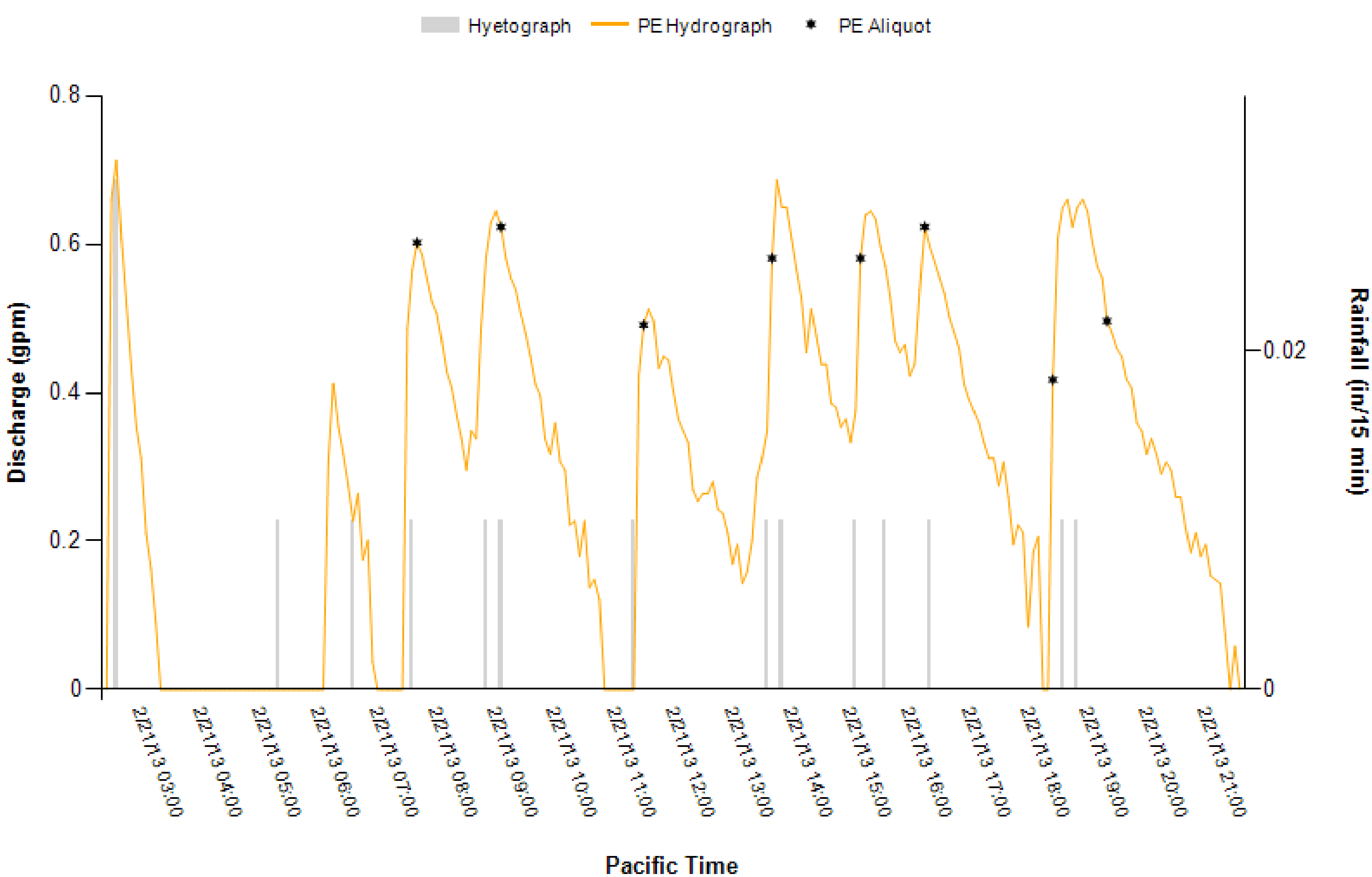
J=Estimate of Hydrology information. There is a data gap with this storm so there is no graph available.

Precipitation				
Total (in)	**Start Time**	**End Time**	**Duration (hrs)**	**Antecedent (hrs)**
0.16	2/21/2013 2:25	2/21/2013 18:50	16.42	37.99

Aliquots							Water Temp		Validation Code
Sample Point (m)	**Aliquots Collected**	**First Aliquot Time**	**Last Aliquot Time**	**Sampling Duration (hrs)**	**Volume (mL)**	**Total Sample Volume (mL)**	**Min (C°)**	**Max (C°)**	
PE	8	2/21/2013 7:40	2/21/2013 19:20	11.67	250	2,000	3.72	5.88	

Runoff / Discharge												
	Runoff Time			**Volume**			**Sampled**		**Flow**			**Stage**
Sample Point (m)	**Start Time**	**End Time**	**Duration (hrs)**	**Total (gal)**	**Intensity (gal/hr)**	**First 24Hrs (gal)**	**Discharge Total Volume Sampled (gal)**	**% Hydrograph Sampled**	**Peak (gpm)**	**Min (gpm)**	**Mean (gpm)**	**Max (ft)**
PE	2/21/2013 2:30	2/21/2013 21:30	19.00	351.43	18.50	351.43	317.09	90.23	0.71	0.04	0.39	0.035

Pilchuck 01 2/21/2013 Storm Event



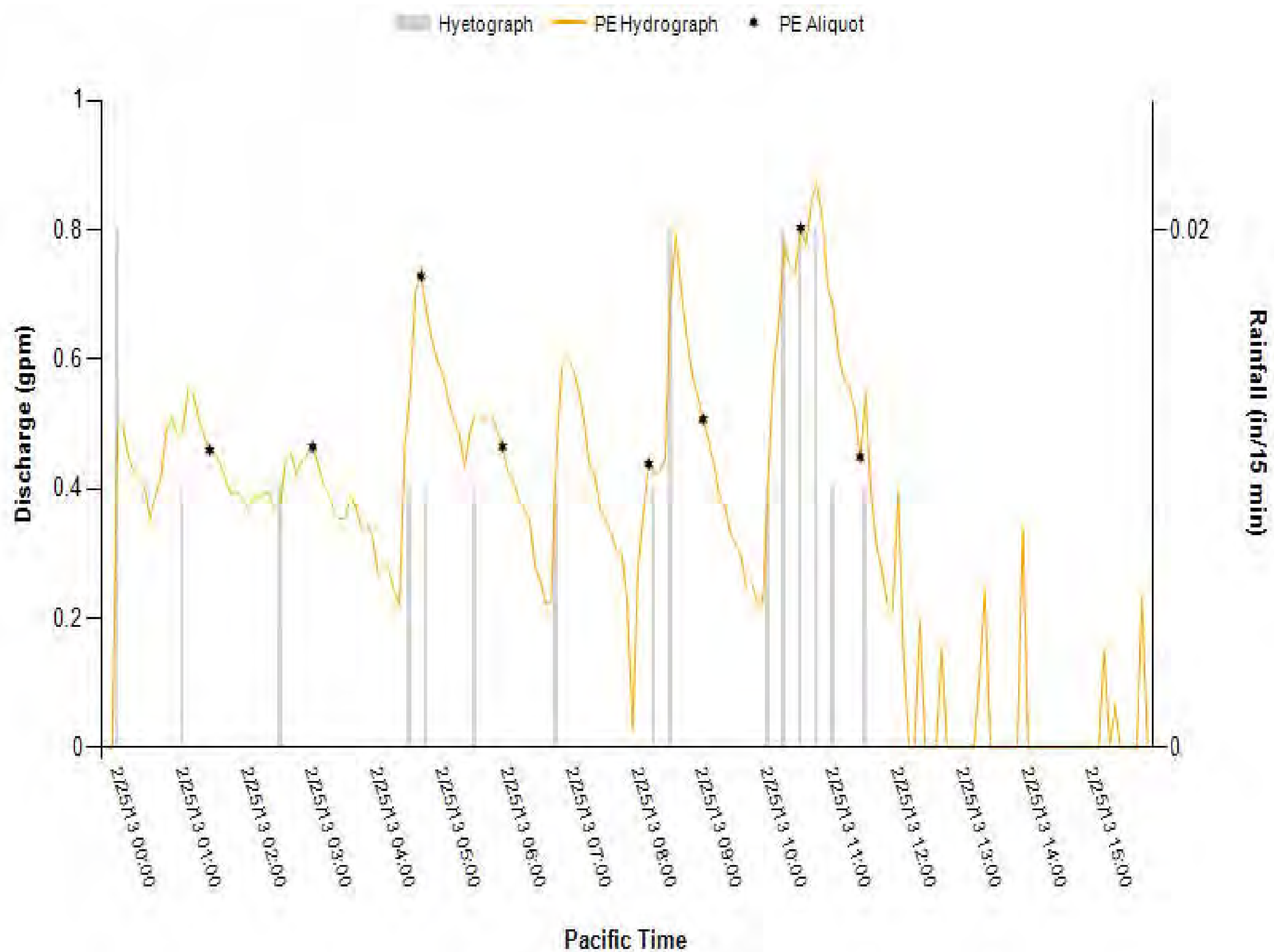
Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.20	2/24/2013 23:50	2/25/2013 11:25	11.58	38

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	8	2/25/2013 1:25	2/25/2013 11:25	10.00	250	2,000	4.74	5.21	J

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	2/25/2013 0:00	2/25/2013 15:45	15.75	337.45	21.43	337.45	317.53	94.10	0.87	0.03	0.44	0.057

J=Estimate of Hydrology information

Pilchuck 01 2/24/2013 Storm Event

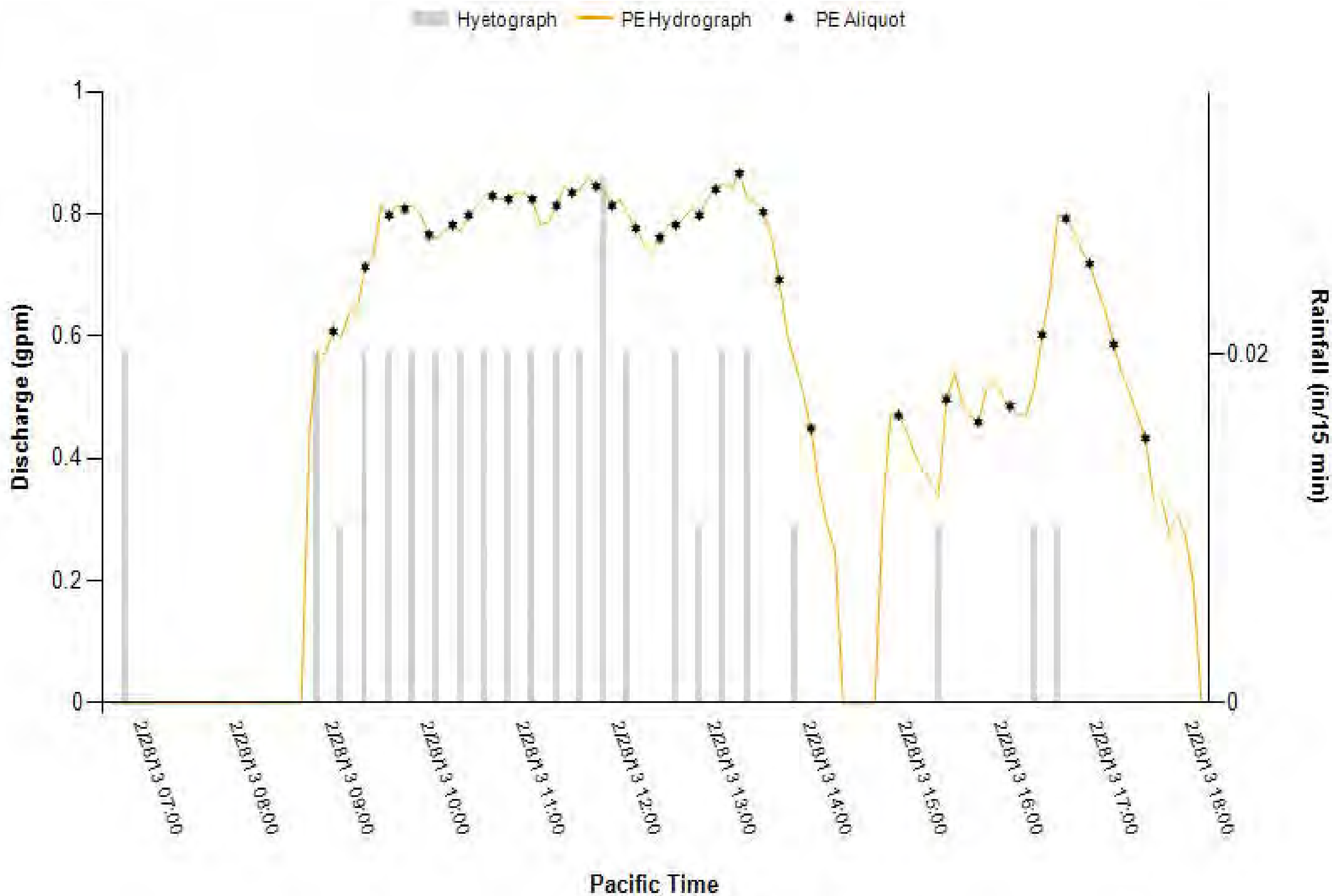


Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.41	2/28/2013 6:40	2/28/2013 16:35	9.92	67.75

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	32	2/28/2013 9:00	2/28/2013 17:30	8.50	250	8,000	5.46	7.77	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	2/28/2013 8:45	2/28/2013 18:00	9.25	347.12	37.53	347.12	338.51	97.52	0.87	0.20	0.65	0.057

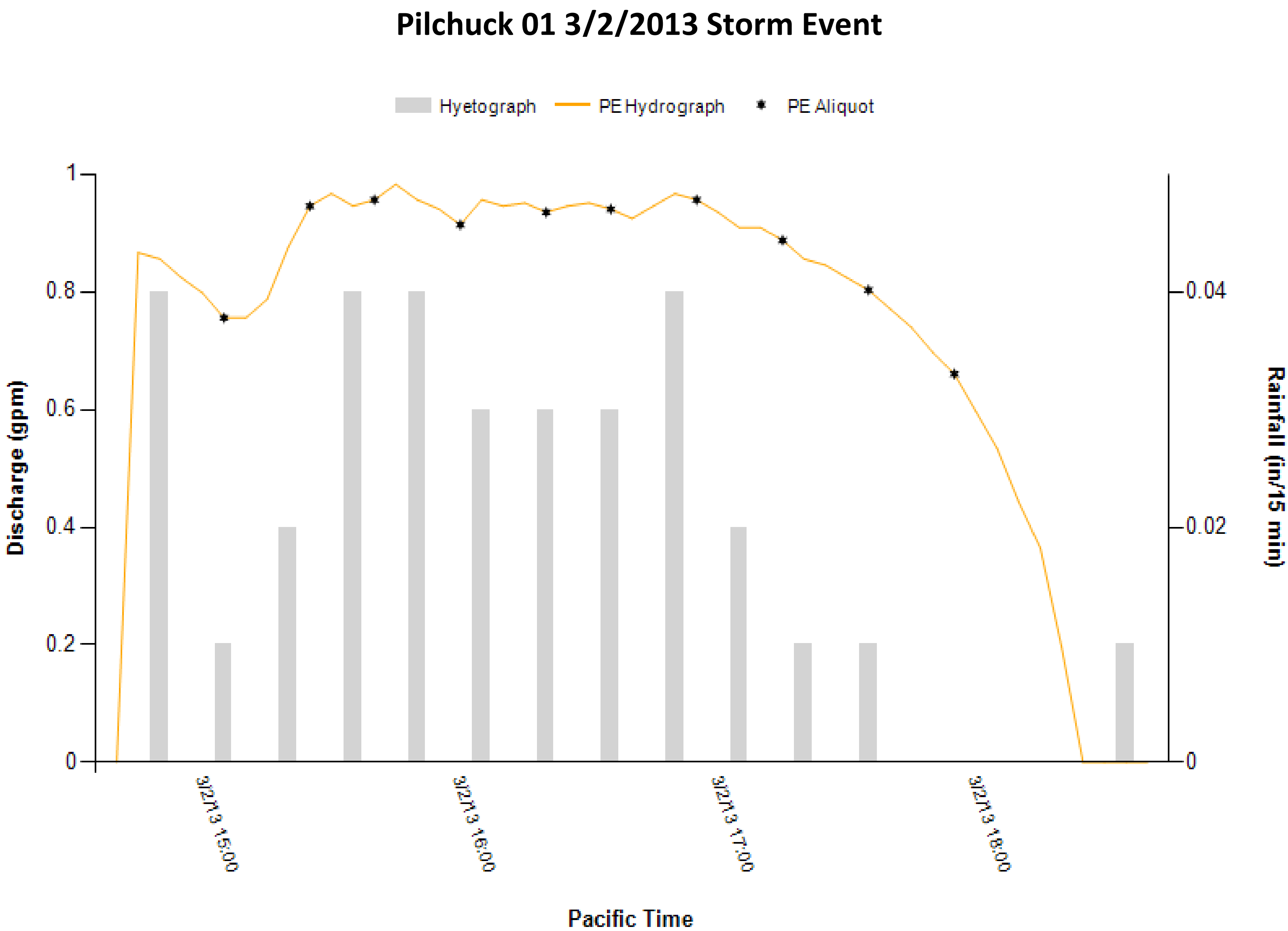
Pilchuck 01 2/28/2013 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.33	3/2/2013 14:40	3/2/2013 18:30	3.83	46.24

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	10	3/2/2013 15:05	3/2/2013 17:55	2.83	250	2,500	6.85	9.20	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	3/2/2013 14:45	3/2/2013 18:20	3.58	182.60	51.00	182.60	171.92	94.16	0.98	0.20	0.83	0.079


Pilchuck 01 3/2/2013 Storm Event
Hyetograph
PE Hydrograph
PE Aliquot
Discharge (gpm)
Rainfall (in/15 min)
1
0.8
0.6
0.4
0.2
0
0.04
0.02
0
3/2/13 15:00
3/2/13 16:00
3/2/13 17:00
3/2/13 18:00
Pacific Time

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.70	3/6/2013 8:55	3/7/2013 1:20	26.42	87.25

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	4.94	7.37	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	3/6/2013 9:50	3/7/2013 14:05	28.25	1,010.45	35.77	893.00	N/A	N/A	0.81	0.18	0.61	0.048

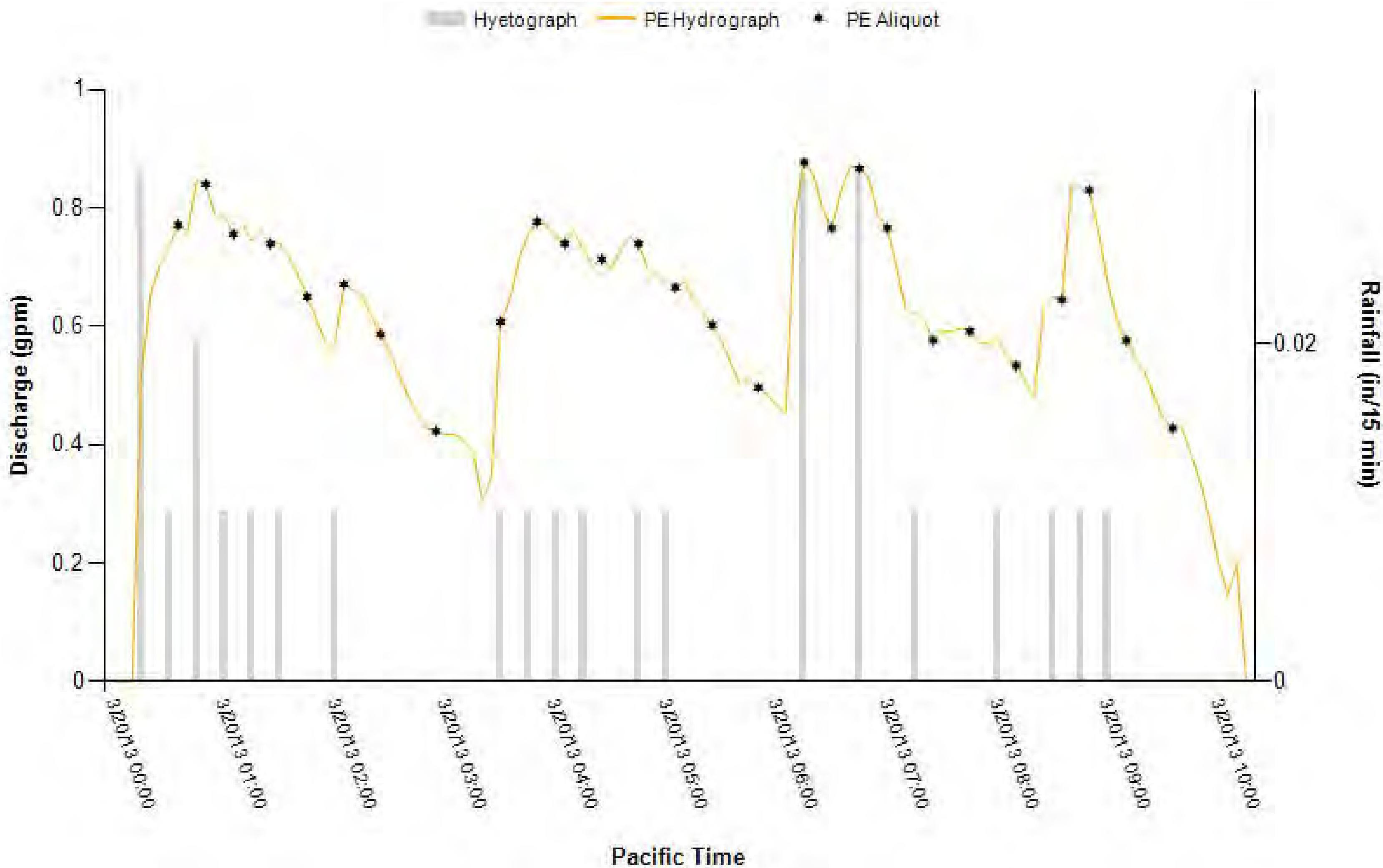
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.27	3/20/2013 0:10	3/20/2013 8:50	8.67	42

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	27	3/20/2013 0:35	3/20/2013 9:35	9.00	250	6,750	6.64	8.99	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	3/20/2013 0:15	3/20/2013 10:10	9.92	373.70	37.67	373.70	363.84	97.36	0.88	0.15	0.62	0.059

Pilchuck 01 3/20/2013 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.34	4/12/2013 20:45	4/13/2013 6:00	9.25	48

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	19	4/12/2013 21:00	4/13/2013 7:00	10.00	250	4,750	6.00	7.90	J

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	4/12/2013 20:50	4/13/2013 7:00	10.17	371.61	36.54	371.61	371.61	100.00	5.36	0.90	3.05	0.098

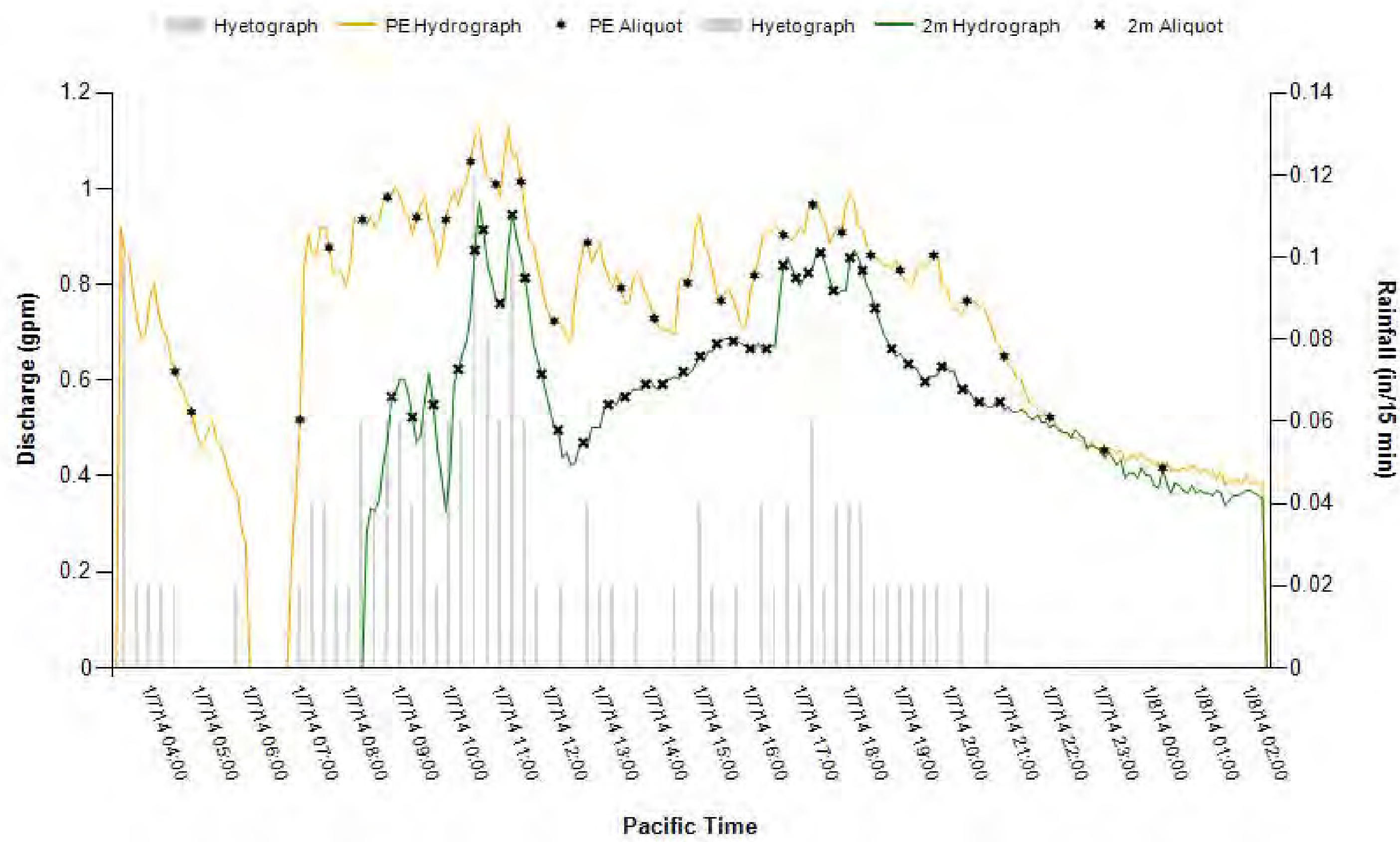
J=Estimate of Hydrology information. There is a data gap with this storm so there is no graph available.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.97	01/07/2014 03:20	01/07/2014 20:35	17.25	79.75

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	29	01/07/2014 04:30	01/08/2014 00:15	19.75	250	7,250	2.07	6.54	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	01/07/2014 03:25	01/08/2014 02:15	22.83	964.6	42.3	964.6	920.2	95.40	1.13	0.23	0.73	0.111

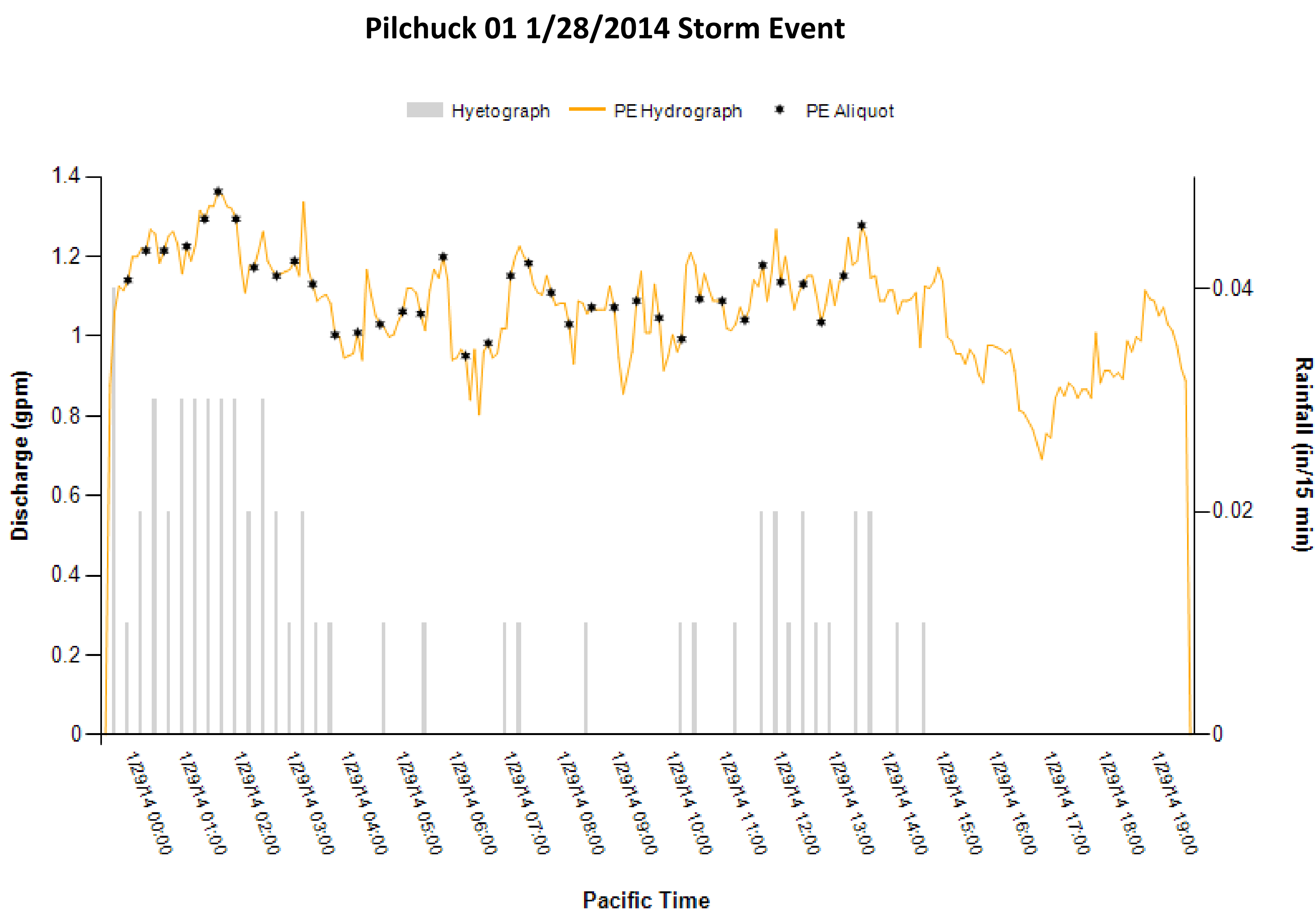
Pilchuck 01 1/7/2014 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.62	1/28/2014 23:30	1/29/2014 14:40	15.17	373.24

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	37	1/28/2014 23:55	1/29/2014 13:30	13.58	250	9,250	5.82	8.87	J

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	1/28/2014 23:35	1/29/2014 19:30	19.92	1,280.30	64.3	1,280.30	931.5	72.8	1.36	0.69	1.07	0.181


Pilchuck 01 1/28/2014 Storm Event
Hyetograph
PE Hydrograph
PE Aliquot
Discharge (gpm)
Rainfall (in/15 min)
Pacific Time
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0.04
0.02
0
1/29/14 00:00
1/29/14 01:00
1/29/14 02:00
1/29/14 03:00
1/29/14 04:00
1/29/14 05:00
1/29/14 06:00
1/29/14 07:00
1/29/14 08:00
1/29/14 09:00
1/29/14 10:00
1/29/14 11:00
1/29/14 12:00
1/29/14 13:00
1/29/14 14:00
1/29/14 15:00
1/29/14 16:00
1/29/14 17:00
1/29/14 18:00
1/29/14 19:00

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.11	2/18/2014 16:15	2/18/2014 23:30	7	16.75

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	5.6	7.7	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.10	03/02/2014 13:55	03/02/2014 22:45	8.83	134.74

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	5.71	5.71	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	03/02/2014 18:55	03/02/2014 22:50	3.92	69.2	17.6	69.2	N/A	N/A	0.80	0.08	0.40	0.046

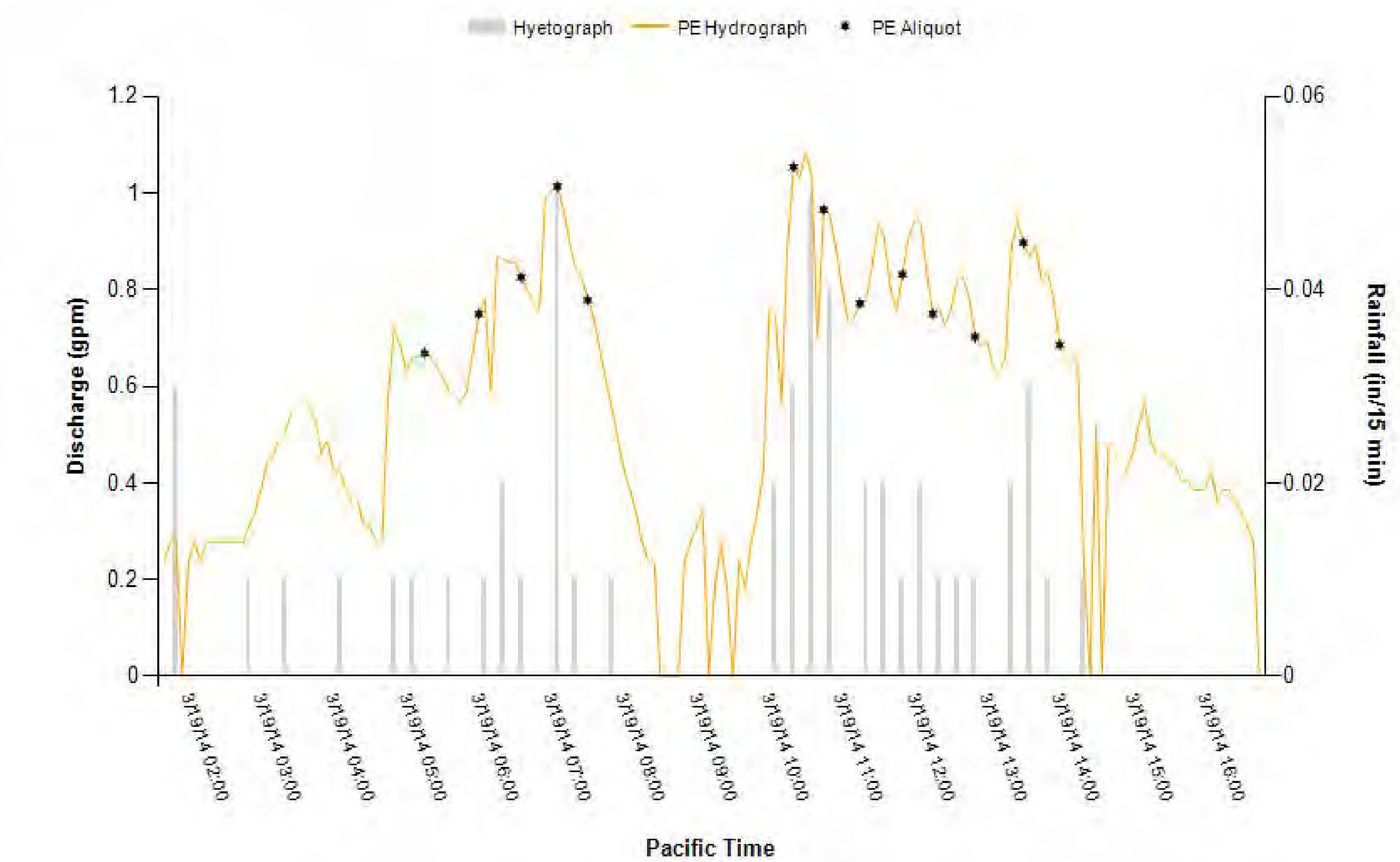
Only grab samples collected.

Precipitation				
Total (in)	**Start Time**	**End Time**	**Duration (hrs)**	**Antecedent (hrs)**
0.51	03/19/2014 01:40	03/19/2014 14:15	12.58	40

Aliquots							Water Temp		Validation Code
Sample Point (m)	**Aliquots Collected**	**First Aliquot Time**	**Last Aliquot Time**	**Sampling Duration (hrs)**	**Volume (mL)**	**Total Sample Volume (mL)**	**Min (C°)**	**Max (C°)**	
PE	13	03/19/2014 05:15	03/19/2014 14:00	8.75	250	3,250	7.28	8.92	

Runoff / Discharge												
	Runoff Time			**Volume**			**Sampled**		**Flow**			**Stage**
Sample Point (m)	**Start Time**	**End Time**	**Duration (hrs)**	**Total (gal)**	**Intensity (gal/hr)**	**First 24Hrs (gal)**	**Discharge Total Volume Sampled (gal)**	**% Hydrograph Sampled**	**Peak (gpm)**	**Min (gpm)**	**Mean (gpm)**	**Max (ft)**
PE	03/19/2014 01:40	03/19/2014 16:40	15.00	502.3	33.5	502.3	436.4	86.90	1.08	0.18	0.59	0.101

Pilchuck 01 3/19/2014 Storm Event

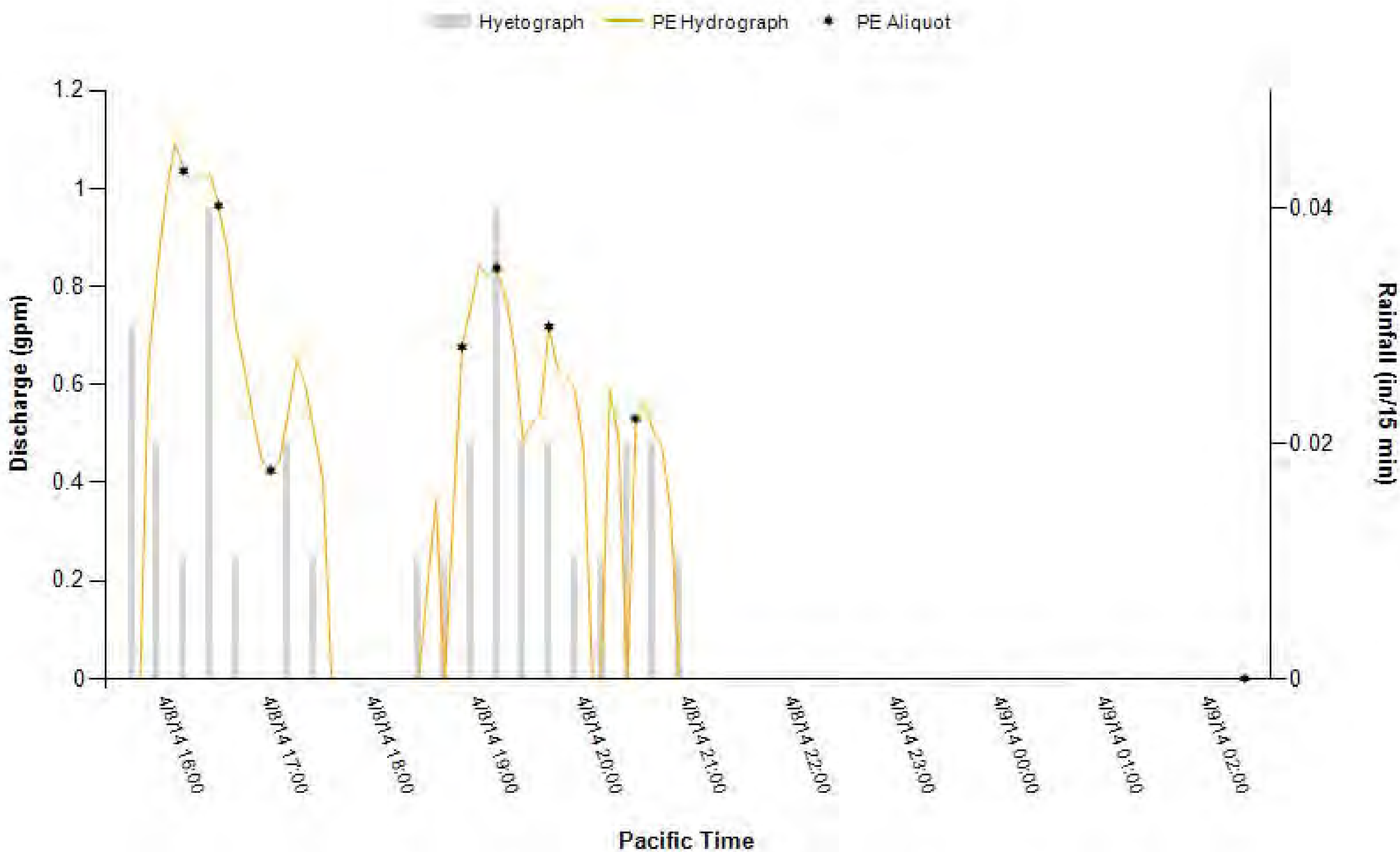


Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.33	4/8/2014 15:30	4/8/2014 20:55	5.42	57.49

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	12	4/8/2014 16:10	4/9/2014 2:20	10.17	250	3,000	6.39	13.78	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	4/8/2014 15:50	4/9/2014 2:20	10.5	148.7	14.2	148.7	148.7	100	1.09	0	0.63	0.103

Pilchuck 01 4/8/2014 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
1.34	04/16/2014 02:55	04/17/2014 20:40	41.75	174.25

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	8.9	13.3	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	04/16/2014 10:35	04/17/2014 20:45	34.17	269.2	7.9	94.2	0.0	0.00	1.20	0.05	0.50	0.133

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
2.15	05/08/2014 13:30	05/10/2014 02:35	37.08	71.5

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	11.97	13.39	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	05/08/2014 13:30	05/10/2014 07:30	42.00	1,456.0	34.7	1,293.3	596.8	46.10	1.27	0.18	0.83	0.153

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.11	05/29/2014 02:40	05/29/2014 05:10	2.50	66.24

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	12.69	12.69	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	05/29/2014 02:55	05/29/2014 06:20	3.42	95.6	28.0	95.6	27.6	28.90	0.96	0.18	0.46	0.073

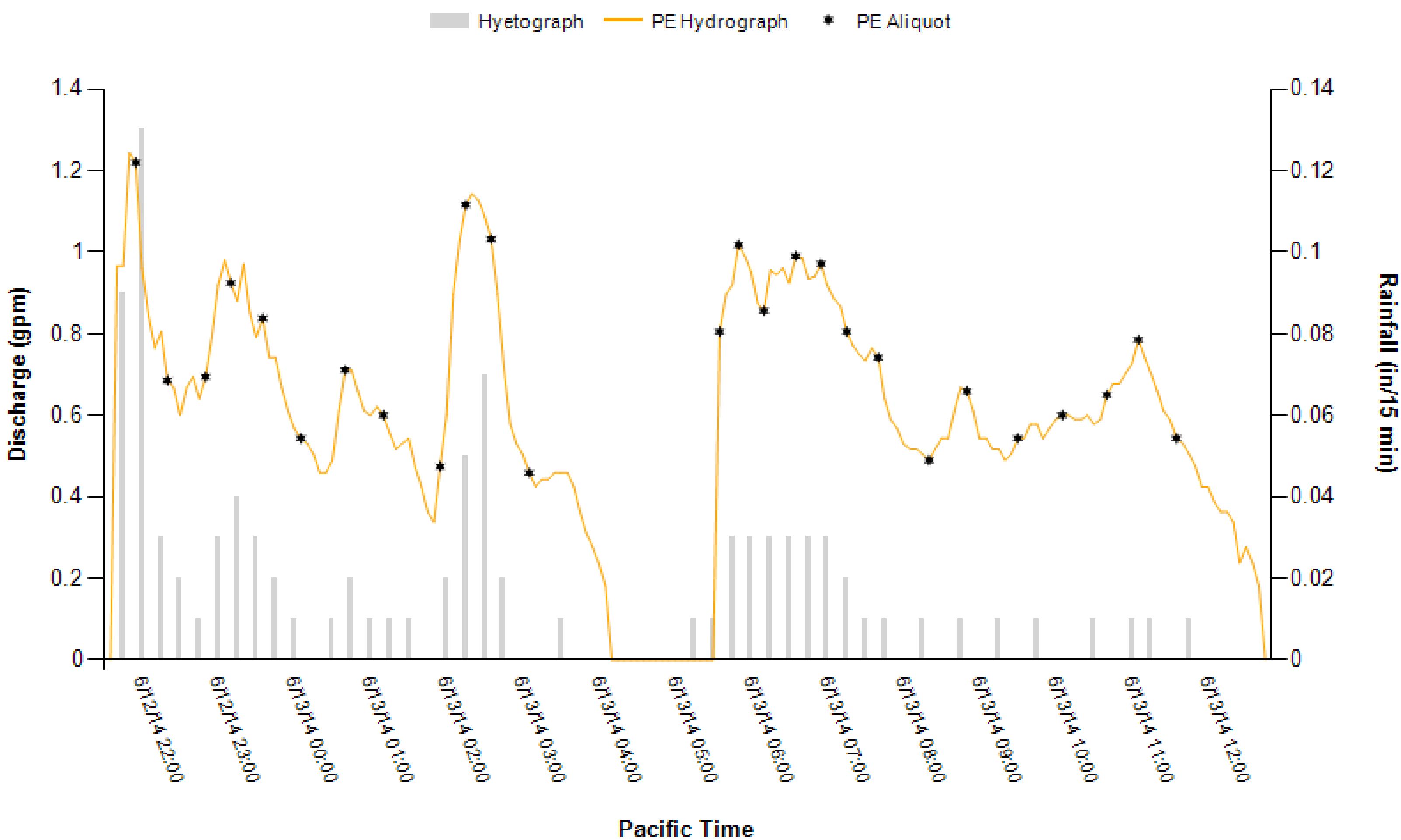
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.96	6/12/2014 21:35	6/13/2014 11:35	14	352.24

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	26	6/12/2014 21:55	6/13/2014 11:35	13.67	250	6,500	12.6	14.9	R

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	6/12/2014 21:40	6/13/2014 12:40	15	539.4	36	539.4	515.7	95.6	1.24	0.18	0.66	0.144

Pilchuck 01 6/12/2014 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.08	06/27/2014 09:30	06/27/2014 10:15	0.75	175.24

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	15.4	15.8	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	06/27/2014 10:15	06/27/2014 15:25	5.17	38.7	7.5	38.7	N/A	N/A	0.69	0.18	0.26	0.031

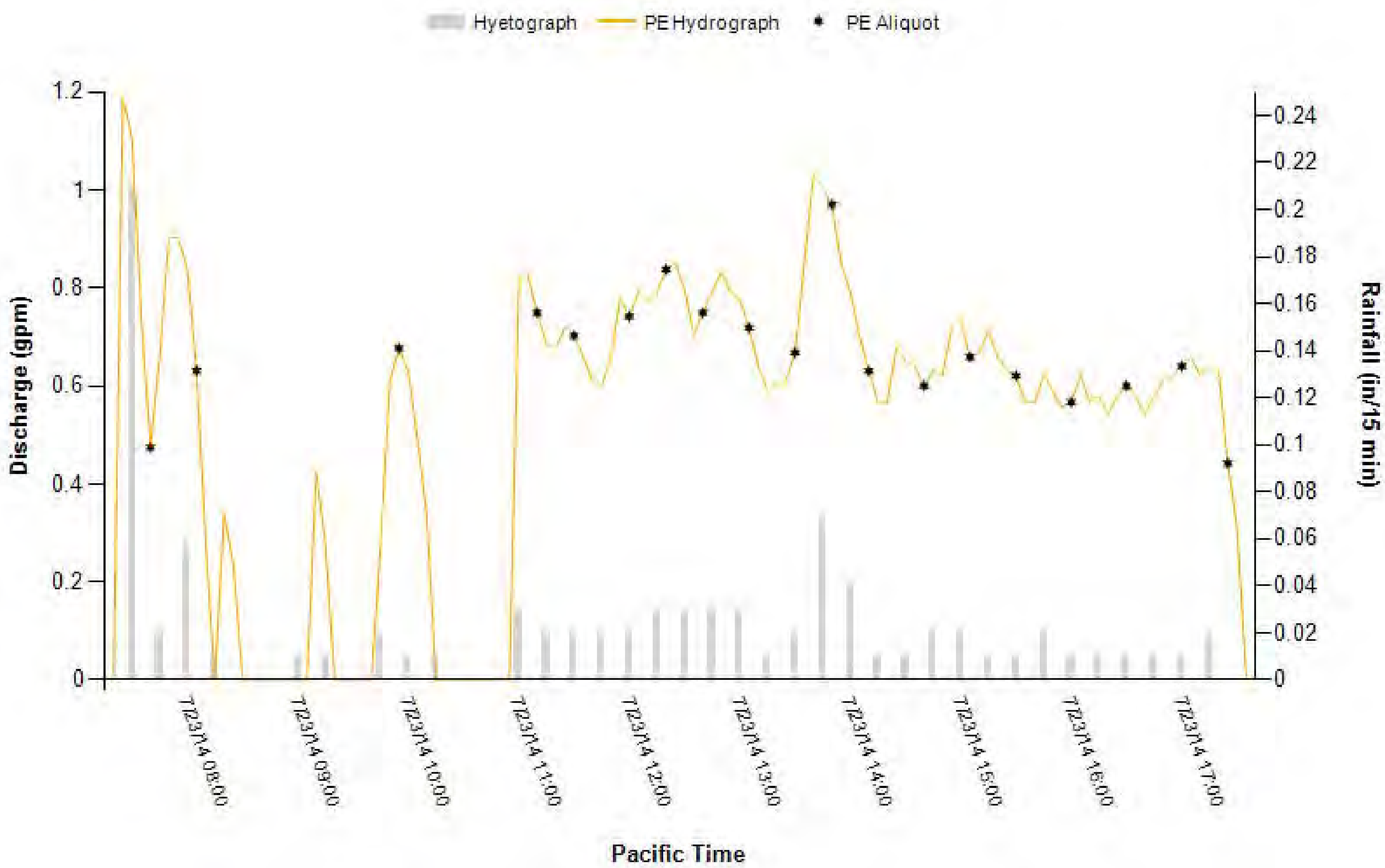
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.90	07/23/2014 07:20	07/23/2014 17:15	9.92	310.41

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	19	07/23/2014 07:40	07/23/2014 17:25	9.75	250	4,750	16.50	18.60	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	07/23/2014 07:25	07/23/2014 17:30	10.08	327.9	32.5	327.9	326.3	99.50	1.19	0.24	0.66	0.128

Pilchuck 01 7/23/2014 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
1.06	08/13/2014 00:40	08/13/2014 09:00	8.33	470.25

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	37	08/13/2014 01:00	08/13/2014 07:20	6.33	250	9,250	17.80	19.50	R

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	08/13/2014 00:55	08/13/2014 09:15	8.33	339.4	40.7	339.4	246.7	72.70	1.05	0.28	0.78	0.094

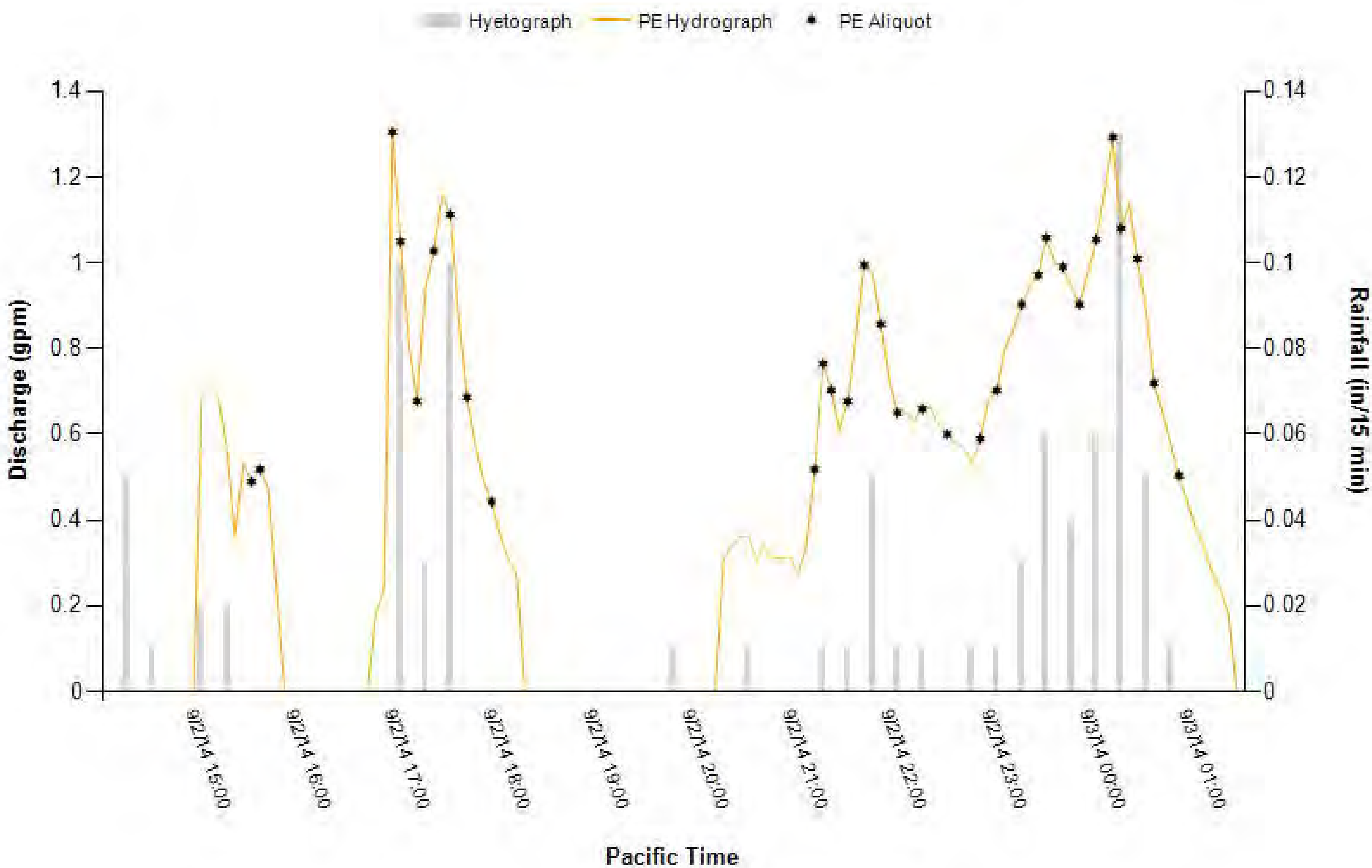
Rejected because less than 75% of the hydrograph was sampled.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.84	09/02/2014 14:10	09/03/2014 00:40	10.50	78.75

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	31	09/02/2014 15:35	09/03/2014 00:55	9.33	250	7,750	13.70	17.90	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	09/02/2014 15:05	09/03/2014 01:25	10.33	296.8	28.7	296.8	287.5	96.90	1.30	0.18	0.66	0.163

Pilchuck 01 9/2/2014 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.75	09/23/2014 21:10	09/24/2014 11:25	14.25	131.33

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	16.30	17.20	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	09/23/2014 22:00	09/24/2014 15:45	17.75	630.8	35.5	630.8	297.8	47.20	1.19	0.18	0.63	0.129

Only grab samples collected.

EVERETT 01

Precipitation				
Total (in)	**Start Time (UTC)**	**End Time (UTC)**	**Duration (hrs)**	**Antecedent (hrs)**
0.04	10/12/2012 19:45	10/12/2012 12:40	2.92	291.25

Aliquots							Water Temp		Validation Code
Sample Point (m)	**Aliquots Collected**	**First Aliquot Time (UTC)**	**Last Aliquot Time (UTC)**	**Sampling Duration (hrs)**	**Volume (mL)**	**Total Sample Volume (mL)**	**Min (C°)**	**Max (C°)**	
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Runoff / Discharge												
	Runoff Time			**Volume**			**Sampled**		**Flow**			**Stage**
Sample Point (m)	**Start Time (UTC)**	**End Time (UTC)**	**Duration (hrs)**	**Total (gal)**	**Intensity (gal/hr)**	**First 24Hrs (gal)**	**Discharge Total Volume Sampled (gal)**	**% Hydrograph Sampled**	**Peak (gpm)**	**Min (gpm)**	**Mean (gpm)**	**Max (ft)**
PE	N/A	N/A	N/A			N/A	N/A	N/A	N/A	N/A	N/A	N/A

Only grab samples collected.

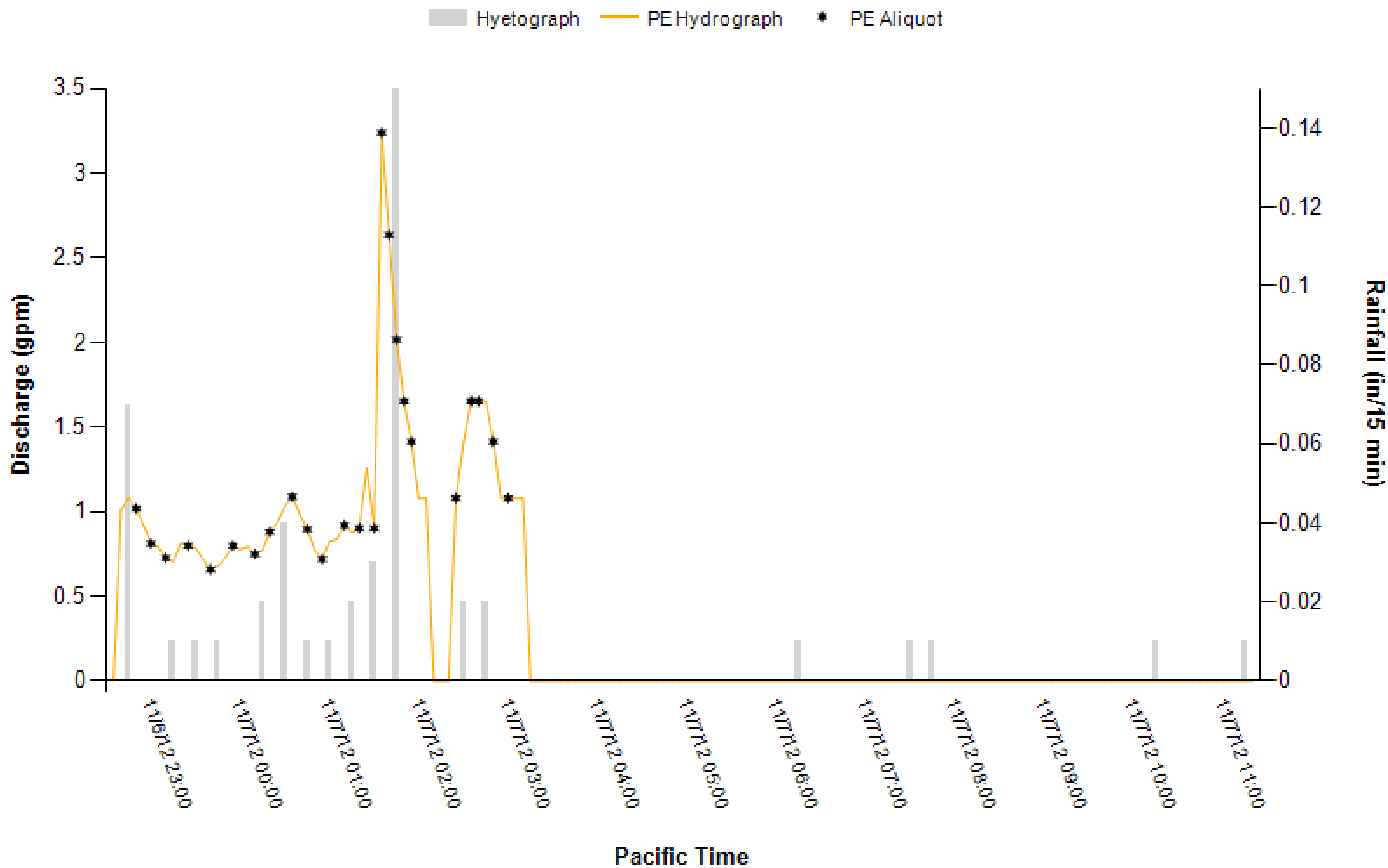
Precipitation				
Total (in)	**Start Time**	**End Time**	**Duration (hrs)**	**Antecedent (hrs)**
0.47	11/6/2012 22:35	11/7/2012 11:15	12.67	47.74

Aliquots							Water Temp		Validation Code
Sample Point (m)	**Aliquots Collected**	**First Aliquot Time**	**Last Aliquot Time**	**Sampling Duration (hrs)**	**Volume (mL)**	**Total Sample Volume (mL)**	**Min (C°)**	**Max (C°)**	
PE	24	11/6/2012 22:50	11/7/2012 3:00	4.17	250	6,000	8.98	10.65	J

Runoff / Discharge												
	Runoff Time			**Volume**			**Sampled**		**Flow**			**Stage**
Sample Point (m)	**Start Time**	**End Time**	**Duration (hrs)**	**Total (gal)**	**Intensity (gal/hr)**	**First 24Hrs (gal)**	**Discharge Total Volume Sampled (gal)**	**% Hydrograph Sampled**	**Peak (gpm)**	**Min (gpm)**	**Mean (gpm)**	**Max (ft)**
PE	11/6/2012 22:40	11/7/2012 3:10	4.50	281.24	62.50	281.24	270.44	96.16	3.24	0.66	1.08	0.500

J=Estimate of Hydrology information

Everett 01 11/6/2012 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.51	12/11/2012 13:45	12/12/2012 7:00	17.25	78

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	5.34	5.97	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	12/11/2012 16:40	12/12/2012 7:25	14.75	525.19	35.61	525.19	N/A	N/A	1.02	0.18	0.66	0.087

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.06	2/11/2013 8:30	2/11/2013 13:15	4.75	44

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	4.00	6.30	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	2/11/2013 14:50	2/11/2013 17:00	2.17	44.46	20.49	44.46	N/A	N/A	0.39	0.28	0.34	N/A

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.93	2/22/2013 10:45	2/23/2013 10:25	23.67	30.24

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	0.06	7.21	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	2/22/2013 10:50	2/23/2013 11:10	24.33	590.62	24.28	588.81	N/A	N/A	1.88	0.18	0.61	0.419

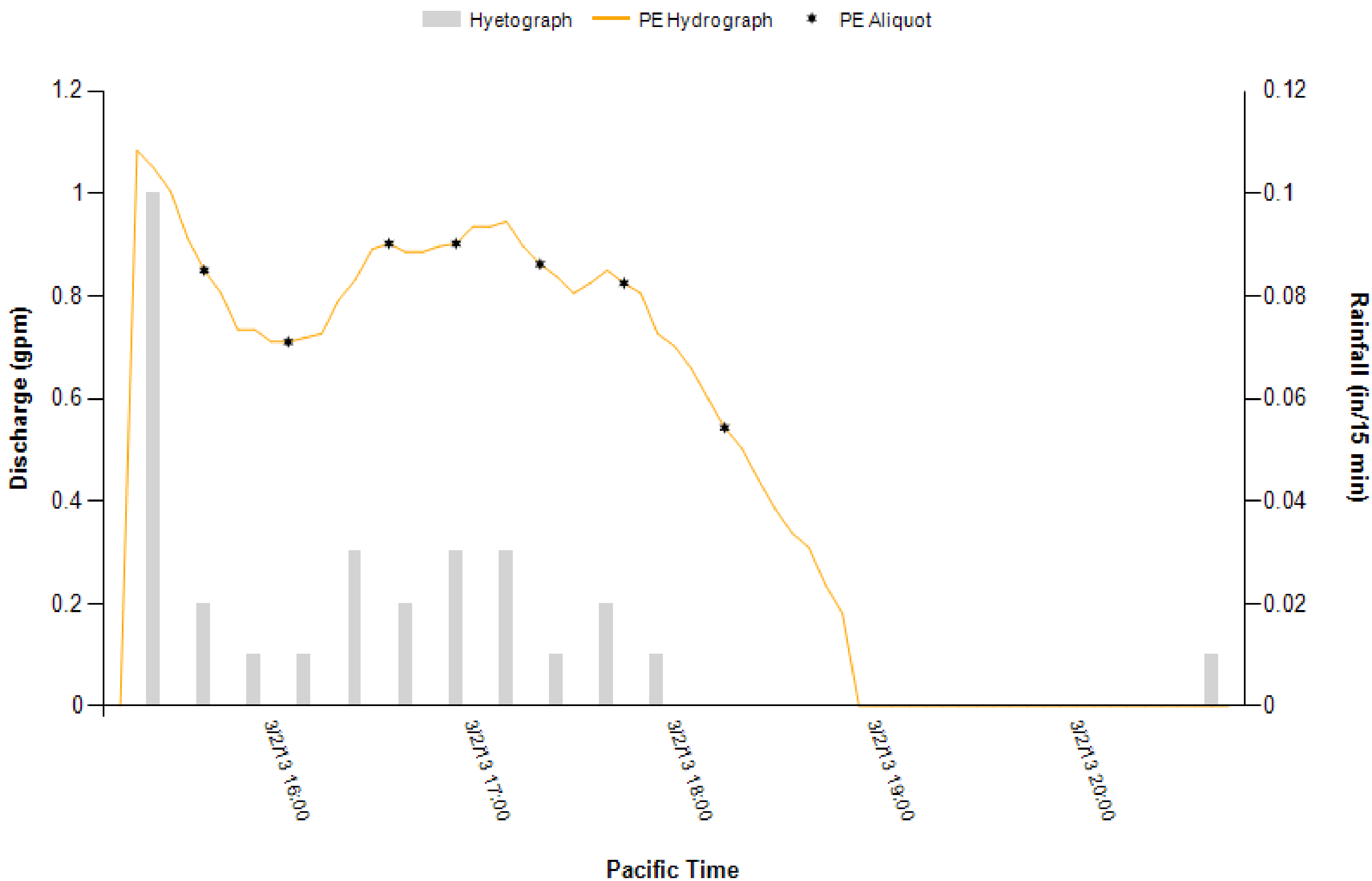
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.30	3/2/2013 15:15	3/2/2013 20:30	5.25	45

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	7	3/2/2013 15:40	3/2/2013 18:15	2.58	250	1,750	7.10	9.12	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	3/2/2013 15:20	3/2/2013 18:50	3.50	160.90	45.97	160.90	148.92	92.55	1.08	0.18	0.75	0.101

Everett 01 3/2/2013 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.63	3/6/2013 9:35	3/7/2013 9:40	24.08	76.25

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	4.97	7.94	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	3/6/2013 9:50	3/7/2013 9:35	23.75	653.46	27.51	652.56	N/A	N/A	0.81	0.18	0.53	0.048

Only grab samples collected.

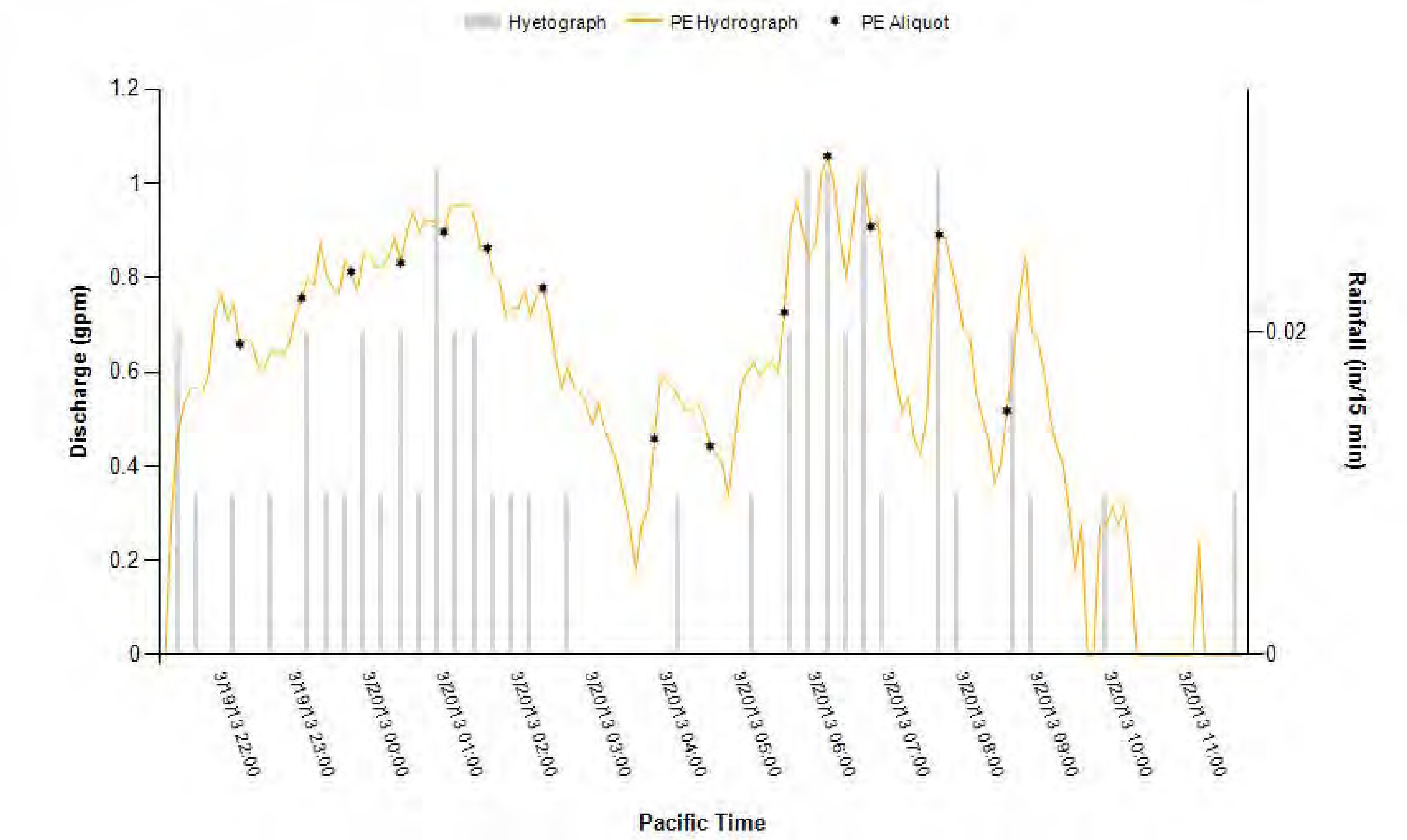
Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.51	3/19/2013 21:15	3/20/2013 11:40	14.42	38.25

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	13	3/19/2013 21:15	3/20/2013 8:35	10.33	250	3,250	6.31	7.63	J

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	3/19/2013 21:20	3/20/2013 11:10	13.83	506.35	36.61	506.35	465.53	86.3	1.06	0.18	0.65	0.095

J=Estimate of Hydrology information

Everett 01 3/19/2013 Storm Event



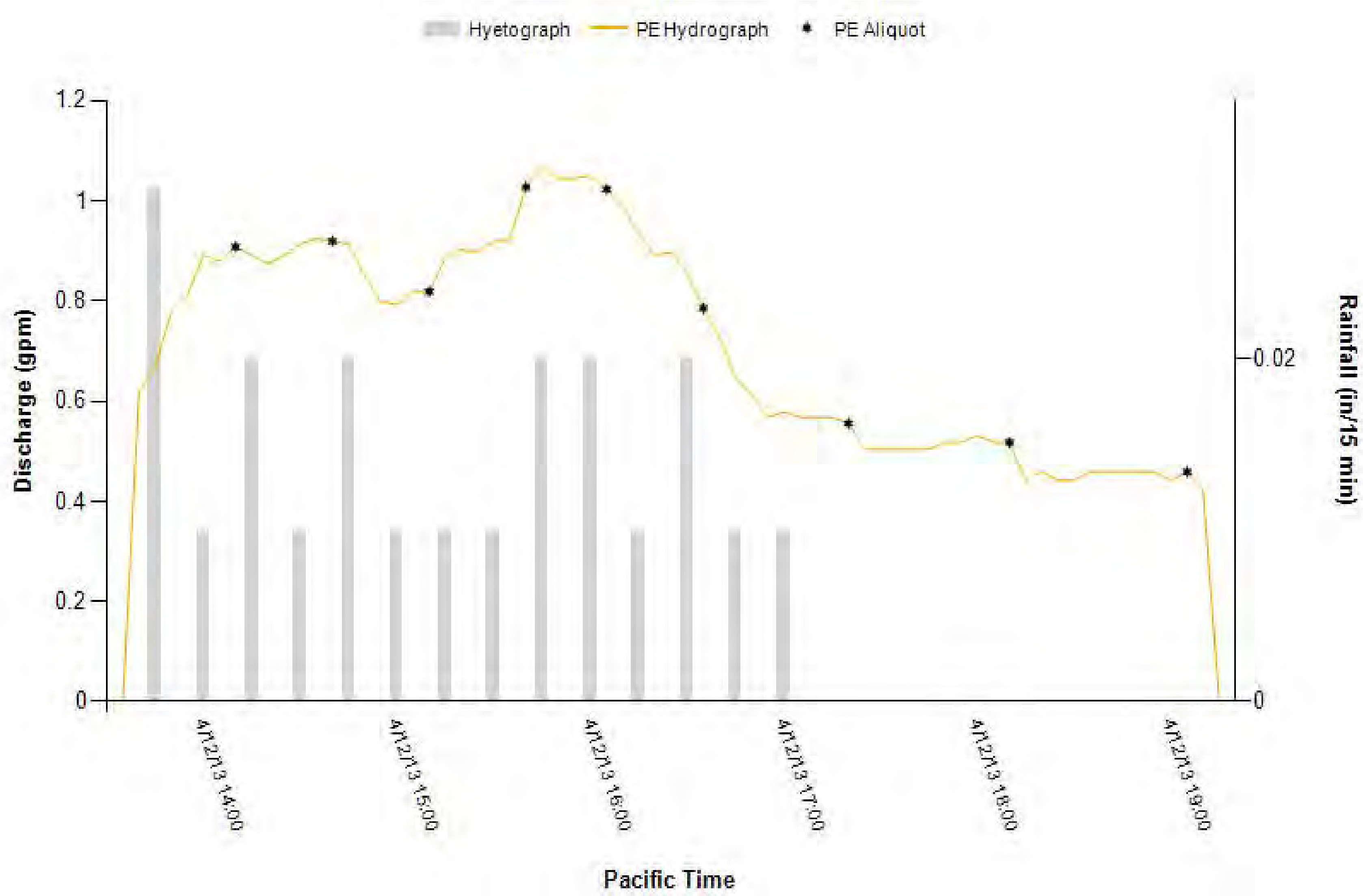
Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.21	4/12/2013 13:35	4/12/2013 16:55	3.33	32

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	9	4/12/2013 14:10	4/12/2013 19:05	4.92	250	2,250	6.53	8.62	J

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	4/12/2013 13:40	4/12/2013 19:10	5.50	240.05	43.65	240.05	237.95	99.12	1.07	0.42	0.72	0.097

J=Estimate of Hydrology information

Everett 01 4/12/2013 Storm Event

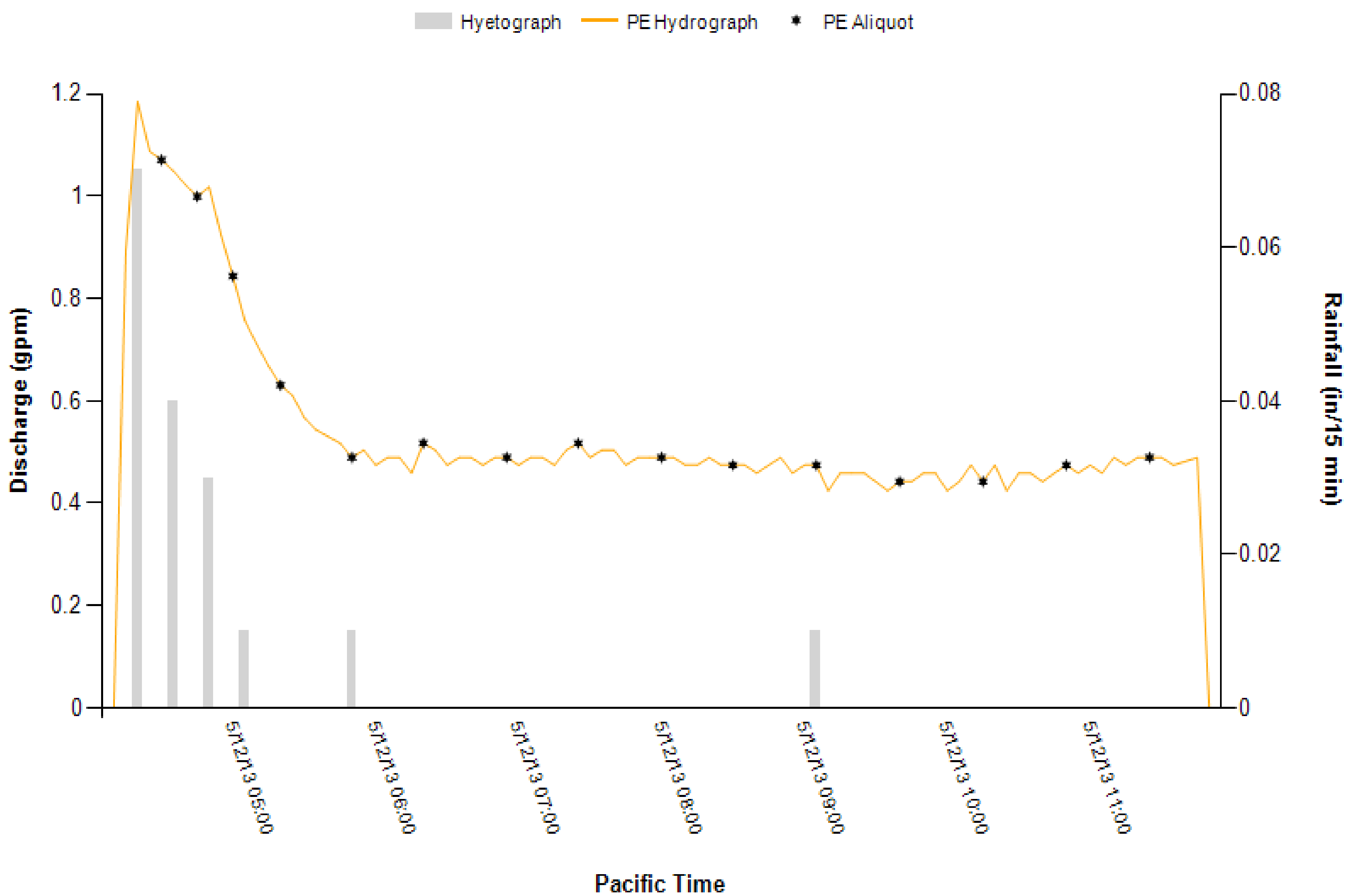


Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.17	5/11/2013 22:10	5/12/2013 9:05	4.92	286.5

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	15	5/12/2013 4:30	5/12/2013 1:25	6.92	250	3,750	15.00	16.02	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	5/12/2013 4:15	5/12/2013 11:45	7.50	246.32	32.84	246.32	239.05	97.05	1.18	0.42	0.55	0.127

Everett 01 5/11/2013 Storm Event

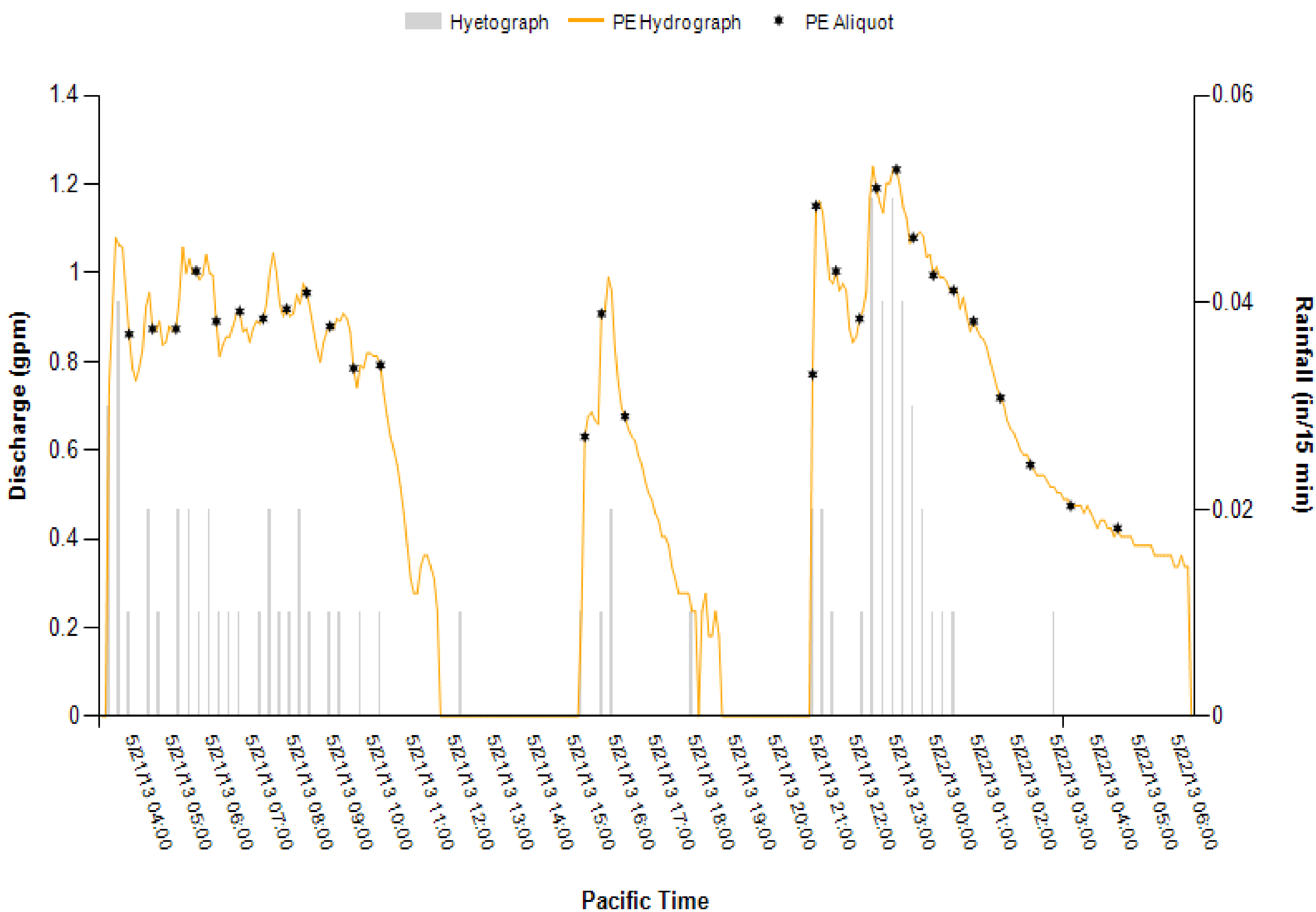


Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.72	5/21/2013 3:15	5/22/2013 2:45	23.50	43.75

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	29	5/21/2013 3:55	5/22/2013 4:30	24.58	250	7,250	8.43	16.25	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	5/21/2013 3:25	5/22/2013 6:15	26.83	922.20	34.37	849.49	849.49	100.00	1.24	0.18	0.53	0.143

Everett 01 5/21/2013 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.36	11/18/2013 12:05	11/19/2013 08:35	20.50	38.25

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	8.6	10.1	

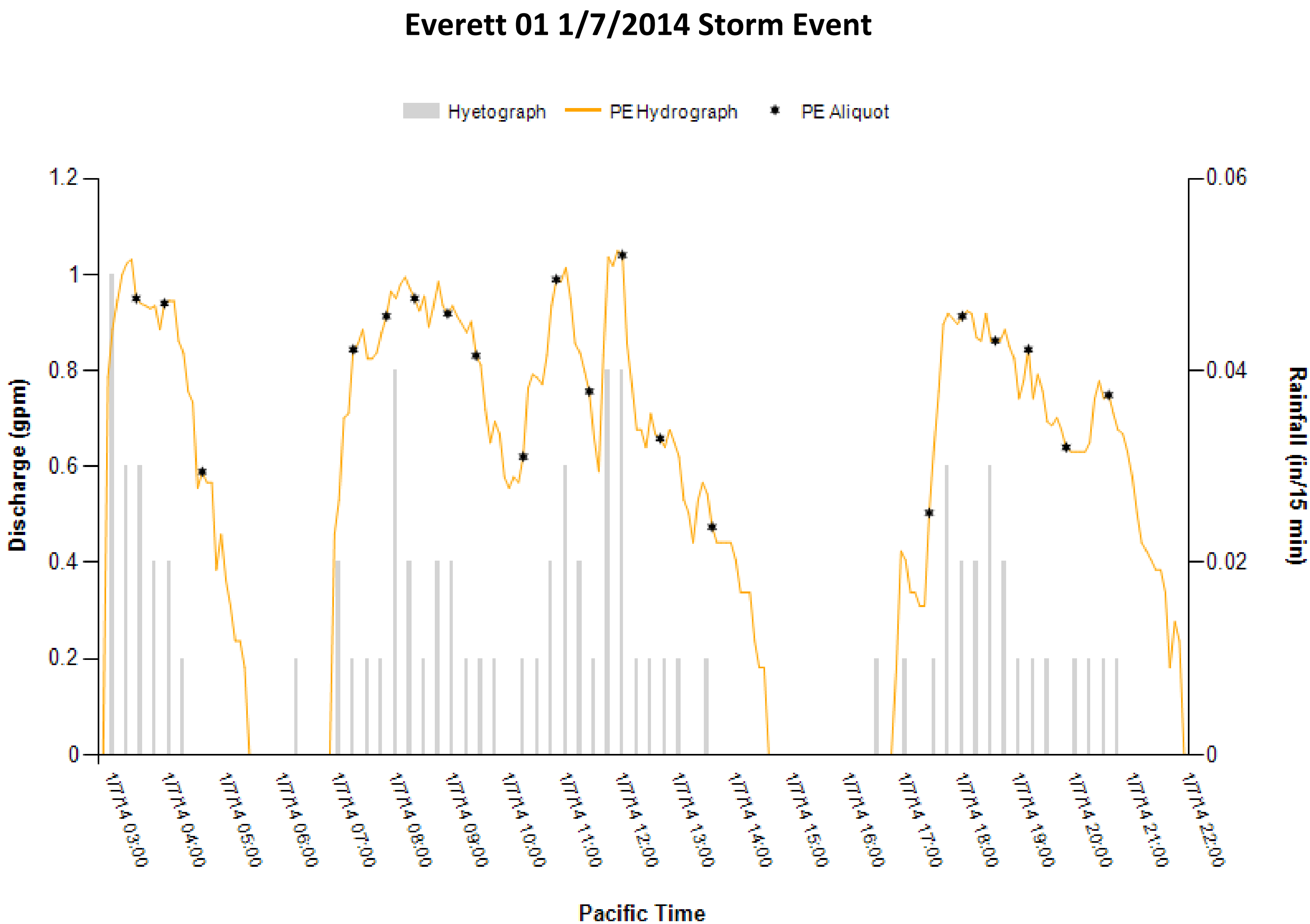
Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	11/18/2013 12:10	11/19/2013 11:30	23.33	923.4	39.6	923.4	0.0	0.00	1.29	0.44	0.66	0.147

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.81	01/07/2014 02:50	01/07/2014 20:35	17.75	101

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	20	01/07/2014 03:25	01/07/2014 20:35	17.17	250	5,000	2.94	6.97	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	01/07/2014 02:55	01/07/2014 21:50	18.92	642.6	34.0	642.6	608.4	94.70	1.05	0.18	0.70	0.093

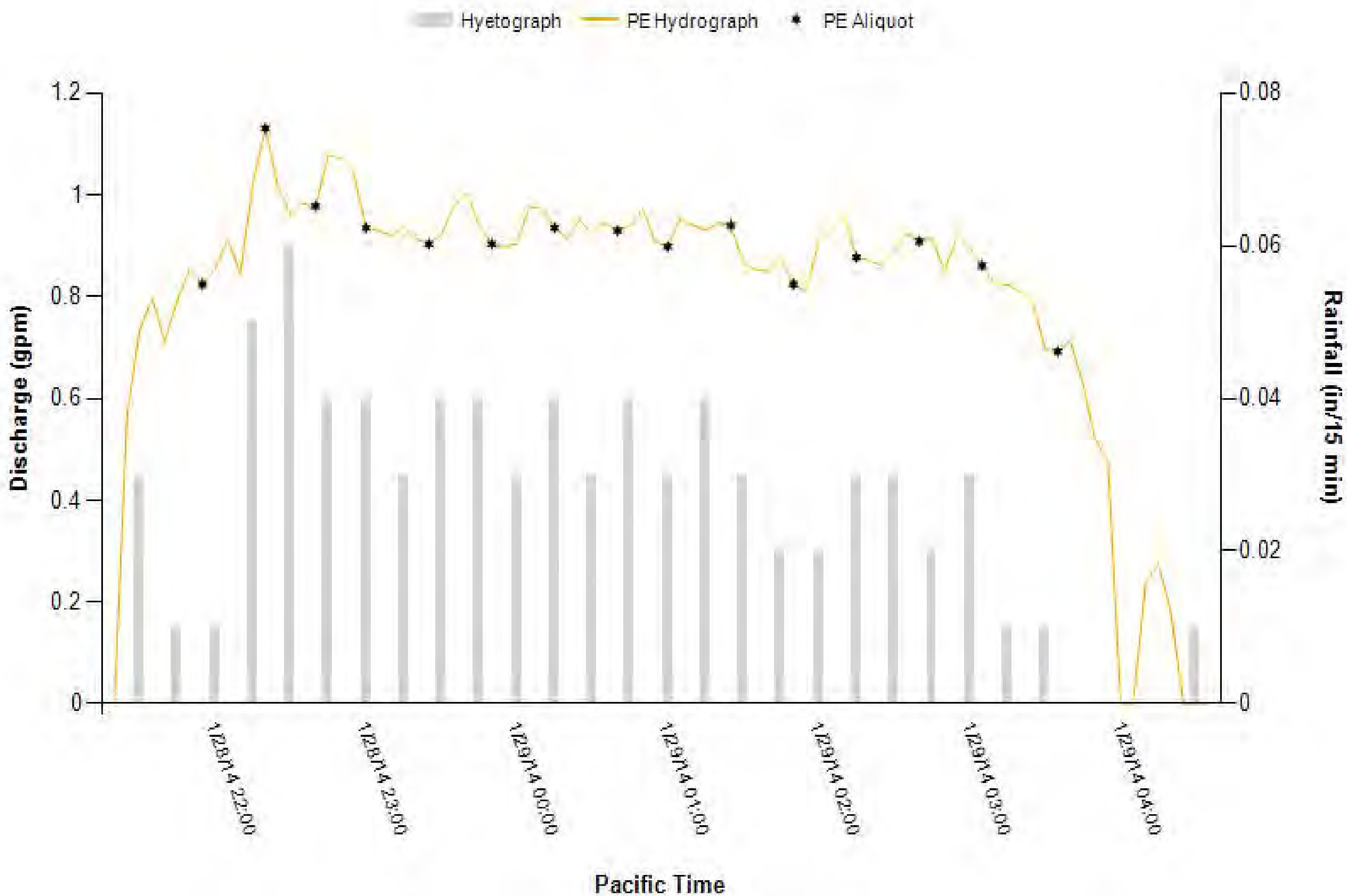

Everett 01 1/7/2014 Storm Event
Hyetograph
PE Hydrograph
PE Aliquot
Discharge (gpm)
Rainfall (in/15 min)
1.2
1
0.8
0.6
0.4
0.2
0
0.06
0.04
0.02
0
1/7/14 03:00
1/7/14 04:00
1/7/14 05:00
1/7/14 06:00
1/7/14 07:00
1/7/14 08:00
1/7/14 09:00
1/7/14 10:00
1/7/14 11:00
1/7/14 12:00
1/7/14 13:00
1/7/14 14:00
1/7/14 15:00
1/7/14 16:00
1/7/14 17:00
1/7/14 18:00
1/7/14 19:00
1/7/14 20:00
1/7/14 21:00
1/7/14 22:00
Pacific Time

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.77	01/28/2014 21:20	01/29/2014 04:25	7.08	386.5

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	15	01/28/2014 21:55	01/29/2014 03:35	5.67	250	3,750	6.30	6.93	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	01/28/2014 21:25	01/29/2014 04:20	6.92	352.8	51.0	352.8	337.7	95.70	1.13	0.18	0.86	0.113

Everett 01 1/28/2014 Storm Event



Precipitation				
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)
0.24	2/18/2014 15:00	2/19/2014 2:45	11.75	13

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time (UTC)	Last Aliquot Time (UTC)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	5.2	8.5	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Only grab samples collected.

Precipitation				
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)
0.51	3/2/2014 20:45	3/3/2014 21:30	23.25	19

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time (UTC)	Last Aliquot Time (UTC)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	3.4	9.9	

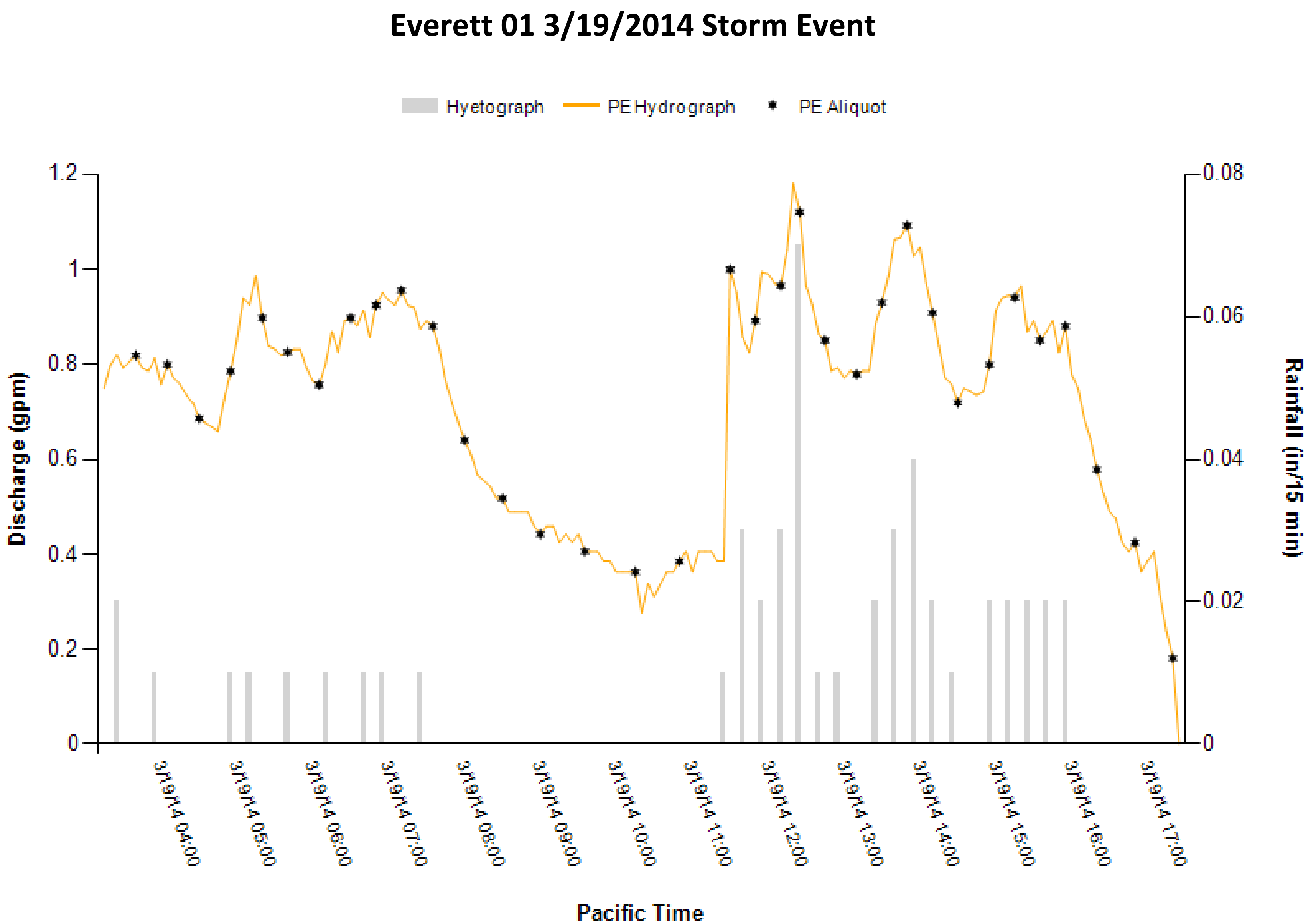
Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Only grab samples collected.

Precipitation				
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)
0.50	03/19/2014 03:15	03/19/2014 15:55	12.67	48

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time (UTC)	Last Aliquot Time (UTC)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	37	03/19/2014 03:40	03/19/2014 18:50	15.17	250	9,250	6.59	9.49	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	03/19/2014 03:15	03/19/2014 17:20	14.08	607.3	43.1	607.3	607.3	100.00	1.18	0.18	0.71	0.126


Everett 01 3/19/2014 Storm Event
Hyetograph
PE Hydrograph
PE Aliquot
Discharge (gpm)
Rainfall (in/15 min)
Pacific Time
1.2
1
0.8
0.6
0.4
0.2
0
0.08
0.06
0.04
0.02
0
3/19/14 04:00
3/19/14 05:00
3/19/14 06:00
3/19/14 07:00
3/19/14 08:00
3/19/14 09:00
3/19/14 10:00
3/19/14 11:00
3/19/14 12:00
3/19/14 13:00
3/19/14 14:00
3/19/14 15:00
3/19/14 16:00
3/19/14 17:00

Precipitation				
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)
0.31	04/08/2014 15:10	04/08/2014 22:00	6.83	59.25

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time (UTC)	Last Aliquot Time (UTC)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	04/08/2014 15:15	04/08/2014 23:15	8.00	287.0	35.9	287.0	0.0	0.00	1.03	0.18	0.68	0.089

Only grab samples collected.

Precipitation				
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)
0.67	4/17/2014 00:30	4/17/2014 21:30	21	18.25

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time (UTC)	Last Aliquot Time (UTC)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	9.8	12.7	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

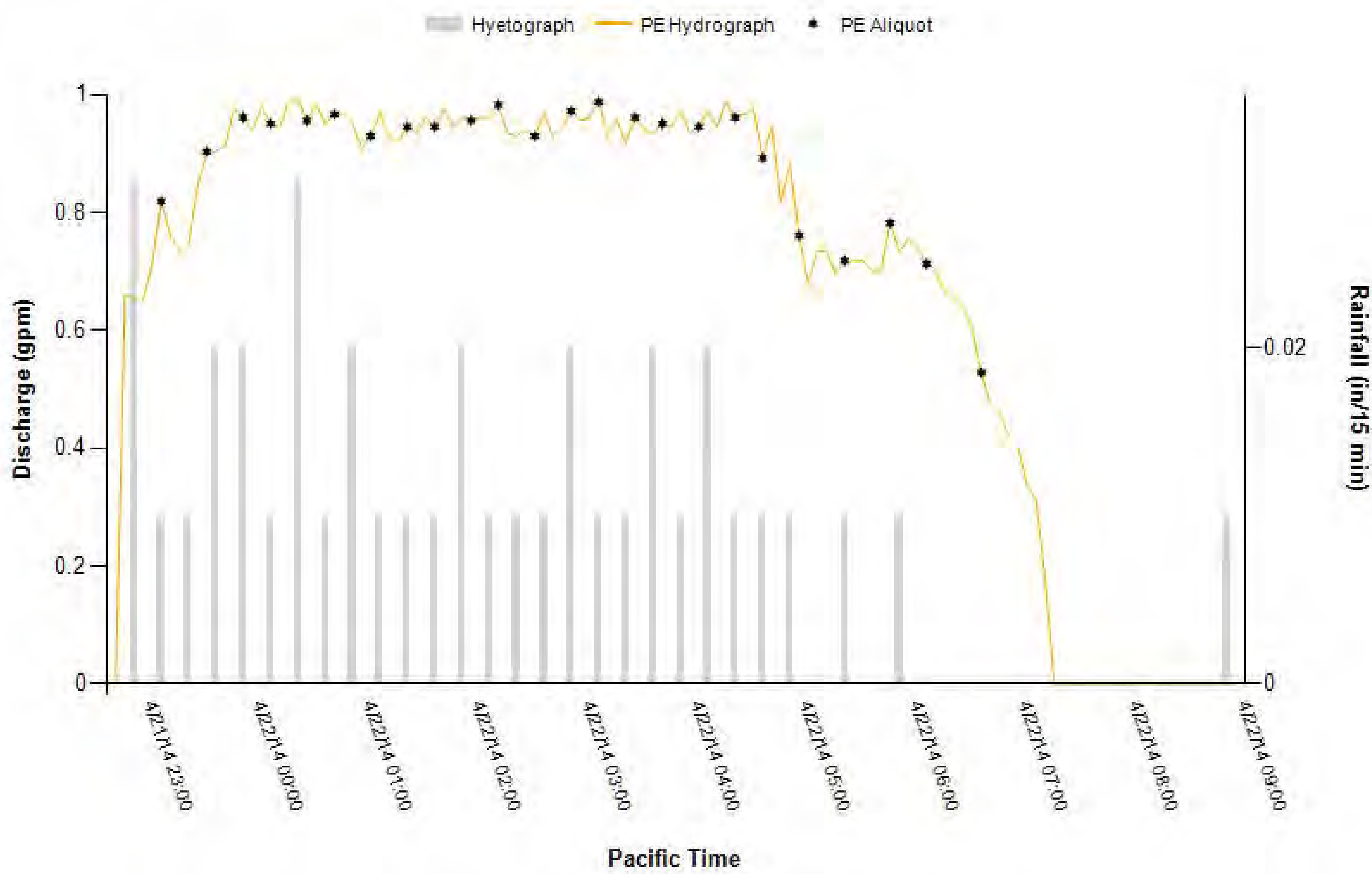
Only grab samples collected.

Precipitation				
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)
0.39	04/21/2014 22:40	04/22/2014 08:50	10.17	51

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time (UTC)	Last Aliquot Time (UTC)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	24	04/21/2014 23:05	04/22/2014 06:35	7.50	250	6,000	6.67	9.80	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	04/21/2014 22:45	04/22/2014 07:10	8.42	427.4	50.8	427.4	414.4	97.00	0.99	0.18	0.84	0.080

Everett 01 4/21/2014 Storm Event



Precipitation				
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)
0.01	5/8/2014 13:00	5/8/2014 13:00	0	39.5

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time (UTC)	Last Aliquot Time (UTC)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	8.2	8.2	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Only grab samples collected.

Precipitation				
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)
0.16	05/23/2014 07:10	05/23/2014 10:45	3.58	102.24

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time (UTC)	Last Aliquot Time (UTC)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	13.5	16	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	05/23/2014 07:10	05/23/2014 16:30	9.33	298.4	32.0	298.4	0.0	0.00	1.10	0.18	0.61	0.106

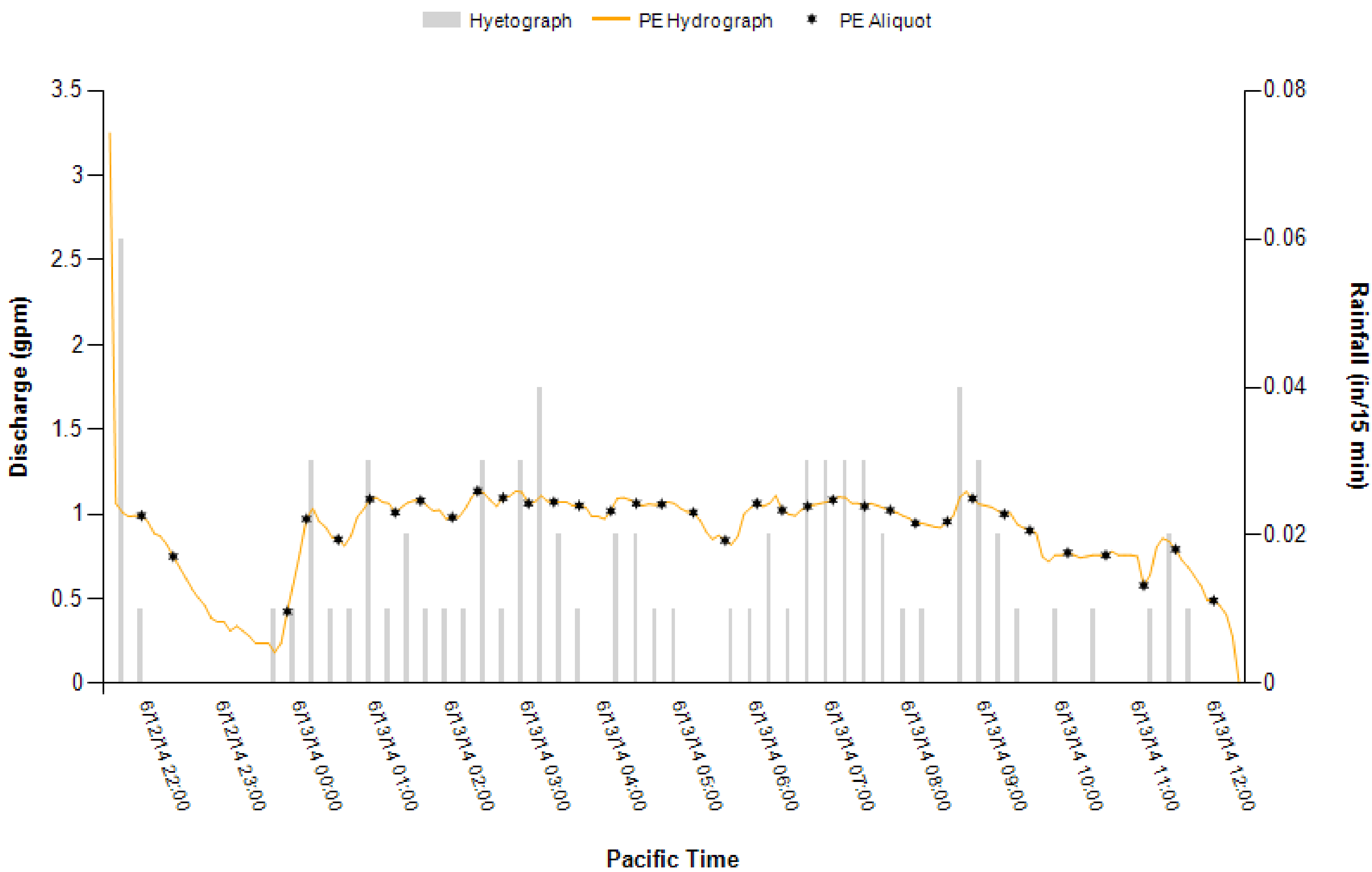
Only grab samples collected.

Precipitation				
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)
0.80	06/12/2014 21:30	06/13/2014 11:35	14.08	79.91

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time (UTC)	Last Aliquot Time (UTC)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	37	06/12/2014 21:55	06/13/2014 13:20	15.42	250	9,250	13.20	16.30	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	06/12/2014 21:30	06/13/2014 12:15	14.75	801.4	54.3	801.4	801.4	100.00	1.14	0.18	0.89	0.114

Everett 01 6/12/2014 Storm Event



Precipitation				
Total (in)	**Start Time (UTC)**	**End Time (UTC)**	**Duration (hrs)**	**Antecedent (hrs)**
0.08	06/27/2014 23:50	06/28/2014 02:35	2.75	188.66

Aliquots							Water Temp		Validation Code
Sample Point (m)	**Aliquots Collected**	**First Aliquot Time (UTC)**	**Last Aliquot Time (UTC)**	**Sampling Duration (hrs)**	**Volume (mL)**	**Total Sample Volume (mL)**	**Min (C°)**	**Max (C°)**	
PE	14	06/28/2014 00:10	06/28/2014 03:55	3.75	250	3,500	15.20	16.40	R

Runoff / Discharge												
	Runoff Time			**Volume**			**Sampled**		**Flow**			**Stage**
Sample Point (m)	**Start Time (UTC)**	**End Time (UTC)**	**Duration (hrs)**	**Total (gal)**	**Intensity (gal/hr)**	**First 24Hrs (gal)**	**Discharge Total Volume Sampled (gal)**	**% Hydrograph Sampled**	**Peak (gpm)**	**Min (gpm)**	**Mean (gpm)**	**Max (ft)**
PE	06/27/2014 23:55	06/28/2014 05:35	5.67	158.8	28.0	158.8	129.7	81.70	0.87	0.18	0.47	0.058

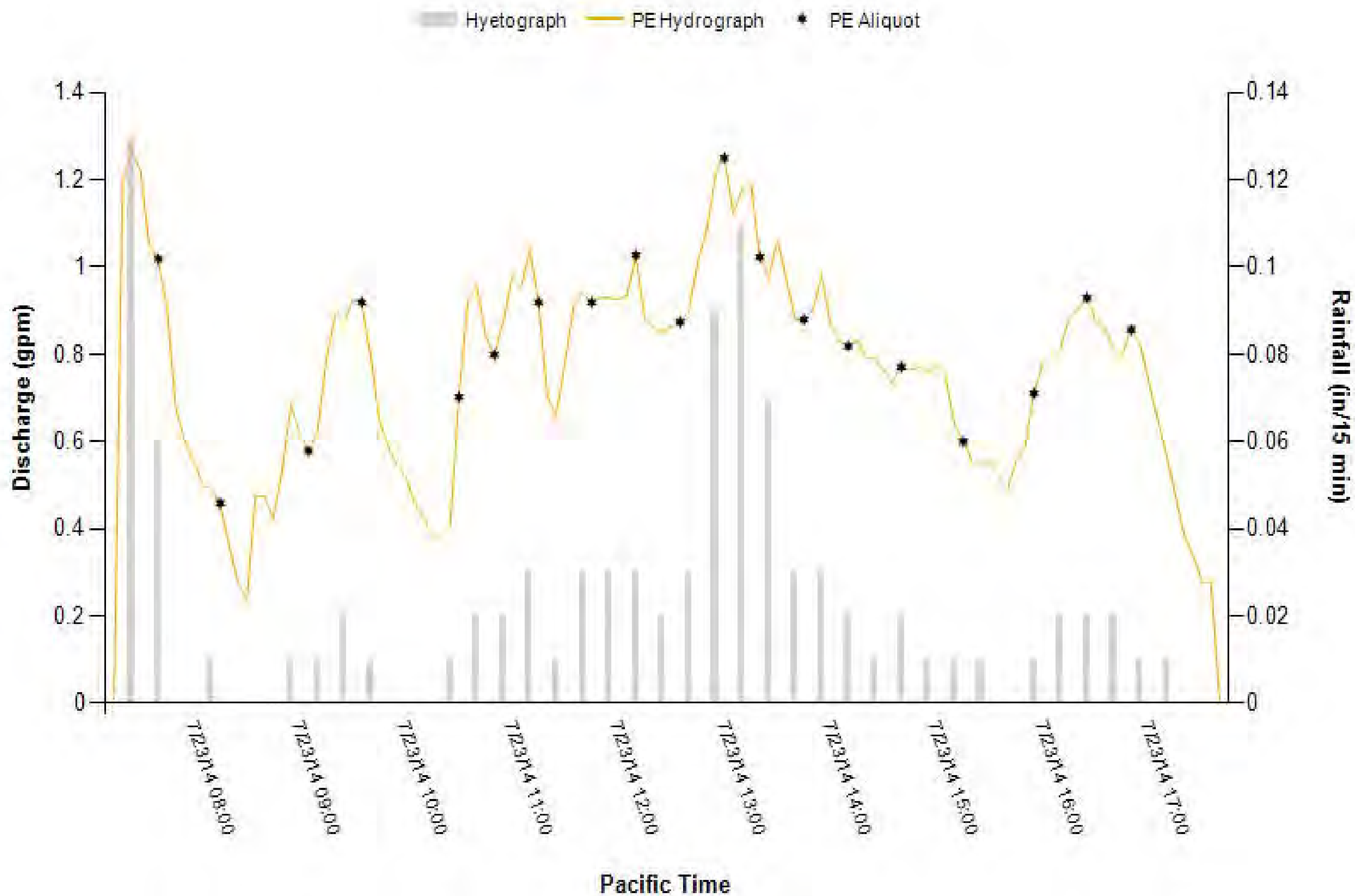
Rejected because rainfall requirements not met.

Precipitation				
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)
0.98	07/23/2014 07:15	07/23/2014 17:10	9.92	604.33

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time (UTC)	Last Aliquot Time (UTC)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	19	07/23/2014 07:40	07/23/2014 16:50	9.17	250	4,750	16.80	18.60	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	07/23/2014 07:20	07/23/2014 17:35	10.25	475.0	46.3	475.0	452.3	95.20	1.27	0.24	0.77	0.151

Everett 01 7/23/2014 Storm Event

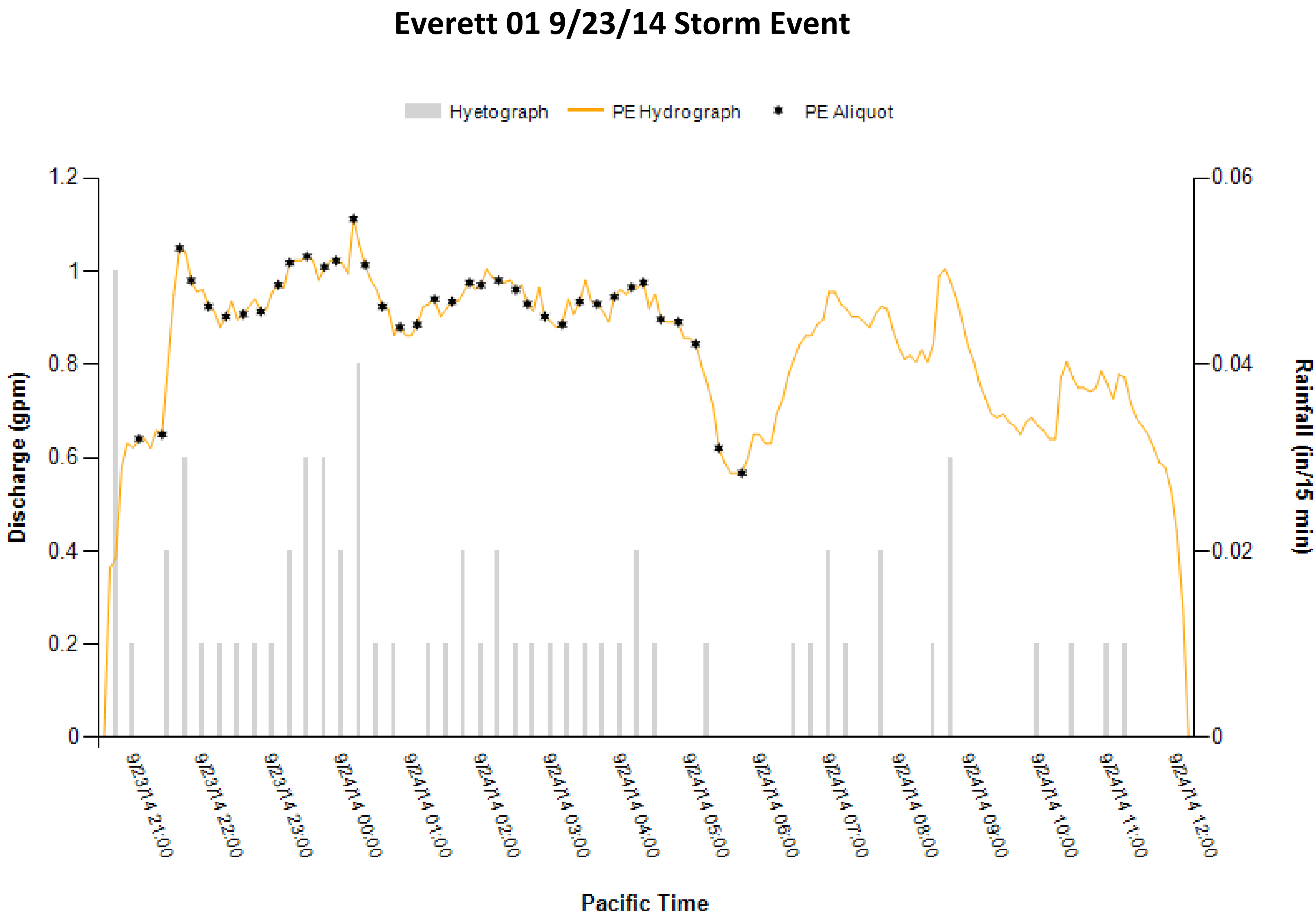


Precipitation				
Total (in)	**Start Time (UTC)**	**End Time (UTC)**	**Duration (hrs)**	**Antecedent (hrs)**
0.65	09/23/2014 20:35	09/24/2014 11:10	14.58	131.08

Aliquots							Water Temp		Validation Code
Sample Point (m)	**Aliquots Collected**	**First Aliquot Time (UTC)**	**Last Aliquot Time (UTC)**	**Sampling Duration (hrs)**	**Volume (mL)**	**Total Sample Volume (mL)**	**Min (C°)**	**Max (C°)**	
PE	37	09/23/2014 21:05	09/24/2014 05:45	8.67	250	9,250	16.70	17.20	R

Runoff / Discharge												
	Runoff Time			**Volume**			**Sampled**		**Flow**			**Stage**
Sample Point (m)	**Start Time (UTC)**	**End Time (UTC)**	**Duration (hrs)**	**Total (gal)**	**Intensity (gal/hr)**	**First 24Hrs (gal)**	**Discharge Total Volume Sampled (gal)**	**% Hydrograph Sampled**	**Peak (gpm)**	**Min (gpm)**	**Mean (gpm)**	**Max (ft)**
PE	09/23/2014 20:40	09/24/2014 12:05	15.42	780.1	50.6	780.1	489.5	62.70	1.11	0.28	0.84	0.108

Rejected because less than 75% of the hydrograph was sampled.


Everett 01 9/23/14 Storm Event
Hyetograph
PE Hydrograph
PE Aliquot
Discharge (gpm)
Rainfall (in/15 min)
Pacific Time
1.2
1
0.8
0.6
0.4
0.2
0
0.06
0.04
0.02
0
9/23/14 21:00
9/23/14 22:00
9/23/14 23:00
9/24/14 00:00
9/24/14 01:00
9/24/14 02:00
9/24/14 03:00
9/24/14 04:00
9/24/14 05:00
9/24/14 06:00
9/24/14 07:00
9/24/14 08:00
9/24/14 09:00
9/24/14 10:00
9/24/14 11:00
9/24/14 12:00

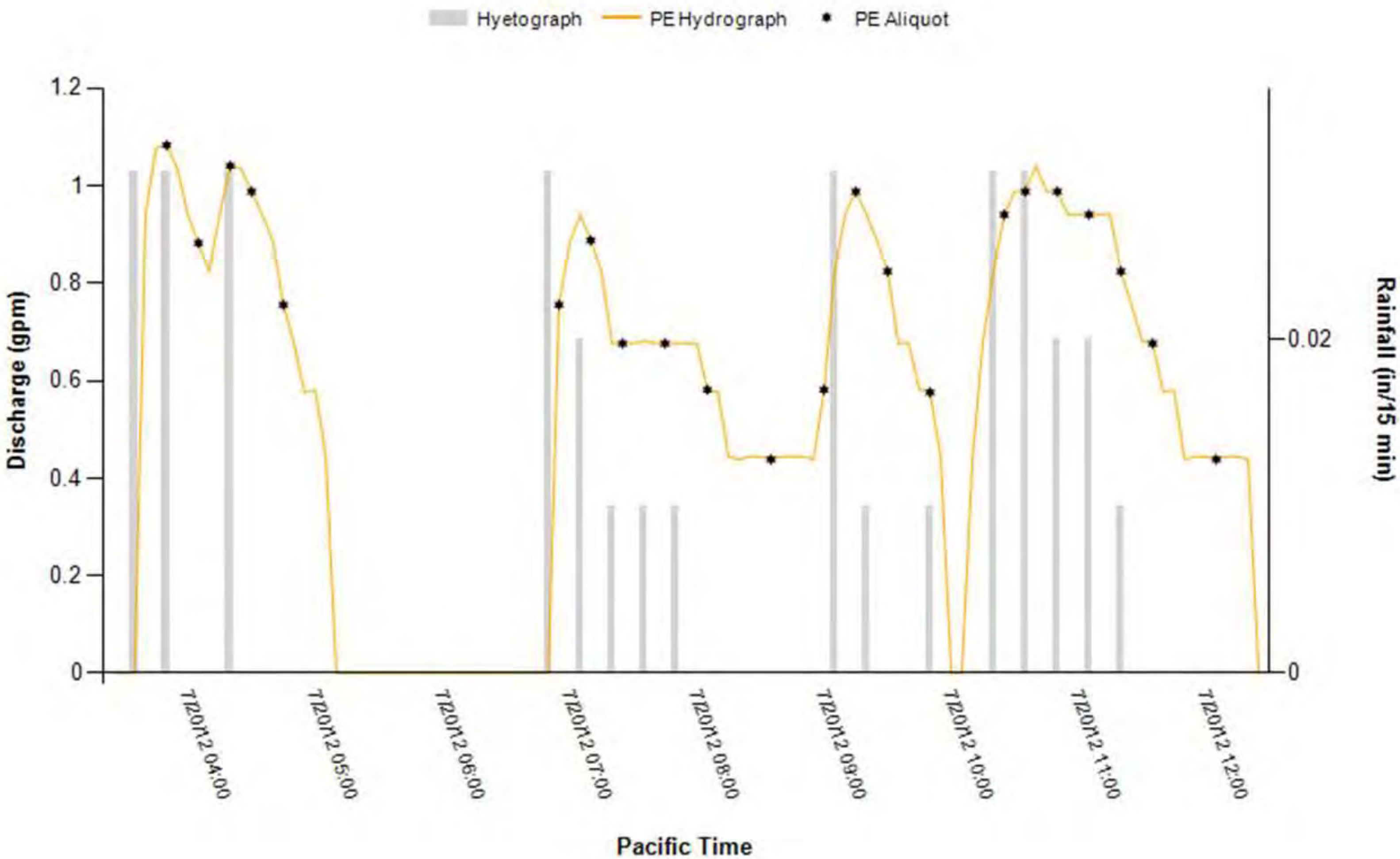
EVERETT 04

Precipitation				
Total (in)	**Start Time**	**End Time**	**Duration (hrs)**	**Antecedent (hrs)**
0.33	07/20/2012 02:45	07/20/2012 11:10	8.4	151.75

Aliquots							Water Temp		Validation Code
Sample Point (m)	**Aliquots Collected**	**First Aliquot Time**	**Last Aliquot Time**	**Sampling Duration (hrs)**	**Volume (mL)**	**Total Sample Volume (mL)**	**Min (C°)**	**Max (C°)**	
PE	22	07/20/2012 03:50	07/20/2012 12:05	8.3	700	15,400	15.8	17.2	

Runoff / Discharge												
	Runoff Time			**Volume**			**Sampled**		**Flow**			**Stage**
Sample Point (m)	**Start Time**	**End Time**	**Duration (hrs)**	**Total (gal)**	**Intensity (gal/hr)**	**First 24Hrs (gal)**	**Discharge Total Volume Sampled (gal)**	**% Hydrograph Sampled**	**Peak (gpm)**	**Min (gpm)**	**Mean (gpm)**	**Max (ft)**
PE	07/20/2012 03:40	07/20/2012 12:20	8.7	299.4	34.4	299.4	299.4	95%	1.1	0.37	0.73	N/A

Everett 04 7/20/2012 Storm Report



Precipitation				
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)
0.03	10/12/2012 9:35	10/12/2012 9:45	0.17	724.99

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time (UTC)	Last Aliquot Time (UTC)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	12.9	13	

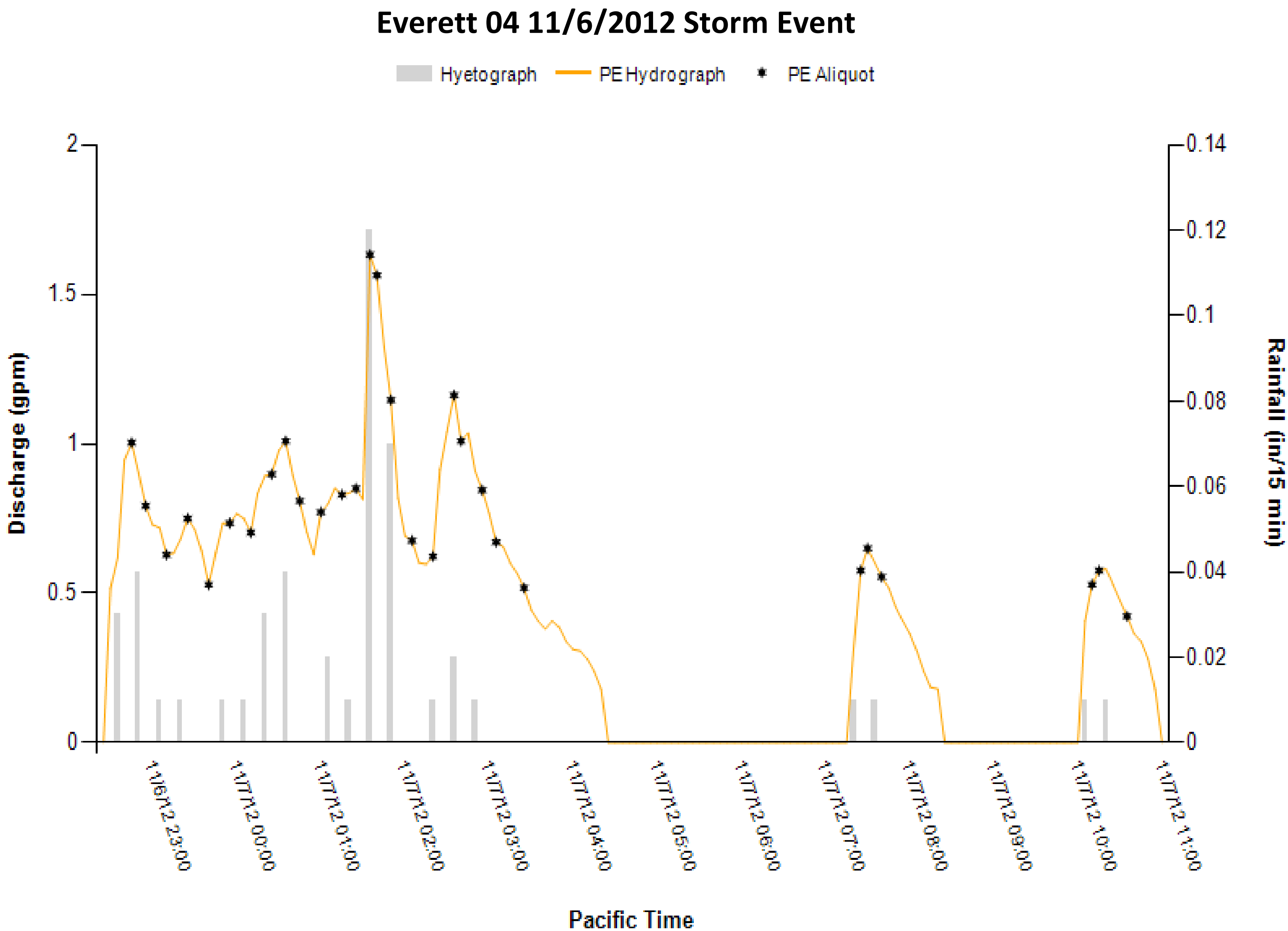
Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	10/12/2012 9:50	10/12/2012 10:10	0.33	9.59	29.06	9.59	N/A	N/A	0.49	0.18	0.38	0.013

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.48	11/6/2012 22:25	11/7/2012 10:15	11.83	48.25

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	29	11/6/2012 22:45	11/7/2012 10:35	11.83	250	7,250	6.73	11.54	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	11/6/2012 22:30	11/7/2012 10:55	12.42	312.99	25.20	312.99	307.18	98.14	1.63	0.18	0.66	0.291


Everett 04 11/6/2012 Storm Event
Hyetograph
PE Hydrograph
PE Aliquot
Discharge (gpm)
Rainfall (in/15 min)
2
1.5
1
0.5
0
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
11/6/12 23:00
11/7/12 00:00
11/7/12 01:00
11/7/12 02:00
11/7/12 03:00
11/7/12 04:00
11/7/12 05:00
11/7/12 06:00
11/7/12 07:00
11/7/12 08:00
11/7/12 09:00
11/7/12 10:00
11/7/12 11:00
Pacific Time

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.53	12/11/2012 13:45	12/12/2012 6:55	17.17	42.24

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	5.29	6.50	

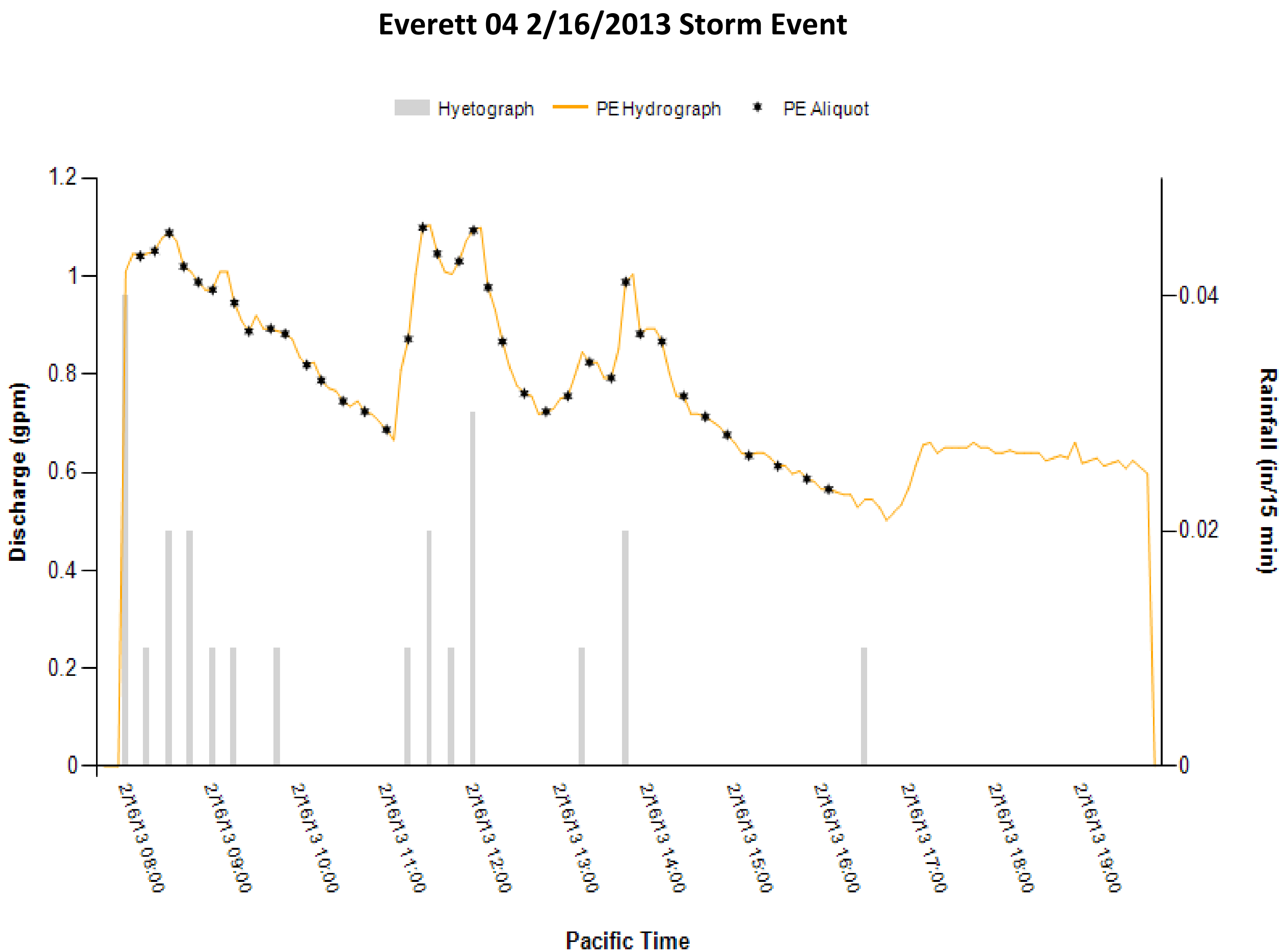
Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	12/11/2012 14:00	12/12/2012 7:40	0.25	595.68	2382.73	519.47	N/A	N/A	1.01	0.18	-0.09	0.085

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.23	2/16/2013 7:45	2/16/2013 16:30	8.75	47.74

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	37	2/16/2013 8:10	2/16/2013 16:05	7.92	250	9,250	4.34	8.55	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	2/16/2013 8:00	2/16/2013 19:45	11.75	542.24	46.15	542.24	410.89	75.78	1.10	0.50	0.57	0.106



Everett 04 2/16/2013 Storm Event
Hyetograph
PE Hydrograph
PE Aliquot
1.2
1
0.8
0.6
0.4
0.2
0
Discharge (gpm)
0.04
0.02
0
Rainfall (in/15 min)
2/16/13 08:00
2/16/13 09:00
2/16/13 10:00
2/16/13 11:00
2/16/13 12:00
2/16/13 13:00
2/16/13 14:00
2/16/13 15:00
2/16/13 16:00
2/16/13 17:00
2/16/13 18:00
2/16/13 19:00
Pacific Time

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.85	2/22/2013 16:35	2/23/2013 8:05	15.50	37.24

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	1.52	10.12	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	2/23/2013 16:35	2/23/2013 12:30	19.92	529.82	26.60	529.82	N/A	N/A	1.34	0.18	0.62	0.174

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.27	3/2/2013 15:15	3/2/2013 17:50	2.58	51.49

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	8	3/2/2013 15:35	3/2/2013 18:45	3.17	250	2,000	6.72	9.70	R

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	3/2/2013 15:15	3/2/2013 22:00	6.75	310.27	45.97	310.27	222.58	71.74	1.25	0.00	0.75	0.146

Rejected because less than 75% of the hydrograph was sampled.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.57	3/6/2013 9:35	3/7/2013 10:45	25.17	37.5

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	4.55	6.78	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	3/6/2013 9:40	3/7/2013 14:15	28.58	1,482.80	51.88	1,346.19	N/A	N/A	1.11	0.18	0.86	0.118

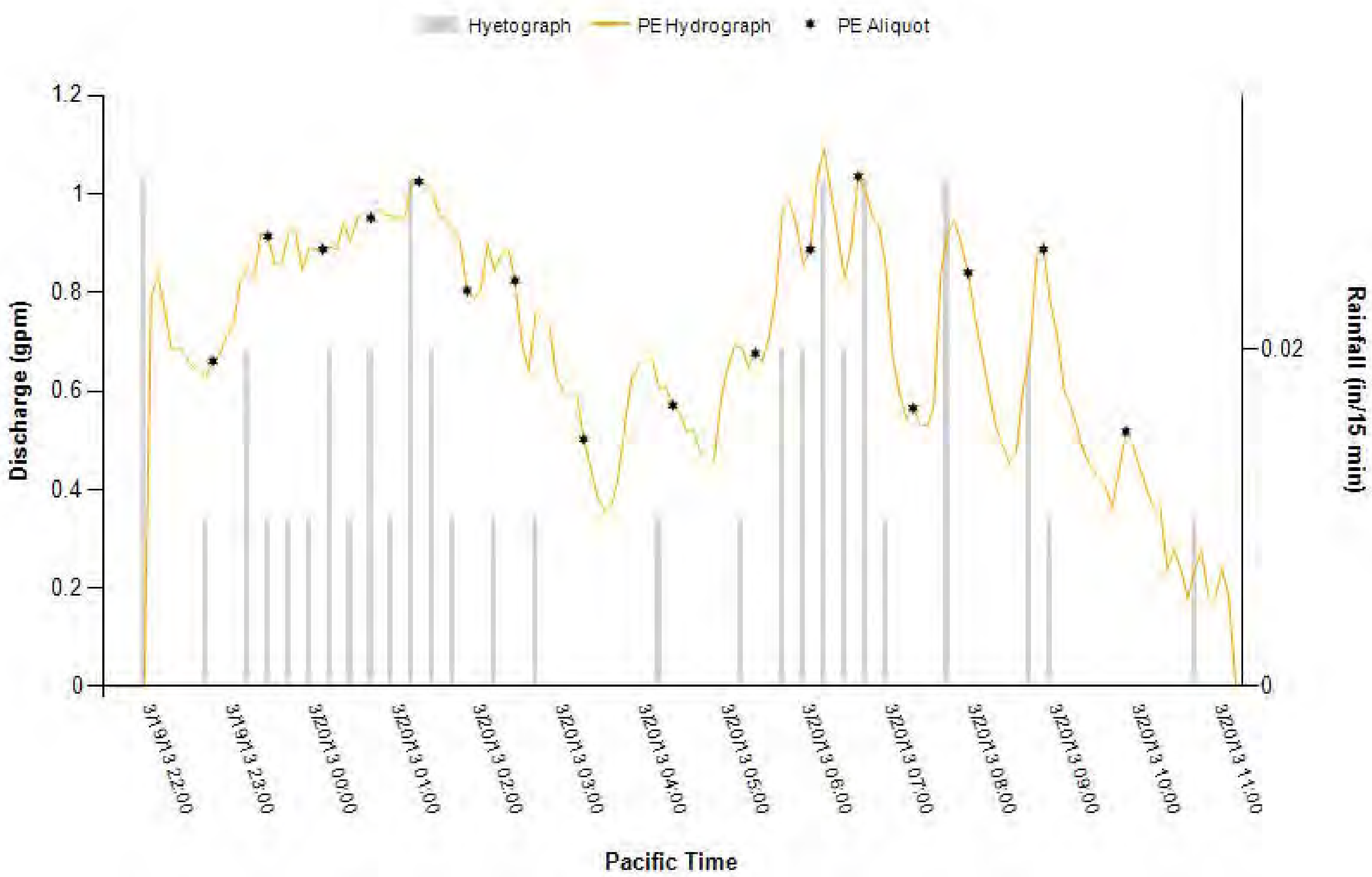
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.45	3/19/2013 21:30	3/20/2013 10:40	13.17	38.74

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	16	3/19/2013 22:45	3/20/2013 9:50	11.08	250	4,000	5.77	8.18	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	3/19/2013 22:00	3/20/2013 11:05	13.08	550.09	42.06	550.09	528.63	96.10	1.09	0.18	0.49	0.103

Everett 04 3/19/2013 Storm Event

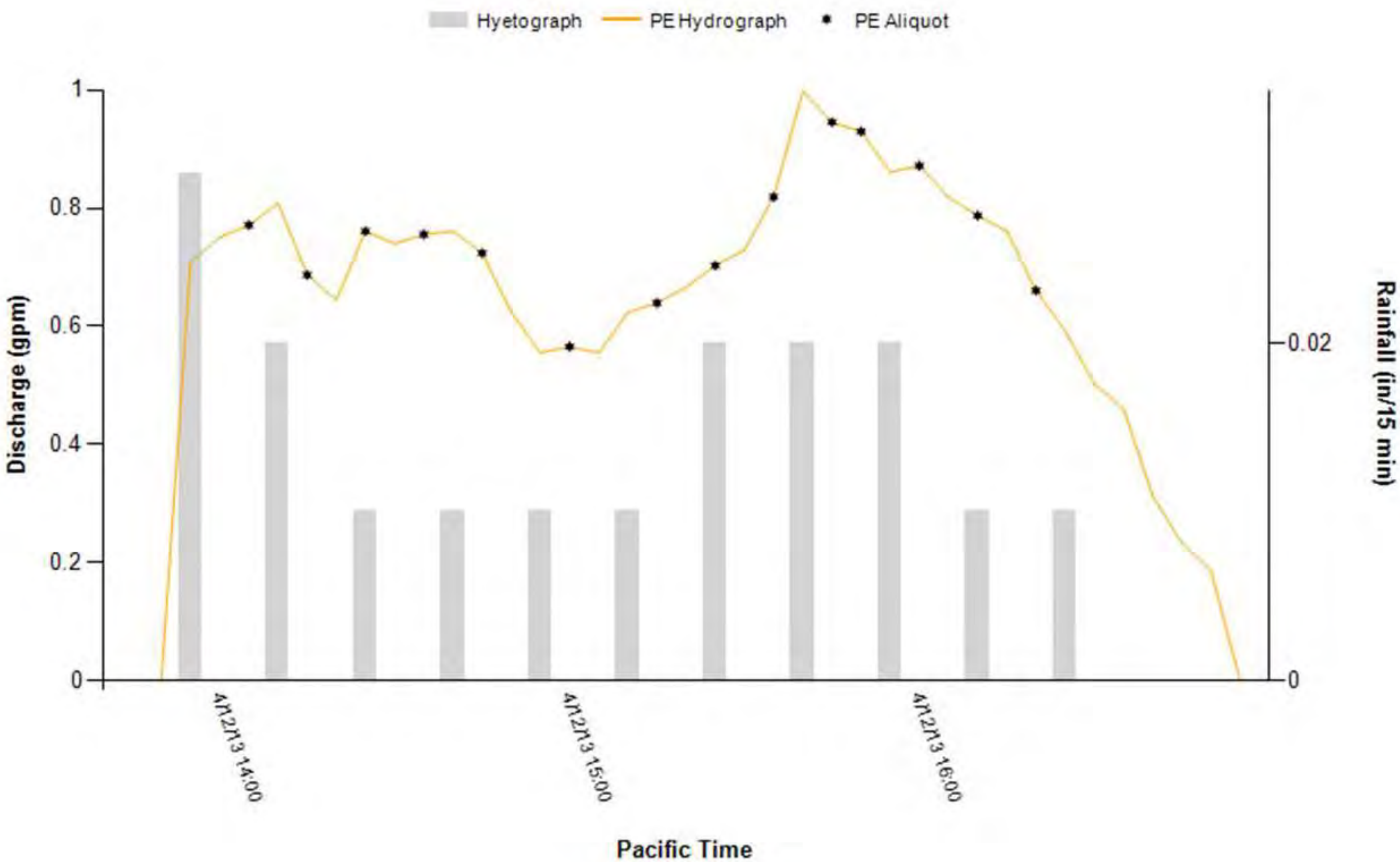


Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.17	4/12/2013 13:45	4/12/2013 16:20	2.58	32.5

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	14	4/12/2013 14:05	4/12/2013 16:20	2.25	250	3,500	6.14	7.62	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	4/12/2013 13:55	4/12/2013 16:50	2.92	122.52	41.96	122.52	111.11	90.69	1.00	0.18	0.38	0.082

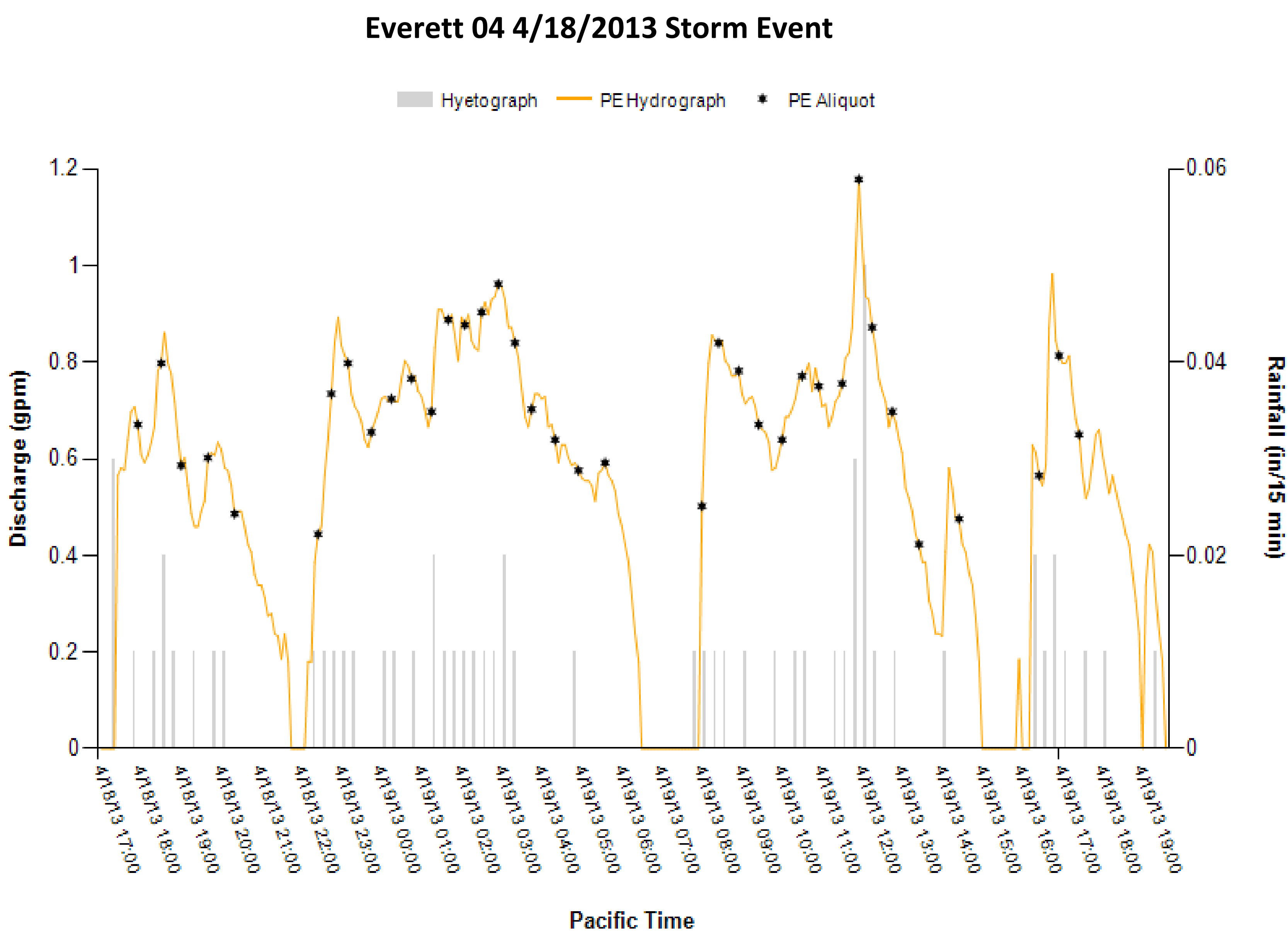
Everett 04 4/12/2013 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.61	4/18/2013 16:45	4/19/2013 19:15	26.25	108.49

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	37	4/18/2013 16:55	4/19/2013 17:25	23.50	250	9,250	8.68	13.23	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	4/18/2013 17:25	4/19/2013 19:30	26.08	868.20	33.29	794.89	794.89	100.00	1.18	0.18	0.54	0.124



Everett 04 4/18/2013 Storm Event
Hyetograph
PE Hydrograph
PE Aliquot
Discharge (gpm)
Rainfall (in/15 min)
Pacific Time
1.2
1
0.8
0.6
0.4
0.2
0
0.06
0.04
0.02
0
4/18/13 17:00
4/18/13 18:00
4/18/13 19:00
4/18/13 20:00
4/18/13 21:00
4/18/13 22:00
4/18/13 23:00
4/19/13 00:00
4/19/13 01:00
4/19/13 02:00
4/19/13 03:00
4/19/13 04:00
4/19/13 05:00
4/19/13 06:00
4/19/13 07:00
4/19/13 08:00
4/19/13 09:00
4/19/13 10:00
4/19/13 11:00
4/19/13 12:00
4/19/13 13:00
4/19/13 14:00
4/19/13 15:00
4/19/13 16:00
4/19/13 17:00
4/19/13 18:00
4/19/13 19:00

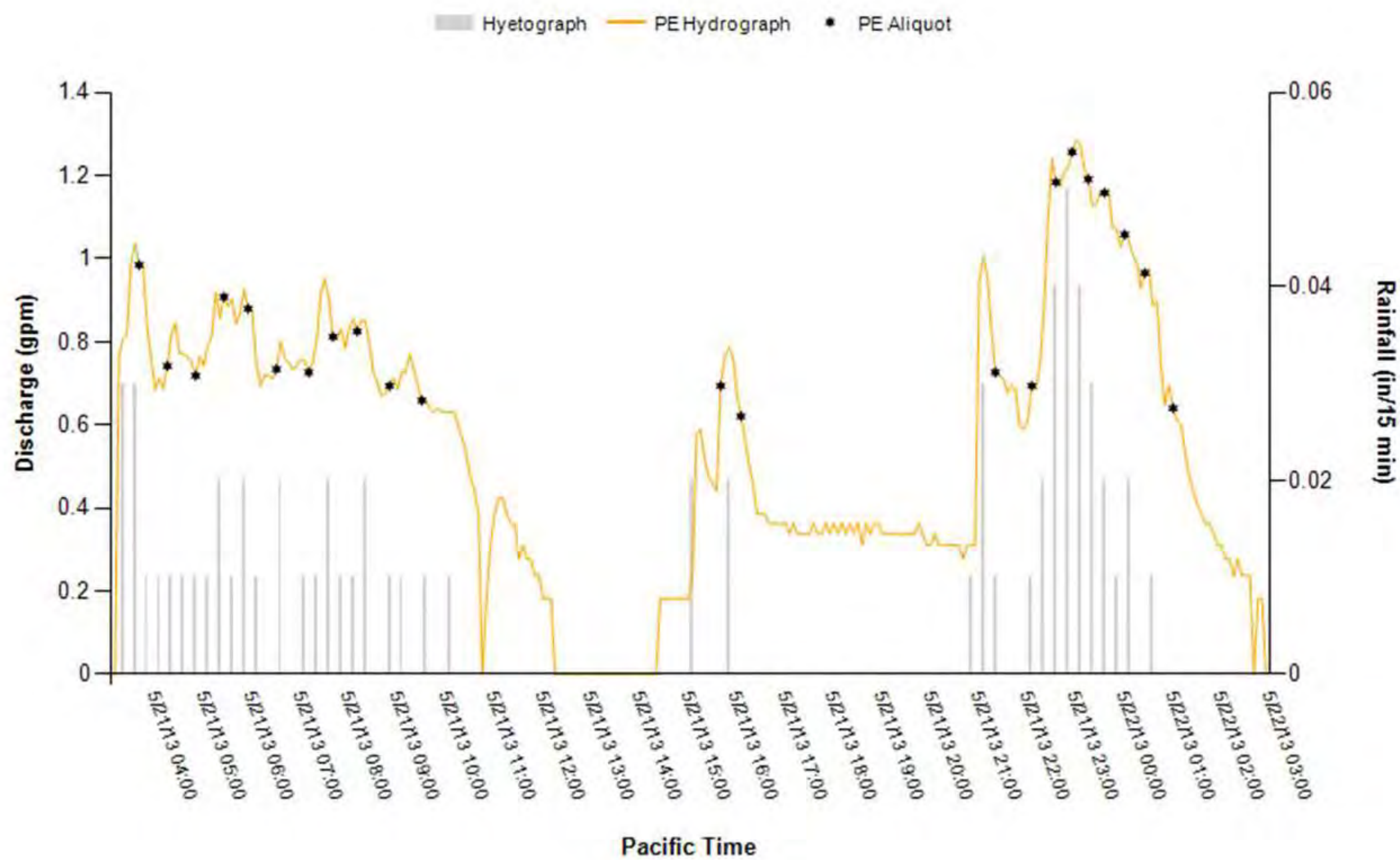
Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.66	5/21/2013 3:10	5/22/2013 0:25	21.25	44.75

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	22	5/21/2013 3:40	5/22/2013 1:00	21.33	250	5,500	8.83	12.09	J

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	5/21/2013 3:15	5/22/2013 5:55	26.67	801.61	30.06	797.08	797.08	100.00	1.29	0.18	0.58	0.157

J=Estimate of Hydrology information

Everett 04 5/21/2013 Storm Event

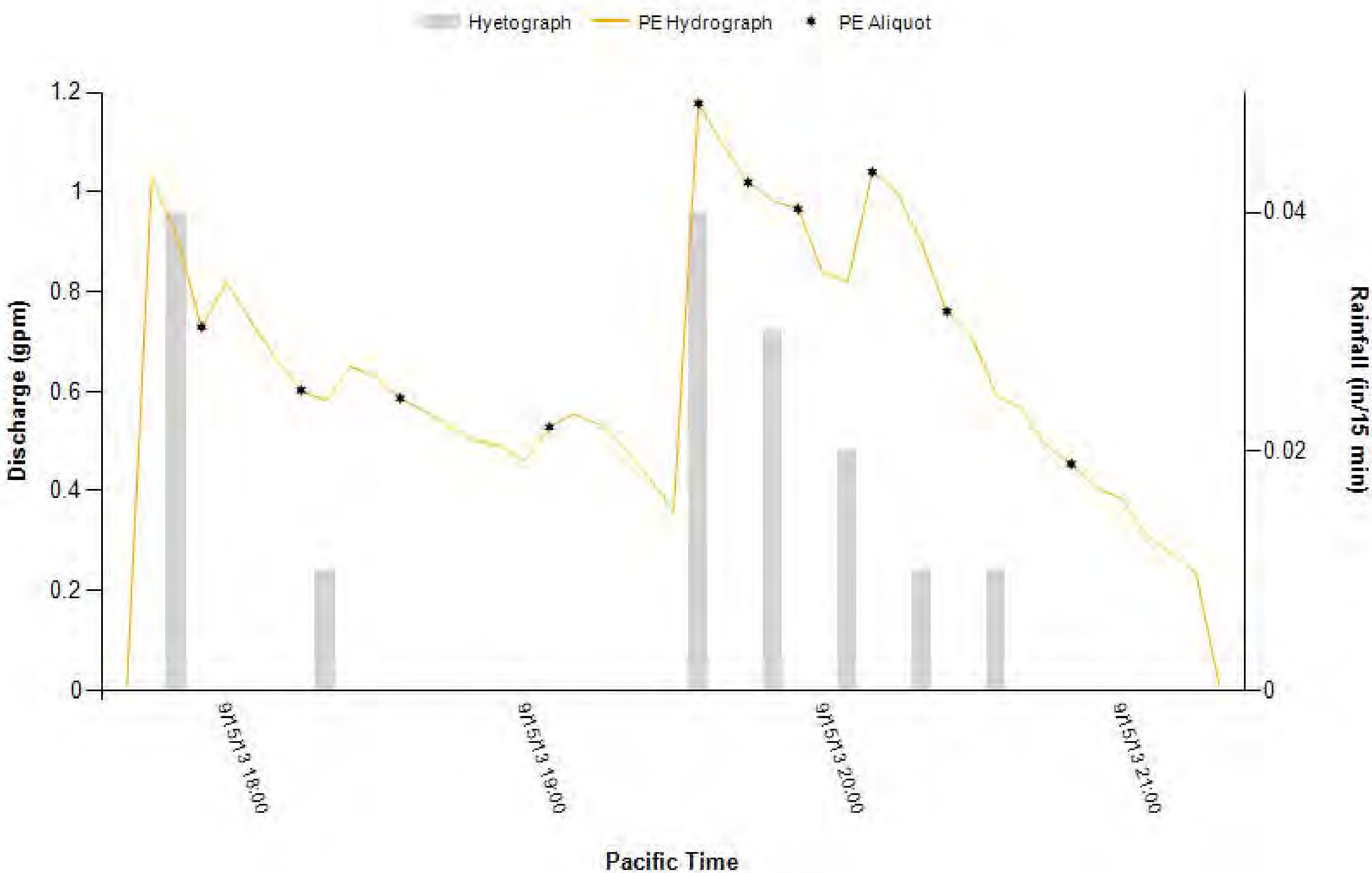


Precipitation				
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)
0.16	9/15/2013 17:40	9/15/2013 20:35	2.92	174.75

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time (UTC)	Last Aliquot Time (UTC)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	10	9/15/2013 17:55	9/15/2013 20:50	2.92	250	2,500	16.97	17.96	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	9/16/2013 17:45	9/16/2013 21:15	3.50	141.99	40.57	141.99	133.91	94.31	1.18	0.24	0.66	0.125

Everett 04 9/15/2013 Storm Event



Precipitation				
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)
0.10	11/18/2013 13:00	11/18/2013 20:50	7.83	38.74

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time (UTC)	Last Aliquot Time (UTC)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	8.5	9.8	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	11/18/2013 13:05	11/18/2013 22:30	9.42	297.7	31.6	297.7	0.0	0.00	0.87	0.18	0.53	0.107

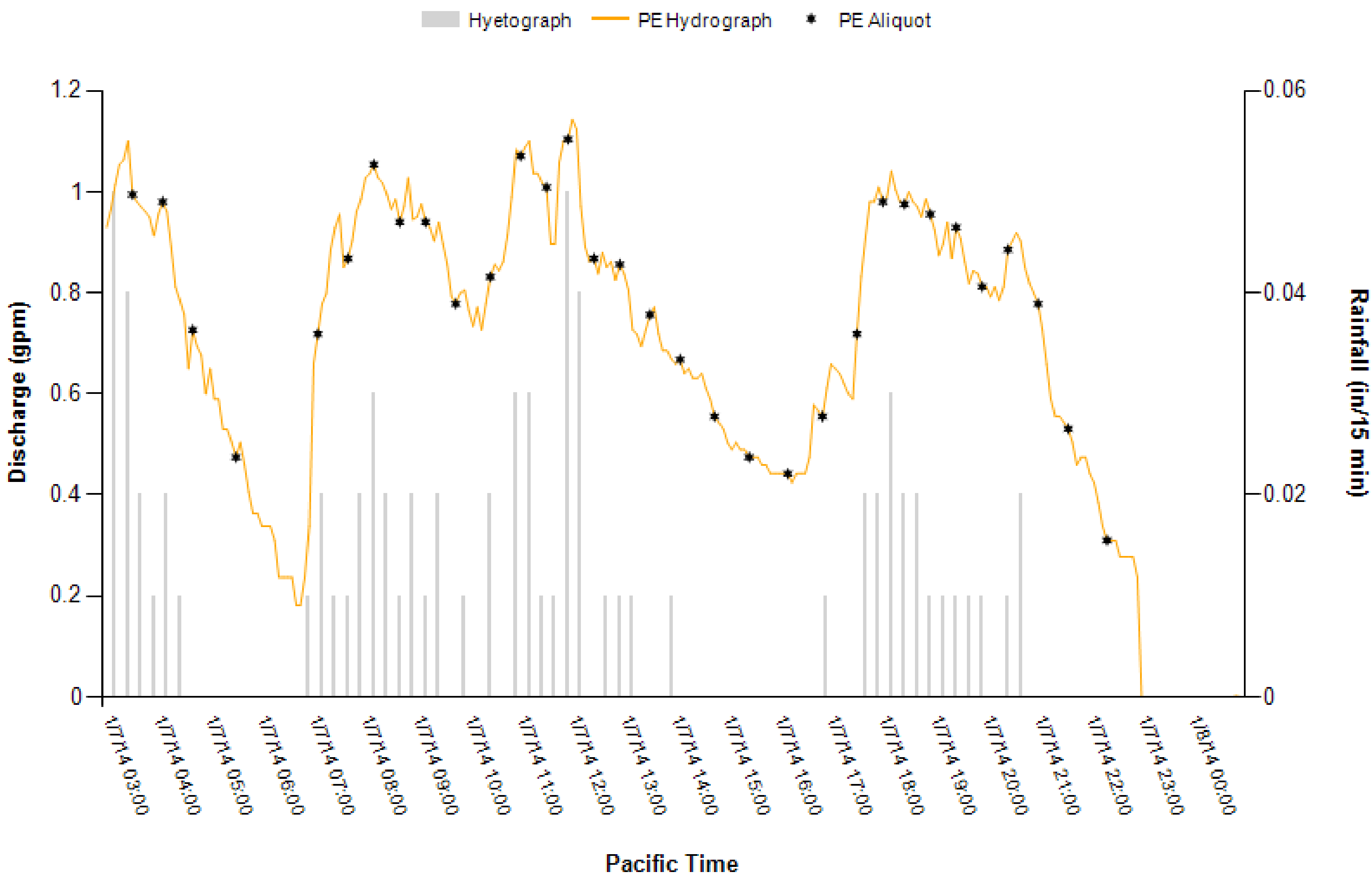
Only grab samples collected.

Precipitation				
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)
0.77	01/07/2014 02:55	01/07/2014 20:35	17.67	101

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time (UTC)	Last Aliquot Time (UTC)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	36	01/07/2014 03:25	01/08/2014 01:25	22.00	250	9,000	2.80	7.06	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	01/07/2014 02:55	01/08/2014 00:45	21.83	884.9	40.5	884.9	884.9	100.00	1.14	0.00	0.73	0.116

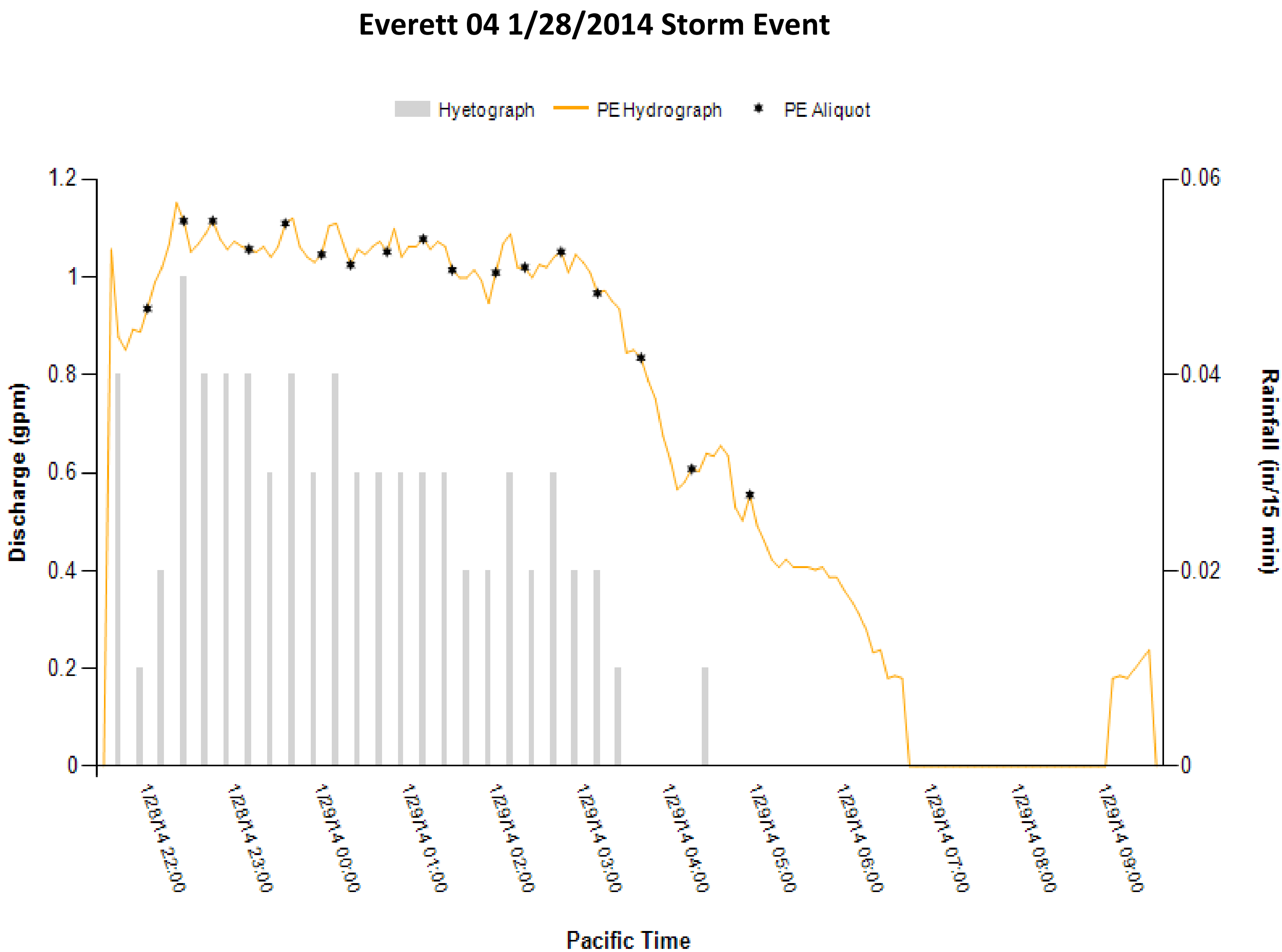
Everett 04 1/7/2014 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.71	01/28/2014 21:30	01/29/2014 04:20	6.83	386.74

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	17	01/28/2014 22:00	01/29/2014 04:55	6.92	250	4,250	6.34	7.36	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	01/28/2014 21:35	01/29/2014 09:30	11.92	467.2	39.2	467.2	426.7	91.30	1.15	0.18	0.82	0.118



Everett 04 1/28/2014 Storm Event
Hyetograph
PE Hydrograph
PE Aliquot
Discharge (gpm)
1.2
1
0.8
0.6
0.4
0.2
0
Rainfall (in/15 min)
0.06
0.04
0.02
0
1/28/14 22:00
1/28/14 23:00
1/29/14 00:00
1/29/14 01:00
1/29/14 02:00
1/29/14 03:00
1/29/14 04:00
1/29/14 05:00
1/29/14 06:00
1/29/14 07:00
1/29/14 08:00
1/29/14 09:00
Pacific Time

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.21	2/18/2014 15:00	2/19/2014 3:45	12.75	13

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	4.7	9.5	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.1	3/3/2014 16:00	3/3/2014 21:30	5.5	8.75

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	7.9	9.5	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

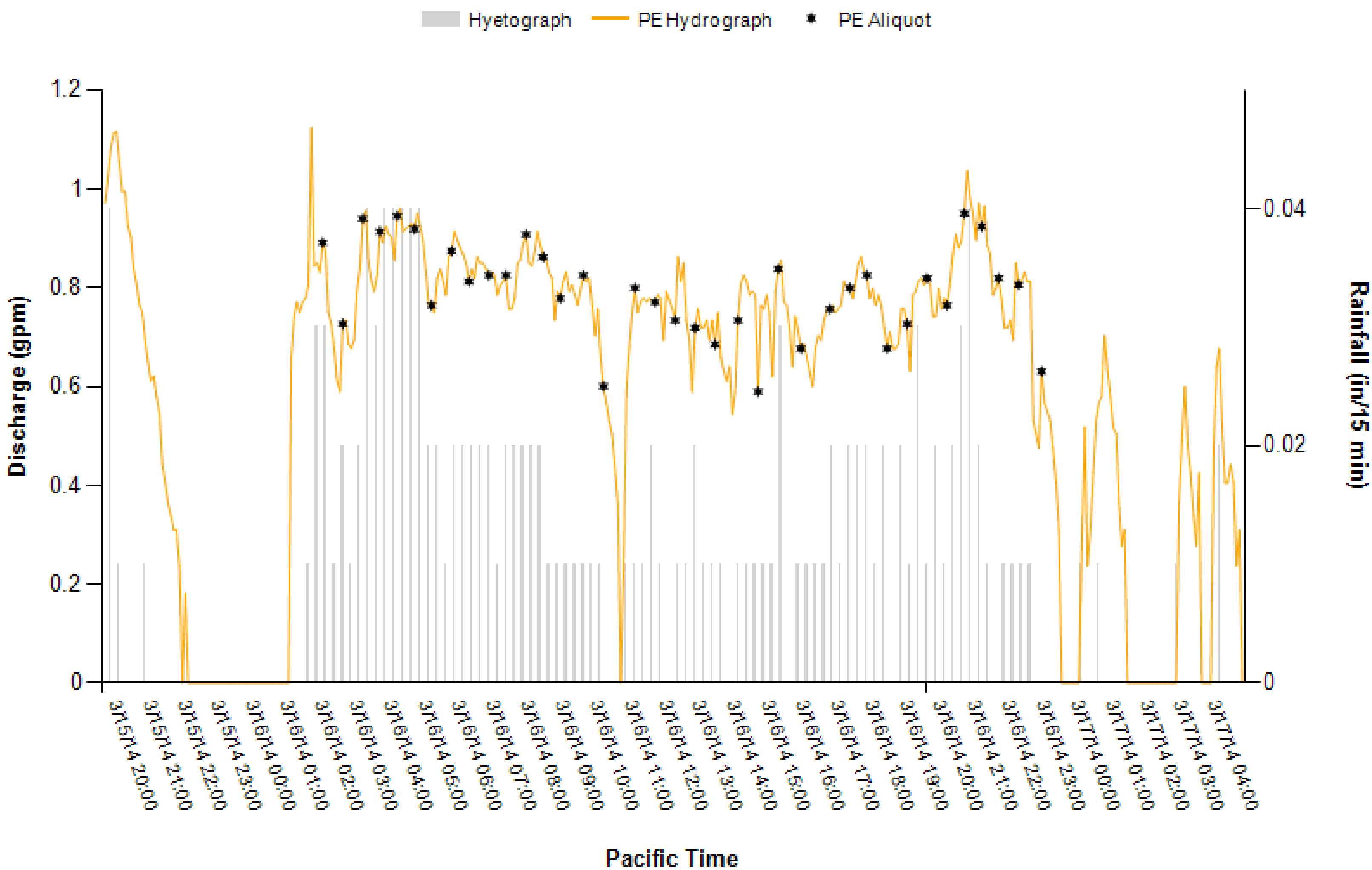
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
1.47	03/15/2014 19:40	03/17/2014 04:00	32.33	28

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	37	03/16/2014 02:00	03/16/2014 22:55	20.92	250	9,250	5.91	10.48	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	03/15/2014 19:40	03/17/2014 04:40	33.00	1,208.5	36.6	1,169.0	1,118.2	95.70	1.12	0.18	0.73	0.111

Everett 04 3/15/2014 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.49	03/19/2014 03:10	03/19/2014 15:55	12.75	48.25

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	7.39	8.12	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	03/19/2014 03:10	03/19/2014 21:45	18.58	483.5	26.0	483.5	N/A	N/A	1.20	0.18	0.66	N/A

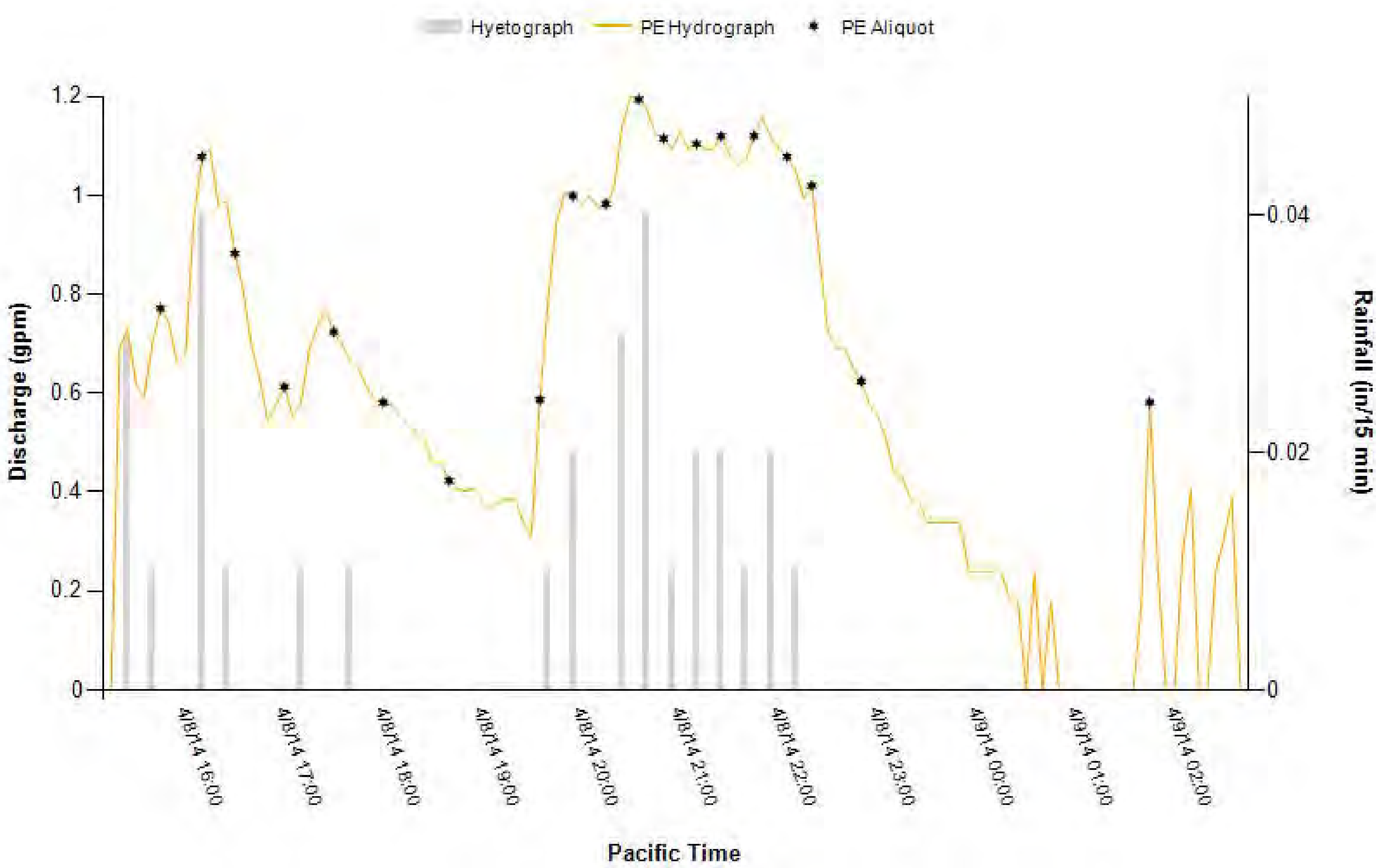
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.30	04/08/2014 15:15	04/08/2014 22:10	6.92	58.75

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	19	04/08/2014 15:45	04/09/2014 01:45	10.00	250	4,750	6.58	14.72	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	04/08/2014 15:20	04/09/2014 02:35	11.25	406.1	36.1	406.1	396.9	97.70	1.20	0.18	0.68	0.132

Everett 04 4/8/2014 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.99	4/17/2014 0:30	4/18/2014 6:30	30	6.75

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	7.5	11.9	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

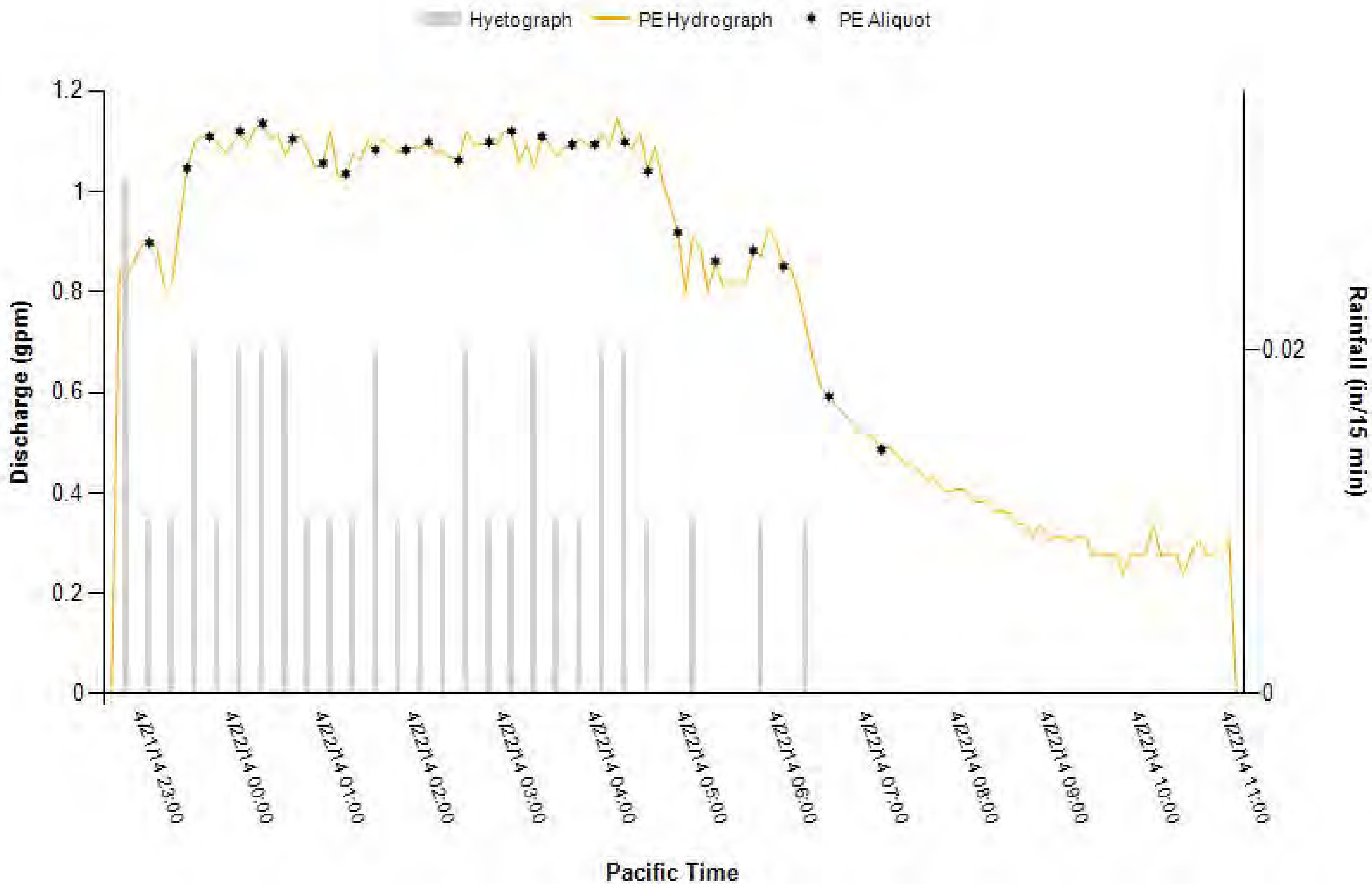
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.38	04/21/2014 22:40	04/22/2014 06:10	7.50	51

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	25	04/21/2014 23:05	04/22/2014 07:10	8.08	250	6,250	6.39	9.99	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	04/21/2014 22:45	04/22/2014 11:00	12.25	572.7	46.8	572.7	496.4	86.70	1.15	0.23	0.78	0.116

Everett 04 4/21/2014 Storm Event

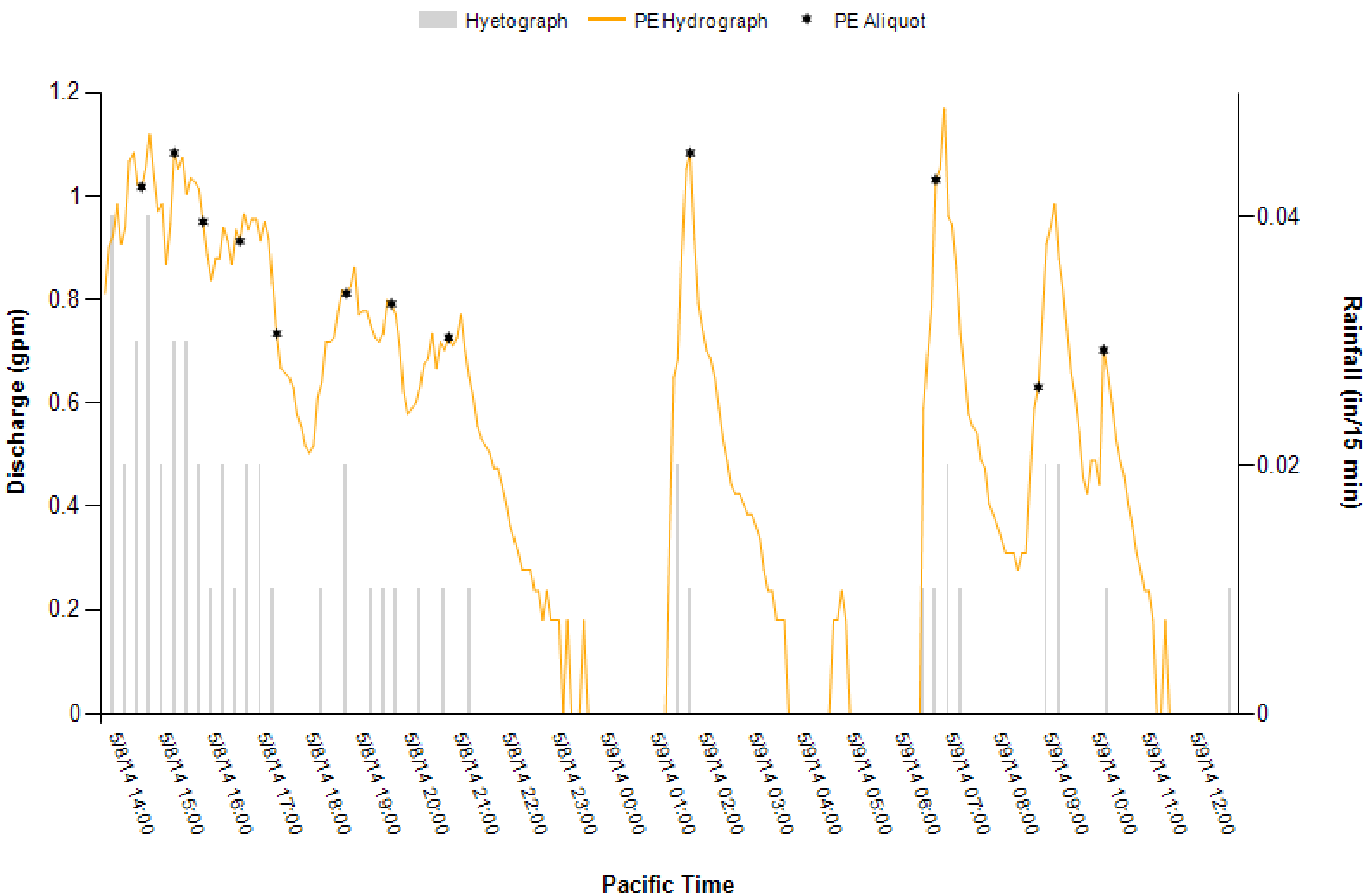


Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.55	05/08/2014 13:45	05/09/2014 12:40	22.92	71.25

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	12	05/08/2014 14:30	05/09/2014 10:05	19.58	250	3,000	9.44	12.93	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	05/08/2014 13:45	05/09/2014 11:20	21.58	654.2	30.3	654.2	629.5	96.20	1.17	0.18	0.64	0.123

Everett 04 5/8/2014 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0	5/23/2014 06:45	5/23/2014 10:45	4	98.5

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	13	15.8	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

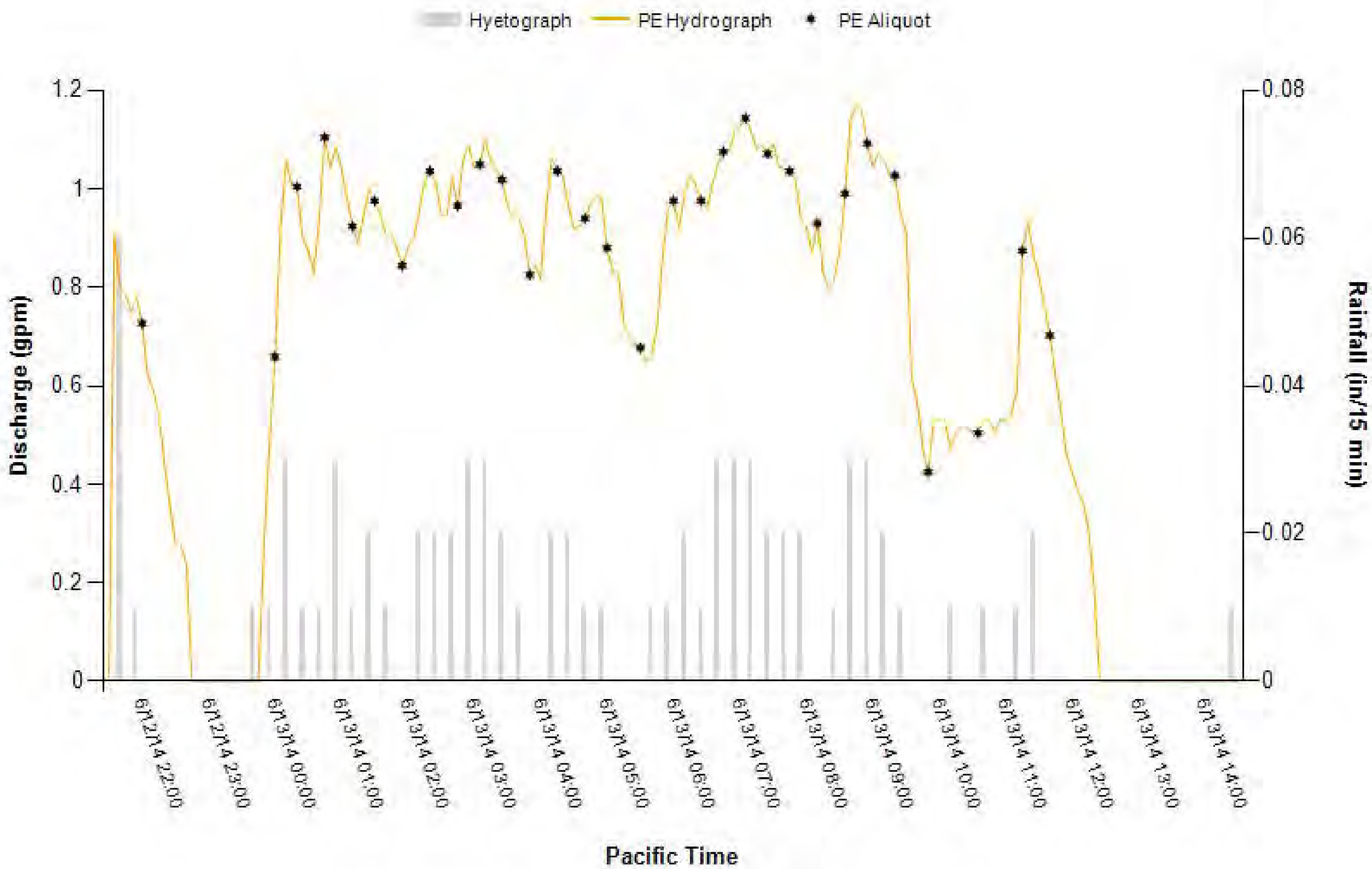
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.78	06/12/2014 21:30	06/13/2014 14:15	16.75	76.41

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	30	06/12/2014 22:00	06/13/2014 11:40	13.67	250	7,500	12.90	15.90	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	06/12/2014 21:35	06/13/2014 12:20	14.75	691.0	46.8	691.0	674.6	97.60	1.17	0.18	0.84	0.123

Everett 04 6/12/2014 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.07	06/28/2014 01:00	06/28/2014 02:30	1.50	189.16

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	15.00	15.50	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	06/28/2014 01:05	06/28/2014 03:50	2.75	82.5	30.0	82.5	65.7	79.70	0.82	0.18	0.49	0.049

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.96	07/23/2014 06:55	07/23/2014 16:50	9.92	76.08

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	30	07/23/2014 07:30	07/23/2014 17:25	9.92	250	7,500	16.00	18.50	R

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	07/23/2014 07:05	07/23/2014 21:20	14.25	644.0	45.2	644.0	570.5	67.80	1.42	0.18	0.75	0.203

Rejected because less than 75% of the hydrograph was sampled.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.64	09/23/2014 18:40	09/24/2014 10:55	16.25	129.08

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	37	09/23/2014 20:30	09/24/2014 04:25	7.92	250	9,250	16.50	17.20	R

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	09/23/2014 18:45	09/24/2014 12:20	17.58	916.4	52.1	916.4	538.8	58.80	1.19	0.34	0.86	0.128

Rejected because less than 75% of the hydrograph was sampled.

SR9 01

Precipitation												
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)								
0.39	05/20/2012 11:00	05/20/2012 23:05	12.1	368.75								

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	10	05/20/2012 19:30	05/20/2012 22:25	2.9	700	7000	10.9	13.4	R

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	05/20/2012 19:15	05/20/2012 11:10	3.5	783.3	223.8	1,169.2	N/A	N/A	N/A	N/A	N/A	N/A

Rejected because less than 75% of the hydrograph was sampled.

Precipitation												
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)								
0.03	10/12/2012 06:30	10/12/2012 10:00	3.5	474.25								

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	4.7	5.6	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

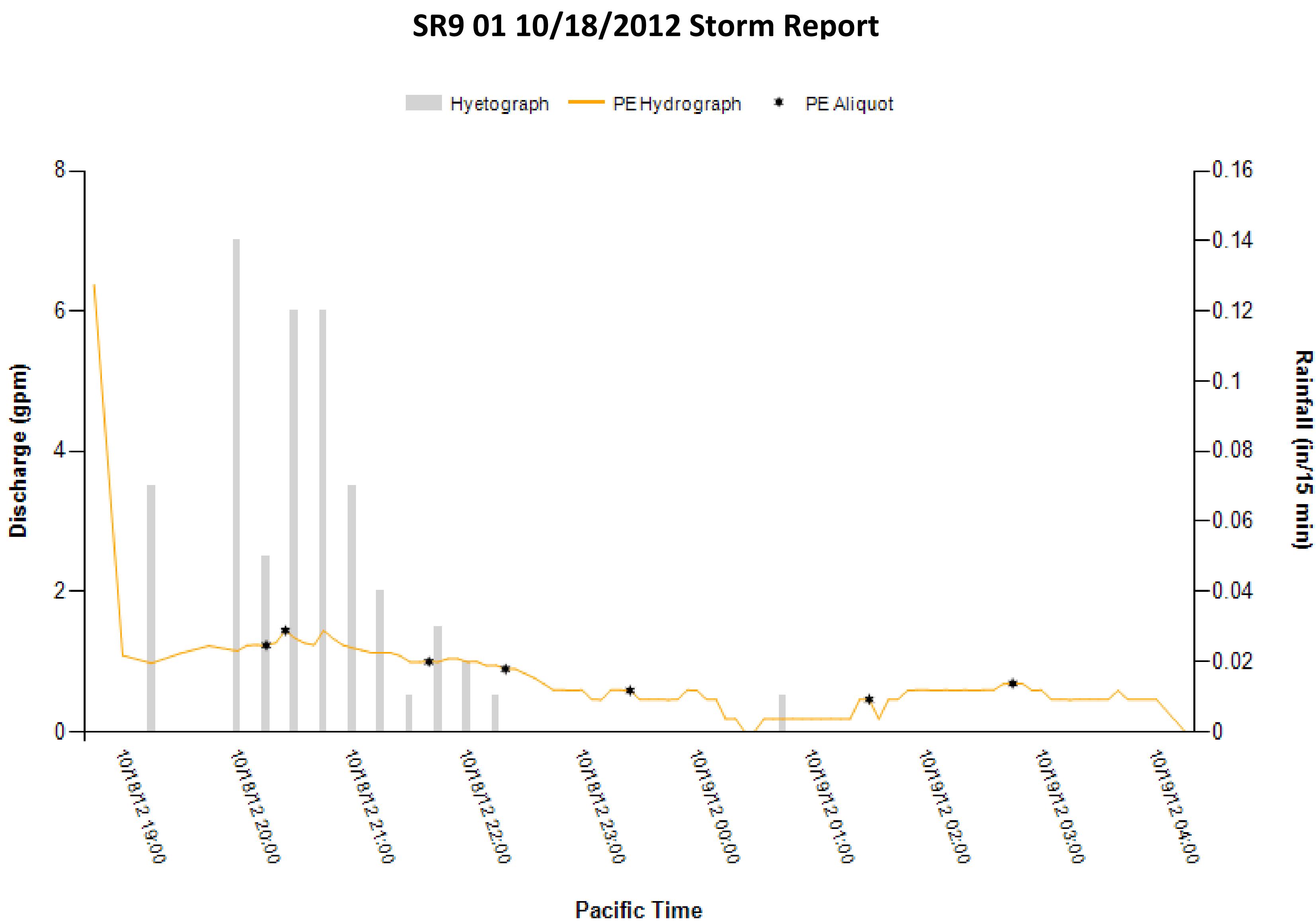
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.69	10/18/2012 18:45	10/19/2012 0:35	5.83	52.5

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	7	10/18/2012 20:15	10/19/2012 2:45	6.50	250	1,750	11.06	12.34	J

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	10/19/2012 18:45	10/19/2012 4:00	9.25	372.35	40.25	372.35	339.43	91.16	1.44	0.18	0.70	0.247

J=Estimate of Hydrology information


SR9 01 10/18/2012 Storm Report
Hyetograph
PE Hydrograph
PE Aliquot
Discharge (gpm)
Rainfall (in/15 min)
0
2
4
6
8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
10/18/12 19:00
10/18/12 20:00
10/18/12 21:00
10/18/12 22:00
10/18/12 23:00
10/19/12 00:00
10/19/12 01:00
10/19/12 02:00
10/19/12 03:00
10/19/12 04:00
Pacific Time

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.68	11/6/2012 22:00	11/7/2012 10:55	12.92	46.24

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	37	11/6/2012 23:10	11/7/2012 2:55	3.75	250	9,250	9.00	10.86	R

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	11/6/2012 22:00	11/7/2012 13:15	15.25	628.05	41.18	628.04	289.86	46.15	1.69	0.18	0.71	0.320

Rejected because less than 75% of the hydrograph was sampled.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
1.27	12/11/2012 21:45	12/12/2012 14:45	17.00	41

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	4.50	5.90	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	12/11/2012 23:45	12/12/2012 15:45:00	16.00	477.04	29.82	477.04	N/A	N/A	1.08	0.00	0.56	N/A

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.06	2/21/2013 5:40	2/21/2013 11:45	6.08	101.25

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	4.00	6.70	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	2/21/2013 5:45	2/21/2013 12:30	6.75	93.25	13.82	93.25	N/A	N/A	0.82	0.44	0.58	0.070

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.32	3/2/2013 15:20	3/2/2013 18:00	2.67	47.74

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	6	3/2/2013 15:50	3/2/2013 21:45	5.92	250	2,000	4.10	8.20	R

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	3/2/2013 15:25	3/2/2013 23:45	8.33	286.97	34.45	286.97	253.82	88.45	1.26	0.44	0.75	0.146

Rejected because not enough aliquots were collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.75	3/6/2013 9:55	3/7/2013 12:10	26.25	76.24

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	5.40	7.70	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	3/6/2013 10:00	3/7/2013 12:50	26.83	1,164.36	43.40	1,091.48	N/A	N/A	0.94	0.44	0.74	0.074

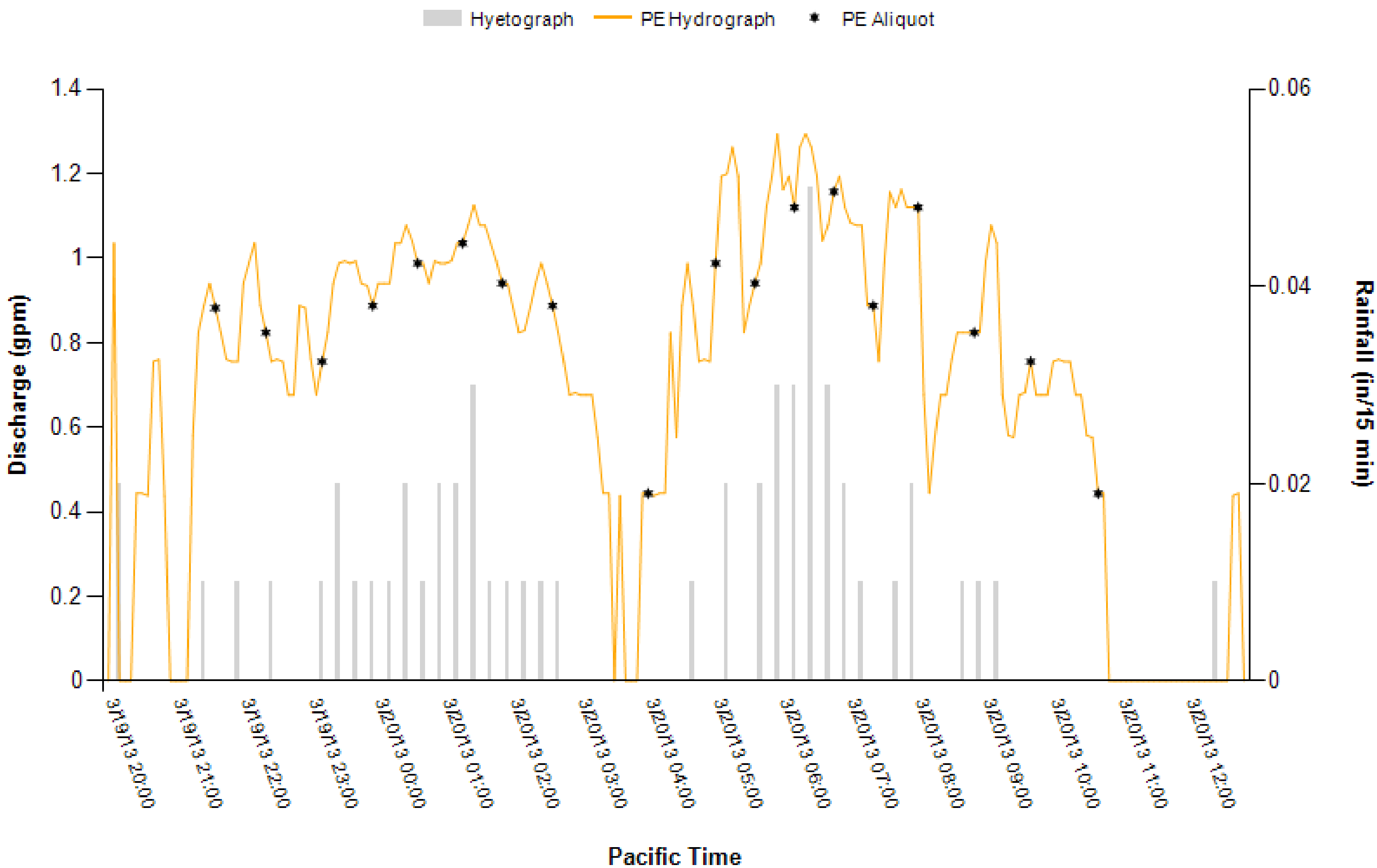
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.55	3/19/2013 19:55	3/19/2013 12:20	16.42	37.24

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	18	3/19/2013 21:30	3/20/2013 10:35	13.08	250	4,500	5.60	9.50	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	3/19/2013 20:00	3/20/2013 12:40	16.67	721.24	43.27	721.24	714.61	99.08	1.29	0.44	0.86	0.154

SR9 01 3/19/2013 Storm Report

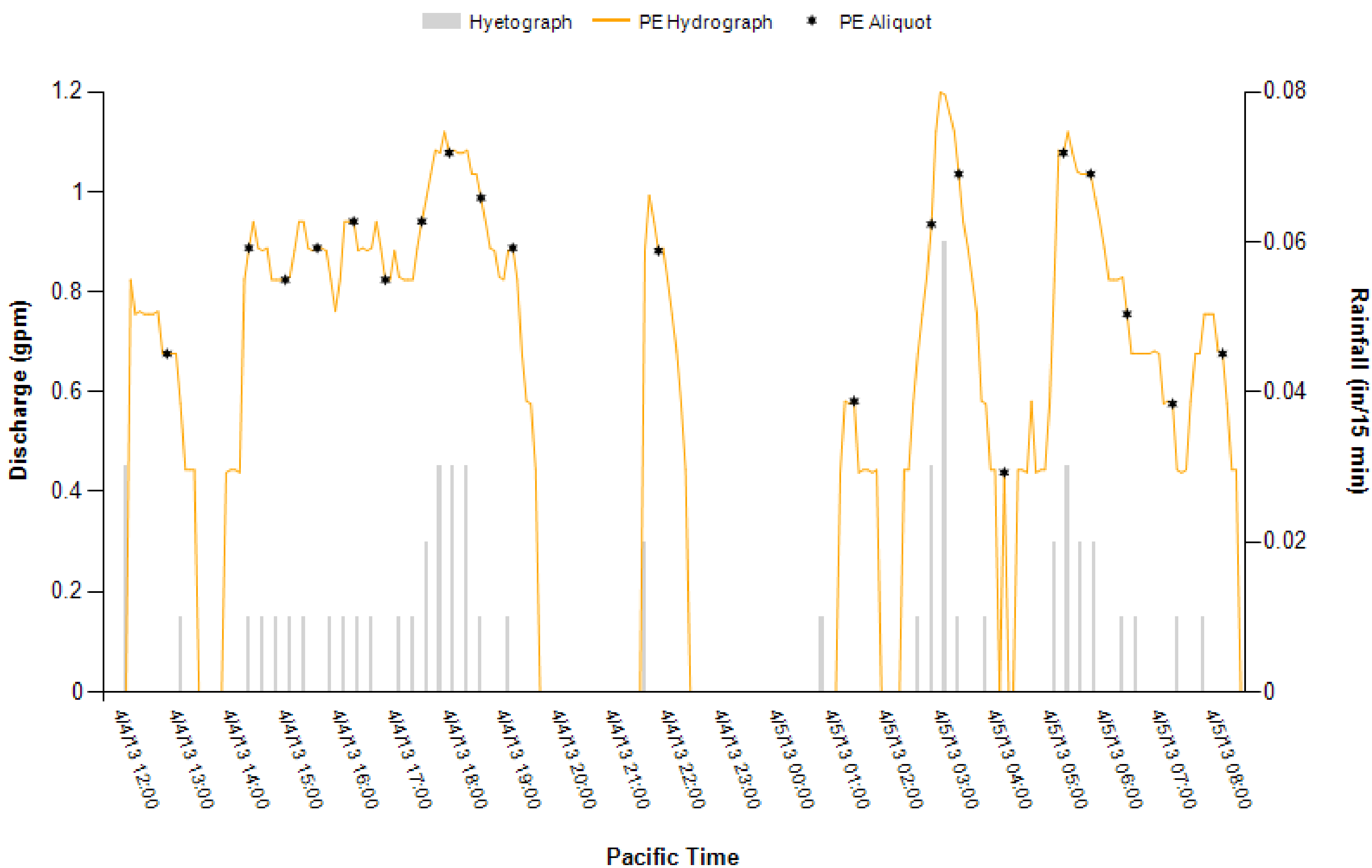


Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.56	4/4/2013 11:45	4/5/2013 7:45	20.00	311.49

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	20	4/4/2013 12:50	4/5/2013 8:10	19.33	250	5,000	9.70	14.60	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	4/4/2013 12:10	4/5/2013 8:25	20.25	670.47	33.11	670.47	663.15	98.91	1.20	0.44	0.77	0.160

SR9 01 4/4/2013 Storm Report

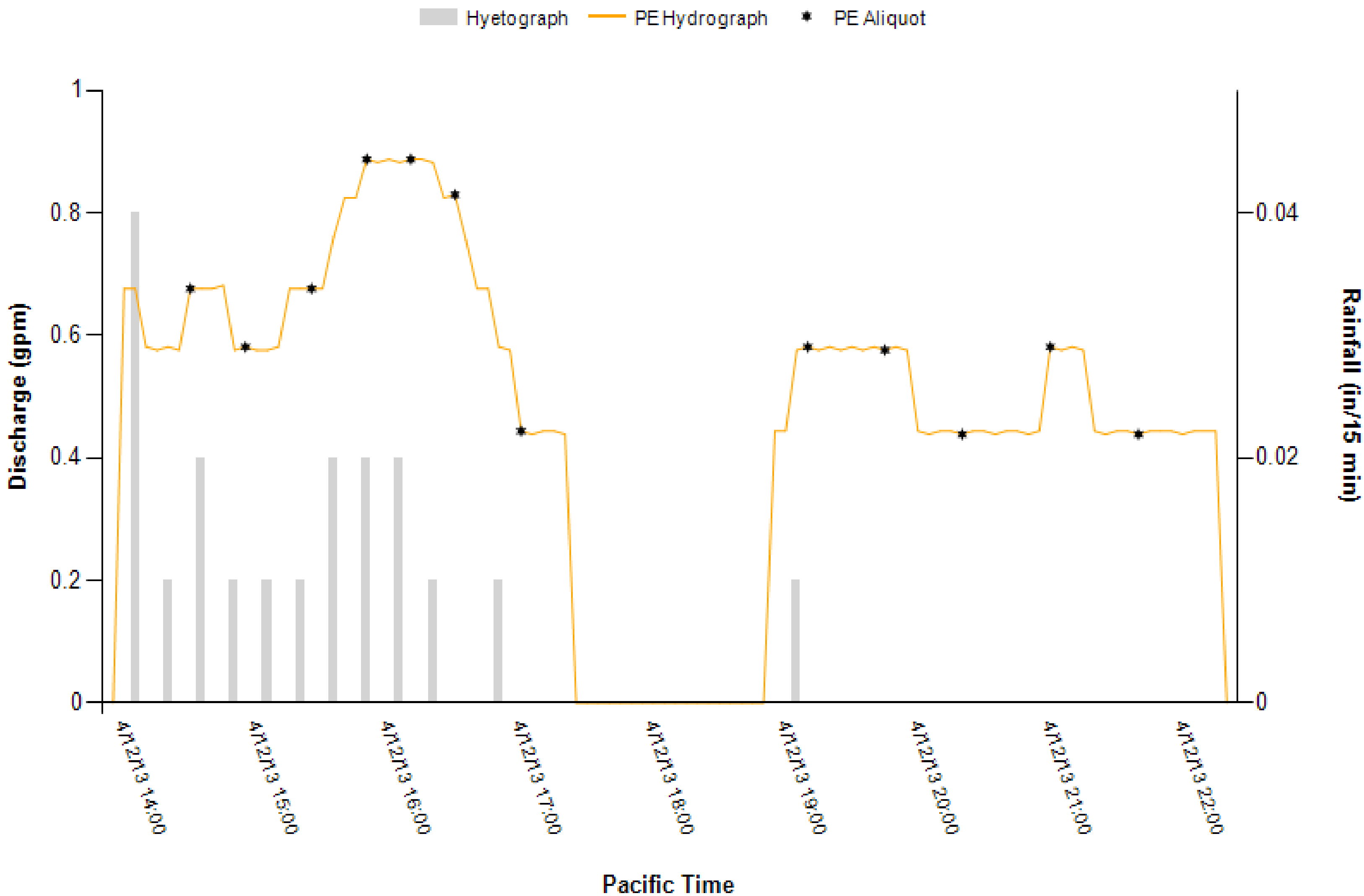


Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.19	4/12/2013 13:55	4/12/2013 19:05	5.17	32.49

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	12	4/12/2013 14:30	4/12/2013 21:40	7.17	250	3,000	5.50	8.60	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	4/12/2013 14:00	4/12/2013 22:15	8.25	237.20	28.75	237.20	223.91	94.40	0.89	0.44	0.59	0.095

SR9 01 4/12/2013 Storm Report

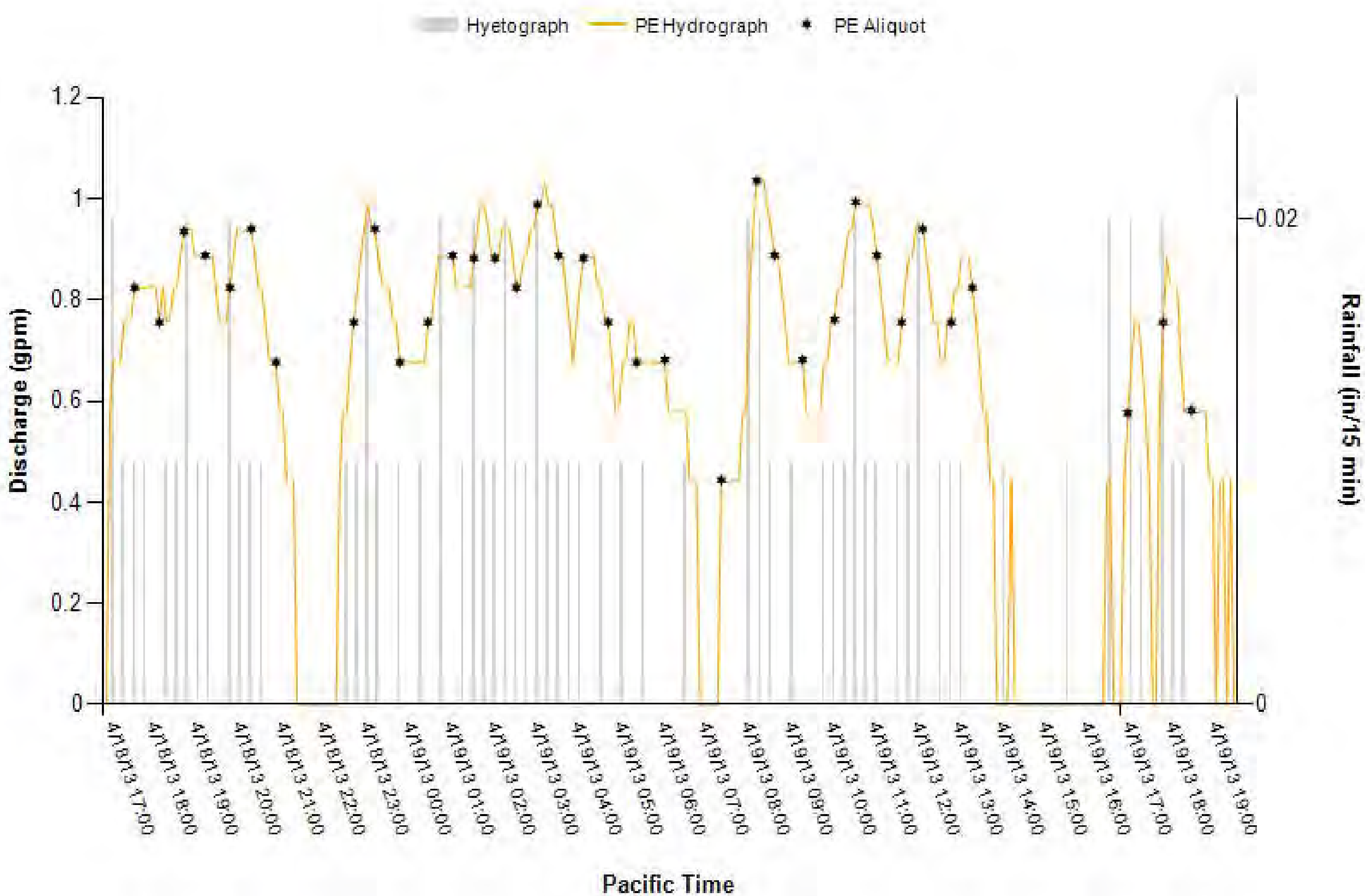


Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.75	4/18/2013 16:50	4/19/2013 18:15	25.42	50.74

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	35	4/19/2013 17:30	4/19/2013 18:25	24.92	250	8,750	8.60	14.60	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	4/18/2013 16:55	4/19/2013 19:20	26.42	995.27	37.67	914.77	914.77	100.00	1.04	0.44	0.76	0.095

SR9 01 4/18/2013 Storm Report



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.70	5/21/2013 2:15	5/22/2013 0:30	22.25	46.5

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	12.70	12.70	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	5/21/2013 2:20	5/22/2013 6:15	27.92	4,317.60	154.64	3,720.41	N/A	N/A	2.69	2.44	2.58	0.168

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.47	11/18/2013 11:35	11/19/2013 05:50	18.25	37.5

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	8.3	9.7	

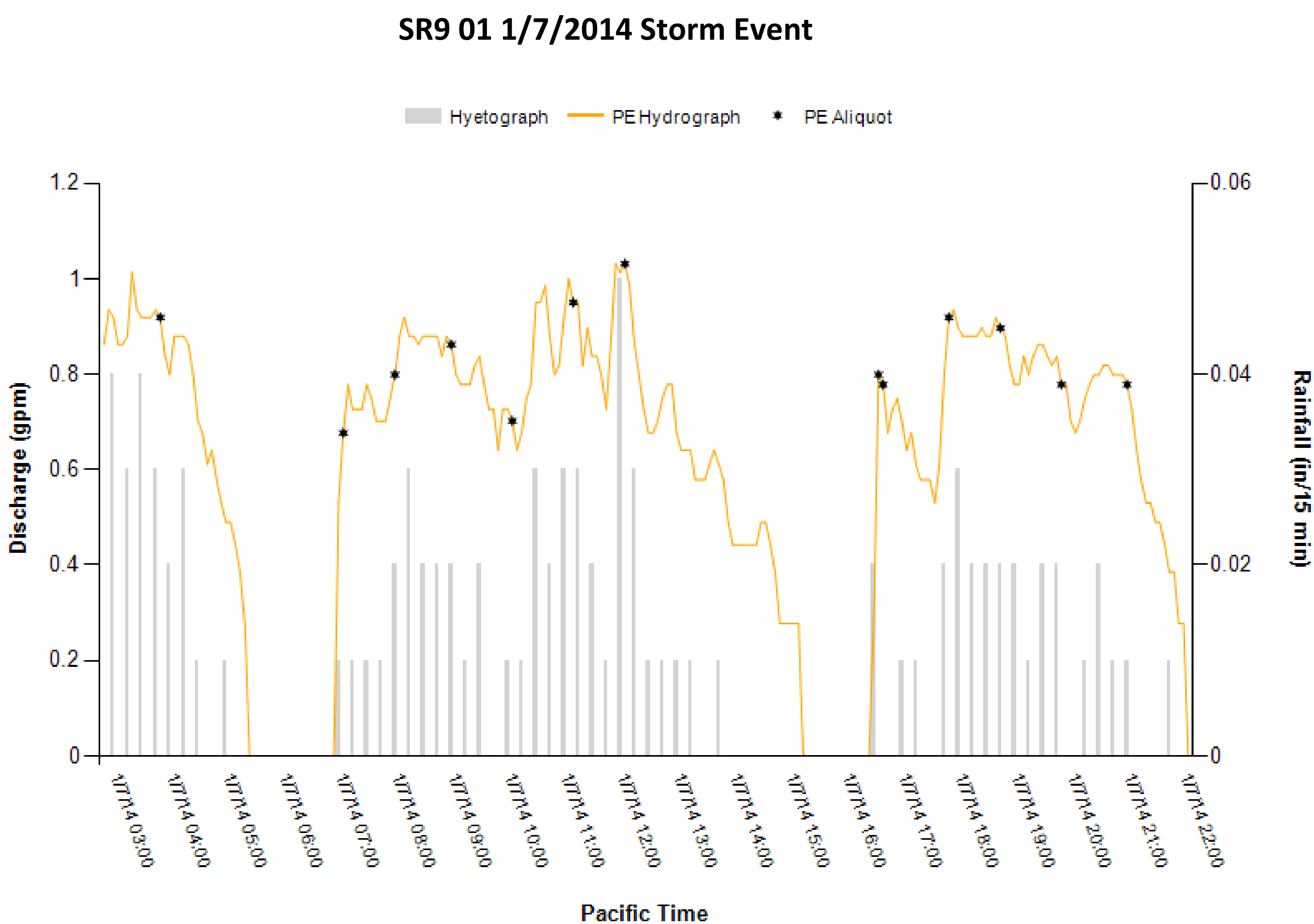
Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	11/18/2013 11:35	11/19/2013 08:05	20.50	931.7	45.4	931.7	N/A	N/A	1.26	0.39	0.75	N/A

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.96	01/07/2014 02:45	01/07/2014 21:35	18.83	100.99

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	13	01/07/2014 03:45	01/07/2014 20:55	17.17	250	3,250	3.10	6.60	

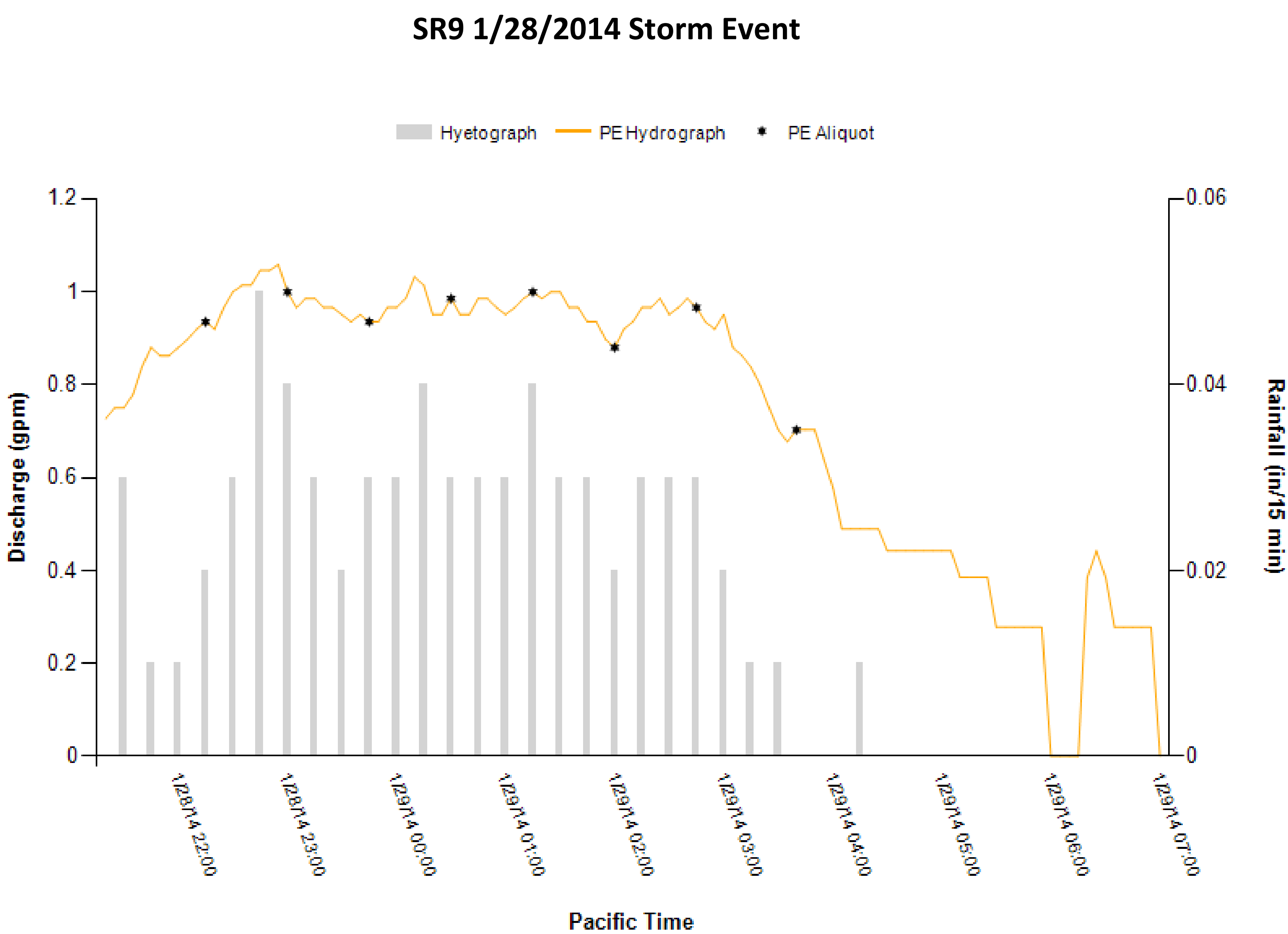
Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	01/07/2014 02:45	01/07/2014 21:55	19.17	717.0	37.4	717.0	688.2	96.00	1.03	0.28	0.73	0.089


SR9 01 1/7/2014 Storm Event
Hyetograph
PE Hydrograph
PE Aliquot
Discharge (gpm)
Rainfall (in/15 min)
Pacific Time
1.2
1
0.8
0.6
0.4
0.2
0
0.06
0.04
0.02
0
1/7/14 03:00
1/7/14 04:00
1/7/14 05:00
1/7/14 06:00
1/7/14 07:00
1/7/14 08:00
1/7/14 09:00
1/7/14 10:00
1/7/14 11:00
1/7/14 12:00
1/7/14 13:00
1/7/14 14:00
1/7/14 15:00
1/7/14 16:00
1/7/14 17:00
1/7/14 18:00
1/7/14 19:00
1/7/14 20:00
1/7/14 21:00
1/7/14 22:00

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.69	01/28/2014 21:20	01/29/2014 04:15	6.92	372

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	8	01/28/2014 22:15	01/29/2014 03:40	5.42	250	2,000	6.50	7.10	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	01/28/2014 21:20	01/29/2014 06:55	9.58	429.6	44.8	429.6	357.5	83.20	1.06	0.28	0.77	0.095


SR9 1/28/2014 Storm Event
Hyetograph
PE Hydrograph
PE Aliquot
Discharge (gpm)
Rainfall (in/15 min)
1.2
1
0.8
0.6
0.4
0.2
0
0.06
0.04
0.02
0
1/28/14 22:00
1/28/14 23:00
1/29/14 00:00
1/29/14 01:00
1/29/14 02:00
1/29/14 03:00
1/29/14 04:00
1/29/14 05:00
1/29/14 06:00
1/29/14 07:00
Pacific Time

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.44	2/18/2014 15:00	2/19/2014 2:45	11.75	12.75

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	4.6	7.5	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.16	3/3/2014 15:00	3/3/2014 21:45	6.75	7.5

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	7	8.9	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

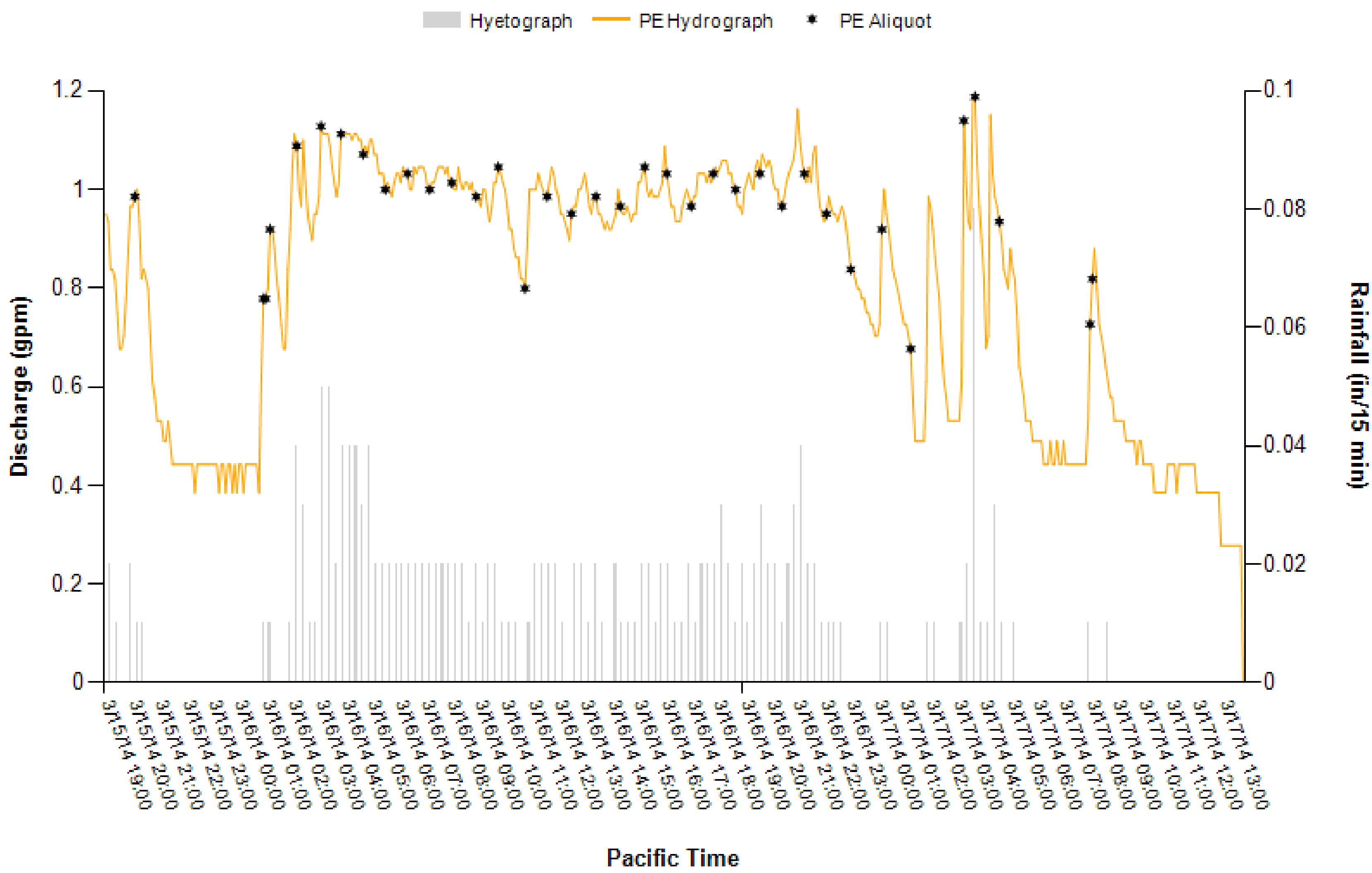
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
1.92	03/15/2014 18:50	03/17/2014 08:20	37.50	27

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	36	03/15/2014 19:55	03/17/2014 07:55	36.00	250	9,000	3.10	10.70	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	03/15/2014 18:50	03/17/2014 13:30	42.67	2,054.4	48.1	1,658.9	1,904.7	100.00	1.19	0.28	0.80	0.128

SR9 3/15/2014 Storm Event

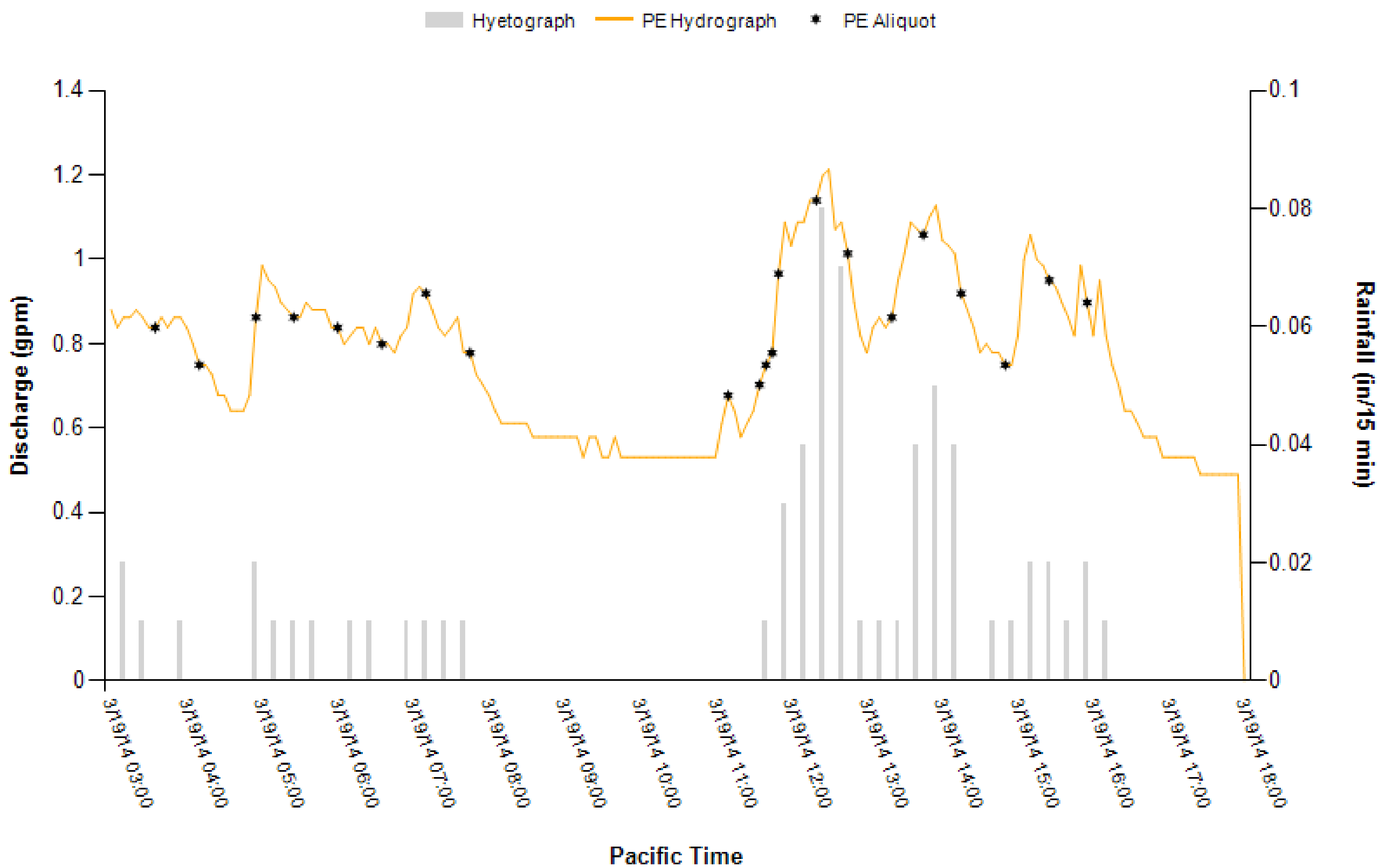


Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.64	03/19/2014 03:00	03/19/2014 16:05	13.08	43

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	21	03/19/2014 03:35	03/19/2014 15:55	12.33	250	5,250	6.70	8.70	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	03/19/2014 03:00	03/19/2014 17:55	14.92	692.8	46.4	692.8	621.5	89.70	1.21	0.49	0.77	0.135

SR9 3/19/2014 Storm Event

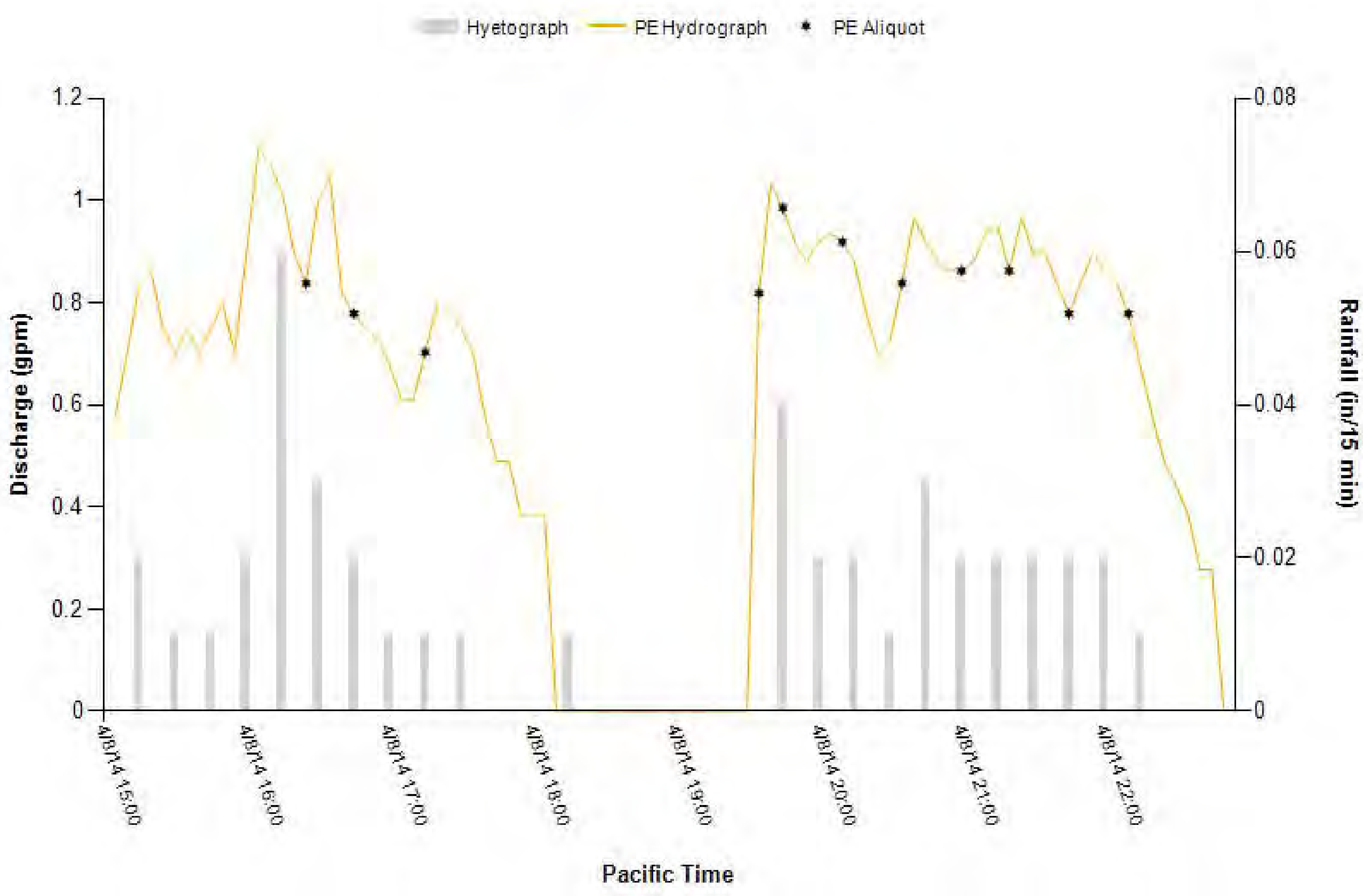


Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.44	04/08/2014 15:05	04/08/2014 22:10	7.08	26.58

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	11	04/08/2014 16:25	04/08/2014 22:10	5.75	250	2,750	9.30	13.80	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	04/08/2014 15:05	04/08/2014 22:45	7.67	292.9	38.2	292.9	277.2	94.70	1.10	0.28	0.77	0.105

SR9 4/8/2014 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
1.16	04/16/2014 16:45	04/18/2014 01:15	32.50	1.08

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	9.3	12.2	

Runoff / Discharge													
	Runoff Time			Volume			Sampled		Flow			Stage	
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)	
PE	04/16/2014 17:00	04/18/2014 00:35	31.58	1,078.8	34.2	1,057.8	N/A	N/A	1.27	0.28	0.64	N/A	

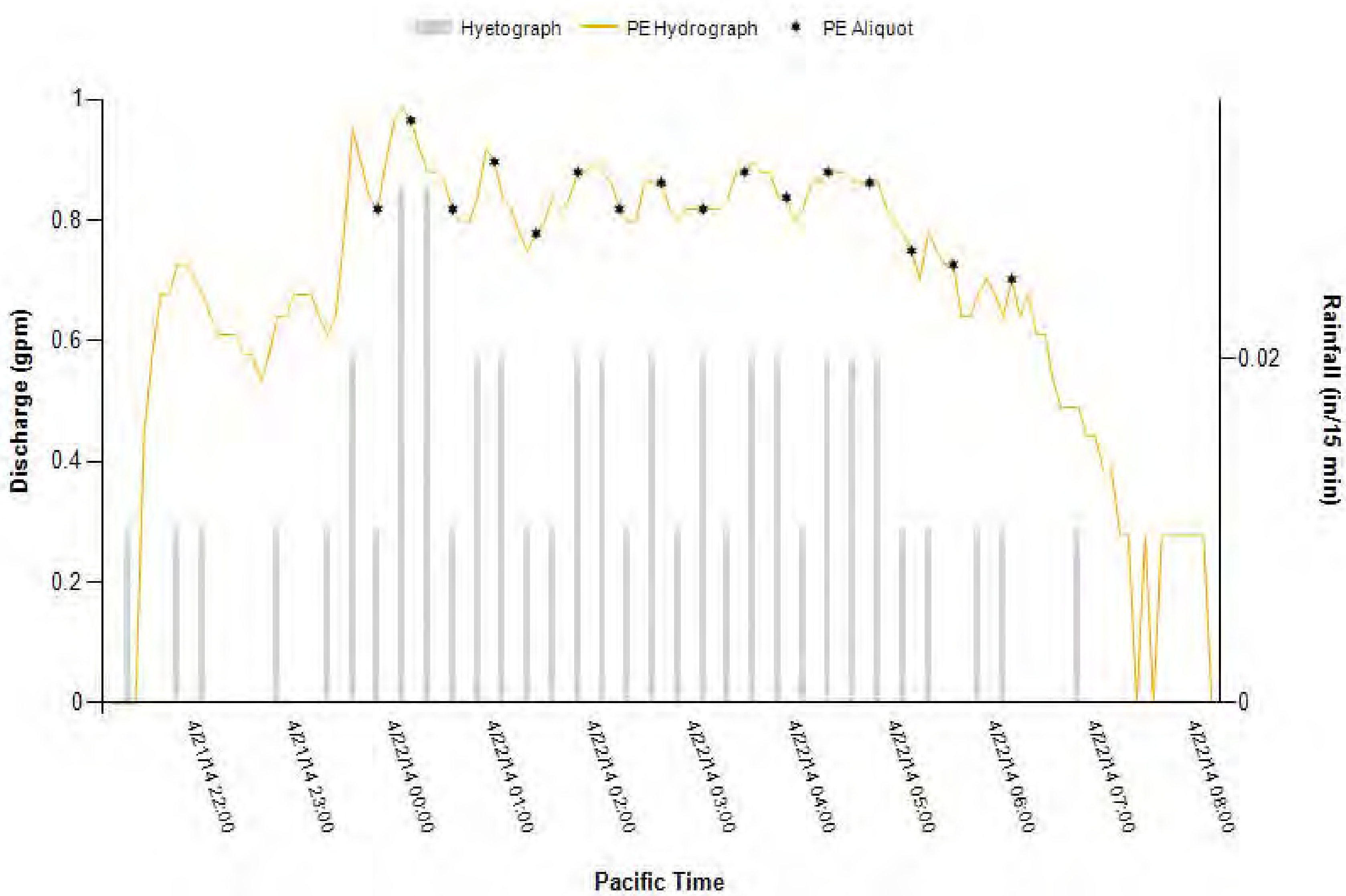
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.48	04/21/2014 21:10	04/22/2014 06:50	9.67	53.41

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	16	04/21/2014 23:50	04/22/2014 06:10	6.33	250	4,000	7.00	9.90	

Runoff / Discharge													
	Runoff Time			Volume			Sampled		Flow			Stage	
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)	
PE	04/21/2014 21:30	04/22/2014 08:05	10.58	453.9	42.9	453.9	410.4	90.40	0.99	0.28	0.72	0.079	

SR9 4/21/2014 Storm Event

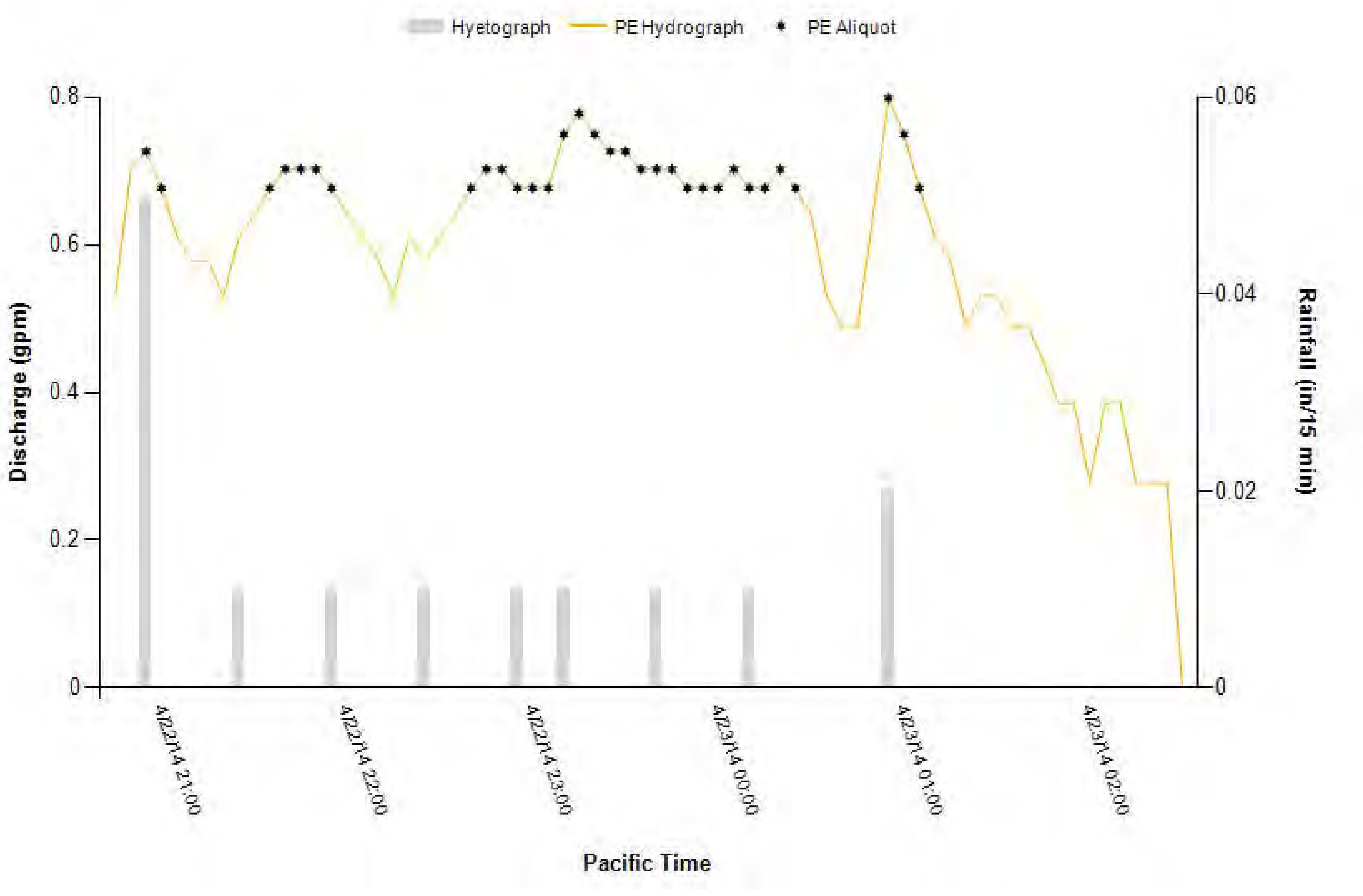


Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.14	04/22/2014 20:45	04/23/2014 00:55	4.17	13.58

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	32	04/22/2014 20:55	04/23/2014 01:05	4.17	250	8,000	7.60	9.70	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	04/22/2014 20:45	04/23/2014 02:25	5.67	208.4	36.8	208.4	174.4	83.70	0.80	0.28	0.61	0.046

SR9 4/22/2014 Storm Event

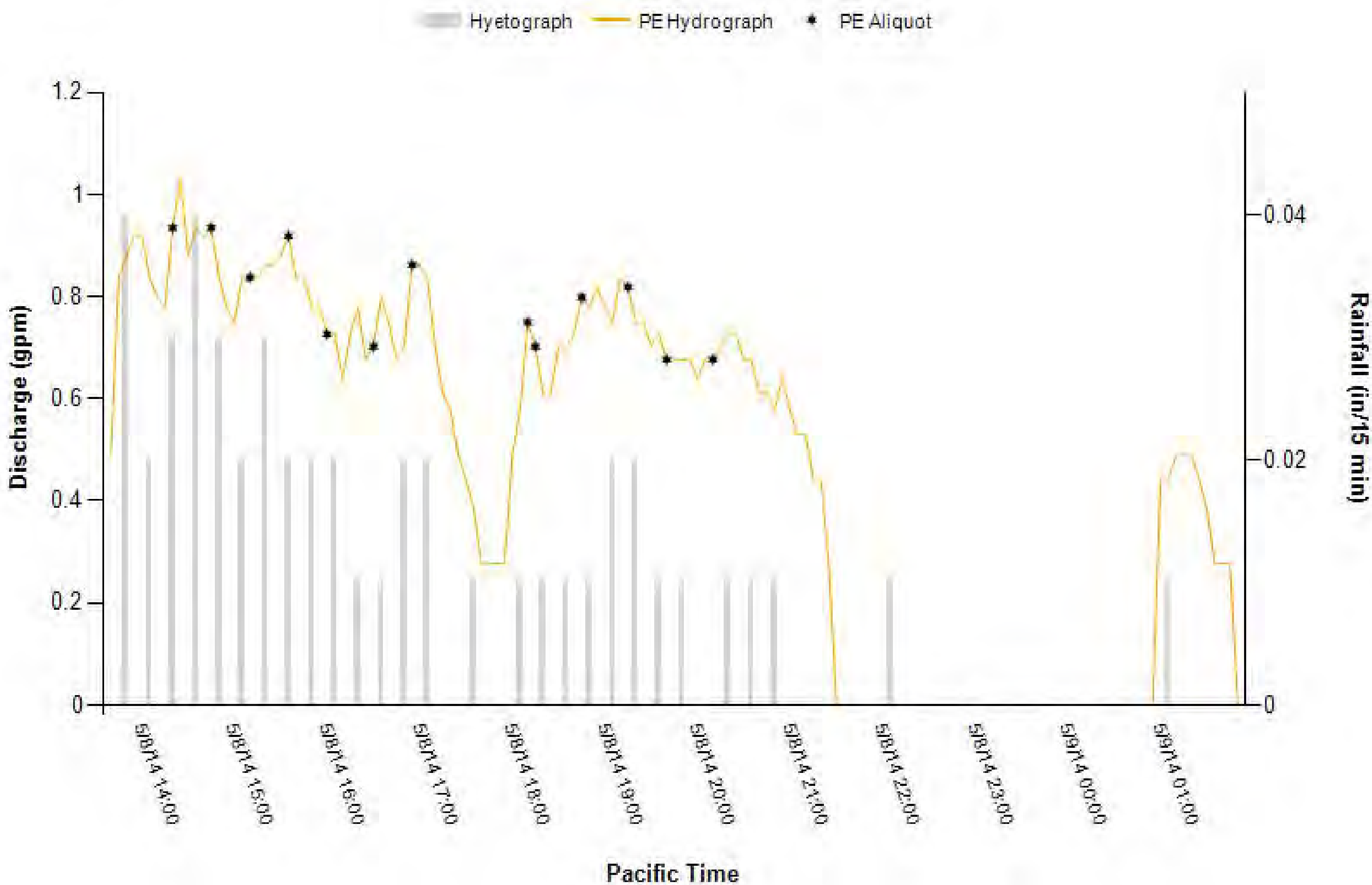


Precipitation				
Total (in)	**Start Time**	**End Time**	**Duration (hrs)**	**Antecedent (hrs)**
0.49	05/08/2014 13:40	05/09/2014 00:55	11.25	70.91

Aliquots							Water Temp		Validation Code
Sample Point (m)	**Aliquots Collected**	**First Aliquot Time**	**Last Aliquot Time**	**Sampling Duration (hrs)**	**Volume (mL)**	**Total Sample Volume (mL)**	**Min (C°)**	**Max (C°)**	
PE	13	05/08/2014 14:20	05/08/2014 20:10	5.83	250	3,250	12.60	14.20	

Runoff / Discharge												
	Runoff Time			**Volume**			**Sampled**		**Flow**			**Stage**
Sample Point (m)	**Start Time**	**End Time**	**Duration (hrs)**	**Total (gal)**	**Intensity (gal/hr)**	**First 24Hrs (gal)**	**Discharge Total Volume Sampled (gal)**	**% Hydrograph Sampled**	**Peak (gpm)**	**Min (gpm)**	**Mean (gpm)**	**Max (ft)**
PE	05/08/2014 13:40	05/09/2014 01:45	12.08	351.8	29.1	351.8	288.0	81.90	1.03	0.28	0.68	0.089

SR9 5/8/2014 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.18	05/23/2014 07:00	05/23/2014 10:55	3.92	97.33

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	15	05/23/2014 08:05	05/23/2014 12:00	3.92	250	3,750	13.40	14.70	R

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	05/23/2014 07:00	05/23/2014 13:00	6.00	241.1	40.2	241.1	221.5	69.3	0.97	0.17	0.66	0.075

Rejected because less than 75% of the hydrograph was sampled.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.06	05/28/2014 07:05	05/28/2014 07:35	0.50	44.49

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	8.30	8.60	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	05/28/2014 07:05	05/28/2014 13:00	5.92	142.7	24.1	142.7	N/A	N/A	1.12	0.18	0.39	0.111

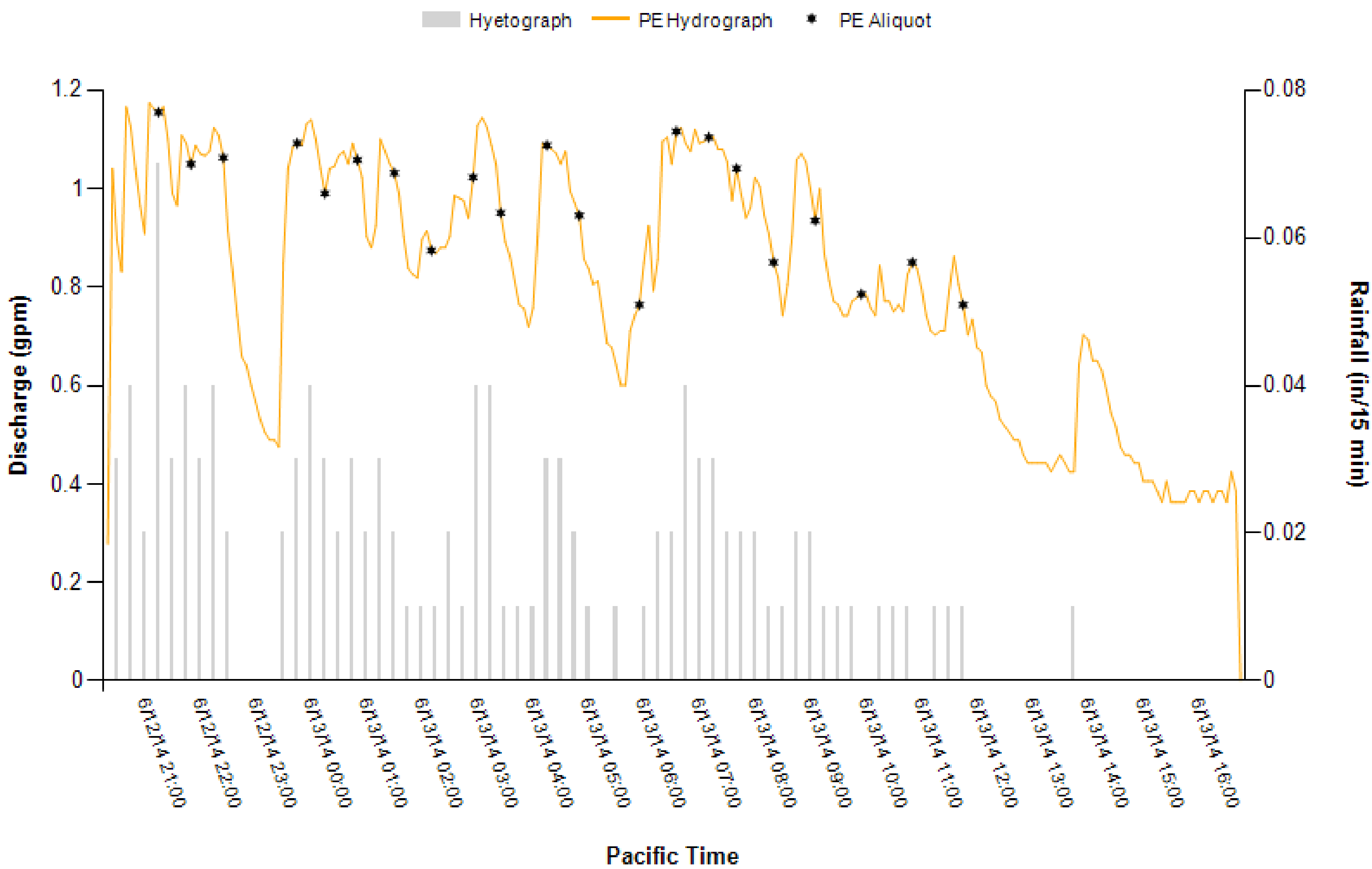
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
1.20	06/12/2014 20:20	06/13/2014 13:45	17.42	372.58

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	21	06/12/2014 21:15	06/13/2014 11:45	14.50	250	5,250	12.80	16.40	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	06/12/2014 20:20	06/13/2014 16:40	20.33	993.4	48.9	993.4	852.1	85.80	1.17	0.36	0.81	0.124

SR9 6/12/2014 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.06	06/28/2014 00:50	06/28/2014 03:45	2.92	189.58

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	14.90	15.00	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	06/28/2014 00:50	06/28/2014 04:20	3.50	79.7	22.8	79.7	N/A	N/A	0.74	0.18	0.41	0.038

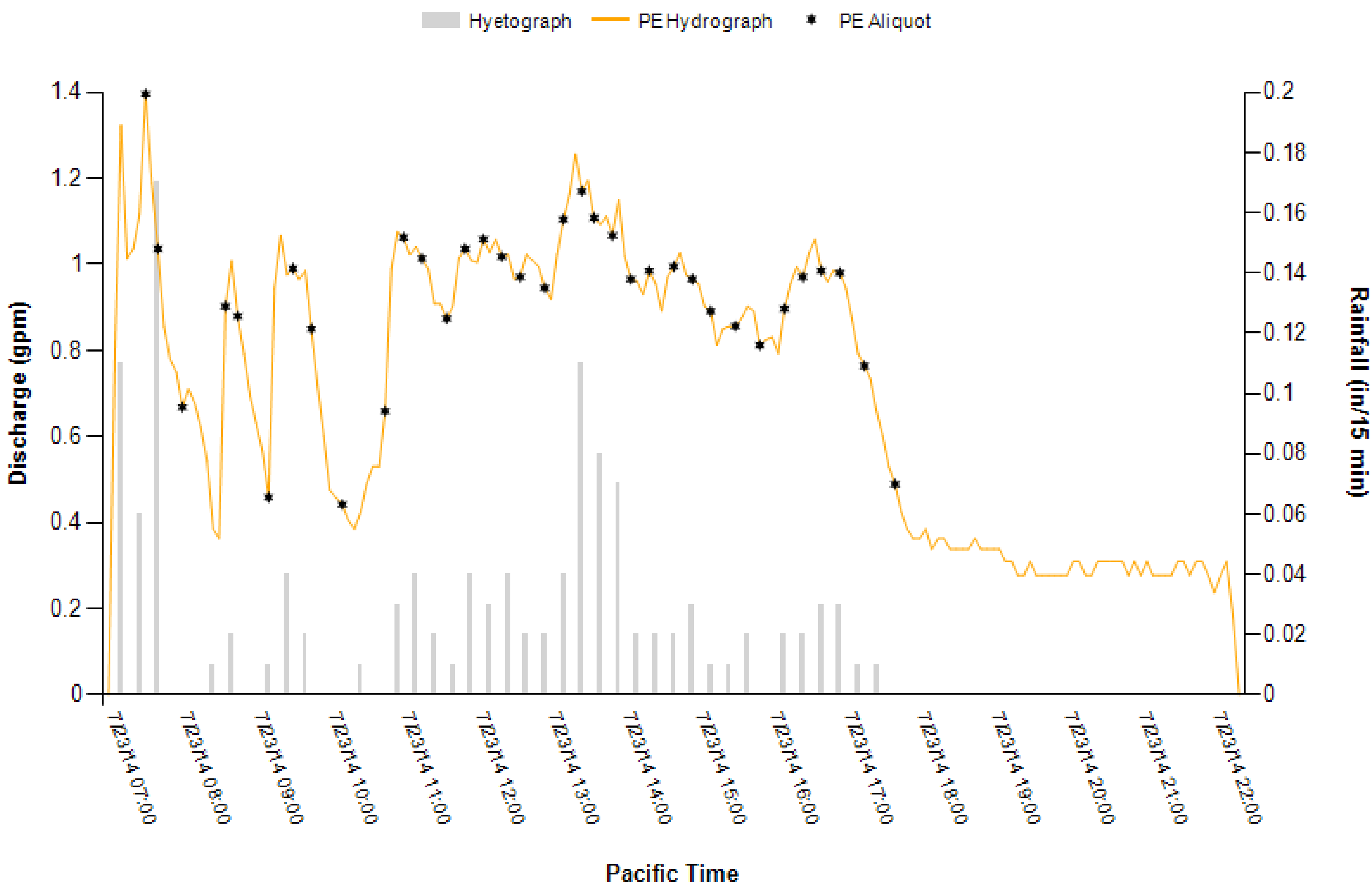
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
1.25	07/23/2014 06:55	07/23/2014 17:10	10.25	77.16

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	35	07/23/2014 07:25	07/23/2014 17:35	10.17	250	8,750	15.40	18.10	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	07/23/2014 07:00	07/23/2014 22:10	15.17	651.5	42.9	651.5	566.5	87.00	1.40	0.18	0.71	0.194

SR9 7/23/2014 Storm Event

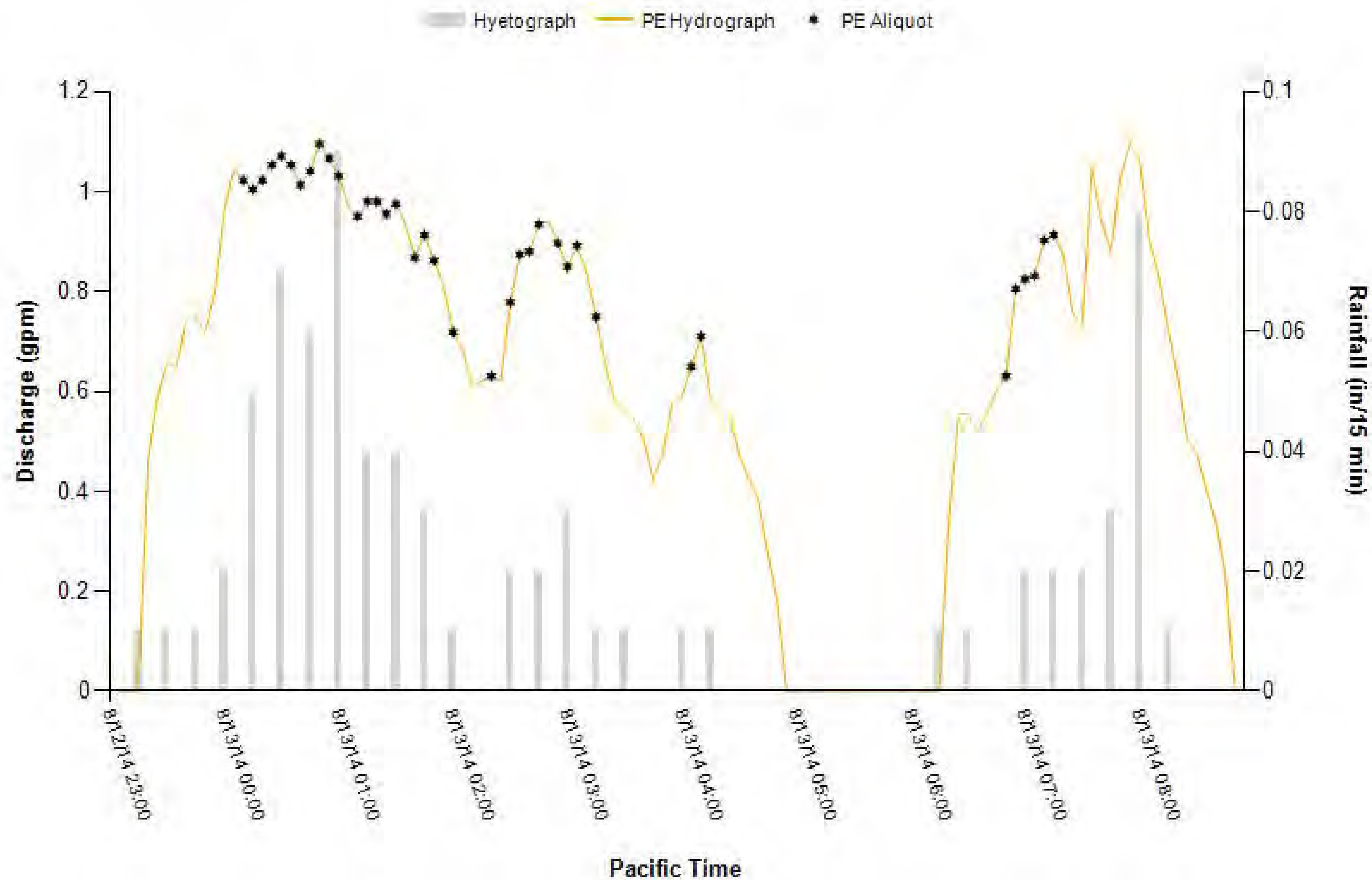


Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.75	08/12/2014 23:05	08/13/2014 08:10	9.08	248.08

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	37	08/13/2014 00:10	08/13/2014 07:15	7.08	250	9,250	17.60	20.50	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	08/12/2014 23:20	08/13/2014 08:45	9.42	364.0	38.6	364.0	296.6	81.50	1.10	0.18	0.75	0.104

SR9 8/12/2014 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.12	09/18/2014 07:30	09/18/2014 10:45	3.25	3.83

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	15.2	15.8	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	09/18/2014 07:50	09/18/2014 11:35	3.75	133.6	35.6	133.6	N/A	N/A	0.97	0.18	0.58	0.076

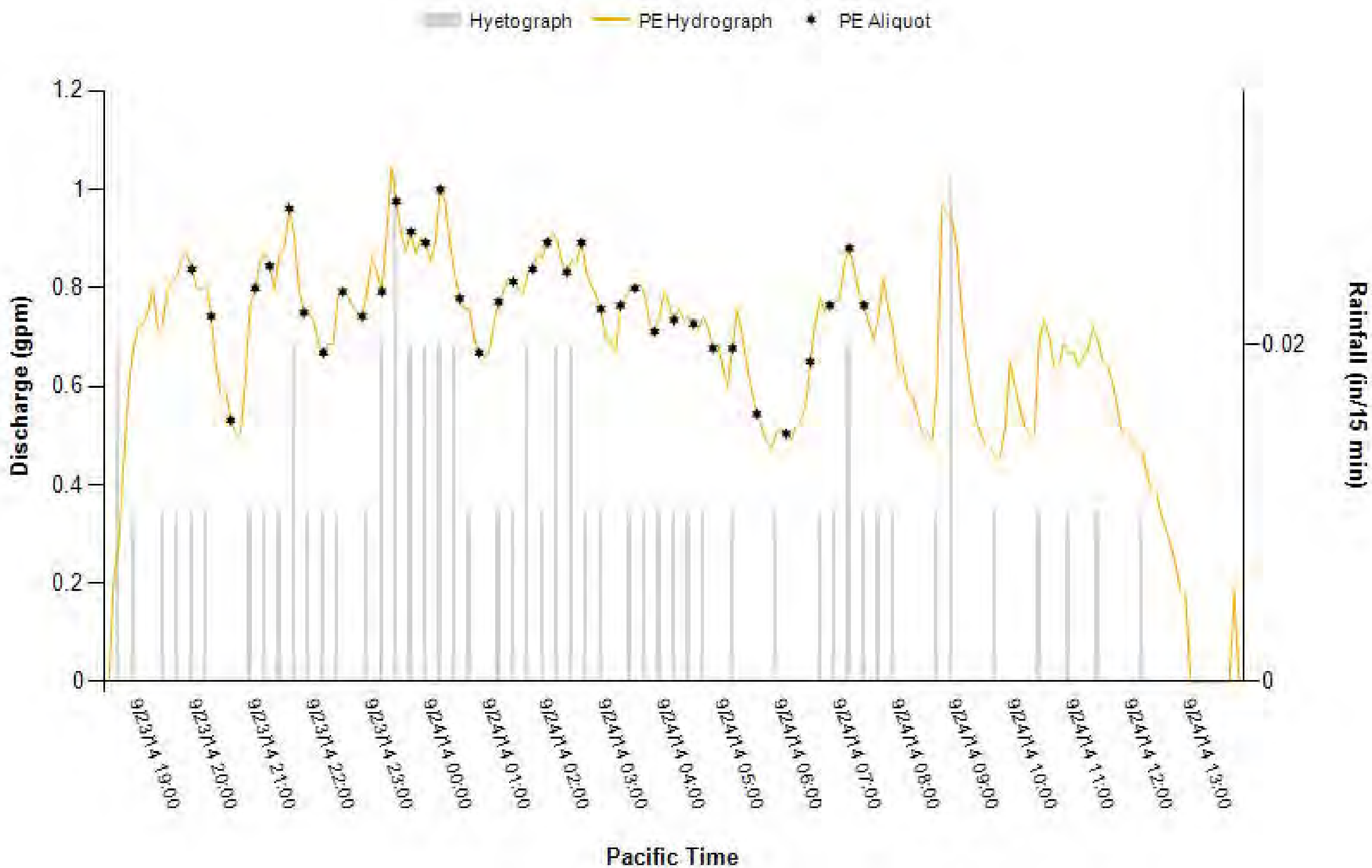
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.65	09/23/2014 18:30	09/24/2014 12:00	17.50	127.41

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	37	09/23/2014 19:55	09/24/2014 07:25	11.50	250	9,250	16.00	16.70	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	09/23/2014 18:35	09/24/2014 13:45	19.17	773.4	40.3	773.4	580.2	75.00	1.05	0.18	0.70	0.092

SR9 9/23/2014 Storm Event



PINES 01

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.55	06/26/2012 08:15	06/26/2012 14:10	5.9	52.75

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Only grab samples collected.

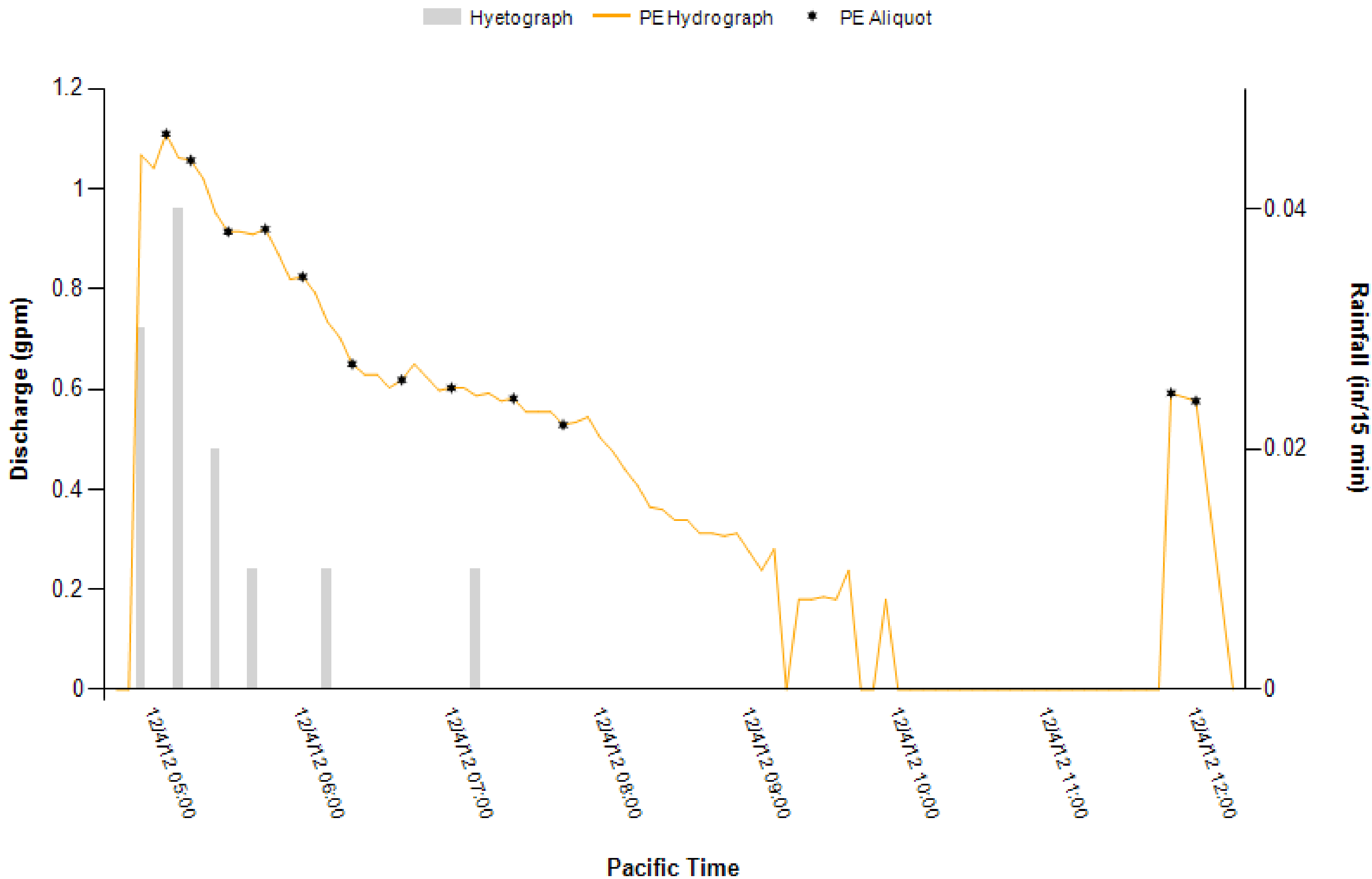
Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.12	12/4/2012 4:45	12/4/2012 7:10	2.42	45.75

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	12	12/4/2012 5:05	12/4/2012 12:00	6.92	250	3,000	4.56	6.65	R

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	12/4/2012 4:55	12/4/2012 12:00	7.08	175.41	24.78	175.41	175.41	100.00	1.11	0.18	0.58	0.107

Non-qualifying rainfall.

PINES 01 12/4/2012 Storm Report

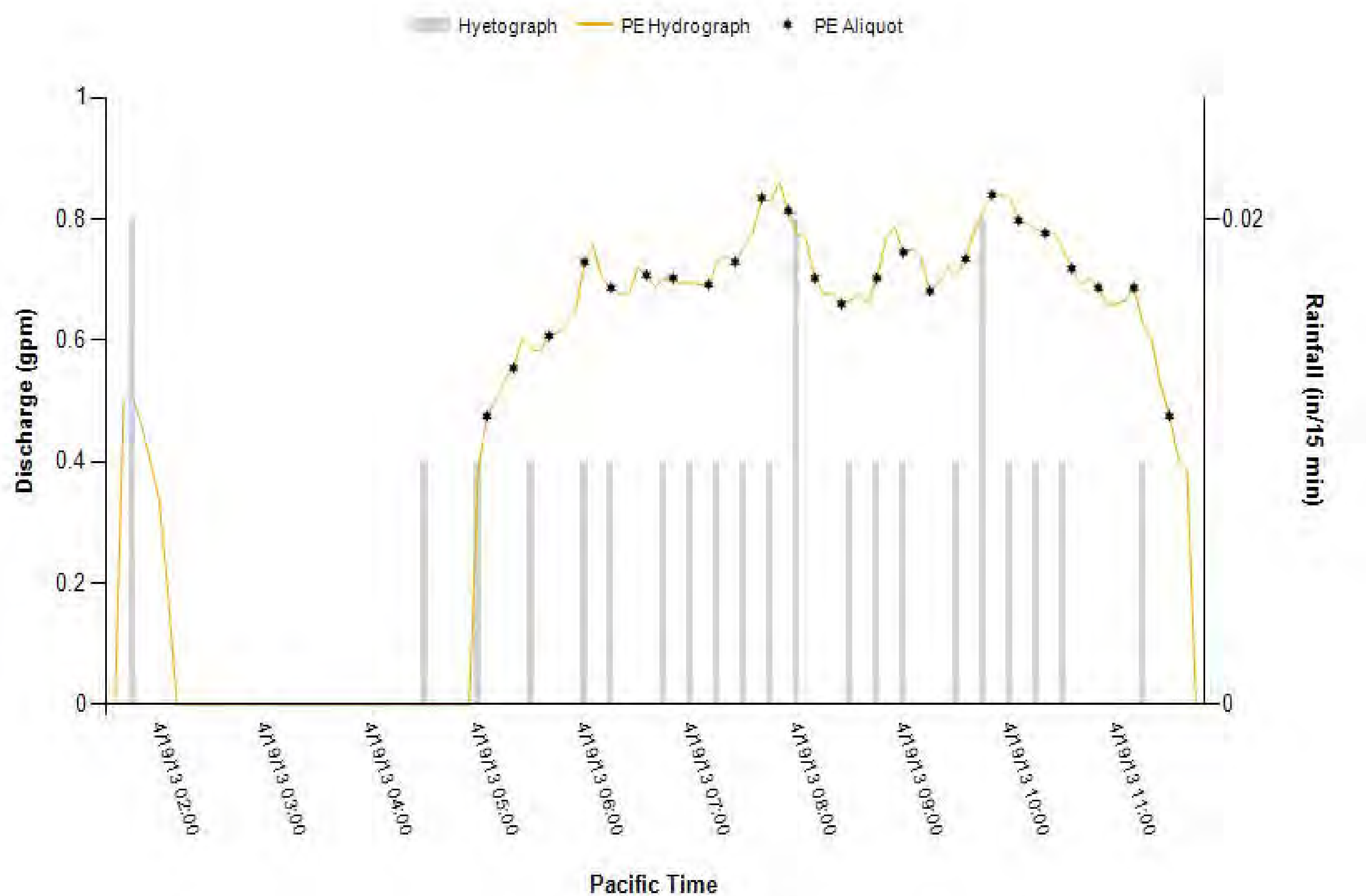


Precipitation				
Total (in)	**Start Time**	**End Time**	**Duration (hrs)**	**Antecedent (hrs)**
0.24	4/19/2013 1:35	4/19/2013 11:10	9.58	147.75

Aliquots							Water Temp		Validation Code
Sample Point (m)	**Aliquots Collected**	**First Aliquot Time**	**Last Aliquot Time**	**Sampling Duration (hrs)**	**Volume (mL)**	**Total Sample Volume (mL)**	**Min (C°)**	**Max (C°)**	
PE	24	4/19/2013 5:05	4/19/2013 11:30	6.42	250	6,000	4.56	8.37	

Runoff / Discharge												
	Runoff Time			**Volume**			**Sampled**		**Flow**			**Stage**
Sample Point (m)	**Start Time**	**End Time**	**Duration (hrs)**	**Total (gal)**	**Intensity (gal/hr)**	**First 24Hrs (gal)**	**Discharge Total Volume Sampled (gal)**	**% Hydrograph Sampled**	**Peak (gpm)**	**Min (gpm)**	**Mean (gpm)**	**Max (ft)**
PE	4/19/2013 1:40	4/19/2013 11:40	10.00	291.36	29.14	291.36	287.39	98.64	0.86	0.18	0.67	0.056

PINES 01 4/19/2013 Storm Report

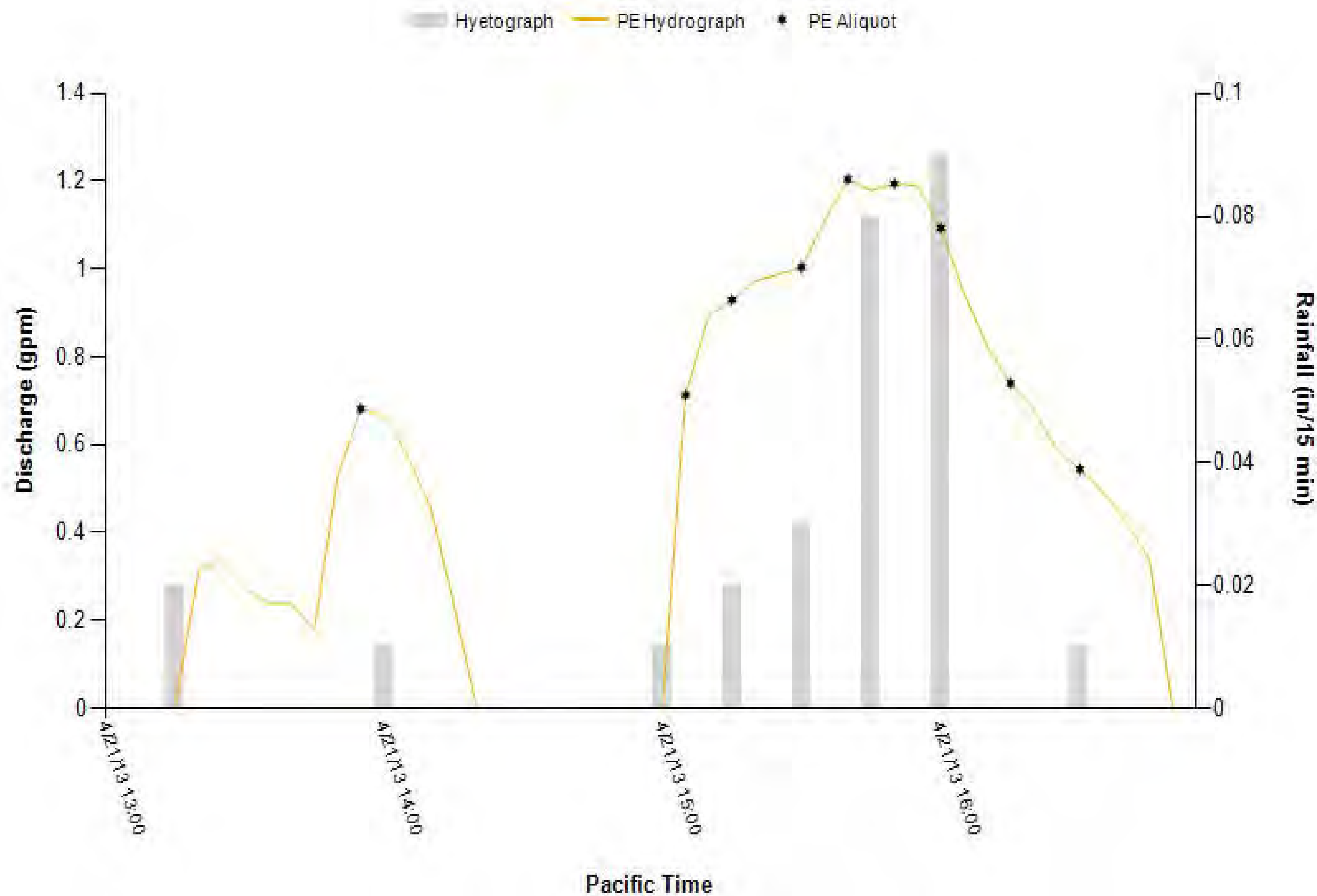


Precipitation				
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)
0.27	4/21/2013 13:05	4/21/2013 16:20	3.25	49.74

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time (UTC)	Last Aliquot Time (UTC)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	9	4/21/2013 13:55	4/21/2013 16:30	2.58	250	2,250	7.15	9.26	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	4/21/2013 13:20	4/21/2013 16:45	3.42	113.86	33.29	113.86	107.60	94.50	1.20	0.18	0.69	0.133

PINES 01 4/21/2013 Storm Report

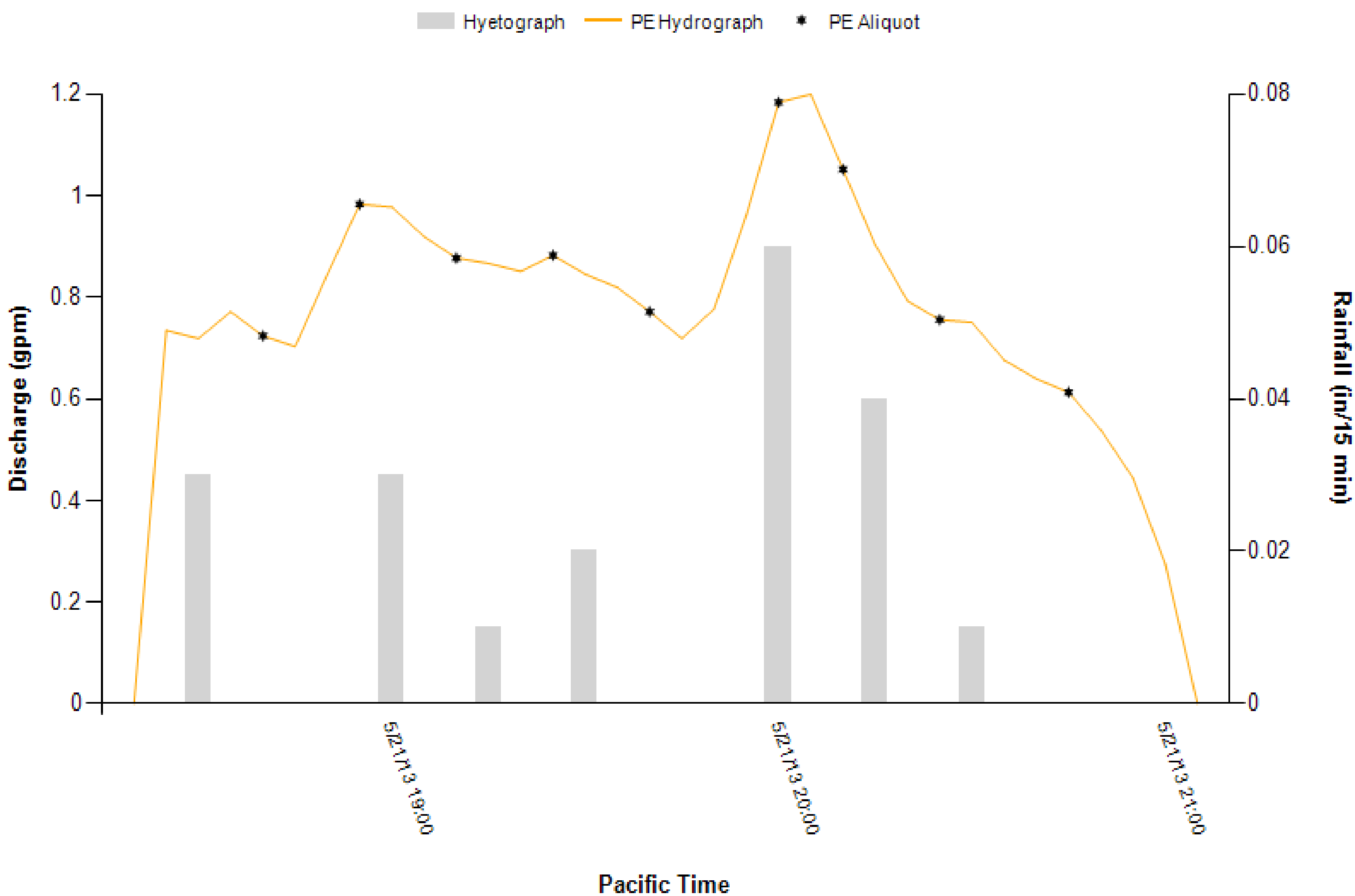


Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.20	5/21/2013 18:20	5/21/2013 20:25	2.08	193.99

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	9	5/21/2013 18:40	5/21/2013 20:45	2.08	250	2,250	10.79	13.37	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	5/21/2013 18:25	5/21/2013 21:00	2.58	127.83	49.55	127.83	121.55	95.08	1.20	0.27	0.80	0.131

PINES 01 5/21/2013 Storm Report

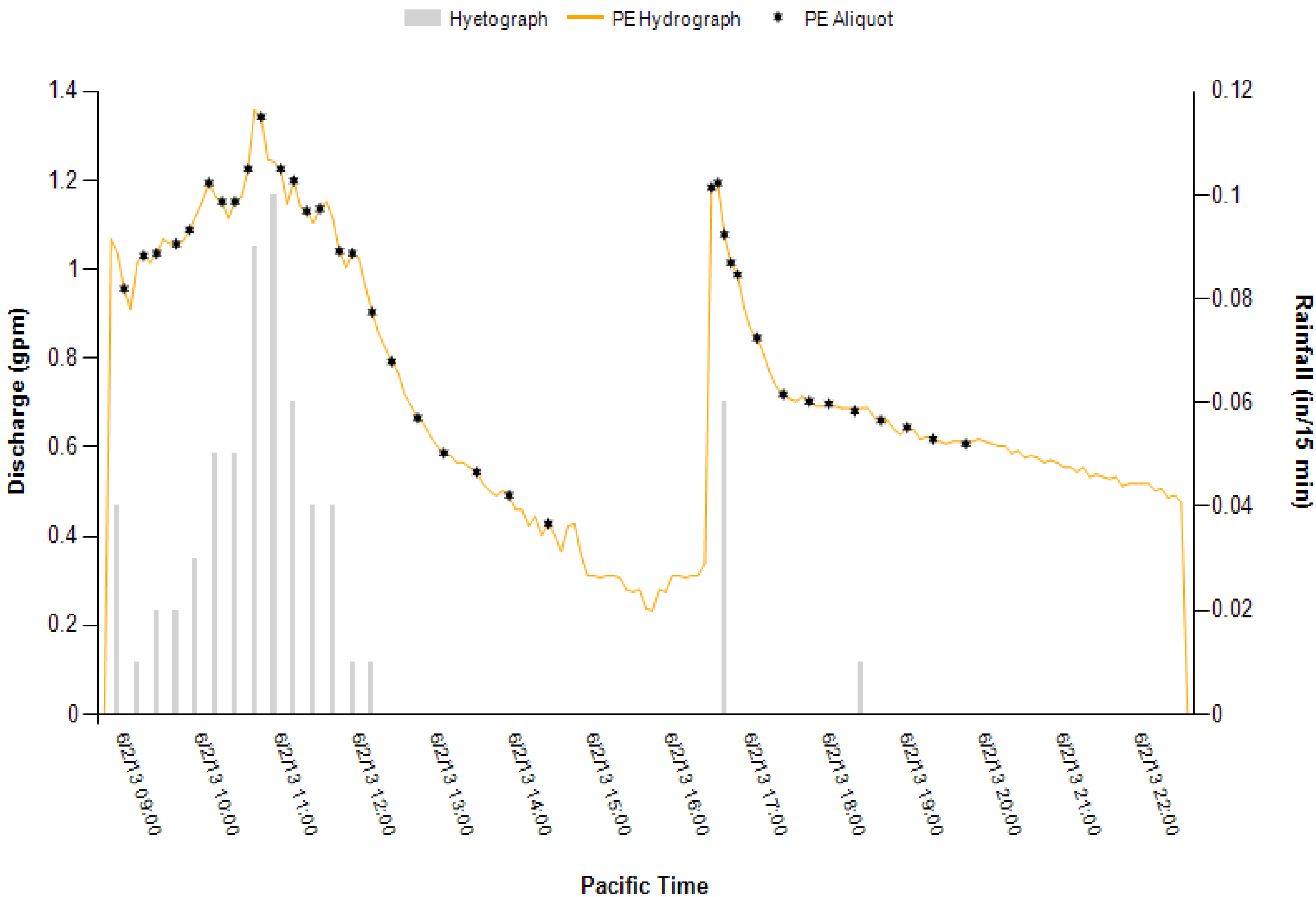


Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.64	6/2/2013 8:45	6/2/2013 18:25	9.67	67.74

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	34	6/2/2013 9:00	6/2/2013 19:45	10.75	250	8,500	12.03	19.17	J

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	6/2/2013 8:50	6/2/2013 22:30	13.67	582.1	42.58	582.1	491.12	76.8	1.36	0.23	0.71	0.181

PINES 01 6/2/2013 Storm Report



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.17	6/3/2013 12:00	6/3/2013 19:00	7	19.50

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	15.8	20.10	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Max (ft)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Only grab samples collected. Equipment failed when reading runoff/flow.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.13	6/19/2013 6:30	6/19/2013 15:05	8.35	24.17

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	10.10	14.20	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	6/19/2013 11:25	6/19/2013 14:50	4.42	67.29	15.22	15.22	N/A	N/A	0.97	0.00	0.32	N/A

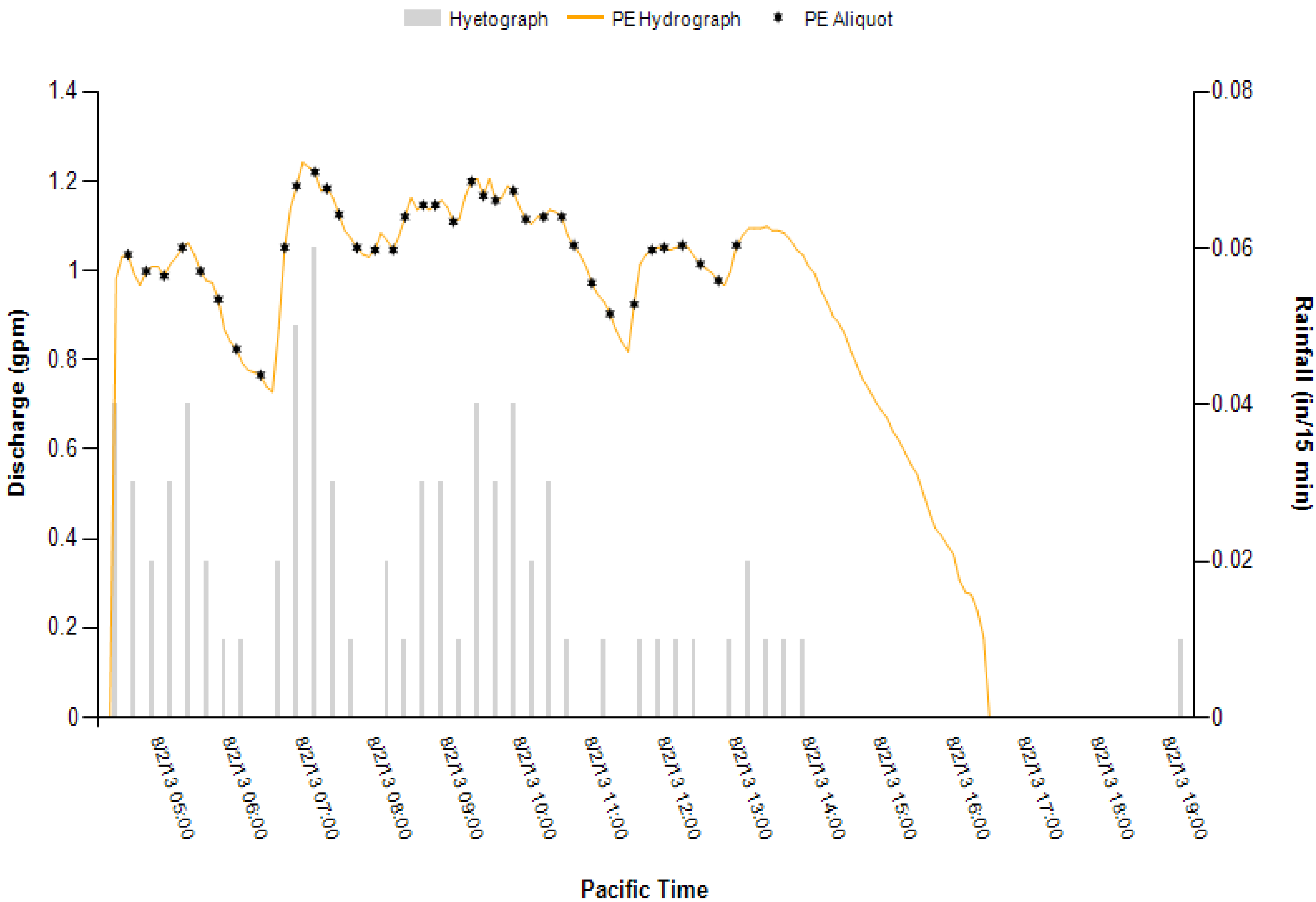
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.76	8/2/2013 4:15	8/2/2013 19:00	14.75	759

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	37	8/2/2013 4:35	8/2/2013 13:00	8.42	250	9,250	8.77	15.20	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	8/2/2013 4:25	8/2/2013 16:25	12.00	692.69	57.72	692.69	541.02	78.11	1.24	0.18	0.96	0.143

PINES 8/2/2013 Storm Report

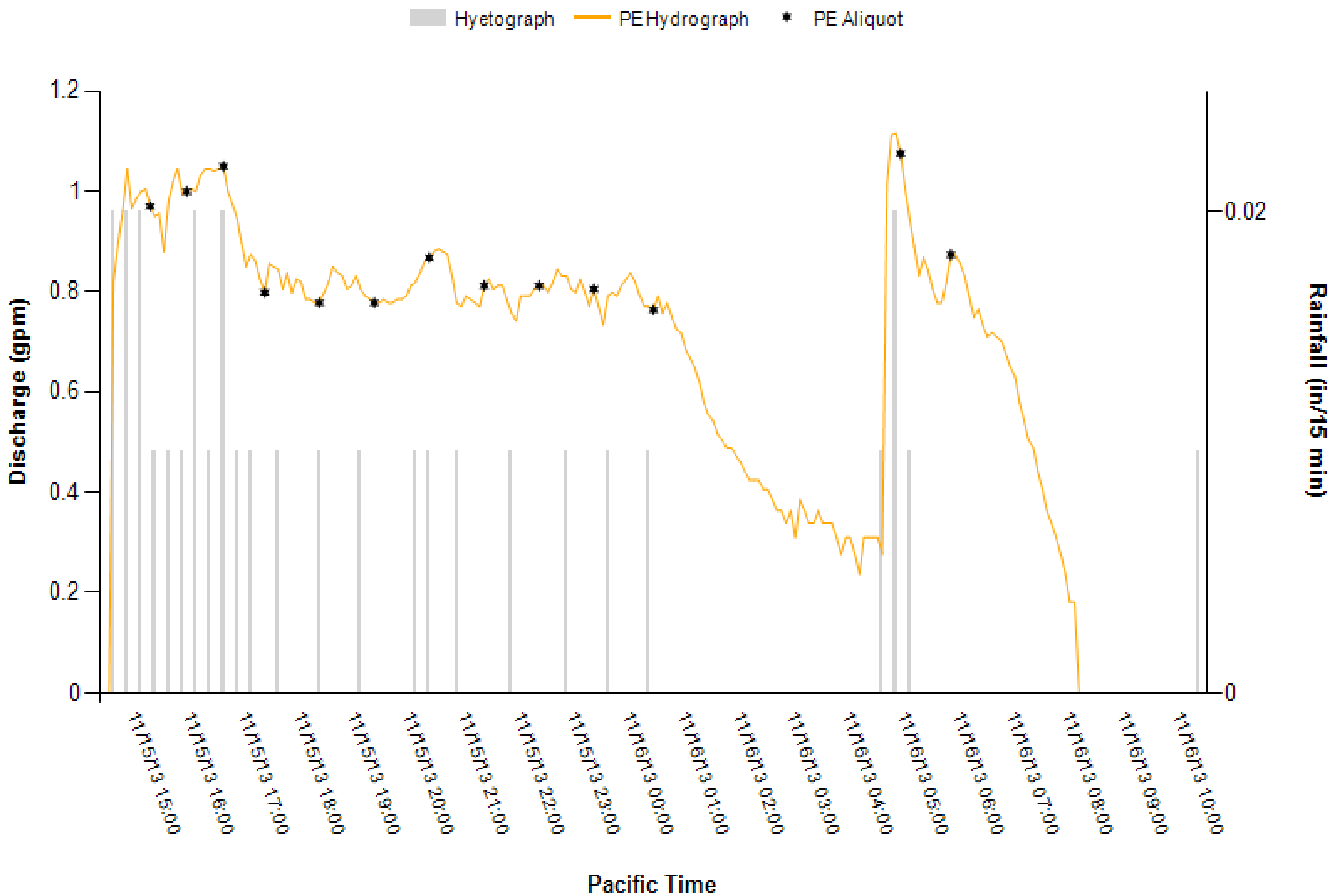


Precipitation				
Total (in)	**Start Time**	**End Time**	**Duration (hrs)**	**Antecedent (hrs)**
0.31	11/15/2013 14:25	11/16/2013 10:20	19.92	190.74

Aliquots							Water Temp		Validation Code
Sample Point (m)	**Aliquots Collected**	**First Aliquot Time**	**Last Aliquot Time**	**Sampling Duration (hrs)**	**Volume (mL)**	**Total Sample Volume (mL)**	**Min (C°)**	**Max (C°)**	
PE	13	11/15/2013 15:15	11/16/2013 05:50	14.58	250	3,250	4.10	6.10	

Runoff / Discharge												
	Runoff Time			**Volume**			**Sampled**		**Flow**			**Stage**
Sample Point (m)	**Start Time**	**End Time**	**Duration (hrs)**	**Total (gal)**	**Intensity (gal/hr)**	**First 24Hrs (gal)**	**Discharge Total Volume Sampled (gal)**	**% Hydrograph Sampled**	**Peak (gpm)**	**Min (gpm)**	**Mean (gpm)**	**Max (ft)**
PE	11/15/2013 14:35	11/16/2013 08:05	17.50	764.0	43.7	764.0	687.7	90.00	1.12	0.18	0.72	0.109

PINES 11/15/2013 Storm Event



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.15	03/14/2014 08:00	03/14/2014 14:15	6.25	123.58

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	2.1	4	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	03/14/2014 08:05	03/14/2014 15:30	7.42	180.2	24.3	180.2	N/A	N/A	1.03	0.18	0.64	0.089

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.15	03/19/2014 17:50	03/19/2014 20:40	2.8	62

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	4	9	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	03/19/2014 17:50	03/19/2014 18:35	0.75	36.0	48.1	36.0	N/A	N/A	0.92	0.31	0.69	0.076

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.06	4/16/2014 18:20	4/16/2014 23:30	5.16	295

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	7.5	11.9	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

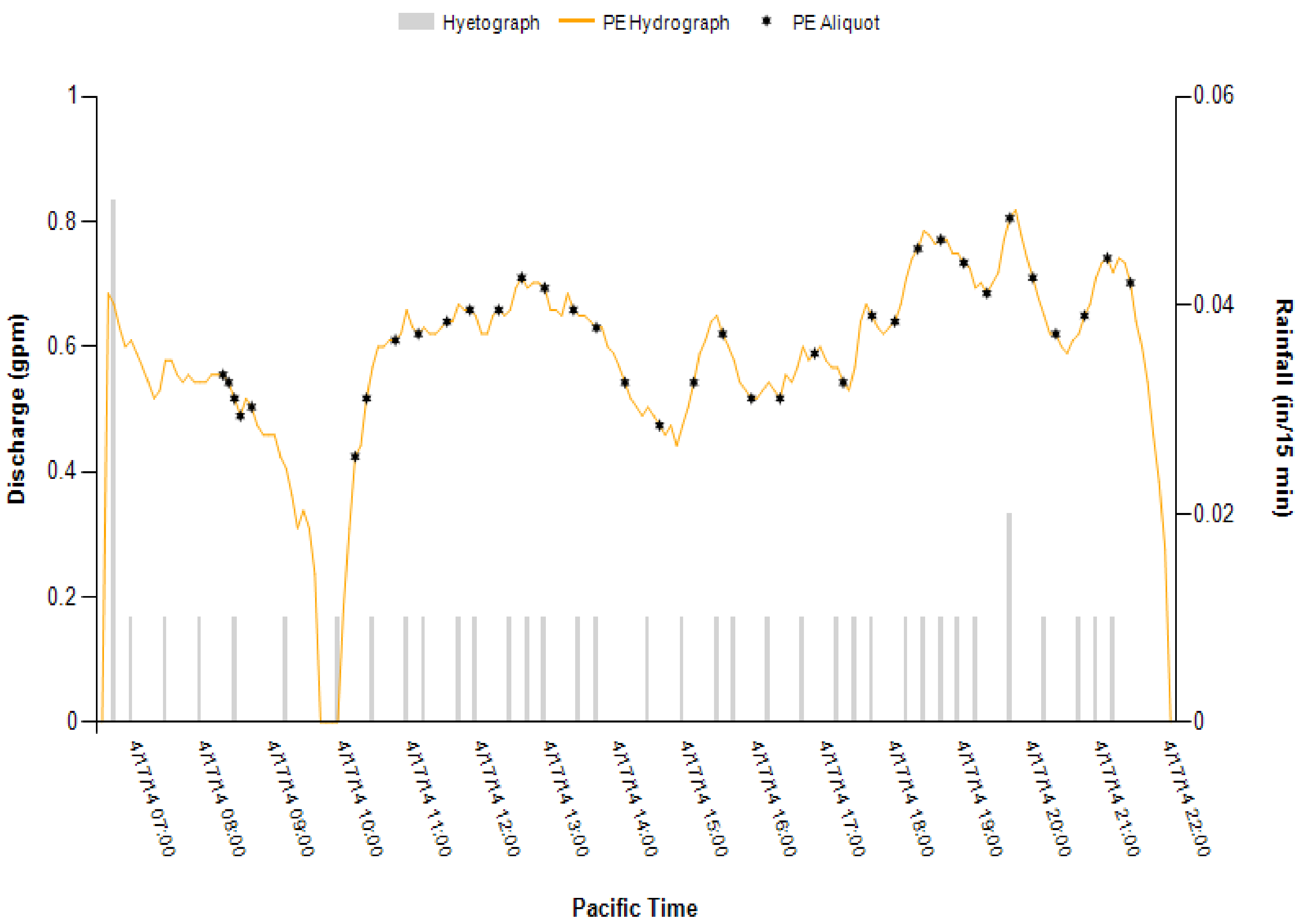
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.41	04/17/2014 06:30	04/17/2014 21:10	14.67	313.41

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	36	04/17/2014 08:15	04/17/2014 21:25	13.17	250	9,000	N/A	N/A	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	04/17/2014 06:35	04/17/2014 21:55	15.33	539.7	35.2	539.7	525.1	97.30	0.82	0.18	0.60	0.049

PINES 4/17/2014 Storm Report



Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.28	04/24/2014 02:35	04/24/2014 12:40	10.08	38.74

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	15	04/24/2014 03:40	04/24/2014 08:45	5.08	250	3,750	N/A	N/A	R

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	04/24/2014 02:40	04/24/2014 08:55	6.25	263.6	42.2	263.6	259.9	71.80	0.95	0.24	0.73	0.072

Rejected because less than 75% of the hydrograph was sampled.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.18	06/02/2014 20:55	06/03/2014 02:00	5.08	122.25

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	06/02/2014 21:00	06/03/2014 03:00	6.00	116.0	19.3	116.0	N/A	N/A	1.81	0.18	0.75	0.377

Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.09	06/14/2014 07:15	06/14/2014 09:55	2.67	253.08

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	6	06/14/2014 07:20	06/14/2014 10:10	2.83	250	2,750	N/A	N/A	R

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	06/14/2014 07:20	06/14/2014 10:15	2.92	39.2	13.4	39.2	37.2	94.80	0.76	0.24	0.52	0.041

Rejected because not enough aliquots were collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
1.29	06/17/2014 07:00	06/18/2014 10:30	27.50	68.75

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	37	06/17/2014 09:10	06/17/2014 19:25	10.25	250	9,250	N/A	N/A	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	06/17/2014 07:00	06/18/2014 11:10	28.17	1,169.2	41.5	1,169.2	N/A	N/A	1.14	0.18	0.78	0.115

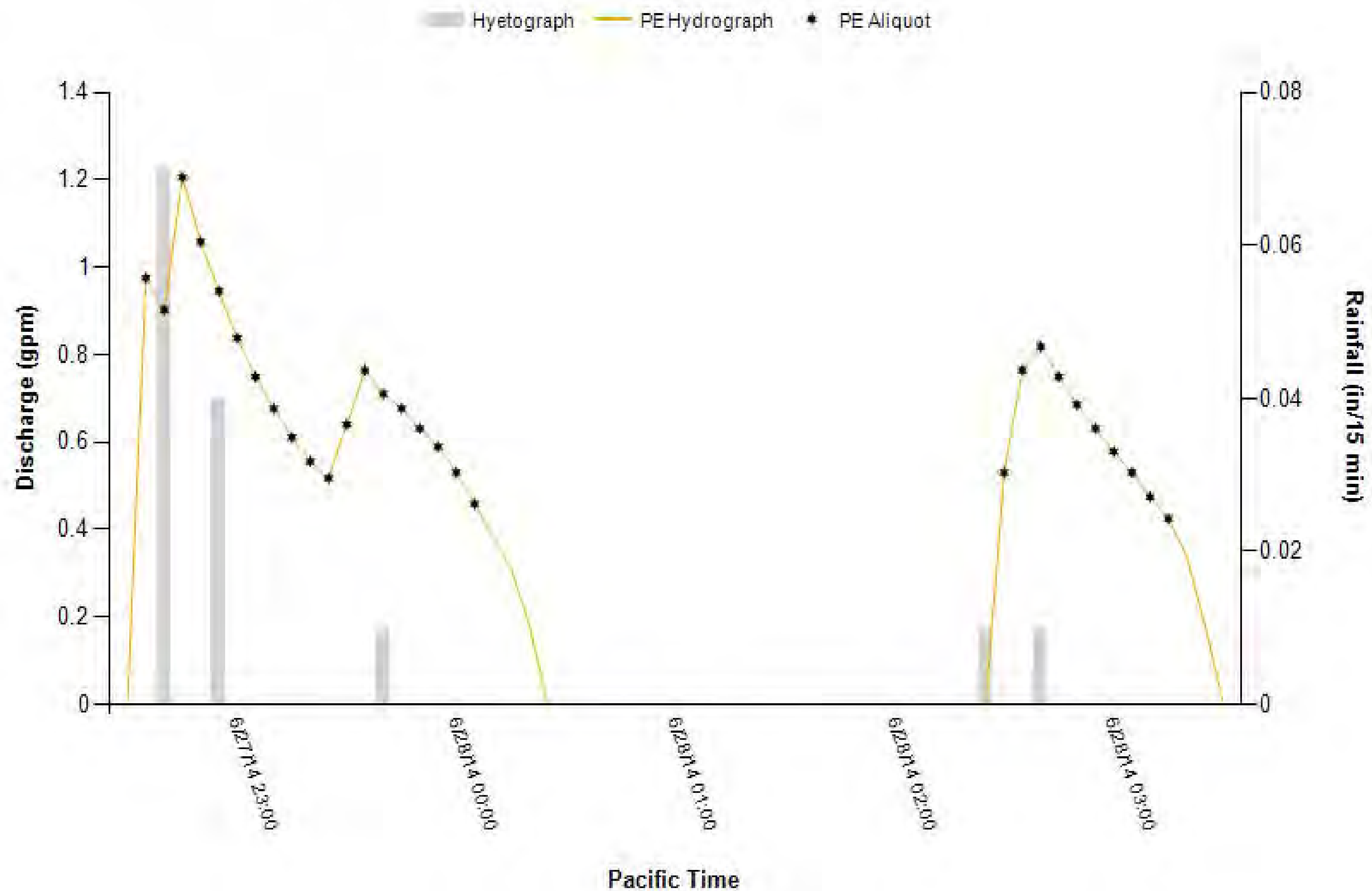
Only grab samples collected.

Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.14	06/27/2014 22:30	06/28/2014 02:30	4.00	12.66

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	29	06/27/2014 22:35	06/28/2014 03:15	4.67	250	7,250	N/A	N/A	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	06/27/2014 22:35	06/28/2014 03:25	4.83	108.1	22.4	108.1	105.5	97.60	1.21	0.18	0.64	0.133

PINES 6/27/2014 Storm Event

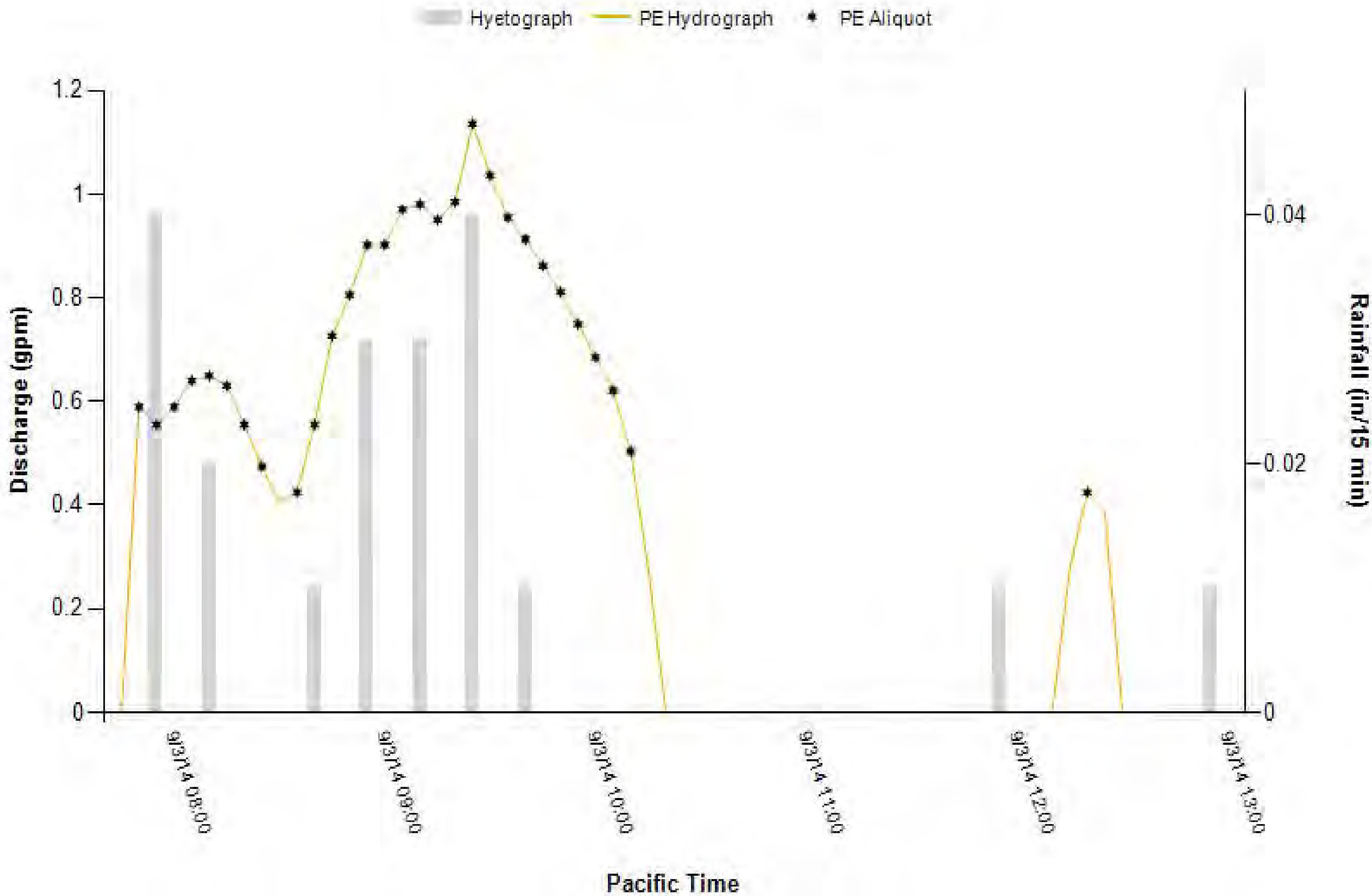


Precipitation				
Total (in)	Start Time	End Time	Duration (hrs)	Antecedent (hrs)
0.20	09/03/2014 07:45	09/03/2014 12:45	5.00	287

Aliquots							Water Temp		Validation Code
Sample Point (m)	Aliquots Collected	First Aliquot Time	Last Aliquot Time	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
PE	29	09/03/2014 07:50	09/03/2014 12:20	4.50	250	7,250	N/A	N/A	

Runoff / Discharge												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time	End Time	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
PE	09/03/2014 07:50	09/03/2014 12:25	4.58	114.7	25.0	114.7	112.7	98.30	1.14	0.28	0.69	0.114

PINES 9/3/2014 Storm Event



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Appendix B:
Monitoring Costs

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Monitoring Costs

Introduction

In February 2009, the Washington State Department of Ecology (Ecology) issued a National Pollutant Discharge and Elimination System (NPDES) and State Waste Discharge Municipal Stormwater Permit (permit) (Ecology 2009a) to the Washington State Department of Transportation (WSDOT).

Under Special Condition S7 of the permit, WSDOT collected baseline stormwater monitoring data from its highways, rest areas, ferry terminals, and maintenance facilities. In addition, the department evaluated the effectiveness of stormwater treatment and hydrologic (flow control) best management practices (BMPs).

In March 2014, Ecology reissued the WSDOT NPDES municipal stormwater permit (Ecology 2014). Although some of the previous monitoring requirements ended with reissuance of the 2014 permit, the new permit required a continuation of the highway runoff characterization and BMP effectiveness monitoring programs.

Implementing a monitoring program to satisfy all of these permit requirements was a complex and resource intensive endeavor.

Monitoring Program Implementation Strategy

To reduce costs, conserve resources, and address logistical challenges in implementing the stormwater monitoring program, WSDOT developed a strategy to limit the total number of monitoring sites needed to meet permit requirements. For example, three of five highway runoff monitoring stations were co-located with BMP effectiveness monitoring study sites along Interstate 5 (I-5) north of Everett. In addition, a monitoring station established along State Route 9 (SR 9) near Marysville combined a rural highway runoff and BMP effluent toxicity sampling station to consolidate two sites to one. Co-locating BMP effectiveness and highway runoff characterization monitoring sites decreased costs and the level of staff resources needed by reducing the total number of sites needed from 20 to 16.

WSDOT also made efforts to consolidate monitoring activities to a minimum number of locations across the state. For example, two rest area monitoring sites, all BMP effectiveness study sites, and four of the five highway runoff monitoring stations were clustered in an area just north of Everett. Clustering sites helped address logistical challenges and reduced monitoring team mobilization costs by minimizing staff travel time and costs. Travel times between the rest areas, BMP, and highway monitoring sites north of Everett were less than 30 minutes.

[Figure B-1](#) shows the location of monitoring sites across the state.

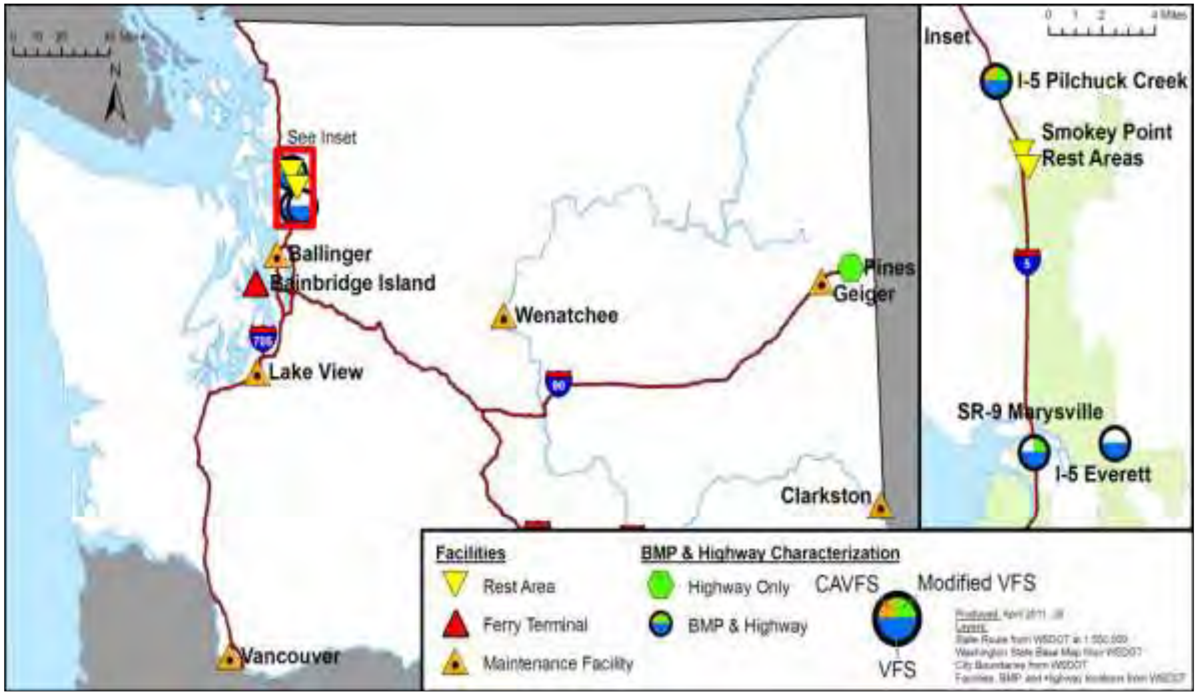

Figure B-1 Monitoring site locations

During the monitoring site selection process, the department carefully considered opportunities to combine internal research interests at WSDOT with permit-required monitoring obligations. For example, BMP study sites along I-5 north of Everett support the department's stormwater research priorities and provide a paired BMP effectiveness study of a low-impact development (LID) approach that also satisfies the permit's BMP monitoring requirements. Monitoring resources and expenses were shared by the department's Stormwater and Watersheds and Highway Runoff Programs. This collaborative partnership helped achieve additional savings for WSDOT.

Other cost containment strategies included automating data collection platforms (DCPs) to the maximum extent possible to reduce staff needs and address the logistics of a monitoring program that is required to span the state. In addition, WSDOT used an existing monitoring station and monitoring infrastructure from a previous stormwater study at the Bainbridge Island ferry terminal to realize further cost reductions.

Monitoring Program Budget

Costs associated with planning and implementing the WSDOT stormwater monitoring program included the following:

Planning (≈ 20% of budget)

- Background research (e.g., previous, similar studies)
- Developing a site selection strategy
- Field reconnaissance for final site selection
- Developing project scope and sampling designs
- Developing monitoring Quality Assurance Project Plans (QAPPs)

Implementation (≈ 80% of budget)

- Equipment and supplies (purchase, installation, maintenance, and replacement)
- Database development and implementation
- Training
- Logistics (e.g., pre-storm preparation and post-storm sample transfer)
- Sample collection (e.g., staff time, travel expenses, etc.)
- Laboratory analysis
- Verification and validation (data quality assurance and quality control)
- Data management
- Data analyses and report writing

Labor Costs

To address logistical challenges in implementing a statewide monitoring program, WSDOT used Stormwater and Watersheds Program staff in the headquarters Environmental Services Office (ESO) and staff from region offices to implement its highways, BMP effectiveness, and facilities monitoring programs.

Eight staff from the headquarters ESO played key roles in implementing the stormwater monitoring program. These staff included:

- A monitoring program coordinator,

- Field lead,
- Data management lead,
- Quality assurance officer,
- Three monitoring field and data management specialists, and
- Telemetry, equipment, and site infrastructure specialist.

Thirty-six staff from WSDOT regional offices across the state supported ESO efforts on a part-time basis and participated in stormwater monitoring at different levels. Personnel included:

- Maintenance facility staff (technicians, engineers, specialists),
- A vessel project engineer,
- Electronic communications systems technician, and
- A building engineer.

In addition, consultants assisted the site selection process, QAPP and quality systems development, monitoring station construction, third-party data validation, database development and implementation, preparation of standard operating procedures (SOPs), and monitoring report technical review.

Equipment, Materials, and Laboratory Analytical Costs

Monitoring start-up costs included costs associated with planning the monitoring program and an initial purchase of equipment for $415,000 (e.g., automatic samplers, data loggers, gas bubblers, pressure transducers, connecting cables, and solar panels). Other significant expenditures included:

- Truck purchase
- Chemistry and hydrology databases (purchase, license, and maintenance fees)
- Equipment storage, staging, and cleaning facilities
- Ruggedized laptops and portable printers
- Tools for station construction and installation
- Sample bottles, coolers, freezer, and icemaker
- Consumables (nitrile gloves, wash brushes, packing supplies)

Data collection platforms (DCPs) at the rest areas, maintenance facilities, and ferry terminal monitoring sites averaged $21,000, including approximately $17,000 for equipment and $4,000 for construction. A combined highway runoff characterization and BMP effectiveness monitoring study site averaged $69,000, including $43,000 for equipment and $26,000 in site construction costs.

Laboratory analytical costs varied depending on the number of samples successfully collected and the number of samples needed for quality assurance and quality control. Six laboratories conducted the analyses for WSDOT.

To ensure site conditions and runoff quality are conducive to performance testing, Ecology recommended baseline water quality sampling prior to construction of the BMP effectiveness study sites. Sampling costs are included as part of start-up costs.

Toxicity sampling results in 2012 and 2013 showed no significant effect and a high survival rate for the target species. WSDOT incurred costs for toxicity testing, but no follow-up actions and additional expenditures were required.

Monitoring Cost Summary

Table B-1 summarizes WSDOT's costs for stormwater monitoring under Special Condition S7 of the 2009 and 2014 NPDES municipal permits.[4] While the BMP effectiveness monitoring program is ongoing, the facilities and toxicity monitoring programs ended in October 2013. The highway runoff characterization monitoring program ended in September 2014.

[4] Monitoring costs are based on *actual* expenditures from March 2009 through September 2014. Values are not equivalent to the *estimated* monitoring expenditures detailed in the WSDOT NPDES Stormwater Reports.

Table B-1 Monitoring Equipment, Materials, and Laboratory Costs

Category	Monitoring Program Costs March 2009 – October 2014
Labor costs for ESO headquarters staff	$2,437,700
Labor costs for region field staff	$398,800
Consultant costs	$785,800
Equipment purchase, repair, & replacement	$1,131,700
Laboratory analytical costs	$417,500
Toxicity testing and follow-up actions	$8,700
Total costs	**$5,180,200.00**

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Appendix C:
Data Quality Report

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Analytical Data Quality Assessment Report

Washington State Department of Transportation
NPDES Stormwater Monitoring Program

Baseline Monitoring of WSDOT Highway Run-off

Data Collected during October 18, 2013 through September 24, 2014

Prepared for:

Cardno
2825 Eastlake Avenue East, Suite 300
Seattle, WA 98102

Prepared by:

Pyron Environmental, Inc.
3530 32nd Way NW
Olympia, WA 98502

October 7, 2015

Executive Summary

This Data Quality Assessment Report (DQAR) presents an overview of the analytical scheme, data verification and validation procedures, and the quality of analytical data collected during the stormwater monitoring year 2014 (October 8, 2013 through September 24, 2014) under the Washington State Department of Transportation's (WSDOT) National Pollution Discharge Elimination System (NPDES) Stormwater Monitoring Program (Program), Baseline Monitoring of WSDOT Highway Run-off. The quality of data was assessed and discussed in terms of Measurement Quality Objectives (MQOs), *i.e.*, precision, accuracy, representativeness, comparability, sensitivity, and completeness.

A total of 272 water samples (187 field stormwater samples, 63 field duplicates and 22 rinsate blanks) and seven sediment samples (five field samples and two field duplicates) were collected during this monitoring period. Sample analyses were primarily performed by the Washington State Department of Ecology (Ecology), Manchester Environmental Laboratory (MEL), and AmTest Laboratories, Inc.), with specialty analyses performed by TestAmerica Laboratories, Inc. (total Kjeldahl nitrogen [TKN] and glyphosate), Analytical Resources, Inc. (particle size distribution in water), and Anatek Labs, Inc. (glyphosate).

A Stage 2B (as defined in USEAP 2009) data validation was performed on 90 percent of the analytical data, and a Stage 3+4 (USEPA 2009, WSDOT 2014b) validation was performed on 10 percent of the data. Based on the on-going oversight of the laboratory performance and the outcome of the data validation, completeness of the data collection effort was calculated as 98.6 percent. This achieves the monitoring goal of 95%. Significant observations and results of the analytical data quality assessment are summarized as follows:

1. The sample filtration for dissolved metals and *ortho*-phosphate was to be conducted within 15 minutes of collection, according to 40CFR, Part 136. Due to field technical difficulty, most of the samples were filtered outside the 15-minute window, yet within 24 hours of collection. The delay in filtration was not expected to result in significant effects on data quality. Dissolved metals and *ortho*-phosphate results were footnoted in the Annual Report for these cases.

2. A total of 41 field samples were collected for pH analysis. For 38 of the 41 samples, the analyses were performed well outside of the required 24 hour hold time. These pH data were qualified unusable, and the results should be reported from the field measurements made during the sample collection.

3. The reporting limits (namely Method Reporting Limits [MRLs] or Practical Quantitation Limits [PQLs]) achieved the Permit requirements for all analyses, except those for semi-volatile organic compounds (SVOCs) in sediment samples. The MRLs were raised three to eight times from the project-expected RLs. This range of elevations resulted from the required dilution of sample extracts to overcome the oily nature of the samples. The reported sample-specific RLs were considered the best-possible RLs given the conditions of the samples. No further actions were feasible other than noting the incident in this document.

4. As part of this overall data quality assessment, the correlation between total and dissolved metal concentrations for each metal/sample was evaluated. Metals results were considered "uncorrelated" and the usability of the results affected if the "total" concentration for a metal was less than its "dissolved" concentration in a sample and the concentration difference was beyond experimental errors (i.e., relative percent difference [RPD] value was >10%, or concentration difference value was >RL). No "uncorrelated" metals results were found.

5. As noted by the laboratory, detections of selected polycyclic aromatic hydrocarbon (PAHs) and phthalates, particularly benzo(a)anthracene and benzo(a)pyrene, could not be definitively identified and accurately quantitated in a great number of samples because the ion abundance ratios for these detections did not meet the method criteria for compound identification.

Table of Contents

Acronyms and Abbreviations

%D	percent difference
%D_I	percent drift
%R	percent recovery
ASTM	American Society of Testing and Materials
CCB	continuing calibration blank
CCV	continuing calibration verification
CLP	U.S. EPA Contract Laboratory Program
COC	chain of custody
CS1	the first (lowest concentration) initial calibration standard
DQAR	data quality assessment report
DQO	data quality objective
DVR	data validation report
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively coupled plasma
ICV	initial calibration verification
LCL	lower control limit
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
MBAS	methyl blue activated substances
MDL	method detection limit
MEL	Washington State Department of Ecology Manchester Environmental Laboratory
MQO	measurement quality objective
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
NPDES	National Pollution Discharge Elimination System
OP	*ortho*-phosphate
PAH	polycyclic aromatic hydrocarbon
PCBs	polychlorinated biphenyls
PQL	practical quantitation limit

Permit	WSDOT NPDES and State Waste Discharge Permit for Municipal Stormwater
Program	NPDES Stormwater Monitoring Program
PSEP	Puget Sound Estuary Program
QAPP	quality assurance project plan
QC	quality control
RL	reporting limit
RPD	relative percent difference
SIM	selective ion monitoring
SMS	Washington State Sediment Management Standards
SVOCs	semi-volatile organic compounds
TAL	TestAmerica Laboratories, Inc.
TKN	total Kjeldahl nitrogen
TOC	total organic carbon
TP	total phosphorus
TPH	total petroleum hydrocarbon
TSS	total suspended solids
WSDOT	Washington State Department of Transportation

1.0 SAMPLE COLLECTION AND ANALYTICAL PROGRAM

1.1 Field Sampling Program

Sample collection for the Washington State Department of Transportation (WSDOT) National Pollution Discharge Elimination System (NPDES) Stormwater Monitoring Program (Program), Baseline Monitoring of WSDOT Highway Run-off was conducted from October 8, 2013 through September 24, 2014 by WSDOT personnel, following the *Quality Assurance Project Plan* (QAPP; WSDOT 2014a). A total of 272 water samples (187 field stormwater samples, 63 stormwater field duplicates and 22 rinsate blanks) and 7 sediment samples (5 field samples and 2 field duplicates) were collected during this period of monitoring.

1.2 Laboratory Analysis Program

Samples collected between October 8, 2013 and April 9, 2014 were primarily analyzed by the Washington State Department of Ecology (Ecology) Manchester Environmental Laboratory (MEL); samples collected between May 8, 2014 and September 24, 2014 were primarily analyzed by AmTest Laboratories, Inc. in Kirkland, Washington. Primary analytes included polycyclic aromatic hydrocarbons (PAHs), phthalates, pesticides (triclopyr, 2,4-D, clopyralid, and picloram), herbicides (diuron and dichlobenil), polychlorinated biphenyls (PCBs), gasoline range total petroleum hydrocarbon (TPH), diesel/motor oil range TPH, metals (total and dissolved cadmium, copper, lead, and zinc), and inorganic parameters (total suspended solids [TSS], hardness, chloride, nitrate/nitrite, *ortho*-phosphate [OP], and total phosphorus [TP]). Selected specialty analyses were performed by TestAmerica Laboratories, Inc. (total Kjeldahl nitrogen [TKN] and glyphosate), Anatek Labs, Inc. in Moscow, Idaho (glyphosate), and Analytical Resources, Inc. (particle size distribution [PSD] in water).

Sample analysis schedule is summarized in **Table 1-1**.

2.0 DATA VERIFICATION AND VALIDATION

2.1 Data Quality Objectives

Data quality objectives (DQOs) for the Program were defined to meet the WSDOT NPDES and State Waste Discharge Permit for Municipal Stormwater (Permit), which was issued by Ecology on February 4, 2009 (Permit No. WAR043000A). Specific data quality goals (i.e., measurement quality objectives [MQOs] commonly presented as precision, accuracy, representativeness, comparability, sensitivity, and completeness) are defined in the QAPP (WSDOT 2014a).

2.2 Data Verification Procedures

Data verification was performed to ensure completeness of the hardcopy and electronic analytical data that was reported and archived. A complete cross-checking of laboratory identification numbers with field identification numbers was performed to ensure that analyses had been performed as specified by the chain of custody (COC) documentation.

Hardcopy laboratory reports were inventory checked for sample result forms, instrument run logs, instrument initial calibration and continuing calibration verifications, associated quality control (QC) analyses, and supporting documents.

2.3 Data Validation Procedures

A Stage 2B data validation (as defined in EPA 2009) was performed on 90 percent of the data, and a Stage 3+4 validation (EPA 2009, WSDOT 2014b) was performed on 10 percent of the data. The validation followed the procedures specified in U.S. Environmental Protection Agency (EPA) Contract Laboratory Program (CLP) National Functional Guidelines for Data Review (EPA 2014a,b), with modifications to accommodate program and analytical method requirements as specified in the WSDOT Stormwater Monitoring Chemical Data Validation Guidance and Criteria, Version 2.0 (WSDOT 2014b).

2.4 Data Assessment Results

As a result of the data validation, data qualifiers were appended to the affected data as:

- H – The sample required filtration within 15 minutes of collection but was not technically feasible. Sample was filtered immediately upon receipt at the laboratory, and the data is usable without further qualification.

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- **J** – The result is an estimated quantity. The associated numerical value is an approximate concentration of the analyte in the sample.
- **R** – The data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria.
- **U** – The analyte was analyzed for, but not detected. The associated numerical value is at or below the method reporting limit (MRL) or practical quantitation limit (PQL).
- **UJ** – The analyte was analyzed for, but not detected. The method detection limit (MDL) and practical quantitation limit (PQL) are estimated values.

A detailed scope of the data validation, validation findings, and data qualification was presented in the data validation reports (DVRs).

3.0 DATA QUALITY AND USABILITY ASSESSMENT

Based on the outcomes of the validation, the following sections present a data quality overview for analytical data collected during the stormwater monitoring year 2014. The following sections address accuracy, precision, representativeness, comparability, sensitivity, and completeness. Quality control parameters applied to evaluating each of the MQOs are summarized in **Table 3-1**.

3.1 Accuracy

Accuracy is a statistical measurement of correctness and includes components of random and systematic errors. It is quantified as the degree of agreement between a measurement and a known reference. Analytical accuracy is evaluated using percent recovery (%R), percent difference (%D), or percent drift (%D_f) for the values of initial and continuing calibration, internal standards, surrogate spikes, matrix spike (MS)/matrix spike duplicate (MSD), and laboratory control sample (LCS)/ laboratory control sample duplicate (LCSD), in conjunction with results of method blanks, calibration blanks, and trip blanks. Results of blanks assist in identifying the type and magnitude of effects on system errors introduced via field and/or laboratory procedures.

Quality control anomalies affecting data accuracy were identified as follows:

3.1.1 Sample Preservation and Holding Times

- The sample filtration for dissolved metals and *ortho*-phosphate was to be conducted within 15 minutes of collection, according to 40CFR, Part 136. Due to field technical difficulty, most of the samples were filtered outside the 15-minute window, yet within 24 hours of collection. The delay in filtration was not expected to result in significant effects on data quality. Dissolved metals and *ortho*-phosphate results were footnoted with (H) to indicate the deviation from standard protocols.

- A total of 41 field samples were collected for pH analysis in the laboratory. Due to required time for sample to be transported to the laboratory, pH analysis for 38 of these samples were performed well beyond the desired holding time (*i.e.*, measured immediately upon sampling). These pH results were determined unusable and all pH values, instead, should be reported from the measurements made in the field upon sample collection. It is recommended that pH analysis not to be submitted for laboratory analysis for future reference.

- Four water samples and one sediment sample were affected by elevated cooler temperature (i.e., >6°C), and the results for these samples were qualified as estimated.

- The sample preparation or analyses for a number of water and sediment samples were performed past the required holding time; the affected results were qualified estimated or unusable (if the required holding time was grossly exceeded).

Data qualified as a result of sample preservation and holding time violations are summarized in **Table 3-2**.

3.1.2 Calibration Verification

Initial and continuing calibration verification (ICV and CCV) analyses verify accuracy of the initial calibration (ICAL) and current instrument condition prior to sample analyses. The recovery of the first (lowest concentration) ICAL standard (CS1) was evaluated to verify the ICAL validity at the RL level. ICV, CCV, and CS1 (for organic analyses only) results are presented as %D or %D_f values. Excessive bias of a %D or %D_f value indicates a potential bias of the analytical results associated with these verification analyses.

- The surfactant result for LAK-01-NC-131008 was qualified as estimated as a result of biased-low recovery of the associated CCV (i.e., %R value was less than the lower control limit of 90-110%).

- The Dichlobenil result for PIN-01-NC-131116 was qualified as estimated as a result of biased-low recovery of the associated CCV (i.e., %R value was less than the lower control limit of 80-120%).

- Benzo(b)fluoranthene, di-n-octylphthalate, and/or benzo(a)anthracene results for six water samples that were affected by biased-low CCV recovery, and were qualified as estimated.

- PCB Aroclors results in sediment sample SED-EVE-01-NS-140527 were affected by biased-low CCV recovery, and were qualified as estimated.

Data usability affected by outlying CS1, ICV, and CCV results was summarized in **Table 3-3**.

3.1.3 Blanks

Four types of blanks - method blanks, calibration blanks (for metals and inorganic constituents only), equipment rinsate blanks, and trip blanks were evaluated. Presence of target analytes in method (preparation) blanks indicated potential false-positive effects on sample results by sample preparation and analytical procedures. Detections of an analyte in calibration blanks indicate potential false–positive effects caused by the analytical system. Detections in rinsate blanks indicate potential contamination introduced during sample collection. Trip blanks monitor potential contamination introduced during sample transportation. Any detections found in blanks may skew the accuracy of associated measurements.

- TKN was detected in selected method blanks and/or calibration blanks at levels greater than their MDLs but less than their MRLs. Six stormwater samples were affected and their TKN results qualified as estimated.
- *bis*(2-Ethylehxyl)phthalate, diethylphthalate, di-*n*-octylphthalate, and naphthalene were occasionally present in method blanks; affected data were qualified as estimated at their reported values, or as non-detects at their MRLs.
- *bis*(2-Ethylehxyl)phthalate, particle size at Phi scale <1, and particle size at Phi scale 1-2 were frequently detected in rinsate blanks. Affected sample results were qualified as estimated.

Data qualified due to detections in method blanks and calibration blanks are summarized in **Table 3-4**.

3.1.4 Laboratory Control Sample Recovery

- Diesel and lube oil results for 7 water samples were qualified as estimated due to low recovery of LCS and LCSD.
- Benz(a)pyrene, *bis*(2-ethylehxyl)phthalate, butylethylphthalate, and/or diethylphthalate for up to 6 stormwater samples were qualified as estimated as a result of low-bias LCS/LCSD recovery.

Data affected by biased LCS and LCSD recovery are summarized in **Table 3-5**.

3.1.5 Matrix Spike and MS Duplicate Recovery

The %R values for MS and MSD analyses indicate levels of potential effects on a given analytical system resulting from the nature of a sample.

- The %R values for TKN and nitrate+nitrite in selected MS analyses performed on water samples were outside the control limits; TKN results for five samples were affected and therefore qualified as estimated.

- The %R values for copper and zinc in a number of the MS/MSD analyses performed on water samples were outside the control limits (75-125%). Copper and zinc results for the samples associated with these MS/MSD pairs were qualified as estimated.

Sample results affected by outlying MS and/or MSD recovery are summarized in **Table 3-6**.

3.1.6 Surrogate Spike Recovery

Surrogate spike recovery indicates the efficiency of sample extraction.

- The surrogate spike %R values for diesel and lube oil analysis in one sample were less than the LCL; the diesel and lube oil results for the sample were qualified as estimated.

- Surrogate spike %R values for SVOCs were less than the LCL in two water samples. SVOCs results for both samples were qualified as estimated.

- Surrogate spike %R values for Dichlobenil and Diuron analyses in four water samples were less than the LCL. Dichlobenil and Diuron results in the samples were qualified as estimated.

- Surrogate spike %R values for PCB Aroclors in one sediment sample were less than their LCLs. All Aroclor results in this sample were qualified as estimated.

Data usability affected by outlying surrogate spike recovery are summarized in **Table 3-7**.

3.2 Precision

Precision is defined as the degree of mutual agreement among independent measurements as the result of repeated application of the same process under similar conditions. Analytical precision is evaluated via the relative percent difference (RPD) values of LCS/LCSD analyses, MS/MSD analyses, and concentrations obtained from the two analytical columns for dual column methodologies. In addition, the level of variability for field duplicates represents the combined precision of sample collection and analysis procedures, as well as sample homogeneity.

3.2.1 Laboratory Duplicates

The RPD or concentration difference values for an LCS/LCSD, and MS/MSD pair, or a laboratory duplicate analyses indicate the variability (imprecision) resulting from the sample matrix and/or analytical system. Notable anomalies relative to laboratory duplicate analyses are discussed below:

- TKN, fecal coliform, total recoverable zinc, diesel, lube oil benzo(a)fluoranthene, and diethylphthalate were qualified as estimated in a number of water samples due to the elevated variability (RPD value was >20%) for the laboratory duplicate analyses.

3.2.2 Field Duplicates

Field duplicate results are indicative of the precision of sample collection, handling, preparation and analysis in combination, as well as sample homogeneity.

- Fecal coliform, TSS, total recoverable cadmium, selected particle size fractions, and *bis*(2-ethylehxyl)phthalate showed significant variability (RPD >20%) in various field duplicate pairs. Affected results were qualified as estimated.

- Selected PAHs and phthalates in the sediment field duplicate pair showed significant variability (RPD >35%). Affected results were qualified as estimated.

Data qualified as a result of outlying laboratory and field duplicate variability are presented in **Table 3-8.**

3.3 Representativeness

Representativeness is the level of confidence that the analytical data reflect the actual field condition. Representativeness is ensured by maintaining sample integrity during collection, preparation, and analysis. The evaluation of associated method and field blanks also assists in identifying artifacts that may skew the representativeness of the samples. As part of this data quality assessment, the correlation between total and dissolved metal concentrations for each metal/sample was evaluated.

No anomalies were identified in sample preservation, handling, preparation, and analysis that affected data representativeness, except for the QC anomalies affecting accuracy (Section 3.1) and precision (Section 3.2) as discussed above.

Metals results were considered "uncorrelated" and the usability of the results affected if the "total" concentration for a metal was less than its "dissolved" concentration in a sample and the concentration difference was beyond experimental errors (i.e., RPD value was >10%, or concentration difference value was >RL). No "uncorrelated" metals results were found.

3.4 Comparability

Comparability is the confidence with which one data set can be compared to another data set. Using standard methods throughout the data generation processes ensures the comparability of data generated in separate sampling days or events.

All samples collected during monitoring year 2014 were analyzed using standardized analytical methodologies. Data generated in monitoring years 2014 are expected to be comparable to data generated in monitoring years 2012 and 2013. This will hold true for data collected in the future as long as the same or equivalent sampling protocols and analytical methodologies are applied to future sample collection activities and laboratory analysis.

3.5 Sensitivity

Sensitivity depicts the level of ability for an analytical system (*i.e.*, sample preparation and instrumental analysis) to detect a target component in a given sample matrix with a defined level of confidence. Factors affecting the sensitivity of an analytical system include: analytical system background (*e.g.*, laboratory artifact or method blank contamination), sample matrix (*e.g.*, mass spectrometry ion ratio change, co-elution of peaks, or baseline elevation), and instrument instability.

To evaluate if the analytical sensitivity achieved the project expectation, sample-specific PQLs were compared against the RL goals set forth in the QAPP. In addition, sample results were compared to detections of target analytes in method blanks to identify potential effects of laboratory background on sensitivity.

The blank-related effects are discussed above in Section 3.1. Sample results affected by the detections in the blanks were qualified as non-detects at the standard PQLs, which sufficed the project PQL goals.

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3.5.1 Sample Matrix Interference

The presence of target or non-target chemicals or subjects in samples may affect the ability of an analytical system to accurately quantitate the target analyte at the expected sensitivity.

- Selected PAHs and phthalates in four water and two sediment samples showed biased low recovery of selected internal standards. These results were qualified as estimated.
- As noted by the laboratory, detections of selected PAHs and phthalates in a great number of samples – particularly benzo(a)pyrene (13 water samples) and benzo(a)anthracene (five water samples) could not be definitively identified and accurately quantitated because the ion abundance ratios for these detections did not meet the method criteria for compound identification. These results were qualified as estimated.
- Zinc results for two sediment samples were qualified as estimated due to the elevated %R values in the associated interference check samples. The results were qualified as estimated.

Qualified data are presented in **Table 3-9**.

3.5.2 Sample-Specific Quantitation Limits

The RLs for semi-volatile organic compounds (SVOCs) in sediment samples were raised three to eight times from the project-expected RLs. This range of elevations resulted from the required dilution of sample extracts to overcome the oily nature of the samples. The reported sample-specific MRLs were considered the best-possible MRLs given the conditions of the samples. No further actions were feasible other than noting the incident in this document.

3.6 Completeness and Data Usability

Completeness is defined as the percentage of usable data divided by the total amount of data collected. Data qualified (R)[1] and target analytes that were not analyzed or reported by the laboratory were counted as unusable data and factored in the completeness determination.

3.6.1 Overall Data Completeness

A total of 3297 data points (including field duplicates and rinsate blanks) were collected, within which 47 of the data points were qualified (R) and rejected. Among the reject data, 38 data points were pH results. These pH data were qualified unusable because the laboratory analyses were performed well past the required holding time. Since pH testing is required to be performed immediately upon sampling, all pH results should be reported from the field measurements made during the sample collection. The overall analytical data completeness for WSDOT's NPDES Stormwater Monitoring Program, during monitoring year 2014 was calculated at 98.6 percent, achieving the project goal of 95 percent.

[1] R – The data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria.

REFERENCES

United States Environmental Protection Agency (EPA) 2009. *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use*, January 13 2009, EPA 540-R-08-005.

EPA 2014a. *Contract Laboratory Program (CLP) National Functional Guidelines for Inorganic Superfund Data Review*. Office of Superfund Remediation and Technical Innovation. August 2014. EPA 540-R-013-001.

EPA 2014b. *CLP National Functional Guidelines for Organic Superfund Data Review*. Office of Superfund Remediation and Technical Innovation. August 2014. EPA 540-R-014-002.

Washington Department of Transportation (WSDOT) 2014a. *Quality Assurance Project Plan for Baseline Monitoring of WSDOT Highway Run-off*. Working draft, March 2014.

WSDOT 2014b. *Stormwater Monitoring: Chemical Data Validation Guidance and Criteria, Version 1.2*. Pyron Environmental, Inc., December 10, 2014.

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TABLES

Table 1-1 Sample Analysis Schedule

Stormwater					
Parameter	**Analytical Method**	**Number of Field Samples**	**Number of Field Duplicates**	**Number of Rinsate Blanks**	**Analytical Laboratory**
pH	SM 4500 H-B	41	4	15	
Total Chloride	EPA 300.0	45	2	6	**Samples collected 10/8/2013 – 4/9/2014:** Washington State Department of Ecology, Manchester Environmental Laboratory (MEL), Manchester, WA **Samples collected 5/8/2014 – 9/24/2014:** AmTest Laboratories, Inc. (AmTest), Kirkland, Washington
Total Suspended Solids (TSS)	SM 2540 D	95	11	5	
Nitrate/Nitrite	EPA 353.2/SM 4500 NO_3-I	84	8	12	
Ortho-phosphate (OP)	SM 4500 P-E/G	53	5	15	
Total Phosphorus (TP)	SM 4500 P-F/H	38	9	6	
Total Recoverable & Dissolved Metals (Cd, Cu, Pb, Zn)	EPA 200.8	100[A]	11	17	
Hardness	SM 2340B	93	13	16	
TPH-Diesel & Motor Oil	NWTPH-Dx	35	4	2	
TPH-Gasoline	NWTPH-Gx	66	7	7	
Polycyclic Aromatic Hydrocarbons (PAHs)	SW8270D-SIM	42	4	6	
Phthalates	SW8270D-SIM	42	4	6	
Diuron & Dichlobenil	SW8270D	4	1	1	
Glyphosate (non-aquatic formula)	EPA 547	44	5	6	TestAmerica Laboratories, Inc. (TAL), Savannah, GA Anatek Labs, Inc. , Moscow, ID
Total Kjeldahl Nitrogen (TKN)	USEPA 351.2/SM 4500 N_{org}-B	43	8	0	TAL – Denver, CO TAL – Nashville, TN
Surfactant (MBAS)	SM5540C	1	0	0	AmTest - Kirkland, Washington
Fecal Coliform	SM 9222 D	56	7	5	
Particle Size Distribution (PSD)	ASTM D3977-97/TAPE	98	10	14	Analytical Resources, Inc. (ARI) – Tukwila, WA

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Sediment					
Parameter	**Analytical Method**	**Number of Samples**	**Number of Field Duplicates**	**Number of Rinsate Blanks**	**Analytical Laboratory**
Grain Size	ASTM D422	5	1	0	AmTest - Kirkland, Washington
Total Solids	SM 2540G	5	2	0	
Total Organic Carbon (TOC)	PSEP Protocols	4	1	0	
Metals (Cd, Cu, Pb, Zn)	EPA 200.8/SW6020A	4	1	0	
TPH-Diesel & Motor Oil	NWTPH-Dx	3	1	0	
Diuron	SW8321A	1	1	0	
SVOCs (SMS compounds)	SW8270D-SIM	4	1	0	
PCB Aroclors	SW8082A	3	1	0	
Glyphosate	EPA 547	1	0	0	Anatek Labs, Inc., Moscow, ID

Notes:

[a] – The number was based on dissolved zinc analysis; the number of samples for other metals species might be less than this number as samples might be analyzed for selected metals than the full suit total and dissolved cadmium, copper, lead, and zinc.

ASTM – American Society of Testing and Materials

EPA Methods – *USEPA Methods for Chemical Analysis of Water and Wastes*, EPA–600/4-79-020, March 1983 Revision

NWTPH - *Analytical Methods for Petroleum Hydrocarbons*, ECY 97-602, Washington State Department of Ecology, June 1997

SM – *Standard Methods for the Examination of Water and Wastewater*, American Public Health Association, 20th Edition, 1995

SW Methods – *USEPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, December 1996

PCB – Polychlorinated biphenyls

PSEP – Puget Sound Estuary Program

SIM – Selective ion monitoring

SMS – Washington State Sediment Management Standards

TAPE – Guidance for Evaluating Emerging Stormwater Treatment Technologies, Technology Assessment Protocol – Ecology, 2008

TPH – Total petroleum hydrocarbon

Table 3-1 Quality Control Parameters Corresponding to Measurement Quality Objectives

MQOs	QC Parameters
Precision	**RPD or Concentration Difference Values of:** LCS/LCSD MS/MSD (or Laboratory Duplicate) Dual Column Confirmation
Accuracy	Holding Time **%RPD, %R, %D, or %D$_r$ Values of:** Calibration Verification (CS1, ICV, CCV) Surrogate Spikes Internal Standards LCS and LCSD MS and MSD Interference Check Sample for Metals Analyzed with ICP Methodologies Serial Dilution for Metals Analyzed with ICP Methodologies **Results of:** Instrument and Calibration Blanks (ICB/CCB) Method (Preparation) Blanks Trip Blanks
Representativeness	Results of All Blanks Sample Integrity Holding Times
Comparability	Sample-specific PQLs Sample Collection Methodologies Sample Preparation and Analytical Methodologies
Completeness	Data Qualifiers Laboratory Deliverables and Analyte Lists Requested/Reported Valid Results Number of Rejected Results
Sensitivity	Sample-specific MDLs and PQLs

Notes:

%R – Percent recovery
%D – Percent difference
%D$_r$ – Percent drift
%RPD – Percent relative percent difference
CCB – Continuing calibration blank
CCV – Continuing calibration verification
CS1 – First (lowest) initial calibration standard
ICB – Initial calibration blank
ICP – Inductively coupled plasma
ICV – Initial calibration verification
LCS – Laboratory control sample
LCSD – Laboratory control sample duplicate
MDL – Method detection limit
MQOs – Measurement quality objectives
MS – Matrix spike
MSD – Matrix spike duplicate
PQL – Practical quantitation limit
RPD – Relative percent difference

Table 3-2 Data Affected by Sample Preservation and Holding Time Anomalies

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Reason Code
PIL-07-NC-140523	14-A007709	W	Hardness (CaCO3)	J	Temp
PIL-06-DC-140523	14-A007708	W	Nitrate + Nitrite	J	Temp
PIL-07-NC-140523	14-A007709	W	Nitrate + Nitrite	J	Temp
PIN-01-NC-140903	14-A014147	W	Nitrate + Nitrite	J	Temp
PIL-06-NC-140523	14-10344-YL78A	W	Particle Size, Phi <1 (>500 um)	J	Temp
PIL-07-NC-140523	14-10345-YL78B	W	Particle Size, Phi <1 (>500 um)	J	Temp
PIL-07-DC-140523	14-10346-YL78C	W	Particle Size, Phi <1 (>500 um)	J	Temp
EVE-01-NC-140628	14-13096-YQ33A	W	Particle Size, Phi <1 (>500 um)	UJ	Temp
PIL-06-NC-140523	14-10344-YL78A	W	Particle Size, Phi >10 (<1.0 um)	J	Temp
PIL-07-NC-140523	14-10345-YL78B	W	PH	J	Temp
PIL-07-DC-140523	14-10346-YL78C	W	Particle Size, Phi >10 (<1.0 um)	J	Temp
EVE-01-NC-140628	14-13096-YQ33A	W	Particle Size, Phi >10 (<1.0 um)	J	Temp
PIL-06-NC-140523	14-10344-YL78A	W	Particle Size, Phi 1-2 (250-500 um)	J	Temp
PIL-07-NC-140523	14-10345-YL78B	W	Particle Size, Phi 1-2 (250-500 um)	J	Temp
PIL-07-DC-140523	14-10346-YL78C	W	Particle Size, Phi 1-2 (250-500 um)	UJ	Temp
EVE-01-NC-140628	14-13096-YQ33A	W	Particle Size, Phi 1-2 (250-500 um)	J	Temp
PIL-06-NC-140523	14-10344-YL78A	W	Particle Size, Phi 2 to 3 (125-250 um)	UJ	Temp
PIL-07-NC-140523	14-10345-YL78B	W	Particle Size, Phi 2 to 3 (125-250 um)	J	Temp
PIL-07-DC-140523	14-10346-YL78C	W	Particle Size, Phi 2 to 3 (125-250 um)	J	Temp
EVE-01-NC-140628	14-13096-YQ33A	W	Particle Size, Phi 2 to 3 (125-250 um)	UJ	Temp
PIL-06-NC-140523	14-10344-YL78A	W	Particle Size, Phi 3 to 4 (62.5-125 um)	J	Temp
PIL-07-NC-140523	14-10345-YL78B	W	Particle Size, Phi 3 to 4 (62.5-125 um)	J	Temp
PIL-07-DC-140523	14-10346-YL78C	W	Particle Size, Phi 3 to 4 (62.5-125 um)	J	Temp
EVE-01-NC-140628	14-13096-YQ33A	W	Particle Size, Phi 3 to 4 (62.5-125 um)	UJ	Temp
PIL-06-NC-140523	14-10344-YL78A	W	Particle Size, Phi 4-8 (3.9-62.5 um)	J	Temp
PIL-07-NC-140523	14-10345-YL78B	W	Particle Size, Phi 4-8 (3.9-62.5 um)	J	Temp
PIL-07-DC-140523	14-10346-YL78C	W	Particle Size, Phi 4-8 (3.9-62.5 um)	J	Temp
EVE-01-NC-140628	14-13096-YQ33A	W	Particle Size, Phi 4-8 (3.9-62.5 um)	J	Temp
PIL-06-NC-140523	14-10344-YL78A	W	Particle Size, Phi 8-10 (1.0-3.9 um)	J	Temp
PIL-07-NC-140523	14-10345-YL78B	W	Particle Size, Phi 8-10 (1.0-3.9 um)	J	Temp
PIL-07-DC-140523	14-10346-YL78C	W	Particle Size, Phi 8-10 (1.0-3.9 um)	J	Temp
EVE-01-NC-140628	14-13096-YQ33A	W	Particle Size, Phi 8-10 (1.0-3.9 um)	J	Temp
PIL-06-DC-140523	14-A007708	W	Total Nitrogen (TKN)	J	Temp
PIL-07-NC-140523	14-A007709	W	Total Nitrogen (TKN)	J	Temp
PIN-01-NC-140903	14-A014147	W	Total Nitrogen (TKN)	J	Temp
PIL-06-DC-140523	14-A007708	W	Total Phosphorus	J	Temp
PIL-07-NC-140523	14-A007709	W	Total Phosphorus	J	Temp
PIN-01-NC-140903	14-A014147	W	Total Phosphorus	J	Temp

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Reason Code
PIL-07-NC-140523	14-A007709	W	Total Suspended Solids	J	Temp
PIN-01-NC-140903	14-A014147	W	Total Suspended Solids	J	Temp
PIN-01-NG-140617	14-A009327	W	Fecal Coliform	R	HT
SR9-01-NC-140508	14-A006979	W	pH	R	HT
SR9-01-NC-140508	14-A006979	W	pH	R	HT
EVE-04-NC-140508	14-A006980	W	pH	R	HT
EVE-04-NC-140508	14-A006980	W	pH	R	HT
SR9-01-NC-140523	14-A007703	W	pH	R	HT
PIL-06-NC-140523	14-A007707	W	pH	R	HT
PIL-07-NC-140523	14-A007709	W	pH	R	HT
EVE-06-NC-140613	14-A008770	W	pH	R	HT
EVE-03-NC-140613	14-A008771	W	pH	R	HT
SR9-01-NC-140613	14-A008772	W	pH	R	HT
PIL-07-NC-140613	14-A008774	W	pH	R	HT
PIL-04-NC-140613	14-A008775	W	pH	R	HT
PIL-04-NC-140613	14-A008775	W	pH	R	HT
PIL-04-DC-140613	14-A008776	W	pH	R	HT
PIL-04-DC-140613	14-A008776	W	pH	R	HT
EVE-01-NC-140613	14-A008777	W	pH	R	HT
PIL-08-NC-140613	14-A008781	W	pH	R	HT
PIL-03-NC-140613	14-A008782	W	pH	R	HT
PIL-03-NC-140613	14-A008782	W	pH	R	HT
EVE-02-NC-140613	14-A008784	W	pH	R	HT
PIL-06-NC-140613	14-A008785	W	pH	R	HT
EVE-05-NC-140613	14-A008786	W	pH	R	HT
PIL-01-NC-140613	14-A008787	W	pH	R	HT
EVE-04-NC-140613	14-A008788	W	pH	R	HT
EVE-04-DC-140613	14-A008789	W	pH	R	HT
PIN-01-NC-140614	14-A008790	W	pH	R	HT
EVE-01-NC-140628	14-A009719	W	pH	R	HT
SR9-01-NC-140723	14-A011425	W	pH	R	HT
EVE-01-NC-140723	14-A011427	W	pH	R	HT
EVE-04-NC-140723	14-A011428	W	pH	R	HT
PIL-01-NC-140723	14-A011430	W	pH	R	HT
SR9-01-NC-140813	14-A012671	W	pH	H	HT
PIL-01-NC-140813	14-A012673	W	pH	H	HT
PIL-01-NC-140902	14-A013985	W	pH	H	HT
PIN-01-NC-140903	14-A014147	W	pH	R	HT
EVE-04-NC-140924	14-A015398	W	pH	R	HT
SR9-01-NC-140924	14-A015399	W	pH	R	HT

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Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Reason Code
EVE-01-NC-140924	14-A015405	W	pH	R	HT
EVE-01-NC-140628	14-A009719	W	Nitrate + Nitrite	J	HT
SR9-01-NC-140813	14-A012671	W	Nitrate + Nitrite	J	HT
PIL-01-NC-140813	14-A012673	W	Nitrate + Nitrite	J	HT
518-03-NC-140107	1401018-05	W	*Ortho*-Phosphate	UJ	HT
518-02-NC-140107	1401018-07	W	*Ortho*-Phosphate	J	HT
PIL-02-DC-140107	1401018-16	W	*Ortho*-Phosphate	J	HT
PIL-08-NC-140314	1403050-01	W	*Ortho*-Phosphate	J	HT
PIL-07-NC-140314	1403050-03	W	*Ortho*-Phosphate	J	HT
PIL-06HNC-140314	1403050-05	W	*Ortho*-Phosphate	J	HT
EVE-04-NC-140508	14-10424-YL99A	W	Particle Size, Phi <1 (>500 um)	J	HT
EVE-04-NC-140508	14-10424-YL99A	W	Particle Size, Phi >10 (<1.0 um)	J	HT
EVE-04-NC-140508	14-10424-YL99A	W	Particle Size, Phi 1-2 (250-500 um)	J	HT
EVE-04-NC-140508	14-10424-YL99A	W	Particle Size, Phi 2 to 3 (125-250 um)	R	HT
EVE-04-NC-140508	14-10424-YL99A	W	Particle Size, Phi 3 to 4 (62.5-125 um)	R	HT
EVE-04-NC-140508	14-10424-YL99A	W	Particle Size, Phi 4-8 (3.9-62.5 um)	J	HT
EVE-04-NC-140508	14-10424-YL99A	W	Particle Size, Phi 8-10 (1.0-3.9 um)	J	HT
SR9-01-NC-140723	14-A011425	W	Dissolved Cadmium	H	HT
PIL-01-NC-140723	14-A011430	W	Dissolved Cadmium	H	HT
PIL-01-DC-140723	14-A011431	W	Dissolved Cadmium	H	HT
SR9-01-NC-140813	14-A012671	W	Dissolved Cadmium	H	HT
PIN-01-NC-140903	14-A014147	W	Dissolved Cadmium	R	HT
EVE-04-NC-140924	14-A015398	W	Dissolved Cadmium	H	HT
SR9-01-NC-140924	14-A015399	W	Dissolved Cadmium	H	HT
EVE-01-NC-140924	14-A015405	W	Dissolved Cadmium	H	HT
EVE-01-NC-140628	14-A009719	W	Dissolved Copper	H	HT
SR9-01-NC-140723	14-A011425	W	Dissolved Copper	H	HT
EVE-01-NC-140723	14-A011427	W	Dissolved Copper	H	HT
EVE-04-NC-140723	14-A011428	W	Dissolved Copper	H	HT
EVE-04-DC-140723	14-A011429	W	Dissolved Copper	H	HT
PIL-01-NC-140723	14-A011430	W	Dissolved Copper	H	HT
PIL-01-DC-140723	14-A011431	W	Dissolved Copper	H	HT
SR9-01-NC-140813	14-A012671	W	Dissolved Copper	H	HT
PIL-01-NC-140813	14-A012673	W	Dissolved Copper	H	HT
PIL-01-NC-140902	14-A013985	W	Dissolved Copper	H	HT
PIN-01-NC-140903	14-A014147	W	Dissolved Copper	R	HT
EVE-04-NC-140924	14-A015398	W	Dissolved Copper	H	HT
SR9-01-NC-140924	14-A015399	W	Dissolved Copper	H	HT
EVE-01-NC-140924	14-A015405	W	Dissolved Copper	H	HT
SR9-01-NC-140723	14-A011425	W	Dissolved Lead	H	HT

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Reason Code
PIL-01-NC-140723	14-A011430	W	Dissolved Lead	H	HT
PIL-01-DC-140723	14-A011431	W	Dissolved Lead	H	HT
SR9-01-NC-140813	14-A012671	W	Dissolved Lead	H	HT
PIN-01-NC-140903	14-A014147	W	Dissolved Lead	R	HT
EVE-04-NC-140924	14-A015398	W	Dissolved Lead	H	HT
SR9-01-NC-140924	14-A015399	W	Dissolved Lead	H	HT
EVE-01-NC-140924	14-A015405	W	Dissolved Lead	H	HT
EVE-01-NC-140628	14-A009719	W	Dissolved Zinc	H	HT
SR9-01-NC-140723	14-A011425	W	Dissolved Zinc	H	HT
EVE-01-NC-140723	14-A011427	W	Dissolved Zinc	H	HT
EVE-04-NC-140723	14-A011428	W	Dissolved Zinc	H	HT
EVE-04-DC-140723	14-A011429	W	Dissolved Zinc	H	HT
PIL-01-NC-140723	14-A011430	W	Dissolved Zinc	H	HT
PIL-01-DC-140723	14-A011431	W	Dissolved Zinc	HJ	HT
SR9-01-NC-140813	14-A012671	W	Dissolved Zinc	H	HT
PIL-01-NC-140813	14-A012673	W	Dissolved Zinc	H	HT
PIL-01-NC-140902	14-A013985	W	Dissolved Zinc	H	HT
PIN-01-NC-140903	14-A014147	W	Dissolved Zinc	R	HT
EVE-04-NC-140924	14-A015398	W	Dissolved Zinc	H	HT
SR9-01-NC-140924	14-A015399	W	Dissolved Zinc	H	HT
EVE-01-NC-140924	14-A015405	W	Dissolved Zinc	H	HT
PIN-01-NG-140603	14-A008651	W	Gasoline	J	HT
PIN-01-NG-140617	14-A009327	W	Gasoline	J	HT
GEI-01-NG-140617	14-A009328	W	Gasoline	J	HT
SR9-01-NC-140723	14-A011425	W	Acenaphthene	UJ	HT
EVE-01-NC-140723	14-A011427	W	Acenaphthene	UJ	HT
EVE-04-NC-140723	14-A011428	W	Acenaphthene	UJ	HT
PIL-01-NC-140723	14-A011430	W	Acenaphthene	UJ	HT
SR9-01-NC-140723	14-A011425	W	Acenaphthylene	UJ	HT
EVE-01-NC-140723	14-A011427	W	Acenaphthylene	UJ	HT
EVE-04-NC-140723	14-A011428	W	Acenaphthylene	UJ	HT
PIL-01-NC-140723	14-A011430	W	Acenaphthylene	UJ	HT
SR9-01-NC-140723	14-A011425	W	Anthracene	UJ	HT
EVE-01-NC-140723	14-A011427	W	Anthracene	UJ	HT
EVE-04-NC-140723	14-A011428	W	Anthracene	UJ	HT
PIL-01-NC-140723	14-A011430	W	Anthracene	UJ	HT
SR9-01-NC-140723	14-A011425	W	Benzo(a)anthracene	UJ	HT
EVE-01-NC-140723	14-A011427	W	Benzo(a)anthracene	UJ	HT
EVE-04-NC-140723	14-A011428	W	Benzo(a)anthracene	UJ	HT
PIL-01-NC-140723	14-A011430	W	Benzo(a)anthracene	UJ	HT

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Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Reason Code
SR9-01-NC-140723	14-A011425	W	Benzo(a)pyrene	UJ	HT
EVE-01-NC-140723	14-A011427	W	Benzo(a)pyrene	UJ	HT
EVE-04-NC-140723	14-A011428	W	Benzo(a)pyrene	UJ	HT
PIL-01-NC-140723	14-A011430	W	Benzo(a)pyrene	UJ	HT
SR9-01-NC-140723	14-A011425	W	Benzo(b)fluoranthene	UJ	HT
EVE-01-NC-140723	14-A011427	W	Benzo(b)fluoranthene	UJ	HT
EVE-04-NC-140723	14-A011428	W	Benzo(b)fluoranthene	UJ	HT
PIL-01-NC-140723	14-A011430	W	Benzo(b)fluoranthene	UJ	HT
SR9-01-NC-140723	14-A011425	W	Benzo(g,h,i)perylene	UJ	HT
EVE-01-NC-140723	14-A011427	W	Benzo(g,h,i)perylene	UJ	HT
EVE-04-NC-140723	14-A011428	W	Benzo(g,h,i)perylene	UJ	HT
PIL-01-NC-140723	14-A011430	W	Benzo(g,h,i)perylene	UJ	HT
SR9-01-NC-140723	14-A011425	W	Benzo(k)fluoranthene	UJ	HT
EVE-01-NC-140723	14-A011427	W	Benzo(k)fluoranthene	UJ	HT
EVE-04-NC-140723	14-A011428	W	Benzo(k)fluoranthene	UJ	HT
PIL-01-NC-140723	14-A011430	W	Benzo(k)fluoranthene	UJ	HT
SR9-01-NC-140723	14-A011425	W	*bis*(2-Ethylhexyl) Phthalate	J	HT
EVE-01-NC-140723	14-A011427	W	*bis*(2-Ethylhexyl) Phthalate	J	HT
EVE-04-NC-140723	14-A011428	W	*bis*(2-Ethylhexyl) Phthalate	J	HT
PIL-01-NC-140723	14-A011430	W	*bis*(2-Ethylhexyl) Phthalate	J	HT
SR9-01-NC-140723	14-A011425	W	Butylbenzylphthalate	UJ	HT
EVE-01-NC-140723	14-A011427	W	Butylbenzylphthalate	UJ	HT
EVE-04-NC-140723	14-A011428	W	Butylbenzylphthalate	UJ	HT
PIL-01-NC-140723	14-A011430	W	Butylbenzylphthalate	UJ	HT
SR9-01-NC-140723	14-A011425	W	Chrysene	UJ	HT
EVE-01-NC-140723	14-A011427	W	Chrysene	UJ	HT
EVE-04-NC-140723	14-A011428	W	Chrysene	UJ	HT
PIL-01-NC-140723	14-A011430	W	Chrysene	UJ	HT
SR9-01-NC-140723	14-A011425	W	Dibenzo(ah)anthracene	UJ	HT
EVE-01-NC-140723	14-A011427	W	Dibenzo(ah)anthracene	UJ	HT
EVE-04-NC-140723	14-A011428	W	Dibenzo(ah)anthracene	UJ	HT
PIL-01-NC-140723	14-A011430	W	Dibenzo(ah)anthracene	UJ	HT
SR9-01-NC-140723	14-A011425	W	Diethylphthalate	UJ	HT
EVE-01-NC-140723	14-A011427	W	Diethylphthalate	UJ	HT
EVE-04-NC-140723	14-A011428	W	Diethylphthalate	UJ	HT
PIL-01-NC-140723	14-A011430	W	Diethylphthalate	UJ	HT
SR9-01-NC-140723	14-A011425	W	Dimethylphthalate	UJ	HT
EVE-01-NC-140723	14-A011427	W	Dimethylphthalate	UJ	HT
EVE-04-NC-140723	14-A011428	W	Dimethylphthalate	UJ	HT
PIL-01-NC-140723	14-A011430	W	Dimethylphthalate	UJ	HT

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Reason Code
SR9-01-NC-140723	14-A011425	W	Di-n-butylphthalate	UJ	HT
EVE-01-NC-140723	14-A011427	W	Di-n-butylphthalate	UJ	HT
EVE-04-NC-140723	14-A011428	W	Di-n-butylphthalate	UJ	HT
PIL-01-NC-140723	14-A011430	W	Di-n-butylphthalate	UJ	HT
SR9-01-NC-140723	14-A011425	W	Di-n-butylphthalate	UJ	HT
EVE-01-NC-140723	14-A011427	W	Di-n-butylphthalate	UJ	HT
EVE-04-NC-140723	14-A011428	W	Di-n-butylphthalate	UJ	HT
PIL-01-NC-140723	14-A011430	W	Di-n-butylphthalate	UJ	HT
SR9-01-NC-140723	14-A011425	W	Fluoranthene	UJ	HT
EVE-01-NC-140723	14-A011427	W	Fluoranthene	UJ	HT
EVE-04-NC-140723	14-A011428	W	Fluoranthene	UJ	HT
PIL-01-NC-140723	14-A011430	W	Fluoranthene	UJ	HT
SR9-01-NC-140723	14-A011425	W	Fluorene	UJ	HT
EVE-01-NC-140723	14-A011427	W	Fluorene	UJ	HT
EVE-04-NC-140723	14-A011428	W	Fluorene	UJ	HT
PIL-01-NC-140723	14-A011430	W	Fluorene	UJ	HT
SR9-01-NC-140723	14-A011425	W	Indeno(123-cd)pyrene	UJ	HT
EVE-01-NC-140723	14-A011427	W	Indeno(123-cd)pyrene	UJ	HT
EVE-04-NC-140723	14-A011428	W	Indeno(123-cd)pyrene	UJ	HT
PIL-01-NC-140723	14-A011430	W	Indeno(123-cd)pyrene	UJ	HT
SR9-01-NC-140723	14-A011425	W	Naphthalene	UJ	HT
EVE-01-NC-140723	14-A011427	W	Naphthalene	UJ	HT
EVE-04-NC-140723	14-A011428	W	Naphthalene	UJ	HT
PIL-01-NC-140723	14-A011430	W	Naphthalene	UJ	HT
SR9-01-NC-140723	14-A011425	W	Phenanthrene	UJ	HT
EVE-01-NC-140723	14-A011427	W	Phenanthrene	UJ	HT
EVE-04-NC-140723	14-A011428	W	Phenanthrene	UJ	HT
PIL-01-NC-140723	14-A011430	W	Phenanthrene	UJ	HT
SR9-01-NC-140723	14-A011425	W	Pyrene	UJ	HT
EVE-01-NC-140723	14-A011427	W	Pyrene	UJ	HT
EVE-04-NC-140723	14-A011428	W	Pyrene	UJ	HT
PIL-01-NC-140723	14-A011430	W	Pyrene	UJ	HT
SED-SR9-01-NS-140610	14-A008659	S	Grain Size PHI +1.0	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Grain Size PHI +10.0	UJ	Temp
SED-SR9-01-NS-140610	14-A008659	S	Grain Size PHI +2.0	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Grain Size PHI +3.0	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Grain Size PHI +4.0	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Grain Size PHI +5.0	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Grain Size PHI +6.0	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Grain Size PHI +7.0	J	Temp

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Reason Code
SED-SR9-01-NS-140610	14-A008659	S	Grain Size PHI +8.0	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Grain Size PHI +9.0	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Grain Size PHI > +10.0	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Grain Size PHI 0	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Grain Size PHI -1.0	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Grain Size PHI -2.0	UJ	Temp
SED-SR9-01-NS-140610	14-A008659	S	Grain Size PHI -2.25	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Total Organic Carbon	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Total Solids	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Arsenic	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Cadmium	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Copper	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Lead	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Zinc	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Diesel	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Heavy Oil	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Acenaphthene	UJ	Temp
SED-SR9-01-NS-140610	14-A008659	S	Acenaphthylene	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Anthracene	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Benzo(a)anthracene	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Benzo(a)pyrene	UJ	Temp
SED-SR9-01-NS-140610	14-A008659	S	Benzo(b)fluoranthene	UJ	Temp
SED-SR9-01-NS-140610	14-A008659	S	Benzo(g,h,i)perylene	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Benzo(k)fluoranthene	UJ	Temp
SED-SR9-01-NS-140610	14-A008659	S	*bis*(2-Ethylhexyl)phthalate	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Butylbenzylphthalate	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Chrysene	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Dibenzo(ah)anthracene	UJ	Temp
SED-SR9-01-NS-140610	14-A008659	S	Diethylphthalate	UJ	Temp
SED-SR9-01-NS-140610	14-A008659	S	Dimethylphthalate	UJ	Temp
SED-SR9-01-NS-140610	14-A008659	S	Di-*n*-butylphthalate	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Di-*n*-octylphthalate	UJ	Temp
SED-SR9-01-NS-140610	14-A008659	S	Fluoranthene	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Fluorene	UJ	Temp
SED-SR9-01-NS-140610	14-A008659	S	Indeno(123-cd)pyrene	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Naphthalene	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Phenanthrene	J	Temp
SED-SR9-01-NS-140610	14-A008659	S	Pyrene	J	Temp
SED-Pin-01-NS-140624	14-A009447	S	Diuron	UJ	HT
SED-Pin-01-DS-140624	14-A009448	S	Diuron	UJ	HT

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Reason Code
SED-EVE-01-NS-140527	14-A007711	S	Total Organic Carbon	J	HT
SED-EVE-01-DS-140527	14-A007712	S	Total Organic Carbon	J	HT
SED-PIL-01-NS-140527	14-A007714	S	Total Organic Carbon	J	HT

Notes:

Temp – The temperature of the cooler containing this sample arrived at the analytical laboratory exceeding the control criteria (>6°C) and the analysis was determined affected by the raised cooler temperature.

H – The filtration of the sample was required within 15 minutes of collection, which was not technically feasible. Sample was filtered immediately upon arrival at the laboratory and the reported results were usable without further qualifying.

HT – The preparation or analysis of the sample was performed past the method required holding time.

J – The analyte was detected in the sample and the reported value was considered as estimated.

UJ – The analyte was not detected in the sample, and the reported quantitation limit associated with this analyte was considered as estimated.

W – Water

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Table 3-3 Data Affected by Calibration Verification Outliers

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Comment
LAK-01-NC-131008	13-A015110	W	Surfactants	J	CCV biased low
PIN-01-NC-131116	1311048-08	W	Dichlobenil	J	CCV biased low
EVE-01-NC-140107	1401018-06	W	Benzo(b)fluoranthene	UJ	CCV biased low
EVE-04-NC-140107	1401018-12	W	Benzo(b)fluoranthene	UJ	CCV biased low
PIL-01-NC-140107	1401018-21	W	Benzo(b)fluoranthene	UJ	CCV biased low
EVE-04-NC-140317	1403052-03	W	Di-n-octyl Phthalate	J	CCV biased low
PIL-01-NC-140319	1403069-01	W	Benz[a]anthracene	J	CCV biased low
EVE-01-NC-140319	1403069-02	W	Benz[a]anthracene	J	CCV biased low
SED-EVE-01-NS-140527	14-A007711	S	PCB-1016	UJ	CCV biased low
SED-EVE-01-NS-140527	14-A007711	S	PCB-1221	UJ	CCV biased low
SED-EVE-01-NS-140527	14-A007711	S	PCB-1232	UJ	CCV biased low
SED-EVE-01-NS-140527	14-A007711	S	PCB-1242	UJ	CCV biased low
SED-EVE-01-NS-140527	14-A007711	S	PCB-1248	UJ	CCV biased low
SED-EVE-01-NS-140527	14-A007711	S	PCB-1254	UJ	CCV biased low
SED-EVE-01-NS-140527	14-A007711	S	PCB-1260	UJ	CCV biased low
SED-EVE-01-NS-140527	14-A007711	S	PCB-1260	UJ	CCV biased low

Notes:

CCV biased low – The continuing calibration verification (CCV) percent difference (%D) values (±10% for inorganics, ±20% for organics) was less than the lower control limit.

J – The analyte was detected in the sample and the reported value was considered as estimated.

S – Sediment

UJ – The analyte was not detected in the sample, and the reported quantitation limit associated with this analyte was considered as estimated.

W – Water

Table 3-4 Data Affected by Detections in Blanks

Field Sample ID	Laboratory Sample ID	Analyte	Original Result	Qualified Result	Unit	Comment
SR9-01-A008	580-35871-1	Nitrogen, Total Kjeldahl	0.90 J	1.0 U	mg/L	MB,CB
EV-01-VEP-A002	580-35871-4	Nitrogen, Total Kjeldahl	0.91 J	1.0 U	mg/L	MB,CB
PIL-01-VEP-A026	580-37130-3	Nitrogen, Total Kjeldahl	0.84 J	1.0 U	mg/L	MB,CB
EV-04-MEP-A014	580-37130-1	Nitrogen, Total Kjeldahl	1.5	1.5 J	mg/L	MB,CB
PIL-01-VEP-A032	580-37270-1	Nitrogen, Total Kjeldahl	0.99 J	1.0 U	mg/L	MB,CB
PIL-01-VEP-A050	580-37300-8	Nitrogen, Total Kjeldahl	1.1	1.1 J	mg/L	MB,CB
EV-01-VEP-A050	1305079-06	Benzo(a)anthracene	0.026	0.026 J	µg/L	MB
PINES-01-A031	1306051-02	*bis*(2-Ethylhexyl) Phthalate	0.24	0.24 J	µg/L	MB
SR9-01-A004	1307055-02	*bis*(2-Ethylhexyl) Phthalate	0.27	0.27 U	µg/L	MB
EV-01-VEP-A004	1307055-05	*bis*(2-Ethylhexyl) Phthalate	0.25	0.25 U	µg/L	MB
EV-04-MEP-A004	1307055-09	*bis*(2-Ethylhexyl) Phthalate	0.38	0.38 U	µg/L	MB
SR9-01-A032	1303082-01	Diethyl phthalate	0.23	0.23 J	µg/L	MB
SR9-01-A036	1303082-02	Diethyl phthalate	0.23	0.23 J	µg/L	MB
EV-01-VEP-A032	1304068-06	Diethyl phthalate	0.33	0.33 J	µg/L	MB
EV-01-VEP-A036	1304068-07	Diethyl phthalate	0.33	0.33 J	µg/L	MB
SR9-01-A050	1304068-05	Diethyl phthalate	0.27	0.27 J	µg/L	MB
PINES-01-A020	1304078-04	Diethyl phthalate	0.3	0.3 J	µg/L	MB
SR9-01-A056	1304078-02	Diethyl phthalate	0.25	0.25 J	µg/L	MB
PINES-01-A004	1306051-04	Di-*n*-Butylphthalate	0.46	0.46 J	µg/L	MB
EV-01-VEP-A032	1304068-06	Di-*n*-Butylphthalate	1.3	1.3 J	µg/L	MB
EV-01-VEP-A036	1304068-07	Di-*n*-Butylphthalate	1.3	1.3 J	µg/L	MB
EV-04-MEP-A044	1304078-01	Di-*n*-Butylphthalate	1.1	1.1 J	µg/L	MB
PINES-01-A014	1304079-02	Di-*n*-Butylphthalate	1.1	1.1 J	µg/L	MB
PINES-01-A018	1304079-03	Di-*n*-Butylphthalate	1.1	1.1 J	µg/L	MB
EV-01-VEP-A002	1211042-05	Indeno(1,2,3-cd)pyrene	0.041	0.041 J	µg/L	MB
SR9-01-A008	1211042-06	Naphthalene	0.017	0.017 J	µg/L	MB
EV-01-VEP-A002	1211042-05	Naphthalene	0.016	0.016 J	µg/L	MB
SR9-01-A004	1307055-02	Naphthalene	0.011	0.011 U	µg/L	MB
SR9-01-NC-140317	1403052-01	*bis*(2-Ethylhexyl)phthalate	2.5	2.5 J	ug/L	EB
SR9-01-NC-140319	1403069-04	*bis*(2-Ethylhexyl)phthalate	3.7	3.7 J	ug/L	EB
SR9-01-NC-140408	1404050-19	*bis*(2-Ethylhexyl)phthalate	2.1	2.1 J	ug/L	EB
EVE-01-NC-140422	1404066-11	*bis*(2-Ethylhexyl)phthalate	2.9	2.9 J	ug/L	EB
SR9-01-NC-140508	14-A006979	bis(2-Ethylhexyl)phthalate	3.64	3.64 J	ug/L	EB

Field Sample ID	Laboratory Sample ID	Analyte	Original Result	Qualified Result	Unit	Comment
SR9-01-NC-140508	14-A006979	*bis*(2-Ethylhexyl)phthalate	3.64	3.64 J	ug/L	EB
SR9-01-NC-140508	14-A006979	*bis*(2-Ethylhexyl)phthalate	3.64	3.64 J	ug/L	EB
SR9-01-NC-140523	14-A007703	*bis*(2-Ethylhexyl)phthalate	2.6	2.6 J	ug/L	EB
SR9-01-NC-140613	14-A008772	*bis*(2-Ethylhexyl)phthalate	1.26	1.26 J	ug/L	EB
EVE-01-NC-140613	14-A008777	*bis*(2-Ethylhexyl)phthalate	4.39	4.39 J	ug/L	EB
EVE-01-NC-140628	14-A009719	*bis*(2-Ethylhexyl)phthalate	2.56	2.56 J	ug/L	EB
SR9-01-NC-140723	14-A011425	*bis*(2-Ethylhexyl)phthalate	4	4 J	ug/L	EB
SR9-01-NC-140813	14-A012671	*bis*(2-Ethylhexyl)phthalate	3.77	3.77 J	ug/L	EB
SR9-01-NC-140924	14-A015399	*bis*(2-Ethylhexyl)phthalate	3.59	3.59 J	ug/L	EB
EVE-04-NC-140508	14-10424-YL99A	Particle Size, Phi <1	0.65	0.65 J	mg/L	EB
EVE-04-NC-140508	14-10424-YL99A	Particle Size, Phi <1	0.65	0.65 J	mg/L	EB
EVE-04-NC-140508	14-10424-YL99A	Particle Size, Phi <1	0.65	0.65 J	mg/L	EB
EVE-01-NC-140613	14-11957-YO50E	Particle Size, Phi <1	7.55	7.55 J	mg/L	EB
EVE-04-NC-140613	14-11966-YO50N	Particle Size, Phi <1	3.74	3.74 J	mg/L	EB
EVE-04-NC-140613	14-11966-YO50N	Particle Size, Phi <1	3.74	3.74 J	mg/L	EB
EVE-01-NC-140723	14-15489-YU26A	Particle Size, Phi <1	14.33	14.33 J	mg/L	EB
EVE-04-NC-140723	14-15490-YU26B	Particle Size, Phi <1	3.35	3.35 J	mg/L	EB
EVE-01-NC-140129	14-1877-XW93F	Particle Size, Phi <1	4.75	4.75 J	mg/L	EB
EVE-04-NC-140129	14-1878-XW93G	Particle Size, Phi <1	3.57	3.57 J	mg/L	EB
EVE-04-NC-140924	14-20422-ZC57A	Particle Size, Phi <1	2.81	2.81 J	mg/L	EB
EVE-01-NC-140924	14-20423-ZC57B	Particle Size, Phi <1	5.99	5.99 J	mg/L	EB
EVE-04-NC-140317	14-4544-YD11D	Particle Size, Phi <1	1.01	1.01 J	mg/L	EB
EVE-04-NC-140107	14-479-XT95E	Particle Size, Phi <1	1.57	1.57 J	mg/L	EB
EVE-01-NC-140107	14-484-XT95I	Particle Size, Phi <1	2.84	2.84 J	mg/L	EB
EVE-01-NC-140319	14-5244-YE02D	Particle Size, Phi <1	1.83	1.83 J	mg/L	EB
EVE-01-NC-140319	14-5244-YE02D	Particle Size, Phi <1	1.83	1.83 J	mg/L	EB
EVE-04-NC-140408	14-6678-YG03B	Particle Size, Phi <1	1.66	1.66 J	mg/L	EB
EVE-04-NC-140408	14-6678-YG03B	Particle Size, Phi <1	1.66	1.66 J	mg/L	EB
EVE-01-NC-140422	14-7726-YH80D	Particle Size, Phi <1	2.31	2.31 J	mg/L	EB
EVE-01-NC-140422	14-7726-YH80D	Particle Size, Phi <1	2.31	2.31 J	mg/L	EB
EVE-04-NC-140422	14-7727-YH80E	Particle Size, Phi <1	4.10	4.10 J	mg/L	EB
EVE-04-NC-140422	14-7727-YH80E	Particle Size, Phi <1	4.10	4.10 J	mg/L	EB
EVE-04-NC-140508	14-10424-YL99A	ParticleSize, Phi 1-2	0.87	0.87 J	mg/L	EB
EVE-04-NC-140508	14-10424-YL99A	ParticleSize, Phi 1-2	0.87	0.87 J	mg/L	EB
EVE-04-NC-140508	14-10424-YL99A	ParticleSize, Phi 1-2	0.87	0.87 J	mg/L	EB

Field Sample ID	Laboratory Sample ID	Analyte	Original Result	Qualified Result	Unit	Comment
EVE-01-NC-140613	14-11957-YO50E	ParticleSize, Phi 1-2	2.31	2.31 J	mg/L	EB
EVE-04-NC-140613	14-11966-YO50N	ParticleSize, Phi 1-2	1.46	1.46 J	mg/L	EB
EVE-04-NC-140613	14-11966-YO50N	ParticleSize, Phi 1-2	1.46	1.46 J	mg/L	EB
EVE-01-NC-140628	14-13096-YQ33A	ParticleSize, Phi 1-2	1.7	1.7 J	mg/L	EB

Notes:

CB – Analyte was detected in initial and/or continuing calibration blanks and the sample result was affected.
EB – Analyte was detected in rinsate blanks and the sample result was affected.
J – The analyte was detected in the sample and the reported value was considered as estimated.
MB – The analyte was detected in method blank and sample result was affected.
mg/L – Milligram per liter
U – The analyte was not detected at or above the associated quantitation limit.
µg/L – Microgram per liter

Table 3-5 Data Affected by Laboratory Control Sample Outliers

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Comment
EVE-01-NG-131118	1311048-01	W	Diesel	UJ	LCS %R <LCL
EVE-01-DG-131118	1311048-02	W	Diesel	UJ	LCS %R <LCL
EVE-04-NG-131118	1311048-03	W	Diesel	UJ	LCS %R <LCL
EVE-04-DG-131118	1311048-04	W	Diesel	UJ	LCS %R <LCL
SR9-01-NG-131118	1311048-05	W	Diesel	UJ	LCS %R <LCL
SR9-01-DG-131118	1311048-06	W	Diesel	UJ	LCS %R <LCL
PIN-01-NG-131116	1311048-07	W	Diesel	UJ	LCS %R <LCL
EVE-01-NG-131118	1311048-01	W	Lube Oil	J	LCS %R <LCL
EVE-01-DG-131118	1311048-02	W	Lube Oil	J	LCS %R <LCL
EVE-04-NG-131118	1311048-03	W	Lube Oil	J	LCS %R <LCL
EVE-04-DG-131118	1311048-04	W	Lube Oil	J	LCS %R <LCL
SR9-01-NG-131118	1311048-05	W	Lube Oil	J	LCS %R <LCL
SR9-01-DG-131118	1311048-06	W	Lube Oil	J	LCS %R <LCL
PIN-01-NG-131116	1311048-07	W	Lube Oil	J	LCS %R <LCL
SR9-01-NC-140613	14-A008772	W	Benzo(a)pyrene	UJ	LCS %R <LCL
SR9-01-DC-140613	14-A008773	W	Benzo(a)pyrene	UJ	LCS %R <LCL
PIL-01-NC-140613	14-A008787	W	Benzo(a)pyrene	UJ	LCS %R <LCL
PIN-01-NC-140614	14-A008790	W	Benzo(a)pyrene	UJ	LCS %R <LCL
EVE-01-BC-140701	14-A009735	W	*bis*(2-Ethylhexyl)phthalate	J	LCS %R <LCL
SR9-01-NC-140613	14-A008772	W	Butylbenzylphthalate	UJ	LCS %R <LCL
SR9-01-DC-140613	14-A008773	W	Butylbenzylphthalate	UJ	LCS %R <LCL
PIL-01-NC-140613	14-A008787	W	Butylbenzylphthalate	UJ	LCS %R <LCL
PIN-01-NC-140614	14-A008790	W	Butylbenzylphthalate	UJ	LCS %R <LCL
SR9-01-NC-140613	14-A008772	W	Diethylphthalate	UJ	LCS %R >UCL
SR9-01-DC-140613	14-A008773	W	Diethylphthalate	UJ	LCS %R <LCL
PIL-01-NC-140613	14-A008787	W	Diethylphthalate	UJ	LCS %R <LCL
PIN-01-NC-140614	14-A008790	W	Diethylphthalate	J	LCS %R <LCL
PIN-01-NC-131116	1311048-08	W	Pyrene	J	LCS %R <LCL

Notes:

%R – Percent recovery

J – The analyte was detected in the sample and the reported value was considered as estimated.

LCL – Lower control limit

LCS – Laboratory control sample

UCL – Upper control limit

UJ – The analyte was not detected in the sample, and the reported quantitation limit associated with this analyte was considered as estimated.

W – Water

Table 3-6 Data Affected by Matrix Spike Outliers

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Comment
EVE-04-NC-140508	14-A006980	W	Total Phosphorus	J	Matrix spike %R >UCL
SR9-01-NC-140508	14-A006979	W	Total Phosphorus	J	Matrix spike %R >UCL
EVE-04-NC-140508	14-A006980	W	Nitrate + Nitrite	J	Matrix spike %R <LCL
SR9-01-NC-140508	14-A006979	W	Nitrate + Nitrite	J	Matrix spike %R <LCL
EVE-02-NC-140613	14-A008784	W	Nitrate + Nitrite	J	Matrix spike %R <LCL
518-01-NC-140107	580-41893-10	W	Nitrogen, Total Kjeldahl	J	Matrix spike %R >UCL
518-01-DC-140107	580-41893-11	W	Nitrogen, Total Kjeldahl	J	Matrix spike %R >UCL
518-02-NC-140107	580-41893-12	W	Nitrogen, Total Kjeldahl	J	Matrix spike %R >UCL
518-03-NC-140107	580-41893-13	W	Nitrogen, Total Kjeldahl	J	Matrix spike %R >UCL
PIL-01-NC-140129	580-42142-10	W	Nitrogen, Total Kjeldahl	J	Matrix spike %R >UCL
PIL-08-NC-140314	1403050-01	W	Zinc	J	Matrix spike %R >UCL
PIL-07-NC-140314	1403050-03	W	Zinc	J	Matrix spike %R >UCL
PIL-06HNC-140314	1403050-05	W	Zinc	J	Matrix spike %R >UCL
SR9-01-NC-140317	1403052-01	W	Zinc	J	Matrix spike %R >UCL
EVE-04-NC-140317	1403052-03	W	Zinc	J	Matrix spike %R >UCL
EVE-03-NC-140316	1403052-05	W	Zinc	J	Matrix spike %R >UCL
SED-EVE-01-NS-140527	14-A007711	S	Copper	J	Matrix spike %R <LCL
SED-EVE-01-DS-140527	14-A007712	S	Copper	J	Matrix spike %R <LCL
SED-PIL-01-NS-140527	14-A007714	S	Copper	J	Matrix spike %R <LCL

Notes:

%R – Percent recovery

J – The analyte was detected in the sample and the reported value was considered as estimated.

LCL – Lower control limit

S – Sediment

UCL – Upper control limit

W – Water

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Table 3-7 Data Affected by Surrogate Spike Recovery Outliers

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Comment
EVE-04-NG-140218	1402028-04	W	Diesel	UJ	Surrogate spike %R <LCL
EVE-04-NG-140218	1402028-04	W	Lube Oil	J	Surrogate spike %R <LCL
EVE-04-DC-140317	1403052-04	W	Anthracene	J	Surrogate spike %R <LCL
EVE-04-DC-140317	1403052-04	W	Benz[a]anthracene	J	Surrogate spike %R <LCL
EVE-04-DC-140317	1403052-04	W	Benzo(a)pyrene	J	Surrogate spike %R <LCL
EVE-04-DC-140317	1403052-04	W	Benzo(b)fluoranthene	J	Surrogate spike %R <LCL
EVE-04-DC-140317	1403052-04	W	Benzo(g,h,i)perylene	J	Surrogate spike %R <LCL
EVE-04-DC-140317	1403052-04	W	Benzo(k)fluoranthene	J	Surrogate spike %R <LCL
EVE-04-DC-140317	1403052-04	W	*bis*(2-Ethylhexyl) phthalate	J	Surrogate spike %R <LCL
EVE-04-DC-140317	1403052-04	W	Chrysene	J	Surrogate spike %R <LCL
EVE-04-DC-140317	1403052-04	W	Di-n-Butylphthalate	UJ	Surrogate spike %R <LCL
EVE-04-DC-140317	1403052-04	W	Fluoranthene	J	Surrogate spike %R <LCL
EVE-04-DC-140317	1403052-04	W	Fluorene	J	Surrogate spike %R <LCL
EVE-04-DC-140317	1403052-04	W	Indeno(1,2,3-cd)pyrene	UJ	Surrogate spike %R <LCL
EVE-04-DC-140317	1403052-04	W	Naphthalene	J	Surrogate spike %R <LCL
EVE-04-DC-140317	1403052-04	W	Phenanthrene	J	Surrogate spike %R <LCL
EVE-04-DC-140317	1403052-04	W	Pyrene	J	Surrogate spike %R <LCL
EVE-01-NC-140319	1403069-02	W	Benz[a]anthracene	J	Surrogate spike %R <LCL
EVE-01-NC-140319	1403069-02	W	Benzo(a)pyrene	J	Surrogate spike %R <LCL
EVE-01-NC-140319	1403069-02	W	Benzo(b)fluoranthene	J	Surrogate spike %R <LCL
EVE-01-NC-140319	1403069-02	W	Benzo(g,h,i)perylene	J	Surrogate spike %R <LCL
EVE-01-NC-140319	1403069-02	W	Benzo(k)fluoranthene	J	Surrogate spike %R <LCL
EVE-01-NC-140319	1403069-02	W	*bis*(2-Ethylhexyl) phthalate	J	Surrogate spike %R <LCL
EVE-01-NC-140319	1403069-02	W	Chrysene	J	Surrogate spike %R <LCL
EVE-01-NC-140319	1403069-02	W	Fluoranthene	J	Surrogate spike %R <LCL
EVE-01-NC-140319	1403069-02	W	Indeno(1,2,3-cd)pyrene	J	Surrogate spike %R <LCL
EVE-01-NC-140319	1403069-02	W	Naphthalene	J	Surrogate spike %R <LCL
EVE-01-NC-140319	1403069-02	W	Phenanthrene	J	Surrogate spike %R <LCL
EVE-01-NC-140319	1403069-02	W	Pyrene	J	Surrogate spike %R <LCL
PIN-01-NC-131116	1311048-08	W	Dichlobenil	J	Surrogate spike %R <LCL
PIN-01-NC-131116	1311048-08	W	Diuron	UJ	Surrogate spike %R <LCL
PIN-01-BC-140416	1404062-03	W	Dichlobenil	UJ	Surrogate spike %R <LCL
PIN-01-BC-140416	1404062-03	W	Diuron	UJ	Surrogate spike %R <LCL

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Comment
PIN-01-NC-140424	1404070-02	W	Dichlobenil	UJ	Surrogate spike %R <LCL
PIN-01-NC-140424	1404070-02	W	Diuron	UJ	Surrogate spike %R <LCL
PIN-01-DC-140424	1404070-03	W	Dichlobenil	UJ	Surrogate spike %R <LCL
PIN-01-DC-140424	1404070-03	W	Diuron	UJ	Surrogate spike %R <LCL
SED-EVE-01-NS-140527	14-A007711	S	PCB-1016	UJ	Surrogate spike %R <LCL
SED-EVE-01-NS-140527	14-A007711	S	PCB-1221	UJ	Surrogate spike %R <LCL
SED-EVE-01-NS-140527	14-A007711	S	PCB-1232	UJ	Surrogate spike %R <LCL
SED-EVE-01-NS-140527	14-A007711	S	PCB-1242	UJ	Surrogate spike %R <LCL
SED-EVE-01-NS-140527	14-A007711	S	PCB-1248	UJ	Surrogate spike %R <LCL
SED-EVE-01-NS-140527	14-A007711	S	PCB-1254	UJ	Surrogate spike %R <LCL
SED-EVE-01-NS-140527	14-A007711	S	PCB-1260	UJ	Surrogate spike %R <LCL

Notes:

%R – Percent recovery

J – The analyte was detected in the sample and the reported value was considered as estimated.

LCL – Lower control limit

S – Sediment

UCL – Upper control limit

UJ – The analyte was not detected in the sample, and the reported quantitation limit associated with this analyte was considered as estimated.

W – Water

Table 3-8 Data Affected by Precision Outliers

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Comment
EVE-05-BC-140918	14-A015137	W	Total Nitrogen (TKN)	J	Laboratory Duplicate
EVE-04-NG-140613	14-A008671	W	Fecal Coliform	J	Laboratory Duplicate
SR9-01-NG-140319	14-A003655	W	Fecal Coliform	J	Laboratory Duplicate
EVE-01-NG-140319	14-A003656	W	Fecal Coliform	J	Laboratory Duplicate
EVE-04-NG-140319	14-A003657	W	Fecal Coliform	J	Laboratory Duplicate
PIL-01-NG-140319	14-A003658	W	Fecal Coliform	J	Laboratory Duplicate
PIL-08-NC-140314	1403050-01	W	Zinc	J	Laboratory Duplicate
PIL-07-NC-140314	1403050-03	W	Zinc	J	Laboratory Duplicate
PIL-06HNC-140314	1403050-05	W	Zinc	J	Laboratory Duplicate
SR9-01-NC-140317	1403052-01	W	Zinc	J	Laboratory Duplicate
EVE-04-NC-140317	1403052-03	W	Zinc	J	Laboratory Duplicate
EVE-03-NC-140316	1403052-05	W	Zinc	J	Laboratory Duplicate
EVE-01-NG-131118	1311048-01	W	Diesel	UJ	Laboratory Duplicate
EVE-01-DG-131118	1311048-02	W	Diesel	UJ	Laboratory Duplicate
EVE-04-NG-131118	1311048-03	W	Diesel	UJ	Laboratory Duplicate
EVE-04-DG-131118	1311048-04	W	Diesel	UJ	Laboratory Duplicate
SR9-01-NG-131118	1311048-05	W	Diesel	UJ	Laboratory Duplicate
SR9-01-DG-131118	1311048-06	W	Diesel	UJ	Laboratory Duplicate
PIN-01-NG-131116	1311048-07	W	Diesel	UJ	Laboratory Duplicate
EVE-01-NG-131118	1311048-01	W	Lube Oil	J	Laboratory Duplicate
EVE-01-DG-131118	1311048-02	W	Lube Oil	J	Laboratory Duplicate
EVE-04-NG-131118	1311048-03	W	Lube Oil	J	Laboratory Duplicate
EVE-04-DG-131118	1311048-04	W	Lube Oil	J	Laboratory Duplicate
SR9-01-NG-131118	1311048-05	W	Lube Oil	J	Laboratory Duplicate
SR9-01-DG-131118	1311048-06	W	Lube Oil	J	Laboratory Duplicate
PIN-01-NG-131116	1311048-07	W	Lube Oil	J	Laboratory Duplicate
LAK-01-NC-131008	1310054-02	W	Dichlobenil	J	Laboratory Duplicate
SR9-01-NC-140508	14-A006979	W	Benzo(b)fluoranthene	UJ	Laboratory Duplicate
SR9-01-NC-140508	14-A006979	W	Benzo(b)fluoranthene	UJ	Laboratory Duplicate
EVE-04-NC-140508	14-A006980	W	Benzo(b)fluoranthene	UJ	Laboratory Duplicate
EVE-04-NC-140508	14-A006980	W	Benzo(b)fluoranthene	UJ	Laboratory Duplicate
SR9-01-NC-140613	14-A008772	W	Diethylphthalate	UJ	Laboratory Duplicate
SR9-01-DC-140613	14-A008773	W	Diethylphthalate	UJ	Laboratory Duplicate
PIL-01-NC-140613	14-A008787	W	Diethylphthalate	UJ	Laboratory Duplicate
PIN-01-NC-140614	14-A008790	W	Diethylphthalate	J	Laboratory Duplicate
SR9-01-NG-140523	14-A007596	W	Fecal Coliform	J	Field Duplicate
SR9-01-DG-140523	14-A007597	W	Fecal Coliform	J	Field Duplicate
EVE-04-NG-140613	14-A008671	W	Fecal Coliform	J	Field Duplicate

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Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Comment
EVE-04-DG-140613	14-A008672	W	Fecal Coliform	J	Field Duplicate
PIL-04-NC-140613	14-A008775	W	Total Suspended Solids	J	Field Duplicate
PIL-04-DC-140613	14-A008776	W	Total Suspended Solids	J	Field Duplicate
EVE-04-NC-140613	14-A008788	W	Total Suspended Solids	J	Field Duplicate
EVE-04-DC-140613	14-A008789	W	Total Suspended Solids	J	Field Duplicate
PIL-01-NC-140723	14-A011430	W	Cadmium	J	Field Duplicate
PIL-01-DC-140723	14-A011431	W	Cadmium	J	Field Duplicate
PIL-03-NC-140613	14-11960-YO50H	W	Particle Size, Phi <1	J	Field Duplicate
PIL-03-NC-140613	14-11960-YO50H	W	Particle Size, Phi 1-2	J	Field Duplicate
PIL-03-DC-140613	14-11961-YO50I	W	Particle Size, Phi <1	J	Field Duplicate
PIL-03-DC-140613	14-11961-YO50I	W	Particle Size, Phi 1-2	J	Field Duplicate
PIL-07-NC-140523	14-10345-YL78B	W	Particle Size, Phi 1-2	J	Field Duplicate
PIL-07-NC-140523	14-10345-YL78B	W	Particle Size, Phi 2 to 3	J	Field Duplicate
PIL-07-NC-140523	14-10345-YL78B	W	Particle Size, Phi 8-10	J	Field Duplicate
PIL-07-DC-140523	14-10346-YL78C	W	Particle Size, Phi 1-2	UJ	Field Duplicate
PIL-07-DC-140523	14-10346-YL78C	W	Particle Size, Phi 2 to 3	J	Field Duplicate
PIL-07-DC-140523	14-10346-YL78C	W	Particle Size, Phi 8-10	J	Field Duplicate
PIL-01-NC-140902	14-18242-YZ22A	W	Particle Size, Phi <1	J	Field Duplicate
PIL-01-DC-140902	14-18243-YZ22B	W	Particle Size, Phi <1	J	Field Duplicate
SR9-01-NG140523	14-A007700	W	Diesel	J	Field Duplicate
SR9-01-NG140523	14-A007700	W	Heavy Oil	J	Field Duplicate
SR9-01-DG-140523	14-A007702	W	Diesel	J	Field Duplicate
SR9-01-DG-140523	14-A007702	W	Heavy Oil	J	Field Duplicate
PIL-01-NC-140813	14-A012673	W	*bis*(2-Ethylhexyl)phthalate	J	Field Duplicate
PIL-01-DC-140813	14-A012674	W	*bis*(2-Ethylhexyl)phthalate	J	Field Duplicate
SED-EVE-01-NS-140527	14-A007711	S	*bis*(2-Ethylhexyl)phthalate	J	Field Duplicate
SED-EVE-01-NS-140527	14-A007711	S	Di-*n*-octylphthalate	UJ	Field Duplicate
SED-EVE-01-NS-140527	14-A007711	S	Anthracene	UJ	Field Duplicate
SED-EVE-01-NS-140527	14-A007711	S	Benzo(k)fluoranthene	J	Field Duplicate
SED-EVE-01-DS-140527	14-A007712	S	*bis*(2-Ethylhexyl)phthalate	J	Field Duplicate
SED-EVE-01-DS-140527	14-A007712	S	Di-*n*-octylphthalate	J	Field Duplicate
SED-EVE-01-DS-140527	14-A007712	S	Anthracene	J	Field Duplicate
SED-EVE-01-DS-140527	14-A007712	S	Benzo(k)fluoranthene	J	Field Duplicate

Notes:

J – The analyte was detected in the sample and the reported value was considered as estimated.

Field Duplicate - The relative percent difference (RPD) or concentration difference value for the analysis of the field duplicates did not meet the project control criteria.

Laboratory Duplicate – The RPD or concentration difference value for the duplicate analysis of the field sample, laboratory control sample, or matrix spike did not meet the project control criteria.

S – Sediment

UJ – The analyte was not detected in the sample, and the reported quantitation limit associated with this analyte was considered as estimated.

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Table 3-9 Data Affected by Sample Matrix Interference

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Comment
EVE-04-NC-140508	14-A006980	W	Benzo(a)pyrene	UJ	Internal Standard
EVE-04-NC-140508	14-A006980	W	Benzo(b)fluoranthene	UJ	Internal Standard
EVE-04-NC-140508	14-A006980	W	Benzo(g,h,i)perylene	UJ	Internal Standard
EVE-04-NC-140508	14-A006980	W	Benzo(k)fluoranthene	UJ	Internal Standard
EVE-04-NC-140508	14-A006980	W	Dibenzo(ah)anthracene	UJ	Internal Standard
EVE-04-NC-140508	14-A006980	W	Di-*n*-octylphthalate	UJ	Internal Standard
EVE-04-NC-140508	14-A006980	W	Indeno(123-cd)pyrene	UJ	Internal Standard
SR9-01-NC-140613	14-A008772	W	*bis*(2-Ethylhexyl)phthalate	J	Internal Standard
EVE-04-NC-140613	14-A008788	W	*bis*(2-Ethylhexyl)phthalate	J	Internal Standard
PIL-01-DC-140813	14-A012674	W	Benzo(a)pyrene	R	Internal Standard
PIL-01-DC-140813	14-A012674	W	Benzo(b)fluoranthene	R	Internal Standard
PIL-01-DC-140813	14-A012674	W	Benzo(g,h,i)perylene	R	Internal Standard
PIL-01-DC-140813	14-A012674	W	Benzo(k)fluoranthene	R	Internal Standard
PIL-01-DC-140813	14-A012674	W	Dibenzo(ah)anthracene	R	Internal Standard
PIL-01-DC-140813	14-A012674	W	Di-*n*-octylphthalate	R	Internal Standard
PIL-01-DC-140813	14-A012674	W	Indeno(123-cd)pyrene	R	Internal Standard
SED-SR9-01-NS-140610	14-A008659	S	Benzo(a)anthracene	J	Internal Standard
SED-SR9-01-NS-140610	14-A008659	S	Benzo(a)pyrene	UJ	Internal Standard
SED-SR9-01-NS-140610	14-A008659	S	Benzo(b)fluoranthene	UJ	Internal Standard
SED-SR9-01-NS-140610	14-A008659	S	Benzo(g,h,i)perylene	J	Internal Standard
SED-SR9-01-NS-140610	14-A008659	S	Benzo(k)fluoranthene	UJ	Internal Standard
SED-SR9-01-NS-140610	14-A008659	S	*bis*(2-Ethylhexyl)phthalate	J	Internal Standard
SED-SR9-01-NS-140610	14-A008659	S	Butylbenzylphthalate	J	Internal Standard
SED-SR9-01-NS-140610	14-A008659	S	Chrysene	J	Internal Standard
SED-SR9-01-NS-140610	14-A008659	S	Dibenzo(ah)anthracene	UJ	Internal Standard
SED-SR9-01-NS-140610	14-A008659	S	Di-*n*-octylphthalate	UJ	Internal Standard
SED-SR9-01-NS-140610	14-A008659	S	Indeno(123-cd)pyrene	J	Internal Standard
SED-SR9-01-NS-140610	14-A008659	S	Pyrene	J	Internal Standard
SED-Pin-01-NS-140624	14-A009447	S	Benzo(a)pyrene	UJ	Internal Standard
SED-Pin-01-NS-140624	14-A009447	S	Benzo(b)fluoranthene	UJ	Internal Standard
SED-Pin-01-NS-140624	14-A009447	S	Benzo(g,h,i)perylene	J	Internal Standard
SED-Pin-01-NS-140624	14-A009447	S	Benzo(k)fluoranthene	UJ	Internal Standard
SED-Pin-01-NS-140624	14-A009447	S	Dibenzo(ah)anthracene	UJ	Internal Standard

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Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Comment
SED-Pin-01-NS-140624	14-A009447	S	Di-n-octylphthalate	UJ	Internal Standard
SED-Pin-01-NS-140624	14-A009447	S	Indeno(123-cd)pyrene	J	Internal Standard
EVE-01-NC-140107	1401018-06	W	Butyl benzyl phthalate	J	Ion Abundance
EVE-01-NC-140107	1401018-06	W	Diethyl phthalate	J	Ion Abundance
PIL-01-NC-140107	1401018-21	W	Diethyl phthalate	J	Ion Abundance
PIL-06HNC-140314	1403050-05	W	Benzo(a)pyrene	J	Ion Abundance
PIL-06HNC-140314	1403050-05	W	Benzo(k)fluoranthene	J	Ion Abundance
PIL-06HNC-140314	1403050-05	W	Indeno(1,2,3-cd)pyrene	J	Ion Abundance
SR9-01-NC-140317	1403052-01	W	Benzo(a)pyrene	J	Ion Abundance
EVE-04-NC-140317	1403052-03	W	Anthracene	J	Ion Abundance
EVE-04-NC-140317	1403052-03	W	Benzo(a)pyrene	J	Ion Abundance
EVE-04-NC-140317	1403052-03	W	Di-n-octyl Phthalate	J	Ion Abundance
EVE-04-DC-140317	1403052-04	W	Anthracene	J	Ion Abundance
EVE-04-DC-140317	1403052-04	W	Benzo(a)pyrene	J	Ion Abundance
PIL-01-NC-140319	1403069-01	W	Benzo(a)pyrene	J	Ion Abundance
EVE-01-NC-140319	1403069-02	W	Benz[a]anthracene	J	Ion Abundance
EVE-01-NC-140319	1403069-02	W	Benzo(a)pyrene	J	Ion Abundance
EVE-01-DC-140319	1403069-03	W	Benzo(a)pyrene	J	Ion Abundance
SR9-01-NC-140319	1403069-04	W	Anthracene	J	Ion Abundance
SR9-01-NC-140319	1403069-04	W	Benzo(a)pyrene	J	Ion Abundance
PIN-01-NC-140417	1404062-01	W	Benz[a]anthracene	J	Ion Abundance
PIN-01-NC-140417	1404062-01	W	Benzo(a)pyrene	J	Ion Abundance
SR9-01-NC-140422	1404066-02	W	Benzo(a)pyrene	J	Ion Abundance
EVE-04-NC-140422	1404066-08	W	Benz[a]anthracene	J	Ion Abundance
EVE-04-NC-140422	1404066-08	W	Benzo(a)pyrene	J	Ion Abundance
EVE-01-NC-140422	1404066-11	W	Benz[a]anthracene	J	Ion Abundance
EVE-01-NC-140422	1404066-11	W	Benzo(a)pyrene	J	Ion Abundance
SR9-01-NC-140423	1404069-02	W	Benz[a]anthracene	J	Ion Abundance
SR9-01-NC-140423	1404069-02	W	Benzo(a)pyrene	J	Ion Abundance
SED-SR9-01-NS-140610	14-A008659	S	Zinc	J	ICS %R >UCL
SED-Pin-01-NS-140624	14-A009447	S	Zinc	J	ICS %R >UCL

Notes:

Primary causes preventing accurate compound identification included: (1) matrix interference where non-target chemical/subject affected chromatographic resolution of the target compound; and (2) ion abundance ratio for the reported detection that did not meet method criteria for compound identification.

ICS – Interference check sample

Internal Standard – The internal standard %R value was less than the lower control limit (LCL).
Ion Abundance – The mass spectrometry ion abundance ratios did not meet the method requirements for a compound identification.
J – The analyte was detected in the sample and the reported value was considered as estimated.
R – The reported result was rejected and could not be used.
S – Sediment
UCL – Upper control limit
UJ – The analyte was not detected in the sample, and the reported quantitation limit associated with this analyte was considered as estimated.
W – Water

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Appendix D:
Sampling Attempt Record

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WY13 and 14 Highway Storm Attempt Record					
Station	**Storm Start Date**	**Attempt**	**Rainfall Qualified?**	**Grab samples collected?**	**Notes**
EVERETT 01	10/12/2012	Successful	NO	YES	Toxicity sample collection -Grab samples only
EVERETT 01	10/18/2012	Failed	YES	NO	Insufficient number of aliquots collected
EVERETT 01	11/6/2012	Successful	YES	NO	Grabs missed due to lack of available staff
EVERETT 01	11/16/2012	Not attempted	YES	NO	Staff unavailable
EVERETT 01	11/28/2012	Failed	NO	NO	Insufficient number of aliquots collected
EVERETT 01	12/11/2012	Successful	YES	YES	Only grabs samples collected
EVERETT 01	1/23/2013	Not attempted	YES	NO	Frozen sample points
EVERETT 01	2/11/2013	Successful	NO	YES	Only grabs samples collected
EVERETT 01	2/16/2013	Failed	YES	NO	Equipment failure
EVERETT 01	2/20/2013	Failed	NO	NO	Insufficient rainfall
EVERETT 01	2/22/2013	Successful	YES	YES	Only grabs samples collected
EVERETT 01	2/25/2013	Not attempted	YES	NO	Staff unavailable
EVERETT 01	2/27/2013	Failed	NO	NO	< 75% hydrograph collected
EVERETT 01	3/2/2013	Successful	YES	NO	Grabs missed due to lack of available staff
EVERETT 01	3/5/2013	Failed	YES	NO	< 75% hydrograph collected
EVERETT 01	3/6/2013	Successful	YES	YES	Only grabs samples collected
EVERETT 01	3/10/2013	Failed	NO	NO	No rainfall
EVERETT 01	3/14/2013	Failed	YES	NO	Equipment failure
EVERETT 01	3/19/2013	Successful	YES	NO	Grabs missed due to lack of available staff
EVERETT 01	4/4/2013	Failed	YES	NO	< 75% hydrograph collected
EVERETT 01	4/9/2013	Failed	YES	NO	< 75% hydrograph collected
EVERETT 01	4/12/2013	Successful	YES	NO	Grabs missed due to lack of available staff
EVERETT 01	4/18/2013	Failed	YES	NO	Equipment failure
EVERETT 01	5/11/2013	Successful	NO	NO	Grabs missed due to lack of available staff
EVERETT 01	5/20/2013	N/A	N/A	N/A	Sediment sample collection
EVERETT 01	5/21/2013	Successful	YES	YES	
EVERETT 01	9/15/2013	Not attempted	NO	NO	Staff unavailable
EVERETT 01	10/12/2013	Successful	NO	YES	Toxicity sample collection
EVERETT 01	10/1/2013	Not attempted	NO	NO	Equipment failure
EVERETT 01	10/6/2013	Not attempted	NO	NO	No rainfall
EVERETT 01	11/2/2013	Not attempted	YES	NO	Rainfall inadequate
EVERETT 01	11/9/2013	Not attempted	NO	NO	Rainfall inadequate
EVERETT 01	11/15/2013	Not attempted	NO	NO	Did not meet antecedent
EVERETT 01	11/18/2013	Successful	YES	YES	Only grabs samples collected
EVERETT 01	12/12/2013	Failed	NO	NO	Rainfall inadequate, frozen sample points
EVERETT 01	1/2/2014	Not attempted	NO	NO	
EVERETT 01	1/7/2014	Successful	YES	YES	

EVERETT 01	1/28/2014	Successful	YES	NO	Grabs missed due to lack of available staff
EVERETT 01	1/29/2014	Successful	YES	YES	Only grabs samples collected
EVERETT 01	2/18/2014	Successful	YES	YES	Only grabs samples collected
EVERETT 01	3/2/2014	Successful	NO	YES	Only grabs samples collected, did not meet antecedent
EVERETT 01	3/13/2014	Failed	NO	NO	Insufficient aliquots collected
EVERETT 01	3/16/2014	Failed	YES	NO	Attempt at non-qualifying forecast event.
EVERETT 01	3/19/2014	Successful	YES	YES	
EVERETT 01	4/3/2014	Not attempted	NO	NO	Rainfall inadequate
EVERETT 01	4/8/2014	Successful	YES	YES	Only grabs samples collected
EVERETT 01	4/15/2014	Not attempted	NO	NO	No rainfall
EVERETT 01	4/17/2014	Successful	YES	YES	Only grabs samples collected
EVERETT 01	4/21/2014	Successful	YES	NO	Grabs missed due to lack of available staff
EVERETT 01	4/26/2014	Not attempted	NO	NO	Rainfall inadequate
EVERETT 01	5/8/2014	Successful	NO	YES	Only grabs samples collected
EVERETT 01	5/18/2014	Not attempted	NO	NO	No rainfall
EVERETT 01	5/23/2014	Successful	YES	YES	Only grabs samples collected
EVERETT 01	5/27/2014	N/A	N/A	N/A	Sediment sampling
EVERETT 01	5/28/2014	Failed	NO	NO	Rainfall inadequate
EVERETT 01	6/12/2014	Successful	YES	YES	
EVERETT 01	6/16/2014	Not attempted	NO	NO	Rainfall inadequate
EVERETT 01	6/27/2014	Successful	NO	YES	
EVERETT 01	7/19/2014	Failed	NO	NO	No rainfall
EVERETT 01	7/23/2014	Successful	YES	YES	
EVERETT 01	7/24/2014	Failed	YES	NO	Field crew did not get on site before ran stopped
EVERETT 01	8/12/2014	Failed	YES	NO	Less than 75% of hydrograph sampled
EVERETT 01	9/2/2014	Not attempted	YES	NO	Staff unavailable
EVERETT 01	9/23/2014	Successful	YES	YES	
EVERETT 04	10/12/2012	Successful	NO	YES	Toxicity sample collection -Grab samples only
EVERETT 04	10/18/2012	Failed	YES	NO	Insufficient number of aliquots collected
EVERETT 04	11/6/2012	Successful	YES	NO	Grabs missed due to lack of available staff
EVERETT 04	11/16/2012	Not attempted	YES	NO	Staff unavailable
EVERETT 04	11/28/2012	Failed	NO	NO	Insufficient number of aliquots collected
EVERETT 04	12/11/2012	Successful	YES	YES	Only grabs samples collected
EVERETT 04	1/23/2013	Not attempted	YES	NO	Frozen sample points
EVERETT 04	2/11/2013	Failed	NO	NO	No samples collected
EVERETT 04	2/16/2013	Successful	YES	NO	Grabs missed due to lack of available staff
EVERETT 04	2/20/2013	Failed	NO	NO	Insufficient rainfall
EVERETT 04	2/22/2013	Successful	YES	YES	Only grabs samples collected
EVERETT 04	2/25/2013	Not attempted	Yes	NO	Staff unavailable
EVERETT 04	2/27/2013	Failed	NO	NO	< 75% hydrograph collected

EVERETT 04	3/2/2013	Successful	YES	NO	Grabs missed due to lack of available staff
EVERETT 04	3/5/2013	Failed	YES	NO	< 75% hydrograph collected
EVERETT 04	3/6/2013	Successful	YES	YES	Only grabs samples collected
EVERETT 04	3/10/2013	Failed	NO	NO	No rainfall
EVERETT 04	3/14/2013	Failed	YES	NO	Insufficient aliquots collected
EVERETT 04	3/19/2013	Successful	YES	NO	Grabs missed due to lack of available staff
EVERETT 04	4/4/2013	Failed	YES	NO	< 75% hydrograph collected
EVERETT 04	4/9/2013	Failed	YES	NO	< 75% hydrograph collected
EVERETT 04	4/12/2013	Successful	YES	NO	Grabs missed due to lack of available staff
EVERETT 04	4/18/2013	Successful	YES	NO	Grabs missed due to lack of available staff
EVERETT 04	5/12/2013	Failed	NO	NO	Inadequate aliquots collected
EVERETT 04	5/21/2013	Successful	YES	YES	
EVERETT 04	6/10/2013	N/A	N/A	N/A	Sediment sample collection
EVERETT 04	9/15/2013	Successful	NO	NO	Toxicity sample collection
EVERETT 04	10/12/2013	Successful	NO	YES	Toxicity sample collection
EVERETT 04	10/1/2013	Not attempted	NO	NO	Equipment failure
EVERETT 04	10/6/2013	Not attempted	NO	NO	No rainfall
EVERETT 04	11/2/2013	Not attempted	YES	NO	
EVERETT 04	11/9/2013	Not attempted	NO	NO	Rainfall inadequate
EVERETT 04	11/15/2013	Not attempted	NO	NO	Did not meet antecedent
EVERETT 04	11/18/2013	Successful	NO	YES	Only grabs samples collected
EVERETT 04	12/12/2013	Failed	NO	NO	Rainfall inadequate, frozen sample points
EVERETT 04	1/2/2014	Not attempted	NO	NO	
EVERETT 04	1/7/2014	Successful	YES	YES	
EVERETT 04	1/28/2014	Successful	YES	NO	Grabs missed due to lack of available staff
EVERETT 04	1/29/2014	Successful	YES	YES	Only grabs samples collected
EVERETT 04	2/19/2014	Successful	YES	YES	Only grabs samples collected
EVERETT 04	3/3/2014	Successful	NO	YES	Only grabs samples collected, did not meet antecedent
EVERETT 04	3/13/2014	Failed	NO	NO	Insufficient aliquots collected
EVERETT 04	3/15/2014	Successful	YES	NO	Grabs missed due to lack of available staff
EVERETT 04	3/19/2014	Successful	YES	NO	Only grabs samples collected
EVERETT 04	4/3/2014	Not attempted	NO	NO	
EVERETT 04	4/8/2014	Successful	YES	YES	
EVERETT 04	4/15/2014	Not attempted	NO	NO	No rainfall
EVERETT 04	4/17/2014	Successful	YES	YES	Only grabs samples collected
EVERETT 04	4/21/2014	Successful	YES	NO	Grabs missed due to lack of available staff
EVERETT 04	4/26/2014	Not attempted	NO	NO	Rainfall inadequate
EVERETT 04	5/8/2014	Successful	YES	YES	
EVERETT 04	5/18/2014	Not attempted	NO	NO	No rainfall
EVERETT 04	5/23/2014	Successful	YES	YES	Only grabs samples collected
EVERETT 04	5/27/2014	N/A	N/A	N/A	Sediment sampling

EVERETT 04	5/28/2014	Failed	NO	NO	Rainfall inadequate
EVERETT 04	6/12/2014	Successful	YES	YES	
EVERETT 04	6/16/2014	Not attempted	NO	NO	Rainfall inadequate
EVERETT 04	6/28/2014	Successful	NO	YES	Only grabs samples collected, rainfall inadequate, insufficient aliquots collected
EVERETT 04	7/19/2014	Failed	NO	NO	No rainfall
EVERETT 04	7/23/2014	Successful	YES	YES	
EVERETT 04	7/24/2014	Failed	YES	NO	
EVERETT 04	8/12/2014	Failed	YES	NO	Less than 75% of hydrograph sampled
EVERETT 04	9/2/2014	Not attempted	YES	NO	Staff unavailable
EVERETT 04	9/23/2014	Successful	YES	YES	
PILCHUCK 01	10/12/2012	Successful	NO	YES	Toxicity sample collection -Grab samples only
PILCHUCK 01	10/18/2012	Successful	YES	YES	
PILCHUCK 01	11/7/2012	Successful	NO	NO	
PILCHUCK 01	11/16/2012	Not attempted	YES	NO	Staff unavailable
PILCHUCK 01	11/28/2012	Failed	NO	NO	Inadequate rainfall
PILCHUCK 01	12/11/2012	Successful	YES	YES	Only grabs samples collected
PILCHUCK 01	1/23/2013	Failed	YES	NO	Frozen sample points
PILCHUCK 01	2/3/2013	Failed	NO	NO	Inadequate rainfall
PILCHUCK 01	2/11/2013	Successful	NO	YES	Only grabs samples collected
PILCHUCK 01	2/16/2013	Successful	YES	NO	Grabs missed due to lack of available staff
PILCHUCK 01	2/21/2013	Successful	NO	YES	
PILCHUCK 01	2/24/2013	Successful	YES	YES	
PILCHUCK 01	2/28/2013	Successful	YES	NO	Grabs missed due to lack of available staff
PILCHUCK 01	3/2/2013	Successful	YES	NO	Grabs missed due to lack of available staff
PILCHUCK 01	3/5/2013	Failed	YES	NO	< 75% hydrograph collected
PILCHUCK 01	3/6/2013	Successful	YES	YES	Only grabs samples collected
PILCHUCK 01	3/10/2013	Failed	NO	NO	No rainfall
PILCHUCK 01	3/13/2013	Failed	NO	NO	Inadequate rainfall
PILCHUCK 01	3/20/2013	Successful	YES	NO	Grabs missed due to lack of available staff
PILCHUCK 01	4/4/2013	Failed	YES	NO	Insufficient number of aliquots collected
PILCHUCK 01	4/10/2013	Failed	NO	NO	Inadequate rainfall
PILCHUCK 01	4/12/2013	Successful	YES	NO	Grabs missed due to lack of available staff
PILCHUCK 01	4/17/2013	Failed	NO	NO	Inadequate rainfall
PILCHUCK 01	5/12/2013	Failed	YES	NO	Equipment failure/insufficient aliquots collected
PILCHUCK 01	6/10/2013	N/A	N/A	N/A	Sediment sample collection
PILCHUCK 01	9/15/2013	Failed	NO	NO	Toxicity sample attempt
PILCHUCK 01	10/7/2013	Not attempted	YES	NO	Toxicity sample attempt-Field staff unavailable

PILCHUCK 01	10/12/2013	Successful	NO	YES	Toxicity sample collection
PILCHUCK 01	10/6/2013	Not attempted	YES	NO	Staff unavailable
PILCHUCK 01	11/3/2013	Not attempted	YES	NO	Staff unavailable
PILCHUCK 01	11/9/2013	Not attempted	NO	NO	Staff unavailable
PILCHUCK 01	11/15/2013	Not attempted	NO	NO	Staff unavailable
PILCHUCK 01	12/12/2013	Failed	NO	NO	Rainfall inadequate, frozen sample points
PILCHUCK 01	1/2/2014	Not attempted	NO	NO	
PILCHUCK 01	1/7/2014	Successful	YES	YES	
PILCHUCK 01	1/28/2014	Successful	YES	YES	
PILCHUCK 01	2/13/2014	Not attempted	NO	NO	
PILCHUCK 01	2/18/2014	Successful	NO	YES	Only grabs samples collected
PILCHUCK 01	3/2/2014	Successful	NO	YES	Only grabs samples collected
PILCHUCK 01	3/13/2014	Failed	YES	NO	Insufficient number of aliquots collected
PILCHUCK 01	3/19/2014	Successful	YES	YES	
PILCHUCK 01	4/3/2014	Failed	NO	NO	
PILCHUCK 01	4/8/2014	Successful	YES	YES	
PILCHUCK 01	4/16/2014	Successful	YES	YES	Only grabs samples collected
PILCHUCK 01	4/21/2014	Failed	YES	NO	Insufficient number of aliquots collected
PILCHUCK 01	4/26/2014	Not attempted	NO	NO	Inadequate rainfall
PILCHUCK 01	5/8/2014	Successful	YES	YES	Only grabs samples collected
PILCHUCK 01	5/18/2014	Not attempted	NO	NO	Inadequate rainfall
PILCHUCK 01	5/23/2014	Not attempted	YES	YES	
PILCHUCK 01	5/27/2014	N/A	N/A	N/A	Sediment sampling
PILCHUCK 01	5/29/2014	Successful	NO	NO	Only grabs samples collected
PILCHUCK 01	6/12/2014	Successful	YES	YES	
PILCHUCK 01	6/16/2014	Not attempted	YES	NO	
PILCHUCK 01	6/27/2014	Successful	NO	YES	Only grabs samples collected
PILCHUCK 01	7/19/2014	Failed	NO	NO	No rainfall
PILCHUCK 01	7/23/2014	Successful	YES	YES	
PILCHUCK 01	7/24/2014	Failed	YES	NO	Staff unavailable
PILCHUCK 01	8/13/2014	Successful	YES	NO	Grabs missed due to lack of available staff
PILCHUCK 01	9/2/2014	Successful	YES	YES	
PILCHUCK 01	9/23/2014	Successful	YES	YES	Grabs only
PINES 01	10/12/2012	Failed	NO	NO	Inadequate rainfall
PINES 01	10/15/2012	Failed	NO	NO	Inadequate rainfall
PINES 01	10/18/2012	Failed	NO	NO	No rainfall
PINES 01	10/22/2012	Failed	NO	NO	Inadequate rainfall
PINES 01	10/31/2012	Failed	NO	NO	Inadequate rainfall
PINES 01	11/12/2012	Not attempted	Yes	NO	Staff unavailable
PINES 01	11/29/2012	Failed	NO	NO	Inadequate rainfall
PINES 01	12/4/2012	Successful	NO	YES	
PINES 01	2/27/2013	Failed	NO	NO	Inadequate rainfall
PINES 01	3/6/2013	Failed	NO	NO	Inadequate rainfall
PINES 01	3/11/2013	Failed	NO	NO	Inadequate rainfall
PINES 01	3/19/2013	Failed	YES	NO	Equipment failure

PINES 01	4/19/2013	Successful	YES	NO	Grabs missed due to lack of available staff
PINES 01	4/21/2013	Successful	YES	NO	Not forecast to qualify; grabs missed due to lack of available staff
PINES 01	5/13/2013	Failed	NO	NO	Inadequate rainfall
PINES 01	5/21/2013	Successful	YES	NO	Grabs missed due to lack of available staff
PINES 01	5/29/2013	Failed	NO	NO	Inadequate rainfall
PINES 01	6/2/2013	Successful	YES	NO	Not forecast to qualify; grabs missed due to lack of available staff
PINES 01	6/3/2013	Successful	NO	YES	Only grabs samples collected
PINES 01	6/4/2013	N/A	N/A	N/A	Sediment sample collection
PINES 01	6/18/2013	Failed	NO	NO	Inadequate rainfall
PINES 01	6/19/2013	Successful	NO	YES	Only grabs samples collected
PINES 01	6/23/2013	Failed	NO	NO	Inadequate rainfall
PINES 01	8/2/2013	Successful	YES	NO	Grabs missed due to lack of available staff
PINES 01	9/4/2013	Failed	YES	NO	Equipment failure
PINES 01	9/17/2013	Failed	NO	NO	Inadequate rainfall
PINES 01	9/22/2013	Failed	NO	NO	Inadequate rainfall
PINES 01	11/6/2013	Not attempted	YES	NO	Staff unavailable
PINES 01	11/9/2013	Not attempted	NO	NO	Staff unavailable
PINES 01	11/15/2013	Successful	YES	YES	
PINES 01	11/18/2013	Not attempted	NO	NO	Staff unavailable
PINES 01	1/8/2014	Not attempted	YES	NO	Staff unavailable
PINES 01	1/10/2014	Not attempted	NO	NO	Staff unavailable
PINES 01	3/4/2014	Not attempted	NO	NO	Rain on snow event
PINES 01	3/14/2014	Successful	YES	YES	Only grabs samples collected
PINES 01	3/16/2014	Failed	NO	NO	Equipment failure
PINES 01	3/19/2014	Successful	NO	YES	Only grabs samples collected
PINES 01	3/26/2014	Not attempted	NO	NO	Staff unavailable
PINES 01	3/28/2014	Not attempted	NO	NO	Equipment failure
PINES 01	4/16/2014	Successful	YES	YES	Only grabs samples collected
PINES 01	4/17/2014	Successful	YES	YES	
PINES 01	4/21/2014	Not attempted	NO	NO	No rain
PINES 01	4/22/2014	Not attempted	NO	NO	Staff unavailable
PINES 01	4/24/2014	Successful	YES	YES	
PINES 01	5/8/2014	Not attempted	YES	NO	Staff unavailable
PINES 01	6/2/2014	Successful	NO	YES	Only grabs samples collected
PINES 01	6/14/2014	Successful	NO	NO	Not forecast to qualify; grabs missed due to lack of available staff
PINES 01	6/17/2014	Successful	YES	YES	Only grabs samples collected
PINES 01	6/24/2014	N/A	N/A	N/A	Sediment sampling
PINES 01	6/26/2014	Failed	NO	NO	Attempt at non-qualifying event, rainfall inadequate
PINES 01	6/27/2014	Successful	NO	NO	Attempt at non-qualifying event,

					Grabs missed due to lack of available staff
PINES 01	7/23/2014	Not attempted	NO	NO	Equipment failure on 7/24, No rain on 7/23
PINES 01	8/13/2014	Failed	NO	NO	
PINES 01	8/15/2014	Not attempted	NO	NO	Staff unavailable
PINES 01	9/3/2014	Successful	YES	NO	Grabs missed due to lack of available staff
SR9 01	10/12/2012	Successful	NO	YES	Toxicity sample collection -Grab samples only
SR9 01	10/18/2012	Successful	YES	NO	
SR9 01	11/6/2012	Successful	YES	NO	Grabs missed due to lack of available staff
SR9 01	11/16/2012	Not attempted	YES	NO	Staff unavailable
SR9 01	11/28/2012	Failed	NO	NO	Inadequate rainfall
SR9 01	12/11/2012	Successful	YES	YES	Only grabs samples collected
SR9 01	1/23/2013	Failed	YES	NO	Frozen sample points
SR9 01	2/4/2013	Failed	NO	NO	Inadequate rainfall
SR9 01	2/11/2013	Failed	NO	NO	Inadequate rainfall
SR9 01	2/16/2013	Not attempted	YES	NO	Staff unavailable
SR9 01	2/21/2013	Successful	NO	YES	Only grabs samples collected
SR9 01	2/25/2013	Failed	NO	NO	Inadequate rainfall
SR9 01	3/2/2013	Successful	YES	NO	Grabs missed due to lack of available staff
SR9 01	3/5/2013	Failed	YES	NO	Inadequate rainfall
SR9 01	3/6/2013	Successful	YES	YES	Only grabs samples collected
SR9 01	3/10/2013	Failed	NO	NO	No rainfall
SR9 01	3/19/2013	Successful	YES	NO	Grabs missed due to lack of available staff
SR9 01	4/4/2013	Successful	YES	NO	Grabs missed due to lack of available staff
SR9 01	4/9/2013	Failed	NO	NO	Inadequate rainfall
SR9 01	4/12/2013	Successful	NO	NO	Grabs missed due to lack of available staff
SR9 01	4/17/2013	Failed	NO	NO	Inadequate rainfall
SR9 01	4/18/2013	Successful	YES	NO	Grabs missed due to lack of available staff
SR9 01	5/9/2013	N/A	N/A	N/A	Sediment sample collection
SR9 01	5/12/2013	Failed	NO	NO	Equipment failure
SR9 01	5/21/2013	Successful	YES	YES	Not forecast to qualify, grabs collected only
SR9 01	9/5/2013	Not attempted	N/A	N/A	Equipment inoperable because of vehicle accident
SR9 01	9/15/2013	Not attempted	N/A	N/A	Equipment inoperable because of vehicle accident
SR9 01	9/20/2013	Not attempted	N/A	N/A	Equipment inoperable because of vehicle accident
SR9 01	9/22/2013	Not attempted	N/A	N/A	Equipment inoperable because of vehicle accident
SR9 01	10/12/2013	Successful	NO	YES	Toxicity sampling
SR9 01	10/30/2013	Successful	NO	NO	Toxicity sampling
SR9 01	10/1/2013	Not attempted	NO	NO	Equipment failure

SR9 01	10/6/2013	Not attempted	NO	NO	Staff unavailable
SR9 01	11/1/2013	Not attempted	YES	NO	Staff unavailable
SR9 01	11/4/2013	Failed	NO	NO	Inadequate rainfall
SR9 01	11/9/2013	Not attempted	NO	NO	Staff unavailable
SR9 01	11/14/2013	Not attempted	NO	NO	Staff unavailable
SR9 01	11/18/2013	Successful	YES	YES	Only grabs samples collected
SR9 01	12/12/2013	Failed	NO	NO	Frozen sample point
SR9 01	1/2/2014	Not attempted	NO	NO	Staff unavailable
SR9 01	1/7/2014	Successful	YES	YES	
SR9 01	1/28/2014	Successful	YES	NO	Grabs missed due to lack of available staff
SR9 01	2/18/2014	Successful	YES	YES	Only grabs samples collected
SR9 01	3/3/2014	Successful	NO	YES	Only grabs samples collected
SR9 01	3/13/2014	Failed	NO	NO	Inadequate rainfall, Insufficient number of aliquots collected
SR9 01	3/15/2014	Successful	YES	NO	Grabs missed due to lack of available staff
SR9 01	3/19/2014	Successful	YES	YES	
SR9 01	4/3/2014	Failed	NO	NO	Inadequate rainfall
SR9 01	4/8/2014	Successful	YES	YES	
SR9 01	4/15/2014	Failed	NO	NO	Inadequate rainfall
SR9 01	4/16/2014	Successful	YES	YES	Only grabs samples collected
SR9 01	4/21/2014	Successful	YES	NO	Grabs missed due to lack of available staff
SR9 01	4/22/2014	Successful	NO	NO	Grabs missed due to lack of available staff
SR9 01	4/23/2014	Not attempted	NO	NO	Inadequate rainfall
SR9 01	5/4/2014	Not attempted	NO	NO	Antecedent not met
SR9 01	5/8/2014	Successful	YES	YES	
SR9 01	5/17/2014	Not attempted	NO	NO	No rain
SR9 01	5/19/2014	Failed	NO	NO	Inadequate rainfall, Insufficient number of aliquots collected
SR9 01	5/23/2014	Successful	YES	YES	
SR9 01	5/28/2014	Successful	NO	YES	Only grabs samples collected
SR9 01	6/10/2014	N/A	N/A	N/A	Sediment sampling
SR9 01	6/12/2014	Successful	YES	YES	
SR9 01	6/16/2014	Not attempted	NO	NO	Staff unavailable
SR9 01	6/28/2014	Successful	NO	YES	Only grabs samples collected
SR9 01	7/19/2014	Failed	NO	NO	Insufficient number of aliquots collected
SR9 01	7/23/2014	Successful	YES	YES	
SR9 01	7/24/2014	Failed	YES	NO	Staff unavailable
SR9 01	8/13/2014	Successful	YES	NO	Grabs missed due to lack of available staff
SR9 01	9/2/2014	Not attempted	YES	NO	Staff unavailable
SR9 01	9/18/2014	Successful	YES	YES	Only grabs samples collected
SR9 01	9/23/2014	Successful	YES	NO	Grabs missed due to lack of available staff

Appendix E:
Data Tables

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Pilchuck 01		Storm Events													
Parameter	**UNITS**	**6/22/12**		**7/20/12**		**10/12/12**		**10/18/12**		**11/7/12**		**12/11/12**		**2/11/13**	
Conventionals															
TSS	mg/L	29		117		--		31		21		--		--	
Chloride	mg/L	1.53		2.78		--		0.92		2.77		--		--	
Hardness as $CaCO_3$	mg/L	25.6		38		--		17		17.4		--		--	
Bacteria															
Fecal coliform	cfu/100mL	--		--		80		18		--		110000		2000	
Nutrients															
Total Phosphorous	mg/L	0.0806		0.266		--		0.0687		0.0562		--		--	
Orthophosphate	mg/L	--		--		--		0.0163	J	0.0142		--		--	
Total Kjeldahl Nitrogen	mg/L	1	J	1.4		--		--		--		--		--	
Nitrate-Nitrite	mg/L	0.112		0.411		--		--		--		--		--	
Metals															
Total Recoverable Copper	ug/L	--		--		--		16		11.4		--		--	
Dissolved Copper	ug/L	--		--		--		3.99		4.51	J	--		--	
Total Recoverable Lead	ug/L	--		--		--		--		--		--		--	
Dissolved Lead	ug/L	--		--		--		--		--		--		--	
Total Recoverable Cadmium	ug/L	--		--		--		--		--		--		--	
Dissolved Cadmium	ug/L	--		--		--		--		--		--		--	
Total Recoverable Zinc	ug/L	--		--		--		62.8		56	J	--		--	
Dissolved Zinc	ug/L	--		--		--		16.8		26	J	--		--	
PAH Compounds															
Acenaphthene	ug/L	0.0098	U	0.0098	U	--		0.011	U	--		--		--	
Acenaphthylene	ug/L	0.0098	U	0.023		--		0.011	U	--		--		--	
Anthracene	ug/L	0.0098	U	0.0098	U	--		0.055		--		--		--	
Benzo(a)anthracene	ug/L	0.0098	U	0.021		--		0.011	U	--		--		--	
Benzo(b)fluoranthene	ug/L	0.020		0.063		--		0.011	U	--		--		--	
Benzo(k)fluoranthene	ug/L	0.0098	U	0.017		--		0.011	U	--		--		--	
Benzo(ghi)perylene	ug/L	0.041		0.12		--		0.043		--		--		--	
Benzo(a)pyrene	ug/L	0.011		0.04		--		0.033	J	--		--		--	
Chrysene	ug/L	0.016		0.042		--		0.011	U	--		--		--	
Dibenzo(a,h)anthracene	ug/L	0.0098	U	0.0098	U	--		0.011	U	--		--		--	

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Pilchuck 01 (Continued)	Storm Events														
Parameter	**UNITS**	**6/22/12**		**7/20/12**		**10/12/12**		**10/18/12**		**11/7/12**		**12/11/12**		**2/11/13**	
PAH Compounds (Continued)															
Fluoranthene	ug/L	0.033		0.089		--		0.062		--		--		--	
Fluorene	ug/L	0.0098	U	0.0098	U	--		0.015	J	--		--		--	
Indeno(1,2,3-cd)pyrene	ug/L	0.12		0.041		--		0.011	U	--		--		--	
Naphthalene	ug/L	0.013	UJ	0.022		--		0.018		--		--		--	
Phenanthrene	ug/L	0.019		0.04	J	--		0.041		--		--		--	
Pyrene	ug/L	0.052		0.13		--		0.063		--		--		--	
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	4.3	J	7.1		--		4.1	J	--		--		--	
Butyl benzyl phthalate	ug/L	0.20	U	0.2	U	--		0.22	J	--		--		--	
Di-n-butyl phthalate	ug/L	0.26	UJ	0.3	UJ	--		0.25	UJ	--		--		--	
Diethyl phthalate	ug/L	0.20	U	0.16	J	--		0.22	U	--		--		--	
Dimethyl phthalate	ug/L	0.20	U	0.84		--		0.22	U	--		--		--	
Di-n-octyl phthalate	ug/L	0.77	J	0.2	U	--		0.75	J	--		--		--	
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--		--	
Glyphosate	ug/L	25	U	25	U	--		--		25	U	--		--	
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	--		--		1.45		1.05		--		8.65		3.95	
Diesel	mg/L	--		--		0.05	U	0.05	U	--		0.15	U	0.15	UJ
Lube Oil	mg/L	--		--		1.4		1		--		8.5		3.8	J
TPH-Gas (NWTPH-Gx)	mg/L	--		--		0.07	U	0.07	U	--		0.07	U	0.07	U
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	0.01	U	0.2		--		0.01	U	--		--		--	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	3.81		11.54		--		4.04		--		--		--	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	4.55		1.43		--		0.01	U	--		--		--	
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	0.01	U	0.02		--		0.01	U	--		--		--	
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	0.01	U	42.14		--		0.01	U	--		--		--	
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	26.42		65.4		--		21.85		--		--		--	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	5.42		13.82		--		5.96		--		--		--	

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TPH-Diesel (NWTPH-Dx) values are calculated as the sum of the Diesel and Lube Oil concentrations

Pilchuck 01 (Continued)		Storm Events													
Parameter	UNITS	2/16/13		2/21/13		2/24/13		2/28/13		3/2/13		3/6/13		3/20/13	
Conventionals															
TSS	mg/L	50		--		32		66		77		--		53	
Chloride	mg/L	13.7		27.6		19.5		--		5.39		--		7.09	
Hardness as $CaCO_3$	mg/L	31.4		--		46.5		29.7		22.8		--		36	
Bacteria															
Fecal coliform	cfu/100mL	--		1200		--		--		--		--		--	
Nutrients															
Total Phosphorous	mg/L	0.0886		0.115		0.0659		0.104		0.0947		--		--	
Orthophosphate	mg/L	--		0.01	U	--		0.01	U	--		--		0.01	U
Total Kjeldahl Nitrogen	mg/L	0.84	U	0.99	U	--		1.1	J	0.57	J	--		0.66	J
Nitrate-Nitrite	mg/L	0.566		0.351		--		0.089		0.078		--		0.115	
Metals															
Total Recoverable Copper	ug/L	--		28.1		--		30.7		--		--		22.3	
Dissolved Copper	ug/L	--		9.9		--		6.3		--		--		6.75	
Total Recoverable Lead	ug/L	--		--		--		--		--		--		--	
Dissolved Lead	ug/L	--		--		--		--		--		--		--	
Total Recoverable Cadmium	ug/L	--		--		--		--		--		--		--	
Dissolved Cadmium	ug/L	--		--		--		--		--		--		--	
Total Recoverable Zinc	ug/L	--		128		--		130		--		--		87.9	
Dissolved Zinc	ug/L	--		32.1		--		15.6		--		--		16.2	
PAH Compounds															
Acenaphthene	ug/L	0.0098	U	--		--		0.01	U	--		--		0.01	U
Acenaphthylene	ug/L	0.0098	U	--		--		0.01	U	--		--		0.01	U
Anthracene	ug/L	0.0098	U	--		--		0.015		--		--		0.0078	J
Benzo(a)anthracene	ug/L	0.021		--		--		0.047		--		--		0.015	
Benzo(b)fluoranthene	ug/L	0.05		--		--		0.051		--		--		0.027	
Benzo(k)fluoranthene	ug/L	0.019		--		--		0.037		--		--		0.02	
Benzo(ghi)perylene	ug/L	0.021		--		--		0.091		--		--		0.06	
Benzo(a)pyrene	ug/L	0.024		--		--		0.033		--		--		0.021	
Chrysene	ug/L	0.052		--		--		0.068		--		--		0.047	
Dibenzo(a,h)anthracene	ug/L	0.0098	U	--		--		0.011		--		--		0.01	U

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Pilchuck 01 (Continued)		Storm Events													
Parameter	**UNITS**	**2/16/13**		**2/21/13**		**2/24/13**		**2/28/13**		**3/2/13**		**3/6/13**		**3/20/13**	
PAH Compounds (Continued)															
Fluoranthene	ug/L	0.073		--		--		0.17		--		--		0.065	
Fluorene	ug/L	0.0098	U	--		--		0.012		--		--		0.01	UJ
Indeno(1,2,3-cd)pyrene	ug/L	0.018		--		--		0.031		--		--		0.016	
Naphthalene	ug/L	0.022		--		--		0.014		--		--		0.013	U
Phenanthrene	ug/L	0.048		--		--		0.078		--		--		0.033	
Pyrene	ug/L	0.12		--		--		0.2		--		--		0.099	
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	4	J	--		--		3.8	J	--		--		3.9	
Butyl benzyl phthalate	ug/L	0.2	U	--		--		0.2	U	--		--		0.24	UJ
Di-n-butyl phthalate	ug/L	0.34	UJ	--		--		0.24	UJ	--		--		0.31	U
Diethyl phthalate	ug/L	0.2	UJ	--		--		0.2	UJ	--		--		0.2	U
Dimethyl phthalate	ug/L	0.2	UJ	--		--		0.2	UJ	--		--		0.2	UJ
Di-n-octyl phthalate	ug/L	0.89	J	--		--		0.61	J	--		--		0.62	
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--		--	
Glyphosate	ug/L	25	U	25	U	25	U	--		25		--		25	U
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	--		2.55		1.75		--		--		4.05		--	
Diesel	mg/L	--		0.15	U	0.15	U	--		--		0.015	UJ	--	
Lube Oil	mg/L	--		2.4		1.6		--		--		3.9		--	
TPH-Gas (NWTPH-Gx)	mg/L	--		0.05	U	0.05	UJ	--		--		0.05	U	--	
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	0.49		--		--		0.7		--		--		1	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	8.12		--		--		12.3		--		--		8.21	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	1.19		--		--		0.56		--		--		6.68	
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	0.01	U	--		--		0.01	U	--		--		0.01	U
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	0.01	U	--		--		0.01	U	--		--		0.01	U
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	18.01		--		--		30.69		--		--		36.06	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	12.18		--		--		16.14		--		--		10.12	

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Pilchuck 01 (Continued)	Storm Events														
Parameter	UNITS	4/12/13		1/7/14		1/28/14		2/18/14		3/2/14		3/19/14		4/8/14	
Conventionals															
TSS	mg/L	54		62		54		--		--		57		34	
Chloride	mg/L	4.66		17.4		19.2		--		--		5.58		4.68	
Hardness as $CaCO_3$	mg/L	31.3		30.4		36.6		--		--		24.1		24.6	
Bacteria															
Fecal coliform	cfu/100mL	--		190		2000		400		1800		2700	J	4100	
Nutrients															
Total Phosphorous	mg/L	0.132	J	0.0987		0.112		--		--		0.09		0.0751	
Orthophosphate	mg/L	--		0.01	U	0.01	U	--		--		--		0.0125	
Total Kjeldahl Nitrogen	mg/L	0.78	J	1.1		0.93	J	--		--		--		--	
Nitrate-Nitrite	mg/L	0.144		0.206		0.363		--		--		--		--	
Metals															
Total Recoverable Copper	ug/L	--		26.4		24.2		--		--		--		17.8	
Dissolved Copper	ug/L	--		4.66		5.91	J	--		--		--		5.97	
Total Recoverable Lead	ug/L	--		--		--		--		--		--		--	
Dissolved Lead	ug/L	--		--		--		--		--		--		--	
Total Recoverable Cadmium	ug/L	--		--		--		--		--		--		--	
Dissolved Cadmium	ug/L	--		--		--		--		--		--		--	
Total Recoverable Zinc	ug/L	--		125		118		--		--		--		66.8	
Dissolved Zinc	ug/L	--		20.8		21.4	J	--		--		--		14.9	
PAH Compounds															
Acenaphthene	ug/L	0.01	U	0.011	U	0.011	U	--		--		0.011	U	--	
Acenaphthylene	ug/L	0.01	U	0.011	U	0.011	U	--		--		0.011	U	--	
Anthracene	ug/L	0.01	U	0.1		0.011	U	--		--		0.011	U	--	
Benzo(a)anthracene	ug/L	0.23	J	0.077		0.021	NJ	--		--		0.1	J	--	
Benzo(b)fluoranthene	ug/L	0.036		0.011	UJ	0.083	J	--		--		0.054		--	
Benzo(k)fluoranthene	ug/L	0.024		0.011	U	0.053	UJ	--		--		0.011	U	--	
Benzo(ghi)perylene	ug/L	0.084		0.066		0.12		--		--		0.1		--	
Benzo(a)pyrene	ug/L	0.026	J	0.011	U	0.041	NJ	--		--		0.038	NJ	--	
Chrysene	ug/L	0.06		0.054		0.045		--		--		0.056		--	
Dibenzo(a,h)anthracene	ug/L	0.01	U	0.011	U	0.083	NJ	--		--		0.011	U	--	

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Pilchuck 01 (Continued)		Storm Events													
Parameter	**UNITS**	**4/12/13**		**1/7/14**		**1/28/14**		**2/18/14**		**3/2/14**		**3/19/14**		**4/8/14**	
PAH Compounds (Continued)															
Fluoranthene	ug/L	0.081	J	0.011	U	0.064		--		--		0.1		--	
Fluorene	ug/L	0.01	U	0.011	U	0.011	UJ	--		--		0.011	U	--	
Indeno(1,2,3-cd)pyrene	ug/L	0.024		0.011	U	0.081		--		--		0.04		--	
Naphthalene	ug/L	0.02		0.021		0.019	U	--		--		0.021		--	
Phenanthrene	ug/L	0.047		0.077		0.062		--		--		0.047		--	
Pyrene	ug/L	0.12		0.2		0.14		--		--		0.13		--	
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	4.6		4.2		3.1	J	--		--		4.9		--	
Butyl benzyl phthalate	ug/L	0.39	U	0.22		0.53	U	--		--		0.21	U	--	
Di-n-butyl phthalate	ug/L	0.5	U	0.38		0.21	U	--		--		0.54		--	
Diethyl phthalate	ug/L	0.2	U	0.11	NJ	0.21	UJ	--		--		0.21	U	--	
Dimethyl phthalate	ug/L	0.2	U	0.46		0.4	J	--		--		0.44		--	
Di-n-octyl phthalate	ug/L	0.84	U	0.73		0.64	NJ	--		--		0.21	U	--	
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--		--	
Glyphosate	ug/L	25	U	25	U	25	U	--		--		--		--	
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	--		3.35		4.15		8.75		3.85		2.15		6.76	
Diesel	mg/L	--		0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.16	U
Lube Oil	mg/L	--		3.2		4		8.6		3.7		2		6.6	
TPH-Gas (NWTPH-Gx)	mg/L	--		0.07	U	0.07	U	0.07	U	0.07	U	0.07	U	0.07	U
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	0.6		1.31		4.31		--		--		1.35		10.48	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	15.9		7.59		6.76		--		--		6.23		2.97	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	7.34		0.92		2.65		--		--		1.91		1.01	
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	0.01	U	0.01	U	0.01	U	--		--		0.01	U	0.01	U
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	0.01	U	0.01	U	0.01	U	--		--		0.01	U	0.48	
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	24.9		29.47		45.33		--		--		47.7		28.01	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	15.35		9.21		9.34		--		--		6.6		2.2	

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Pilchuck 01 (Continued)		Storm Events													
Parameter	**UNITS**	**4/16/14**		**5/8/14**		**5/29/14**		**6/12/14**		**6/27/14**		**7/23/14**		**8/13/14**	
Conventionals															
TSS	mg/L	--		--		--		80		--		89		90	
Chloride	mg/L	--		--		--		--		--		2.51		1.4	
Hardness as $CaCO_3$	mg/L	--		--		--		39		--		37		34	
Bacteria															
Fecal coliform	cfu/100mL	1900		200		8300		600		140000		3400		--	
Nutrients															
Total Phosphorous	mg/L	--		--		--		0.173		--		0.154		0.133	
Orthophosphate	mg/L	--		--		--		--		--		0.022		0.027	
Total Kjeldahl Nitrogen	mg/L	--		--		--		1.66		--		5.6		1.96	
Nitrate-Nitrite	mg/L	--		--		--		0.21		--		0.042		0.37	J
Metals															
Total Recoverable Copper	ug/L	--		--		--		--		--		36.1		20.8	
Dissolved Copper	ug/L	--		--		--		--		--		9.26	J	7.19	J
Total Recoverable Lead	ug/L	--		--		--		--		--		35.4		--	
Dissolved Lead	ug/L	--		--		--		--		--		0.665	J	--	
Total Recoverable Cadmium	ug/L	--		--		--		--		--		3.26	J	--	
Dissolved Cadmium	ug/L	--		--		--		--		--		0.087	J	--	
Total Recoverable Zinc	ug/L	--		--		--		--		--		116		81	
Dissolved Zinc	ug/L	--		--		--		--		--		22.1	J	15.2	J
PAH Compounds															
Acenaphthene	ug/L	--		--		--		0.1	U	--		0.1	UJ	0.1	U
Acenaphthylene	ug/L	--		--		--		0.1	U	--		0.1	UJ	0.1	U
Anthracene	ug/L	--		--		--		0.1	U	--		0.1	UJ	0.1	U
Benzo(a)anthracene	ug/L	--		--		--		0.1	U	--		0.1	UJ	0.1	U
Benzo(b)fluoranthene	ug/L	--		--		--		0.1	U	--		0.1	UJ	0.1	U
Benzo(k)fluoranthene	ug/L	--		--		--		0.1	U	--		0.1	UJ	0.1	U
Benzo(ghi)perylene	ug/L	--		--		--		0.1	U	--		0.1	UJ	0.1	U
Benzo(a)pyrene	ug/L	--		--		--		0.1	UJ	--		0.1	UJ	0.1	U
Chrysene	ug/L	--		--		--		0.1	U	--		0.1	UJ	0.1	U
Dibenzo(a,h)anthracene	ug/L	--		--		--		0.1	U	--		0.1	UJ	0.1	U

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Pilchuck 01 (Continued)		Storm Events													
Parameter	**UNITS**	**4/16/14**		**5/8/14**		**5/29/14**		**6/12/14**		**6/27/14**		**7/23/14**		**8/13/14**	
PAH Compounds (Continued)															
Fluoranthene	ug/L	--		--		--		0.1	U	--		0.1	UJ	0.1	U
Fluorene	ug/L	--		--		--		0.1	U	--		0.1	UJ	0.1	U
Indeno(1,2,3-cd)pyrene	ug/L	--		--		--		0.1	U	--		0.1	UJ	0.1	U
Naphthalene	ug/L	--		--		--		0.1	U	--		0.1	UJ	0.1	U
Phenanthrene	ug/L	--		--		--		0.1	U	--		0.1	UJ	0.1	U
Pyrene	ug/L	--		--		--		0.1	U	--		0.1	UJ	0.1	U
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	--		--		--		1.15		--		3.93	J	4.06	J
Butyl benzyl phthalate	ug/L	--		--		--		1	UJ	--		1	UJ	1	U
Di-n-butyl phthalate	ug/L	--		--		--		1	U	--		1	UJ	1	U
Diethyl phthalate	ug/L	--		--		--		1	UJ	--		1	UJ	1	U
Dimethyl phthalate	ug/L	--		--		--		1	U	--		1	UJ	1	U
Di-n-octyl phthalate	ug/L	--		--		--		1	U	--		1	UJ	1	U
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--		--	
Glyphosate	ug/L	--		--		--		10	U	--		10	U	10	U
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	4.86		3.78		4.1		4.8		9.2		2.43		--	
Diesel	mg/L	0.16	U	0.88		1.1		1.5		2.8		0.83		--	
Lube Oil	mg/L	4.7		2.9		3		3.3		6.4		1.6		--	
TPH-Gas (NWTPH-Gx)	mg/L	0.07	U	0.1	U	0.1	U	0.1	U	4.52		0.1	U	--	
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	--		--		--		0.01	U	--		0.87		1.28	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	--		--		--		4.39		--		13.53		17.02	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	--		--		--		0.21		--		0.58		2.13	
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	--		--		--		0.01	U	--		0.01	U	0.01	U
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	--		--		--		0.03		--		0.01	U	0.01	U
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	--		--		--		71.06		--		65.76		56.54	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	--		--		--		5.16		--		10.3		11.89	

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Pilchuck 01	Storm Events														
Parameter	**UNITS**	**9/2/14**		**9/23/14**											
Conventionals															
TSS	mg/L	90		--											
Chloride	mg/L	1.82		--											
Hardness as $CaCO_3$	mg/L	32		--											
Bacteria															
Fecal coliform	cfu/100mL	22000		4900											
Nutrients															
Total Phosphorous	mg/L	0.158		--											
Orthophosphate	mg/L	0.013		--											
Total Kjeldahl Nitrogen	mg/L	1.66		--											
Nitrate-Nitrite	mg/L	0.15	J	--											
Metals															
Total Recoverable Copper	ug/L	22.4		--											
Dissolved Copper	ug/L	6.84	J	--											
Total Recoverable Lead	ug/L	--		--											
Dissolved Lead	ug/L	--		--											
Total Recoverable Cadmium	ug/L	--		--											
Dissolved Cadmium	ug/L	--		--											
Total Recoverable Zinc	ug/L	98.8		--											
Dissolved Zinc	ug/L	19.6	J	--											
PAH Compounds															
Acenaphthene	ug/L	--		--											
Acenaphthylene	ug/L	--		--											
Anthracene	ug/L	--		--											
Benzo(a)anthracene	ug/L	--		--											
Benzo(b)fluoranthene	ug/L	--		--											
Benzo(k)fluoranthene	ug/L	--		--											
Benzo(ghi)perylene	ug/L	--		--											
Benzo(a)pyrene	ug/L	--		--											
Chrysene	ug/L	--		--											
Dibenzo(a,h)anthracene	ug/L	--		--											

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Pilchuck 01 (Continued)	Storm Events														
Parameter	**UNITS**	**9/2/14**		**9/23/14**											
PAH Compounds (Continued)															
Fluoranthene	ug/L	--		--											
Fluorene	ug/L	--		--											
Indeno(1,2,3-cd)pyrene	ug/L	--		--											
Naphthalene	ug/L	--		--											
Phenanthrene	ug/L	--		--											
Pyrene	ug/L	--		--											
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	--		--											
Butyl benzyl phthalate	ug/L	--		--											
Di-n-butyl phthalate	ug/L	--		--											
Diethyl phthalate	ug/L	--		--											
Dimethyl phthalate	ug/L	--		--											
Di-n-octyl phthalate	ug/L	--		--											
Herbicides															
Dichlobenil	ug/L	--		--											
Diuron	ug/L	--		--											
Glyphosate	ug/L	10	U	--											
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	9.5		4.68											
Diesel	mg/L	2.7	J	0.88	J										
Lube Oil	mg/L	6.8		3.8											
TPH-Gas (NWTPH-Gx)	mg/L	0.1	U	0.25	U										
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	2.15	J	--											
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	15.6		--											
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	3.66		--											
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	0.01	U	--											
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	0.01	U	--											
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	67.91		--											
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	12.81		--											

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Everett 01	Storm Events														
Parameter	**UNITS**	**10/12/12**		**11/6/12**		**12/11/12**		**2/11/13**		**2/22/13**		**3/2/13**		**3/6/13**	
Conventionals															
TSS	mg/L	--		29		--		--		--		132		--	
Chloride	mg/L	--		3.51		--		--		--		--		--	
Hardness as $CaCO_3$	mg/L	--		11.5		--		--		--		--		--	
Bacteria															
Fecal coliform	cfu/100mL	9300		--		800		4400		--		--		--	
Nutrients															
Total Phosphorous	mg/L	--		0.0423		--		--		--		--		--	
Orthophosphate	mg/L	--		0.01	U	--		--		--		--		--	
Total Kjeldahl Nitrogen	mg/L	--		0.91	U	--		--		--		--		--	
Nitrate-Nitrite	mg/L	--		0.335		--		--		--		--		--	
Metals															
Total Recoverable Copper	ug/L	--		21.7		--		--		--		--		--	
Dissolved Copper	ug/L	--		6.05	J	--		--		--		--		--	
Total Recoverable Lead	ug/L	--		--		--		--		--		--		--	
Dissolved Lead	ug/L	--		--		--		--		--		--		--	
Total Recoverable Cadmium	ug/L	--		--		--		--		--		--		--	
Dissolved Cadmium	ug/L	--		--		--		--		--		--		--	
Total Recoverable Zinc	ug/L	--		64.5		--		--		--		--		--	
Dissolved Zinc	ug/L	--		27.7	J	--		--		--		--		--	
PAH Compounds															
Acenaphthene	ug/L	--		0.0099	U	--		--		--		--		--	
Acenaphthylene	ug/L	--		0.0099	U	--		--		--		--		--	
Anthracene	ug/L	--		0.0099	U	--		--		--		--		--	
Benzo(a)anthracene	ug/L	--		0.014		--		--		--		--		--	
Benzo(b)fluoranthene	ug/L	--		0.04		--		--		--		--		--	
Benzo(k)fluoranthene	ug/L	--		0.015		--		--		--		--		--	
Benzo(ghi)perylene	ug/L	--		0.061		--		--		--		--		--	
Benzo(a)pyrene	ug/L	--		0.025		--		--		--		--		--	
Chrysene	ug/L	--		0.033		--		--		--		--		--	
Dibenzo(a,h)anthracene	ug/L	--		0.0099	U	--		--		--		--		--	

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Everett 01 (Continued)		Storm Events													
Parameter	**UNITS**	**10/12/12**		**11/6/12**		**12/11/12**		**2/11/13**		**2/22/13**		**3/2/13**		**3/6/13**	
PAH Compounds (Continued)															
Fluoranthene	ug/L	--		0.04		--		--		--		--		--	
Fluorene	ug/L	--		0.0099	U	--		--		--		--		--	
Indeno(1,2,3-cd)pyrene	ug/L	--		0.041	J	--		--		--		--		--	
Naphthalene	ug/L	--		0.016	J	--		--		--		--		--	
Phenanthrene	ug/L	--		0.024		--		--		--		--		--	
Pyrene	ug/L	--		0.069		--		--		--		--		--	
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	--		0.2	U	--		--		--		--		--	
Butyl benzyl phthalate	ug/L	--		0.2	U	--		--		--		--		--	
Di-n-butyl phthalate	ug/L	--		0.2	U	--		--		--		--		--	
Diethyl phthalate	ug/L	--		0.2	U	--		--		--		--		--	
Dimethyl phthalate	ug/L	--		0.2	U	--		--		--		--		--	
Di-n-octyl phthalate	ug/L	--		0.2	U	--		--		--		--		--	
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--		--	
Glyphosate	ug/L	--		25	U	--		--		--		--		--	
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	2.10		--		12.15		21.15		4.35		--		4.75	
Diesel	mg/L	0.10	U	--		0.15	U	0.15	UJ	0.15	U	--		0.15	UJ
Lube Oil	mg/L	2		--		12		21	J	4.2		--		4.6	J
TPH-Gas (NWTPH-Gx)	mg/L	0.07	U	--		0.07	U	0.07	U	0.05	U	--		0.05	U
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	--		0.11		--		--		--		--		--	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	--		17.11		--		--		--		--		--	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	--		0.22		--		--		--		--		--	
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	--		0.01	U	--		--		--		--		--	
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	--		0.01	U	--		--		--		--		--	
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	--		4.94		--		--		--		--		--	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	--		8.27		--		--		--		--		--	

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Everett 01 (Continued)	Storm Events														
Parameter	**UNITS**	**3/19/13**		**4/12/13**		**5/11/13**		**5/21/13**		**11/18/13**		**1/7/14**		**1/28/14**	
Conventionals															
TSS	mg/L	--		--		38		67		--		97		92	
Chloride	mg/L	5.84		--		--		3.51		--		35.2		56.7	
Hardness as $CaCO_3$	mg/L	16.5		--		--		18.3		--		43.3		--	
Bacteria															
Fecal coliform	cfu/100mL	--		--		--		3400		240		5900		6700	
Nutrients															
Total Phosphorous	mg/L	0.121		--		--		0.157		--		0.149		0.113	
Orthophosphate	mg/L	--		--		1.12		0.0189		--		0.0102		0.0114	J
Total Kjeldahl Nitrogen	mg/L	0.85	J	--		3.8	J	1.2	J	--		1.6		1.2	
Nitrate-Nitrite	mg/L	0.224		--		0.513		0.74		--		0.328		0.202	
Metals															
Total Recoverable Copper	ug/L	--		--		37.4		40.1		--		51.4		38.6	
Dissolved Copper	ug/L	--		--		28.4		12.5		--		12.5		12.7	J
Total Recoverable Lead	ug/L	--		--		--		--		--		8.83		--	
Dissolved Lead	ug/L	--		--		--		--		--		0.12		--	
Total Recoverable Cadmium	ug/L	--		--		--		--		--		0.54		--	
Dissolved Cadmium	ug/L	--		--		--		--		--		0.174		--	
Total Recoverable Zinc	ug/L	--		--		89.3		131		--		215		177	
Dissolved Zinc	ug/L	--		--		73.2		40.5		--		65.1		62.9	J
PAH Compounds															
Acenaphthene	ug/L			0.01	U	--		0.037		--		0.01	U	--	
Acenaphthylene	ug/L	--		0.01	U	--		0.01	U	--		0.01	U	--	
Anthracene	ug/L	--		0.01	U	--		0.022		--		0.19		--	
Benzo(a)anthracene	ug/L	--		0.029	J	--		0.026	J	--		0.16		--	
Benzo(b)fluoranthene	ug/L	--		0.035		--		0.04		--		0.01	UJ	--	
Benzo(k)fluoranthene	ug/L	--		0.029		--		0.026		--		0.01	U	--	
Benzo(ghi)perylene	ug/L	--		0.082		--		0.055		--		0.15		--	
Benzo(a)pyrene	ug/L	--		0.027	J	--		0.032		--		0.01	U	--	
Chrysene	ug/L	--		0.075		--		0.071		--		0.12		--	
Dibenzo(a,h)anthracene	ug/L	--		0.011	U	--		0.016		--		0.01	U	--	

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Everett 01 (Continued)															
Parameter	**UNITS**	**3/19/13**		**4/12/13**		**5/11/13**		**5/21/13**		**11/18/13**		**1/7/14**		**1/28/14**	
PAH Compounds (Continued)															
Fluoranthene	ug/L	--		0.11	J	--		0.088		--		0.25		--	
Fluorene	ug/L	--		0.01	U	--		0.036		--		0.01	U	--	
Indeno(1,2,3-cd)pyrene	ug/L	--		0.024		--		0.03		--		0.01	U	--	
Naphthalene	ug/L	--		0.021		--		0.018		--		0.028		--	
Phenanthrene	ug/L	--		0.064		--		0.11		--		0.15		--	
Pyrene	ug/L	--		0.16		--		0.14		--		0.4		--	
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	--		6.5		--		5.4		--		7.7		--	
Butyl benzyl phthalate	ug/L	--		0.39	U	--		0.37		--		0.31	NJ	--	
Di-n-butyl phthalate	ug/L	--		0.62	U	--		0.45	U	--		0.45		--	
Diethyl phthalate	ug/L	--		0.33	J	--		0.21	U	--		0.21	NJ	--	
Dimethyl phthalate	ug/L	--		0.2	U	--		0.21	U	--		0.086	J	--	
Di-n-octyl phthalate	ug/L	--		1.3	J	--		0.79		--		1.2		--	
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--		--	
Glyphosate	ug/L	--		--		25	U	25	U	--		25	U	25	U
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	--		--		--		7.45		1.26		9.35		6.25	
Diesel	mg/L	--		--		--		0.15	UJ	0.15	UJ	0.15	U	0.15	U
Lube Oil	mg/L	--		--		--		7.3	J	1.1	J	9.2		6.1	
TPH-Gas (NWTPH-Gx)	mg/L	--		--		--		0.07	U	0.07	U	0.07	U	0.07	U
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	9.82		--		--		15.96		--		2.84		--	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	10.76		--		--		29.86		--		11.99		--	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	8.25		--		--		13.62		--		2.73		--	
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	0.01	U	--		--		0.01	U	--		0.01	U	--	
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	0.01	U	--		--		0.01	U	--		0.01	U	--	
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	57.94		--		--		8.11		--		70.65		--	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	12.3		--		--		24.89		--		15.62		--	

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Everett 01 (Continued)	Storm Events														
Parameter	**UNITS**	**2/18/14**		**3/2/14**		**3/19/14**		**4/8/14**		**4/17/14**		**4/21/14**		**5/8/14**	
Conventionals															
TSS	mg/L	--		--		65		--		--		23		--	
Chloride	mg/L	--		--		27.4		--		--		4.5		--	
Hardness as $CaCO_3$	mg/L	--		--		33.1		--		--		13.9		--	
Bacteria															
Fecal coliform	cfu/100mL	1000		270		3800	J	2600		2200		--		2300	
Nutrients															
Total Phosphorous	mg/L	--		--		0.112		--		--		0.0689		--	
Orthophosphate	mg/L	--		--		--		--		--		0.0202		--	
Total Kjeldahl Nitrogen	mg/L	--		--		1.6		--		--		1.4		--	
Nitrate-Nitrite	mg/L	--		--		0.708		--		--		0.559		--	
Metals															
Total Recoverable Copper	ug/L	--		--		--		--		--		30.1		--	
Dissolved Copper	ug/L	--		--		--		--		--		16.1		--	
Total Recoverable Lead	ug/L	--		--		--		--		--		--		--	
Dissolved Lead	ug/L	--		--		--		--		--		--		--	
Total Recoverable Cadmium	ug/L	--		--		--		--		--		--		--	
Dissolved Cadmium	ug/L	--		--		--		--		--		--		--	
Total Recoverable Zinc	ug/L	--		--		--		--		--		72		--	
Dissolved Zinc	ug/L	--		--		--		--		--		28.1		--	
PAH Compounds															
Acenaphthene	ug/L	--		--		0.01	U	--		--		0.01	U	--	
Acenaphthylene	ug/L	--		--		0.01	U	--		--		0.01	U	--	
Anthracene	ug/L	--		--		0.01	U	--		--		0.01	U	--	
Benzo(a)anthracene	ug/L	--		--		0.062	NJ	--		--		0.014	NJ	--	
Benzo(b)fluoranthene	ug/L	--		--		0.09	J	--		--		0.01	U	--	
Benzo(k)fluoranthene	ug/L	--		--		0.041	J	--		--		0.01	U	--	
Benzo(ghi)perylene	ug/L	--		--		0.14	J	--		--		0.045		--	
Benzo(a)pyrene	ug/L	--		--		0.055	NJ	--		--		0.016	NJ	--	
Chrysene	ug/L	--		--		0.1	J	--		--		0.033		--	
Dibenzo(a,h)anthracene	ug/L	--		--		0.01	U	--		--		0.01	U	--	

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Everett 01 (Continued)															
Parameter	**UNITS**	**2/18/14**		**3/2/14**		**3/19/14**		**4/8/14**		**4/17/14**		**4/21/14**		**5/8/14**	
PAH Compounds (Continued)															
Fluoranthene	ug/L	--		--		0.18	J	--		--		0.048		--	
Fluorene	ug/L	--		--		0.01	U	--		--		0.01	U	--	
Indeno(1,2,3-cd)pyrene	ug/L	--		--		0.053	J	--		--		0.016		--	
Naphthalene	ug/L	--		--		0.023	J	--		--		0.02		--	
Phenanthrene	ug/L	--		--		0.095	J	--		--		0.031		--	
Pyrene	ug/L	--		--		0.25	J	--		--		0.067		--	
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	--		--		7.4	J	--		--		2.9		--	
Butyl benzyl phthalate	ug/L	--		--		0.21	U	--		--		0.2	U	--	
Di-n-butyl phthalate	ug/L	--		--		0.21	U	--		--		0.44		--	
Diethyl phthalate	ug/L	--		--		0.21	U	--		--		0.2	U	--	
Dimethyl phthalate	ug/L	--		--		0.21	U	--		--		0.2	U	--	
Di-n-octyl phthalate	ug/L	--		--		0.21	U	--		--		0.2	U	--	
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--		--	
Glyphosate	ug/L	--		--		25	U	--		--		25	U	--	
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	8.36		2.8		9.15		4.15		6.86		--		10.1	
Diesel	mg/L	0.16	U	1.1		0.15	U	0.15	U	0.16	U	--		3.4	
Lube Oil	mg/L	8.2		1.7		9		4		6.7		--		6.7	
TPH-Gas (NWTPH-Gx)	mg/L	0.07	U	0.07	U	0.07	U	0.07	U	0.07	U	--		0.1	U
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	--		--		1.83		--		--		2.31		--	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	--		--		8.41		--		--		4.2		--	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	--		--		1.03		--		--		0.1		--	
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	--		--		0.01	U	--		--		0.01	U	--	
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	--		--		0.12		--		--		0.01	U	--	
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	--		--		52.19		--		--		17.55		--	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	--		--		6.54		--		--		2.09		--	

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Everett 01 (Continued)															
Parameter	**UNITS**	**5/23/14**		**6/12/14**		**6/27/14**		**7/23/14**		**9/23/14**					
Conventionals															
TSS	mg/L	--		38		27		71		26					
Chloride	mg/L	--		3.25		16.6		1.82		1.34					
Hardness as $CaCO_3$	mg/L	--		19		56		19		12					
Bacteria															
Fecal coliform	cfu/100mL	15000		1100		--		5800		4800					
Nutrients															
Total Phosphorous	mg/L	--		0.098		--		0.052		0.092					
Orthophosphate	mg/L	--		--		--		0.012		0.027					
Total Kjeldahl Nitrogen	mg/L	--		2.71		3.93		8.41		2.17					
Nitrate-Nitrite	mg/L	--		0.51		1.3	J	0.21		2.9	J				
Metals															
Total Recoverable Copper	ug/L	--		--		50.9		51.8		24.3					
Dissolved Copper	ug/L	--		--		38.9	J	17.4	J	10.2	J				
Total Recoverable Lead	ug/L	--		--		--		--		3.05					
Dissolved Lead	ug/L	--		--		--		--		0.232	J				
Total Recoverable Cadmium	ug/L	--		--		--		--		0.148					
Dissolved Cadmium	ug/L	--		--		--		--		0.08	J				
Total Recoverable Zinc	ug/L	--		--		92.9		133		66.9					
Dissolved Zinc	ug/L	--		--		82.5	J	36.5	J	35	J				
PAH Compounds															
Acenaphthene	ug/L	--		0.1	U	0.1	U	0.1	UJ	0.1	U				
Acenaphthylene	ug/L	--		0.32		0.1	U	0.1	UJ	0.1	U				
Anthracene	ug/L	--		0.1	U	0.1	U	0.1	UJ	0.1	U				
Benzo(a)anthracene	ug/L	--		0.1	U	0.1	U	0.1	UJ	0.1	U				
Benzo(b)fluoranthene	ug/L	--		0.1	U	0.1	U	0.1	UJ	0.1	U				
Benzo(k)fluoranthene	ug/L	--		0.1	U	0.1	U	0.1	UJ	0.1	U				
Benzo(ghi)perylene	ug/L	--		0.1	U	0.1	U	0.1	UJ	0.1	U				
Benzo(a)pyrene	ug/L	--		0.1	U	0.1	U	0.1	UJ	0.1	U				
Chrysene	ug/L	--		0.1	U	0.1	U	0.1	UJ	0.1	U				
Dibenzo(a,h)anthracene	ug/L	--		0.1	U	0.1	U	0.1	UJ	0.1	U				

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Everett 01 (Continued)															
Parameter	**UNITS**	**5/23/14**		**6/12/14**		**6/27/14**		**7/23/14**		**9/23/14**					
PAH Compounds (Continued)															
Fluoranthene	ug/L	--		0.1	U	0.1	U	0.1	UJ	0.1	U				
Fluorene	ug/L	--		0.1	U	0.1	U	0.1	UJ	0.1	U				
Indeno(1,2,3-cd)pyrene	ug/L	--		0.1	U	0.1	U	0.1	UJ	0.1	U				
Naphthalene	ug/L	--		0.11		0.1	U	0.1	UJ	0.1	U				
Phenanthrene	ug/L	--		0.1	U	0.1	U	0.1	UJ	0.1	U				
Pyrene	ug/L	--		0.11		0.1	U	0.1	UJ	0.1	U				
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	--		4.39		2.56		9.46	J	8.08					
Butyl benzyl phthalate	ug/L	--		1	U	1	U	1	UJ	1	U				
Di-n-butyl phthalate	ug/L	--		1	U	1	U	1	UJ	1	U				
Diethyl phthalate	ug/L	--		1	U	1	U	1	UJ	1	U				
Dimethyl phthalate	ug/L	--		1	U	1	U	1	UJ	1	U				
Di-n-octyl phthalate	ug/L	--		1	U	1	U	1	UJ	1	U				
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--					
Diuron	ug/L	--		--		--		--		--					
Glyphosate	ug/L	--		10	U	--		10	U	10	U				
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	7.8		4		7.1		7.5		5.7					
Diesel	mg/L	1.6		1.1		2.1		2.1		0.87	J				
Lube Oil	mg/L	6.2		2.9		5		5.4		5.7					
TPH-Gas (NWTPH-Gx)	mg/L	0.1	U	0.1	U	0.36		0.1	U	0.25	U				
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	--		7.55			UJ	14.33		5.99					
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	--		24.45		4.69	J	37.85		21.88					
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	--		2.31		1.7	J	3.26		1.04					
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	--		0.01	U	0.01	UJ	0.01	U	0.01	U				
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	--		0.01	U	0.01	UJ	0.01	U	0.01	U				
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	--		0.01	U	16.73	J	2.48		0.01	U				
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	--		12.54		10.94	J	15.6		8.01					

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Everett 04		Storm Events													
Parameter	**UNITS**	**7/20/12**		**10/12/12**		**11/6/12**		**12/11/12**		**2/16/13**		**2/22/13**		**3/2/13**	
Conventionals															
TSS	mg/L	109		--		51	J	--		74		--		100	
Chloride	mg/L	2.82		--		3.91		--		25.9		--		10.1	
Hardness as $CaCO_3$	mg/L	21.5		--		13.5		--		29.2		--		17.3	
Bacteria															
Fecal coliform	cfu/100mL			40000		--		400		--		--		--	
Nutrients															
Total Phosphorous	mg/L	0.268		--		0.0817		--		0.129		--		0.107	
Orthophosphate	mg/L	--		--		0.01	U	--		--		--		--	
Total Kjeldahl Nitrogen	mg/L	2		--		1.1		--		1.5	J	--		1.1	
Nitrate-Nitrite	mg/L	0.983		--		0.373		--		0.739		--		0.246	
Metals															
Total Recoverable Copper	ug/L	--		--		19.6		--		--		--		--	
Dissolved Copper	ug/L	--		--		5.93	J	--		--		--		--	
Total Recoverable Lead	ug/L	--		--		--		--		--		--		--	
Dissolved Lead	ug/L	--		--		--		--		--		--		--	
Total Recoverable Cadmium	ug/L	--		--		--		--		--		--		--	
Dissolved Cadmium	ug/L	--		--		--		--		--		--		--	
Total Recoverable Zinc	ug/L	--		--		109		--		--		--		--	
Dissolved Zinc	ug/L	--		--		73.5	J	--		--		--		--	
PAH Compounds															
Acenaphthene	ug/L	0.0099	U	--		0.01	U	--		0.01	U	--		--	
Acenaphthylene	ug/L	0.0099	U	--		0.01	U	--		0.01	U	--		--	
Anthracene	ug/L	0.0099	U	--		0.01	U	--		0.018		--		--	
Benzo(a)anthracene	ug/L	0.041		--		0.01	U	--		0.047		--		--	
Benzo(b)fluoranthene	ug/L	0.099		--		0.053		--		0.097		--		--	
Benzo(k)fluoranthene	ug/L	0.026		--		0.019		--		0.029		--		--	
Benzo(ghi)perylene	ug/L	0.12		--		0.092		--		0.029		--		--	
Benzo(a)pyrene	ug/L	0.047		--		0.028		--		0.046		--		--	
Chrysene	ug/L	0.081		--		0.047		--		0.1		--		--	
Dibenzo(a,h)anthracene	ug/L	0.013		--		0.028	UJ	--		0.01	U	--		--	

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Everett 04 (Continued)	Storm Events														
Parameter	**UNITS**	**7/20/12**		**10/12/12**		**11/6/12**		**12/11/12**		**2/16/13**		**2/22/13**		**3/2/13**	
PAH Compounds (Continued)															
Fluoranthene	ug/L	0.16		--		0.056		--		0.14		--		--	
Fluorene	ug/L	0.0099	U	--		0.01	U	--		0.013		--		--	
Indeno(1,2,3-cd)pyrene	ug/L	0.047		--		0.066	J	--		0.025		--		--	
Naphthalene	ug/L	0.028	J	--		0.014	UJ	--		0.034		--		--	
Phenanthrene	ug/L	0.083		--		0.029		--		0.078		--		--	
Pyrene	ug/L	0.26		--		0.094		--		0.23		--		--	
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	13		--		0.2	U	--		6.9	J	--		--	
Butyl benzyl phthalate	ug/L	0.31		--		0.2	U	--		0.36	UJ	--		--	
Di-n-butyl phthalate	ug/L	0.47	UJ	--		0.2	U	--		0.46	UJ	--		--	
Diethyl phthalate	ug/L	0.27		--		0.2	U	--		0.42		--		--	
Dimethyl phthalate	ug/L	0.2	U	--		0.2	U	--		0.11	J	--		--	
Di-n-octyl phthalate	ug/L	1.5		--		0.2	U	--		1.7	J	--		--	
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--		--	
Glyphosate	ug/L	25	U	--		25	U	--		25	U	--		25	U
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	--		2.15		--		6.55		--		5.75		--	
Diesel	mg/L	--		0.05	U	--		0.15	U	--		0.15	U	--	
Lube Oil	mg/L	--		2.1		--		6.4		--		5.6		--	
TPH-Gas (NWTPH-Gx)	mg/L	--		0.07	U	--		0.07	U	--		0.05	U	--	
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	64.27		--		1.96		--		0.6		--		--	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	5.64		--		4		--		12.45		--		--	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	8.07		--		2.82		--		0.69		--		--	
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	0.01	U	--		0.01	U	--		0.01	U	--		--	
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	47.95		--		0.01	U	--		0.01	U	--		--	
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	58.02		--		30.07		--		42.59		--		--	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	4.22		--		4.78		--		16.91		--		--	

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Everett 04 (Continued)		Storm Events													
Parameter	**UNITS**	**3/6/13**		**3/19/13**		**4/12/13**		**4/18/13**		**5/21/13**		**9/15/13**		**11/18/13**	
Conventionals															
TSS	mg/L	--		88		72		46		55		81		--	
Chloride	mg/L	--		--		--		6.39		3.69		4.57		--	
Hardness as $CaCO_3$	mg/L	--		14.1		17.6		18.2		16.8				--	
Bacteria															
Fecal coliform	cfu/100mL	--		--		--		--		2600		--		140	
Nutrients															
Total Phosphorous	mg/L	--		0.13		0.138	J	0.0928		0.142		--		--	
Orthophosphate	mg/L	--		--		--		--		0.0183		--		--	
Total Kjeldahl Nitrogen	mg/L	--		--		0.46	J	--		1.5	J	--		--	
Nitrate-Nitrite	mg/L	--		0.198		0.455		0.531		0.676		--		--	
Metals															
Total Recoverable Copper	ug/L	--		--		--		--		34.6		64.8		--	
Dissolved Copper	ug/L	--		--		--		--		13.8		28		--	
Total Recoverable Lead	ug/L	--		--		--		--		--		--		--	
Dissolved Lead	ug/L	--		--		--		--		--		--		--	
Total Recoverable Cadmium	ug/L	--		--		--		--		--		--		--	
Dissolved Cadmium	ug/L	--		--		--		--		--		--		--	
Total Recoverable Zinc	ug/L	--		--		--		--		157		257		--	
Dissolved Zinc	ug/L	--		--		--		--		74.2		16		--	
PAH Compounds															
Acenaphthene	ug/L	--		0.011	U	--		0.01	U	--		--		--	
Acenaphthylene	ug/L	--		0.011	U	--		0.01	U	--		--		--	
Anthracene	ug/L	--		0.011	J	--		0.01	U	--		--		--	
Benzo(a)anthracene	ug/L	--		0.042		--		0.021		--		--		--	
Benzo(b)fluoranthene	ug/L	--		0.078		--		0.035		--		--		--	
Benzo(k)fluoranthene	ug/L	--		0.049		--		0.024		--		--		--	
Benzo(ghi)perylene	ug/L	--		0.11		--		0.053		--		--		--	
Benzo(a)pyrene	ug/L	--		0.045		--		0.025		--		--		--	
Chrysene	ug/L	--		0.12		--		0.064		--		--		--	
Dibenzo(a,h)anthracene	ug/L	--		0.016	U	--		0.0089	J	--		--		--	

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Everett 04 (Continued)		Storm Events													
Parameter	**UNITS**	**3/6/13**		**3/19/13**		**4/12/13**		**4/18/13**		**5/21/13**		**9/15/13**		**11/18/13**	
PAH Compounds (Continued)															
Fluoranthene	ug/L	--		0.15		--		0.075		--		--		--	
Fluorene	ug/L	--		0.011	U	--		0.01	U	--		--		--	
Indeno(1,2,3-cd)pyrene	ug/L	--		0.043		--		0.016		--		--		--	
Naphthalene	ug/L	--		0.016		--		0.014		--		--		--	
Phenanthrene	ug/L	--		0.067		--		0.041		--		--		--	
Pyrene	ug/L	--		0.22		--		0.12		--		--		--	
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	--		6.8		--		7.1		--		--		--	
Butyl benzyl phthalate	ug/L	--		0.31	UJ	--		0.32	UJ	--		--		--	
Di-n-butyl phthalate	ug/L	--		0.41	U	--		0.44	U	--		--		--	
Diethyl phthalate	ug/L	--		0.51		--		0.46		--		--		--	
Dimethyl phthalate	ug/L	--		0.21	UJ	--		0.21	UJ	--		--		--	
Di-n-octyl phthalate	ug/L	--		0.73		--		1.1	J	--		--		--	
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--		--	
Glyphosate	ug/L	--		25	U	--		18	J	25	U	--		--	
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	7.05		--		--		--		3.35		--		3.15	
Diesel	mg/L	0.15	UJ	--		--		--		0.15	UJ	--		0.15	UJ
Lube Oil	mg/L	6.9	J	--		--		--		3.2	J	--		3	J
TPH-Gas (NWTPH-Gx)	mg/L	0.05	U	--		--		--		0.07	U	--		0.07	UJ
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	--		--		9.04		11.17		12.76		--		--	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	--		--		17.83		5.66		32.66		--		--	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	--		--		8.74		8.55		10.98		--		--	
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	--		--		0.01	U	0.01	U	0.01	U	--		--	
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	--		--		0.01	U	0.01	U	0.01	U	--		--	
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	--		--		18.71		41.01		0.01	U	--		--	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	--		--		22.11		0.12		21.86		--		--	

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Everett 04 (Continued)		Storm Events													
Parameter	**UNITS**	**1/7/14**		**1/28/14**		**2/18/14**		**3/3/14**		**3/15/14**		**3/19/14**		**4/8/14**	
Conventionals															
TSS	mg/L	89		70		--		--		43		--		55	
Chloride	mg/L	32.8		47.5		--		--		2.58		--		8.31	
Hardness as $CaCO_3$	mg/L	39.5		50.2		--		--		8.67		--		20.8	
Bacteria															
Fecal coliform	cfu/100mL	6000		11000		680		4700		--		4100	J	2000	
Nutrients															
Total Phosphorous	mg/L	0.129		0.0932		--		--		0.0533		--		0.237	
Orthophosphate	mg/L	0.01	U	0.01	UJ	--		--		0.01	U	--		0.018	
Total Kjeldahl Nitrogen	mg/L	1.4		1.5		--		--		0.77		--		--	
Nitrate-Nitrite	mg/L	0.39		0.202		--		--		0.149		--		--	
Metals															
Total Recoverable Copper	ug/L	47.4		31.6		--		--		20.7		--		61	
Dissolved Copper	ug/L	13		11	J	--		--		5.48		--		37.5	
Total Recoverable Lead	ug/L	7.36		--		--		--		--		--		--	
Dissolved Lead	ug/L	0.23		--		--		--		--		--		--	
Total Recoverable Cadmium	ug/L	0.51		--		--		--		--		--		--	
Dissolved Cadmium	ug/L	0.195		--		--		--		--		--		--	
Total Recoverable Zinc	ug/L	224		184		--		--		84.3	J	--		191	
Dissolved Zinc	ug/L	83.3		85.6	J	--		--		40.6		--		91.4	
PAH Compounds															
Acenaphthene	ug/L	0.01	U	--		--		--		0.01	U	--		0.01	U
Acenaphthylene	ug/L	0.01	U	--		--		--		0.01	U	--		0.053	
Anthracene	ug/L	0.19		--		--		--		0.016	NJ	--		0.015	
Benzo(a)anthracene	ug/L	0.16		--		--		--		0.033		--		0.024	
Benzo(b)fluoranthene	ug/L	0.01	UJ	--		--		--		0.041		--		0.055	
Benzo(k)fluoranthene	ug/L	0.01	U	--		--		--		0.025		--		0.02	
Benzo(ghi)perylene	ug/L	0.13		--		--		--		0.077		--		0.098	
Benzo(a)pyrene	ug/L	0.01	U	--		--		--		0.032	NJ	--		0.029	
Chrysene	ug/L	0.12		--		--		--		0.047		--		0.072	
Dibenzo(a,h)anthracene	ug/L	0.01	U	--		--		--		0.01	U	--		0.01	U

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Everett 04 (Continued)		Storm Events													
Parameter	UNITS	1/7/14		1/28/14		2/18/14		3/3/14		3/15/14		3/19/14		4/8/14	
PAH Compounds (Continued)															
Fluoranthene	ug/L	0.25		--		--		--		0.093		--		0.1	
Fluorene	ug/L	0.01	U	--		--		--		0.01	U	--		0.01	U
Indeno(1,2,3-cd)pyrene	ug/L	0.01	U	--		--		--		0.033		--		0.03	
Naphthalene	ug/L	0.026		--		--		--		0.015		--		0.015	
Phenanthrene	ug/L	0.15		--		--		--		0.043		--		0.057	
Pyrene	ug/L	0.38		--		--		--		0.1		--		0.16	
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	7.6		--		--		--		4.5		--		7.1	
Butyl benzyl phthalate	ug/L	0.34		--		--		--		0.21	U	--		0.29	
Di-n-butyl phthalate	ug/L	0.48		--		--		--		0.54		--		0.46	
Diethyl phthalate	ug/L	0.37		--		--		--		0.21	U	--		0.21	U
Dimethyl phthalate	ug/L	0.068	J	--		--		--		0.21	U	--		0.21	U
Di-n-octyl phthalate	ug/L	1.2		--		--		--		1.2	NJ	--		1.2	
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--		--	
Glyphosate	ug/L	25	U	25	U	--		--		25	U	--		25	U
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	10.15		6.45		7.15		5.2		--		10.15		3.46	
Diesel	mg/L	0.15	U	0.15	U	0.15	UJ	2.3		--		0.15	U	0.16	U
Lube Oil	mg/L	10		6.3		7	J	2.9		--		10		3.3	
TPH-Gas (NWTPH-Gx)	mg/L	0.07	U	0.07	U	0.07	U	0.07	U	--		0.07	U	0.07	U
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	1.57		3.57		--		--		1.01		--		1.66	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	11.86		6.67		--		--		5.18		--		8.1	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	1.46		3.13		--		--		0.67		--		1.11	
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	0.01	U	0.01	U	--		--		0.01	U	--		0.01	U
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	0.01	U	0.01	U	--		--		0.01	U	--		0.2	
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	64.73		59.22		--		--		32.59		--		60.67	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	15.36		8.64		--		--		3.67		--		3.38	

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Everett 04 (Continued)	Storm Events														
Parameter	UNITS	4/17/14		4/21/14		5/8/14		5/23/14		6/12/14		6/28/14		7/23/14	
Conventionals															
TSS	mg/L	--		36		52		--		38	J	--		62	
Chloride	mg/L	--		4.28		3.61		--		2.76		--		2.4	
Hardness as $CaCO_3$	mg/L	--		12.4		17		--		15		--		16	
Bacteria															
Fecal coliform	cfu/100mL	1800		--		1000		13000		100	J	--		6400	
Nutrients															
Total Phosphorous	mg/L	--		0.0671		0.078		--		0.114		--		0.122	
Orthophosphate	mg/L	--		0.01	U	--		--		--		--		0.016	
Total Kjeldahl Nitrogen	mg/L	--		1.3		4.29		--		2.95		--		11.2	
Nitrate-Nitrite	mg/L	--		0.572		0.35		--		0.33		--		0.15	
Metals															
Total Recoverable Copper	ug/L	--		21.8		--		--		--		--		49.5	
Dissolved Copper	ug/L	--		8.19		--		--		--		--		18.3	J
Total Recoverable Lead	ug/L	--		--		--		--		--		--		--	
Dissolved Lead	ug/L	--		--		--		--		--		--		--	
Total Recoverable Cadmium	ug/L	--		--		--		--		--		--		--	
Dissolved Cadmium	ug/L	--		--		--		--		--		--		--	
Total Recoverable Zinc	ug/L	--		121		--		--		--		--		181	
Dissolved Zinc	ug/L	--		64.5		--		--		--		--		87.6	J
PAH Compounds															
Acenaphthene	ug/L	--		0.01	U	0.1	U	--		0.1	U	--		0.1	UJ
Acenaphthylene	ug/L	--		0.01	U	0.1	U	--		0.1	U	--		0.1	UJ
Anthracene	ug/L	--		0.01	U	0.1	U	--		0.1	U	--		0.1	UJ
Benzo(a)anthracene	ug/L	--		0.019	NJ	0.1	U	--		0.1	U	--		0.1	UJ
Benzo(b)fluoranthene	ug/L	--		0.034		0.1	UJ	--		0.1	U	--		0.1	UJ
Benzo(k)fluoranthene	ug/L	--		0.017		0.1	UJ	--		0.1	U	--		0.1	UJ
Benzo(ghi)perylene	ug/L	--		0.062		0.1	UJ	--		0.1	U	--		0.1	UJ
Benzo(a)pyrene	ug/L	--		0.021	NJ	0.1	UJ	--		0.1	U	--		0.1	UJ
Chrysene	ug/L	--		0.044		0.1	U	--		0.1	U	--		0.1	UJ
Dibenzo(a,h)anthracene	ug/L	--		0.01	U	0.1	UJ	--		0.1	U	--		0.1	UJ

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TPH-Diesel (NWTPH-Dx) values are calculated as the sum of the Diesel and Lube Oil concentrations

Everett 04 (Continued)		Storm Event													
Parameter	**UNITS**	**4/17/14**		**4/21/14**		**5/8/14**		**5/23/14**		**6/12/14**		**6/28/14**		**7/23/14**	
PAH Compounds (Continued)															
Fluoranthene	ug/L	--		0.063		0.1	U	--		0.1	U	--		0.1	UJ
Fluorene	ug/L	--		0.01	U	0.1	U	--		0.1	U	--		0.1	UJ
Indeno(1,2,3-cd)pyrene	ug/L	--		0.019		0.1	UJ	--		0.1	U	--		0.1	UJ
Naphthalene	ug/L	--		0.014		0.1	U	--		0.1	U	--		0.1	UJ
Phenanthrene	ug/L	--		0.038		0.1	U	--		0.1	U	--		0.1	UJ
Pyrene	ug/L	--		0.083		0.1	U	--		0.1	U	--		0.1	UJ
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	--		3.2		9.74		--		1.63	J	--		11.8	J
Butyl benzyl phthalate	ug/L	--		0.21	U	1	U	--		1	U	--		1	UJ
Di-n-butyl phthalate	ug/L	--		0.42		1	U	--		1	U	--		1	UJ
Diethyl phthalate	ug/L	--		0.38		1	U	--		1	U	--		1	UJ
Dimethyl phthalate	ug/L	--		0.21	U	1	U	--		1	U	--		1	UJ
Di-n-octyl phthalate	ug/L	--		0.21	U	1	UJ	--		1	U	--		1	UJ
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--		--	
Glyphosate	ug/L	--		8.1	J	10	U	--		10	U	--		10	U
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	8.36		--		10		6.8		5.8		5.3		6.2	
Diesel	mg/L	0.16	U	--		3.2		1.3		1.5		1.8		1.7	
Lube Oil	mg/L	8.2		--		6.8		5.5		4.3		3.5		4.5	
TPH-Gas (NWTPH-Gx)	mg/L	0.07	U	--		0.1	U	0.1	U	0.1	U	0.49		0.1	U
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	--		4.1		0.65	J	--		3.74		--		3.35	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	--		5.2		3.25	J	--		21.63		--		36.89	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	--		0.11		0.87	J	--		1.46		--		1.68	
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	--		0.01	U		R	--		0.01	U	--		0.01	U
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	--		0.01	U		R	--		0.01	U	--		0.01	U
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	--		28.99		48.97	J	--		0.01	U	--		7.9	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	--		2.38		3.66	J	--		18.28		--		17.35	

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TPH-Diesel (NWTPH-Dx) values are calculated as the sum of the Diesel and Lube Oil concentrations

Everett 04 (Continued)	Storm Events														
Parameter	**UNITS**	**9/23/14**													
Conventionals															
TSS	mg/L	43													
Chloride	mg/L	2.26													
Hardness as $CaCO_3$	mg/L	13													
Bacteria															
Fecal coliform	cfu/100mL	16000													
Nutrients															
Total Phosphorous	mg/L	0.098													
Orthophosphate	mg/L	0.005	U												
Total Kjeldahl Nitrogen	mg/L	1.38													
Nitrate-Nitrite	mg/L	0.89													
Metals															
Total Recoverable Copper	ug/L	27.5													
Dissolved Copper	ug/L	10.2	J												
Total Recoverable Lead	ug/L	4.17													
Dissolved Lead	ug/L	0.156	J												
Total Recoverable Cadmium	ug/L	0.205													
Dissolved Cadmium	ug/L	0.093	J												
Total Recoverable Zinc	ug/L	148													
Dissolved Zinc	ug/L	94.9	J												
PAH Compounds															
Acenaphthene	ug/L	0.1	U												
Acenaphthylene	ug/L	0.1	U												
Anthracene	ug/L	0.1	U												
Benzo(a)anthracene	ug/L	0.1	U												
Benzo(b)fluoranthene	ug/L	0.1	U												
Benzo(k)fluoranthene	ug/L	0.1	U												
Benzo(ghi)perylene	ug/L	0.1	U												
Benzo(a)pyrene	ug/L	0.1	U												
Chrysene	ug/L	0.1	U												
Dibenzo(a,h)anthracene	ug/L	0.1	U												

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Everett 04 (Continued)	Storm Event														
Parameter	**UNITS**	**9/23/14**													
PAH Compounds (Continued)															
Fluoranthene	ug/L	0.1	U												
Fluorene	ug/L	0.1	U												
Indeno(1,2,3-cd)pyrene	ug/L	0.1	U												
Naphthalene	ug/L	0.1	U												
Phenanthrene	ug/L	0.1	U												
Pyrene	ug/L	0.1	U												
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	3.75													
Butyl benzyl phthalate	ug/L	1	U												
Di-n-butyl phthalate	ug/L	1	U												
Diethyl phthalate	ug/L	1	U												
Dimethyl phthalate	ug/L	1	U												
Di-n-octyl phthalate	ug/L	1	U												
Herbicides															
Dichlobenil	ug/L	--													
Diuron	ug/L	--													
Glyphosate	ug/L	10	U												
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	1.63													
Diesel	mg/L	0.53													
Lube Oil	mg/L	1.1													
TPH-Gas (NWTPH-Gx)	mg/L	0.25	U												
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	2.81													
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	36.05													
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	1.28													
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	0.01	U												
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	0.01	U												
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	0.01	U												
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	9.47													

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SR9	Storm Events														
Parameter	**UNITS**	**5/20/12**		**10/12/12**		**10/18/12**		**11/6/12**		**12/11/12**		**2/21/13**		**3/2/13**	
Conventionals															
TSS	mg/L	288	J	--		88	J	161	J	--		--		117	
Chloride	mg/L	--		--		0.46		1.71		--		--		--	
Hardness as $CaCO_3$	mg/L	--		--		--		6.72		--		--		--	
Bacteria															
Fecal coliform	cfu/100mL	--		900		12		--		200		2400		--	
Nutrients															
Total Phosphorous	mg/L	11.1		--		--		0.0936		--		--		--	
Orthophosphate	mg/L	--		--		--		0.01	U	--		--		--	
Total Kjeldahl Nitrogen	mg/L	33		--		--		0.9	U	--		--		--	
Nitrate-Nitrite	mg/L	0.241		--		--		0.175		--		--		--	
Metals															
Total Recoverable Copper	ug/L	--		--		18		20.2		--		--		--	
Dissolved Copper	ug/L	--		--		--		1.4		--		--		--	
Total Recoverable Lead	ug/L	--		--		6.25		7.24		--		--		--	
Dissolved Lead	ug/L	--		--		--		0.097		--		--		--	
Total Recoverable Cadmium	ug/L	--		--		0.13		0.14		--		--		--	
Dissolved Cadmium	ug/L	--		--		--		0.02	U	--		--		--	
Total Recoverable Zinc	ug/L	--		--		70.8		79.5		--		--		--	
Dissolved Zinc	ug/L	--		--		--		22.1		--		--		--	
PAH Compounds															
Acenaphthene	ug/L	--		--		--		0.01	U	--		--		--	
Acenaphthylene	ug/L	--		--		--		0.01	U	--		--		--	
Anthracene	ug/L	--		--		--		0.01	U	--		--		--	
Benzo(a)anthracene	ug/L	--		--		--		0.01	U	--		--		--	
Benzo(b)fluoranthene	ug/L	--		--		--		0.057		--		--		--	
Benzo(k)fluoranthene	ug/L	--		--		--		0.018		--		--		--	
Benzo(ghi)perylene	ug/L	--		--		--		0.097		--		--		--	
Benzo(a)pyrene	ug/L	--		--		--		0.031		--		--		--	
Chrysene	ug/L	--		--		--		0.037		--		--		--	
Dibenzo(a,h)anthracene	ug/L	--		--		--		0.01	U	--		--		--	

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SR9 (Continued)		Storm Events													
Parameter	**UNITS**	**5/20/12**		**10/12/12**		**10/18/12**		**11/6/12**		**12/11/12**		**2/21/13**		**3/2/13**	
PAH Compounds (Continued)															
Fluoranthene	ug/L	--		--		--		0.057		--		--		--	
Fluorene	ug/L	--		--		--		0.01	U	--		--		--	
Indeno(1,2,3-cd)pyrene	ug/L	--		--		--		0.051	J	--		--		--	
Naphthalene	ug/L	--		--		--		0.017	J	--		--		--	
Phenanthrene	ug/L	--		--		--		0.03		--		--		--	
Pyrene	ug/L	--		--		--		0.11		--		--		--	
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	--		--		--		0.2	U	--		--		--	
Butyl benzyl phthalate	ug/L	--		--		--		0.2	U	--		--		--	
Di-n-butyl phthalate	ug/L	--		--		--		0.2	U	--		--		--	
Diethyl phthalate	ug/L	--		--		--		0.2	U	--		--		--	
Dimethyl phthalate	ug/L	--		--		--		0.2	U	--		--		--	
Di-n-octyl phthalate	ug/L	--		--		--		0.2	U	--		--		--	
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--		--	
Glyphosate	ug/L	--		--		--		25	U	--		--		--	
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	--		12.71		0.71		--		3.65		6.75		--	
Diesel	mg/L	--		0.05	U	0.05	U	--		0.15	U	0.15	U	--	
Lube Oil	mg/L	--		12		0.66		--		3.5		6.6		--	
TPH-Gas (NWTPH-Gx)	mg/L	--		0.07	U	0.07	U	--		0.07	U	0.05	U	--	
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	--		--				--		--		--		--	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	--		--				--		--		--		--	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	--		--				--		--		--		--	
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	--		--				--		--		--		--	
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	--		--				--		--		--		--	
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	--		--				--		--		--		--	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	--		--				--		--		--		--	

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SR9 (Continued)	Storm Events														
Parameter	**UNITS**	**3/6/13**		**3/19/13**		**4/4/13**		**4/12/13**		**4/18/13**		**5/21/13**		**11/18/13**	
Conventionals															
TSS	mg/L	--		121		85		46		37		--		--	
Chloride	mg/L	--		3.5		64.3		6.98		2.99		--		--	
Hardness as $CaCO_3$	mg/L	--		9.38		89.4		16.7		7.79		--		--	
Bacteria															
Fecal coliform	cfu/100mL	--		--		--		--		--		2900		360	
Nutrients															
Total Phosphorous	mg/L	--		0.137		0.141		0.1	J	0.0647		--		--	
Orthophosphate	mg/L	--		--		--		--		--		--		--	
Total Kjeldahl Nitrogen	mg/L	--		0.66	J	1.6		1.2		0.89	J	--		--	
Nitrate-Nitrite	mg/L	--		0.111		0.228		0.27		0.212		--		--	
Metals															
Total Recoverable Copper	ug/L	--		--		--		--		--		--		--	
Dissolved Copper	ug/L	--		--		--		--		--		--		--	
Total Recoverable Lead	ug/L	--		--		--		--		--		--		--	
Dissolved Lead	ug/L	--		--		--		--		--		--		--	
Total Recoverable Cadmium	ug/L	--		--		--		--		--		--		--	
Dissolved Cadmium	ug/L	--		--		--		--		--		--		--	
Total Recoverable Zinc	ug/L	--		--		--		--		--		--		--	
Dissolved Zinc	ug/L	--		--		--		--		--		--		--	
PAH Compounds															
Acenaphthene	ug/L	--		0.01	U	0.011	U	0.01	U	0.01	U	--		--	
Acenaphthylene	ug/L	--		0.01	U	0.011	U	0.01	U	0.01	U	--		--	
Anthracene	ug/L	--		0.0082	J	0.011	U	0.014		0.01	U	--		--	
Benzo(a)anthracene	ug/L	--		0.025		0.023	J	0.028	J	0.021		--		--	
Benzo(b)fluoranthene	ug/L	--		0.047		0.041		0.038		0.032		--		--	
Benzo(k)fluoranthene	ug/L	--		0.03		0.026		0.03		0.018		--		--	
Benzo(ghi)perylene	ug/L	--		0.11		0.093		0.1		0.064		--		--	
Benzo(a)pyrene	ug/L	--		0.032		0.031		0.031	J	0.024		--		--	
Chrysene	ug/L	--		0.098		0.097		0.087		0.061		--		--	
Dibenzo(a,h)anthracene	ug/L	--		0.012	U	0.012		0.012	U	0.0091	J	--		--	

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SR9 (Continued)	Storm Events														
Parameter	**UNITS**	**3/6/13**		**3/19/13**		**4/4/13**		**4/12/13**		**4/18/13**		**5/21/13**		**11/18/13**	
PAH Compounds (Continued)															
Fluoranthene	ug/L	--		0.11		0.096		0.12	J	0.066		--		--	
Fluorene	ug/L	--		0.01	UJ	0.011	U	0.01	U	0.01	UJ	--		--	
Indeno(1,2,3-cd)pyrene	ug/L	--		0.029		0.023		0.026		0.017		--		--	
Naphthalene	ug/L	--		0.018		0.025		0.031		0.015		--		--	
Phenanthrene	ug/L	--		0.057		0.058		0.062		0.034		--		--	
Pyrene	ug/L	--		0.18		0.16		0.18		0.12		--		--	
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	--		3.5		4.7		3.8		3		--		--	
Butyl benzyl phthalate	ug/L	--		0.25	UJ	0.27	UJ	0.28	U	0.22	UJ	--		--	
Di-n-butyl phthalate	ug/L	--		0.3	U	0.34	U	0.38	U	0.26	U	--		--	
Diethyl phthalate	ug/L	--		0.23	J	1.1		0.27	J	0.25	J	--		--	
Dimethyl phthalate	ug/L	--		0.2	UJ	0.21	U	0.2	U	0.2	UJ	--		--	
Di-n-octyl phthalate	ug/L	--		0.47		0.62	UJ	0.2	U	0.51	UJ	--		--	
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--		--	
Glyphosate	ug/L	--		25	U	25	U	25	U	58		--		--	
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	4.05		--		--		--		--		3.95		5.15	
Diesel	mg/L	0.15	UJ	--		--		--		--		0.15	UJ	0.15	UJ
Lube Oil	mg/L	3.9	J	--		--		--		--		3.8	J	5	J
TPH-Gas (NWTPH-Gx)	mg/L	0.014	J	--		--		--		--		0.07	U	0.07	U
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	--		--		--		--		--		--		--	

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SR9 (Continued)		Storm Events													
Parameter	**UNITS**	**1/7/14**		**1/28/14**		**2/18/14**		**3/3/14**		**3/15/14**		**3/19/14**		**4/8/14**	
Conventionals															
TSS	mg/L	88		--		--		--		40		72		--	
Chloride	mg/L	5.54		--		--		--		4		5.03		1.77	
Hardness as $CaCO_3$	mg/L	11.4		--		--		--		6.19		9.82		5.31	
Bacteria															
Fecal coliform	cfu/100mL	--		--		460		120		--		400		1400	
Nutrients															
Total Phosphorous	mg/L	0.114		--		--		--		0.0496		0.104		0.0536	
Orthophosphate	mg/L	0.01	U	0.0119	J	--		--		0.01	U	--		0.01	U
Total Kjeldahl Nitrogen	mg/L	--		--		--		--		1		0.61	J	--	
Nitrate-Nitrite	mg/L	--		--		--		--		0.109		0.369		0.167	
Metals															
Total Recoverable Copper	ug/L	26.1		16.6		--		--		9.43		--		14	
Dissolved Copper	ug/L	3.47		3.5	J	--		--		2.37		--		4.73	
Total Recoverable Lead	ug/L	7.64		--		--		--		--		--		2.5	
Dissolved Lead	ug/L	0.12		--		--		--		--		--		0.13	
Total Recoverable Cadmium	ug/L	0.146		--		--		--		--		--		0.1	U
Dissolved Cadmium	ug/L	0.1	U	--		--		--		--		--		0.1	U
Total Recoverable Zinc	ug/L	133		93.6		--		--		43.4	J	--		58.1	
Dissolved Zinc	ug/L	26.2		26.3	J	--		--		17.1		--		23	
PAH Compounds															
Acenaphthene	ug/L	--		0.012	U	--		--		0.01	U	0.01	U	0.01	U
Acenaphthylene	ug/L	--		0.012	U	--		--		0.01	U	0.01	U	0.01	U
Anthracene	ug/L	--		0.012	U	--		--		0.01	U	0.02	NJ	0.01	U
Benzo(a)anthracene	ug/L	--		0.085		--		--		0.023		0.044		0.013	
Benzo(b)fluoranthene	ug/L	--		0.1	J	--		--		0.032		0.068		0.023	
Benzo(k)fluoranthene	ug/L	--		0.059	UJ	--		--		0.018		0.028		0.0086	J
Benzo(ghi)perylene	ug/L	--		0.16	J	--		--		0.066		0.13		0.049	
Benzo(a)pyrene	ug/L	--		0.054	NJ	--		--		0.027	NJ	0.043	NJ	0.017	
Chrysene	ug/L	--		0.069		--		--		0.038		0.089		0.033	
Dibenzo(a,h)anthracene	ug/L	--		0.059	U	--		--		0.01	U	0.01	U	0.01	U

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SR9 (Continued)		Storm Events													
Parameter	**UNITS**	**1/7/14**		**1/28/14**		**2/18/14**		**3/3/14**		**3/15/14**		**3/19/14**		**4/8/14**	
PAH Compounds (Continued)															
Fluoranthene	ug/L	--		0.092		--		--		0.071		0.13		0.045	
Fluorene	ug/L	--		0.012	UJ	--		--		0.01	U	0.01	U	0.01	U
Indeno(1,2,3-cd)pyrene	ug/L	--		0.094		--		--		0.026		0.041		0.014	
Naphthalene	ug/L	--		0.026	U	--		--		0.02		0.024		0.019	
Phenanthrene	ug/L	--		0.1		--		--		0.04		0.083		0.036	
Pyrene	ug/L	--		0.2		--		--		0.09		0.23		0.087	
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	--		2.2	J	--		--		2.5		3.7		2.1	
Butyl benzyl phthalate	ug/L	--		0.59	U	--		--		0.21	U	0.21	U	0.22	
Di-n-butyl phthalate	ug/L	--		0.24	U	--		--		0.21	U	0.21	U	0.31	
Diethyl phthalate	ug/L	--		0.24	UJ	--		--		0.21	U	0.21	U	0.2	U
Dimethyl phthalate	ug/L	--		0.24	UJ	--		--		0.21	U	0.21	U	0.2	U
Di-n-octyl phthalate	ug/L	--		0.59	UJ	--		--		0.21	U	0.21	U	0.2	U
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--		--	
Glyphosate	ug/L	25	U	25	U	--		--		25	U	25	U	--	
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	2.65		--		6.35		5.05		--		3.76		5.96	
Diesel	mg/L	0.15	UJ	--		0.15	U	0.15	U	--		0.16	U	0.16	U
Lube Oil	mg/L	2.5		--		6.2		4.9		--		3.6		5.8	
TPH-Gas (NWTPH-Gx)	mg/L	0.07	U	--		0.07	U	0.07	U	--		0.07	U	0.07	U
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	1.01		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	9.07		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	0.9		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	0.01	U	--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	0.01	U	--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	58.8		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	13.12		--		--		--		--		--		--	

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SR9 (Continued)	Storm Event														
Parameter	**UNITS**	**4/16/14**		**4/21/14**		**4/22/14**		**5/8/14**		**5/23/14**		**5/28/14**		**6/12/14**	
Conventionals															
TSS	mg/L	--		21		30		44		33		--		21	
Chloride	mg/L	--		1.74		3.07		1.78		3.12	J	--		0.84	
Hardness as $CaCO_3$	mg/L	--		3.99		9.43		6.8		11		--		5.7	
Bacteria															
Fecal coliform	cfu/100mL	200		--		--		1300		170000	J	1300		600	
Nutrients															
Total Phosphorous	mg/L	--		0.0335		0.0581		0.076		0.101		--		0.071	
Orthophosphate	mg/L	--		0.01	U	0.01	U	--		--		--		--	
Total Kjeldahl Nitrogen	mg/L	--		0.73		1.2	J	2.33		3.06		--		2.51	
Nitrate-Nitrite	mg/L	--		--		0.261		0.14		0.43		--		0.16	
Metals															
Total Recoverable Copper	ug/L	--		10.9		15.2		--		--		--		--	
Dissolved Copper	ug/L	--		5.82		7.23		--		--		--		--	
Total Recoverable Lead	ug/L	--		--		--		--		--		--		--	
Dissolved Lead	ug/L	--		--		--		--		--		--		--	
Total Recoverable Cadmium	ug/L	--		--		--		--		--		--		--	
Dissolved Cadmium	ug/L	--		--		--		--		--		--		--	
Total Recoverable Zinc	ug/L	--		37.3		57.4		--		--		--		--	
Dissolved Zinc	ug/L	--		20.3		20.1		--		--		--		--	
PAH Compounds															
Acenaphthene	ug/L	--		0.01	U	0.01	U	0.1	U	0.1	U	--		0.1	U
Acenaphthylene	ug/L	--		0.01	U	0.01	U	0.1	U	0.1	U	--		0.1	U
Anthracene	ug/L	--		0.01	U	0.01	U	0.1	U	0.1	U	--		0.1	U
Benzo(a)anthracene	ug/L	--		0.01	U	0.0088	NJ	0.1	U	0.1	U	--		0.1	U
Benzo(b)fluoranthene	ug/L	--		0.027		0.015		0.1	UJ	0.1	U	--		0.1	U
Benzo(k)fluoranthene	ug/L	--		0.011		0.01	U	0.1	U	0.1	U	--		0.1	U
Benzo(ghi)perylene	ug/L	--		0.064		0.036		0.1	U	0.1	U	--		0.1	U
Benzo(a)pyrene	ug/L	--		0.02	NJ	0.012	NJ	0.1	U	0.1	U	--		0.1	UJ
Chrysene	ug/L	--		0.043		0.023		0.1	U	0.1	U	--		0.1	U
Dibenzo(a,h)anthracene	ug/L	--		0.01	U	0.01	U	0.1	U	0.1	U	--		0.1	U

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SR9 (Continued)		Storm Event													
Parameter	**UNITS**	**4/16/14**		**4/21/14**		**4/22/14**		**5/8/14**		**5/23/14**		**5/28/14**		**6/12/14**	
PAH Compounds (Continued)															
Fluoranthene	ug/L	--		0.052		0.031		0.1	U	0.1	U	--		0.1	U
Fluorene	ug/L	--		0.01	U	0.01	U	0.1	U	0.1	U	--		0.1	U
Indeno(1,2,3-cd)pyrene	ug/L	--		0.017		0.011		0.1	U	0.1	U	--		0.1	U
Naphthalene	ug/L	--		0.017		0.019		0.1	U	0.1	U	--		0.1	U
Phenanthrene	ug/L	--		0.044		0.027		0.1	U	0.1	U	--		0.1	U
Pyrene	ug/L	--		0.09		0.047		0.1	U	0.1	U	--		0.1	U
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	--		1.7	U	1.1	U	3.64		2.6		--		1.26	J
Butyl benzyl phthalate	ug/L	--		0.2	U	0.2	U	1	U	1	U	--		1	UJ
Di-n-butyl phthalate	ug/L	--		0.35		0.29		1	U	1	U	--		1	U
Diethyl phthalate	ug/L	--		0.2	U	0.2	U	1	U	1	U	--		1	UJ
Dimethyl phthalate	ug/L	--		0.2	U	0.2	U	1	U	1	U	--		1	U
Di-n-octyl phthalate	ug/L	--		0.2	U	0.2	U	1	U	1	U	--		1	U
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--		--	
Glyphosate	ug/L	--		--		18	J	10	U	10	U	--		10	U
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	3.25		--		--		2.12		5.8		4.2		3.7	
Diesel	mg/L	0.15	U	--		--		0.72		1.5	J	1		1.2	
Lube Oil	mg/L	3.1		--		--		1.4		4.3	J	3.2		2.5	
TPH-Gas (NWTPH-Gx)	mg/L	0.07	U	--		--		0.1	U	0.1	U	0.1	U	0.1	U
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	--		--		--		--		--		--		--	

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SR9 (Continued)	Storm Event														
Parameter	**UNITS**	**6/28/14**		**7/23/14**		**8/12/14**		**9/18/14**		**9/23/14**					
Conventionals															
TSS	mg/L	--		44		43		--		16					
Chloride	mg/L	--		0.77		0.78		--		0.73					
Hardness as $CaCO_3$	mg/L	--		6.7		6.9		--		5.9					
Bacteria															
Fecal coliform	cfu/100mL	--		730		--		5300		--					
Nutrients															
Total Phosphorous	mg/L	--		0.076		0.089		--		0.068					
Orthophosphate	mg/L	--		0.005	U	0.018		--		0.018					
Total Kjeldahl Nitrogen	mg/L	--		5.6		2.34		--		1.43					
Nitrate-Nitrite	mg/L	--		0.061		0.36	J	--		0.34					
Metals															
Total Recoverable Copper	ug/L	--		18.5		17		--		14.2					
Dissolved Copper	ug/L	--		7.02	J	7.62	J	--		5.49	J				
Total Recoverable Lead	ug/L	--		3.98		3.19		--		1.92					
Dissolved Lead	ug/L	--		0.085	J	0.136	J	--		0.119	J				
Total Recoverable Cadmium	ug/L	--		0.09		0.081		--		0.064					
Dissolved Cadmium	ug/L	--		0.039	J	0.043	J	--		0.041	J				
Total Recoverable Zinc	ug/L	--		48		60.6		--		51					
Dissolved Zinc	ug/L	--		26.1	J	34	J	--		26.3	J				
PAH Compounds															
Acenaphthene	ug/L	--		0.1	UJ	0.1	U	--		0.1	U				
Acenaphthylene	ug/L	--		0.1	UJ	0.1	U	--		0.1	U				
Anthracene	ug/L	--		0.1	UJ	0.1	U	--		0.1	U				
Benzo(a)anthracene	ug/L	--		0.1	UJ	0.1	U	--		0.1	U				
Benzo(b)fluoranthene	ug/L	--		0.1	UJ	0.1	U	--		0.1	U				
Benzo(k)fluoranthene	ug/L	--		0.1	UJ	0.1	U	--		0.1	U				
Benzo(ghi)perylene	ug/L	--		0.1	UJ	0.1	U	--		0.1	U				
Benzo(a)pyrene	ug/L	--		0.1	UJ	0.1	U	--		0.1	U				
Chrysene	ug/L	--		0.1	UJ	0.1	U	--		0.1	U				
Dibenzo(a,h)anthracene	ug/L	--		0.1	UJ	0.1	U	--		0.1	U				

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SR9 (Continued)	Storm Event														
Parameter	**UNITS**	**6/28/14**		**7/23/14**		**8/12/14**		**9/18/14**		**9/23/14**					
PAH Compounds (Continued)															
Fluoranthene	ug/L	--		0.1	UJ	0.1	U	--		0.1	U				
Fluorene	ug/L	--		0.1	UJ	0.1	U	--		0.1	U				
Indeno(1,2,3-cd)pyrene	ug/L	--		0.1	UJ	0.1	U	--		0.1	U				
Naphthalene	ug/L	--		0.1	UJ	0.1	U	--		0.1	U				
Phenanthrene	ug/L	--		0.1	UJ	0.1	U	--		0.1	U				
Pyrene	ug/L	--		0.1	UJ	0.1	U	--		0.1	U				
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	--		4	J	3.77		--		3.59					
Butyl benzyl phthalate	ug/L	--		1	UJ	1	U	--		1	U				
Di-n-butyl phthalate	ug/L	--		1	UJ	1	U	--		1	U				
Diethyl phthalate	ug/L	--		1	UJ	1	U	--		1	U				
Dimethyl phthalate	ug/L	--		1	UJ	1	U	--		1	U				
Di-n-octyl phthalate	ug/L	--		1	UJ	1	U	--		1	U				
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--					
Diuron	ug/L	--		--		--		--		--					
Glyphosate	ug/L	--		10	U	10	U	--		10	U				
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	3.9		2.36		--		6.8		--					
Diesel	mg/L	1.2		0.76		--		1.6	J	--					
Lube Oil	mg/L	2.7		1.6		--		5.2	J	--					
TPH-Gas (NWTPH-Gx)	mg/L	0.46		0.1	U	--		0.25	U	--					
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	--		--		--		--		--					
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	--		--		--		--		--					
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	--		--		--		--		--					
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	--		--		--		--		--					
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	--		--		--		--		--					
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	--		--		--		--		--					
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	--		--		--		--		--					

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Pines		Storm Events													
Parameter	UNITS	6/26/12		12/4/12		4/19/13		4/21/13		5/21/13		6/2/13		6/19/13	
Conventionals															
TSS	mg/L	--		102	J	48		--		--		117	J	--	
Chloride	mg/L	--		21.7		29.9		22.9		--		17.6	J	--	
Hardness as $CaCO_3$	mg/L	--		--		40.8		--		--		32.6		--	
Bacteria															
Fecal coliform	cfu/100mL	--		--		--		--		--		--		--	
Nutrients															
Total Phosphorous	mg/L	--		--		0.152		--		--		0.262	J	--	
Orthophosphate	mg/L	--		--		--		--		--		--		--	
Total Kjeldahl Nitrogen	mg/L	--		--		--		--		--		1.2	J	--	
Nitrate-Nitrite	mg/L	--		--		0.339		--		--		0.337	J	--	
Metals															
Total Recoverable Copper	ug/L	--		--		18.6		--		37.2		22.6		--	
Dissolved Copper	ug/L	--		--		10.8		--		15.8		8.81		--	
Total Recoverable Lead	ug/L	--		--		3.97		--		12.1		8.09		--	
Dissolved Lead	ug/L	--		--		0.17		--		0.4		0.55		--	
Total Recoverable Cadmium	ug/L	--		--		0.11		--		0.29		0.16		--	
Dissolved Cadmium	ug/L	--		--		0.1	UJ	--		0.1	U	0.1	U	--	
Total Recoverable Zinc	ug/L	--		--		79.6		--		192		104		--	
Dissolved Zinc	ug/L	--		--		22.7		--		40.1		31.3		--	
PAH Compounds															
Acenaphthene	ug/L	--		0.026		0.011	U	0.01	U	0.019	U	0.011	UJ	--	
Acenaphthylene	ug/L	--		0.0099	U	0.011	U	0.01	U	0.019	U	0.011	UJ	--	
Anthracene	ug/L	--		0.028		0.011	U	0.01	U	0.027		0.015	J	--	
Benzo(a)anthracene	ug/L	--		0.051		0.013		0.026		0.035	U	0.02	UJ	--	
Benzo(b)fluoranthene	ug/L	--		0.092		0.03		0.07		0.066		0.033	J	--	
Benzo(k)fluoranthene	ug/L	--		0.031		0.018		0.04		0.041		0.021	J	--	
Benzo(ghi)perylene	ug/L	--		0.11	J	0.054		0.08		0.1		0.08	J	--	
Benzo(a)pyrene	ug/L	--		0.053		0.019		0.032		0.05		0.027	J	--	
Chrysene	ug/L	--		0.11		0.081		0.15		0.16		0.086	J	--	
Dibenzo(a,h)anthracene	ug/L	--		0.016	J	0.011	U	0.01	U	0.025		0.016	J	--	

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TPH-Diesel (NWTPH-Dx) values are calculated as the sum of the Diesel and Lube Oil concentrations

Pines (Continued)		Storm Events													
Parameter	**UNITS**	**6/26/12**		**12/4/12**		**4/19/13**		**4/21/13**		**5/21/13**		**6/2/13**		**6/19/13**	
PAH Compounds															
Fluoranthene	ug/L	--		0.16		0.09		0.17		0.11		0.062	J	--	
Fluorene	ug/L	--		0.034		0.011	U	0.011		0.019	UJ	0.011	UJ	--	
Indeno(1,2,3-cd)pyrene	ug/L	--		0.069	J	0.012		0.023		0.046		0.031	J	--	
Naphthalene	ug/L	--		0.048		0.035		0.032		0.042		0.02	J	--	
Phenanthrene	ug/L	--		0.15		0.084		0.13		0.091		0.053	J	--	
Pyrene	ug/L	--		0.23		0.13		0.23		0.19		0.092	J	--	
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	--		6	J	4.3		5		5.8	J	4.3	J	--	
Butyl benzyl phthalate	ug/L	--		0.34		0.49	UJ	0.2	U	0.56		0.35	J	--	
Di-n-butyl phthalate	ug/L	--		0.52	UJ	0.71	U	0.33	U	0.72	U	0.46	J	--	
Diethyl phthalate	ug/L	--		0.2	U	0.3	J	0.21	UJ	0.35	J	0.15	J	--	
Dimethyl phthalate	ug/L	--		0.2	U	0.23	UJ	0.2	UJ	0.37	U	0.22	UJ	--	
Di-n-octyl phthalate	ug/L	--		0.2	U	0.94	UJ	1.1	J	1.3	J	0.93	J	--	
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--		--	
Glyphosate	ug/L	--		25	U	--		--		--		25	U	--	
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	1.35				--		--		--		4.24		4.15	
Diesel	mg/L	0.05	U		R	--		--		--		0.44	U	0.15	U
Lube Oil	mg/L	1.3			R	--		--		--		3.8		4	
TPH-Gas (NWTPH-Gx)	mg/L	0.07	U	0.07	U	--		--		--		0.07	U	0.07	U
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	--		--		--		--		--		--		--	

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Pines (Continued)		Storm Events															
Parameter	**UNITS**	**8/2/13**		**11/15/13**		**3/14/14**		**3/19/14**		**4/16/14**		**4/17/2014**		**4/24/14**	
Conventionals															
TSS	mg/L	53		27		--		--		--		56		--	
Chloride	mg/L	8.87		12.7		--		--		--		38.9		--	
Hardness as $CaCO_3$	mg/L	31.7		--		--		--		--		39.1		--	
Bacteria															
Fecal coliform	cfu/100mL	--		--		--		--		--		--		--	
Nutrients															
Total Phosphorous	mg/L	0.156		0.109		--		--		--		0.163		--	
Orthophosphate	mg/L	--		--		--		--		--		--		--	
Total Kjeldahl Nitrogen	mg/L	0.72	J	--		--		--		--		0.69		--	
Nitrate-Nitrite	mg/L	0.364		--		--		--		--		0.401		--	
Metals															
Total Recoverable Copper	ug/L	20.6		--		--		--		--		22.1		--	
Dissolved Copper	ug/L	9.24		--		--		--		--		10.9		--	
Total Recoverable Lead	ug/L	5.47		--		--		--		--		4.44		--	
Dissolved Lead	ug/L	0.28		--		--		--		--		0.1	U	--	
Total Recoverable Cadmium	ug/L	0.14		--		--		--		--		0.15		--	
Dissolved Cadmium	ug/L	0.1	U	--		--		--		--		0.1	U	--	
Total Recoverable Zinc	ug/L	94.3		--		--		--		--		79.3		--	
Dissolved Zinc	ug/L	42.6		--		--		--		--		15.7		--	
PAH Compounds															
Acenaphthene	ug/L	0.0099	U	0.012	U	--		--		--		0.01	U	--	
Acenaphthylene	ug/L	0.0099	U	0.012	U	--		--		--		0.01	U	--	
Anthracene	ug/L	0.0099	U	0.012	U	--		--		--		0.01	U	--	
Benzo(a)anthracene	ug/L	0.025	UJ	0.027		--		--		--		0.017	NJ	--	
Benzo(b)fluoranthene	ug/L	0.031		0.036		--		--		--		0.034		--	
Benzo(k)fluoranthene	ug/L	0.016		0.023		--		--		--		0.017		--	
Benzo(ghi)perylene	ug/L	0.068		0.055		--		--		--		0.07		--	
Benzo(a)pyrene	ug/L	0.029		0.025		--		--		--		0.019	NJ	--	
Chrysene	ug/L	0.093		0.055		--		--		--		0.067		--	
Dibenzo(a,h)anthracene	ug/L	0.015		0.0097	J	--		--		--		0.01	U	--	

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Pines (Continued)		Storm Events													
Parameter	UNITS	8/2/13		11/15/13		3/14/14		3/19/14		4/16/14		4/17/2014		4/24/14	
PAH Compounds															
Fluoranthene	ug/L	0.051		0.095		--		--		--		0.076		--	
Fluorene	ug/L	0.0099	UJ	0.012	U	--		--		--		0.01	U	--	
Indeno(1,2,3-cd)pyrene	ug/L	0.027	U	0.016		--		--		--		0.018		--	
Naphthalene	ug/L	0.021		0.03		--		--		--		0.022		--	
Phenanthrene	ug/L	0.037		0.084		--		--		--		0.067		--	
Pyrene	ug/L	0.094		0.15	J	--		--		--		0.12		--	
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	5.1		3.7		--		--		--		4.4		--	
Butyl benzyl phthalate	ug/L	0.34		0.35		--		--		--		0.25		--	
Di-n-butyl phthalate	ug/L	0.63	U	0.87		--		--		--		0.56		--	
Diethyl phthalate	ug/L	0.2	UJ	0.2	J	--		--		--		0.4		--	
Dimethyl phthalate	ug/L	0.2	U	0.24	U	--		--		--		0.21		--	
Di-n-octyl phthalate	ug/L	1.2		1		--		--		--		1.1		--	
Herbicides															
Dichlobenil	ug/L	0.034	U	0.6	J	--		--		--		0.033	U	0.038	UJ
Diuron	ug/L	0.051	U	0.06	UJ	--		--		--		0.049	U	0.057	UJ
Glyphosate	ug/L	25	U	25	U	--		--		--		25	U	--	
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	--		3.95		4.15		2.86		2.96		3.56		4.15	
Diesel	mg/L	--		0.15	UJ	0.15	U	0.16	U	0.16	U	0.16	--	0.15	U
Lube Oil	mg/L	--		3.8	J	4		2.7		2.8		3.4	--	2.8	
TPH-Gas (NWTPH-Gx)	mg/L	--		0.07	U	0.07	U	0.07	U	0.07	U	0.07	U	0.07	U
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	--		--		--		--		--		--		--	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	--		--		--		--		--		--		--	

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Pines (Continued)	Storm Events														
Parameter	UNITS	6/2/2014		6/14/2014		6/17/2014		6/27/2014		9/3/2014					
Conventionals															
TSS	mg/L	--		48		--		--		56	J				
Chloride	mg/L	--		229		--		--		30.5					
Hardness as $CaCO_3$	mg/L	--		--		--		36		44					
Bacteria															
Fecal coliform	cfu/100mL	300		--		--		--		--					
Nutrients															
Total Phosphorous	mg/L	--		--		--		0.12		0.272	J				
Orthophosphate	mg/L	--		--		--		--		--					
Total Kjeldahl Nitrogen	mg/L	--		--		--		--		3.57	J				
Nitrate-Nitrite	mg/L	--		--		--		--		0.62	J				
Metals															
Total Recoverable Copper	ug/L	--		--		--		--		27					
Dissolved Copper	ug/L	--		--		--		--		--					
Total Recoverable Lead	ug/L	--		--		--		--		6.36					
Dissolved Lead	ug/L	--		--		--		--		--					
Total Recoverable Cadmium	ug/L	--		--		--		--		0.159					
Dissolved Cadmium	ug/L	--		--		--		--		--					
Total Recoverable Zinc	ug/L	--		--		--		--		112					
Dissolved Zinc	ug/L	--		--		--		--		--					
PAH Compounds															
Acenaphthene	ug/L	--		0.1	U	--		--		--					
Acenaphthylene	ug/L	--		0.1	U	--		--		--					
Anthracene	ug/L	--		0.1	U	--		--		--					
Benzo(a)anthracene	ug/L	--		0.1	U	--		--		--					
Benzo(b)fluoranthene	ug/L	--		0.1	U	--		--		--					
Benzo(k)fluoranthene	ug/L	--		0.1	U	--		--		--					
Benzo(ghi)perylene	ug/L	--		0.1	U	--		--		--					
Benzo(a)pyrene	ug/L	--		0.1	UJ	--		--		--					
Chrysene	ug/L	--		0.1	U	--		--		--					
Dibenzo(a,h)anthracene	ug/L	--		0.1	U	--		--		--					

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Pines (Continued)															
Parameter	**UNITS**	**6/2/2014**		**6/14/2014**		**6/17/2014**		**6/27/2014**		**9/3/2014**					
PAH Compounds															
Fluoranthene	ug/L	--		0.1	U	--		--		--					
Fluorene	ug/L	--		0.1	U	--		--		--					
Indeno(1,2,3-cd)pyrene	ug/L	--		0.1	U	--		--		--					
Naphthalene	ug/L	--		0.1	U	--		--		--					
Phenanthrene	ug/L	--		0.1	U	--		--		--					
Pyrene	ug/L	--		0.1	U	--		--		--					
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	--		1	U	--		--		--					
Butyl benzyl phthalate	ug/L	--		1	UJ	--		--		--					
Di-n-butyl phthalate	ug/L	--		1	U	--		--		--					
Diethyl phthalate	ug/L	--		1.48	J	--		--		--					
Dimethyl phthalate	ug/L	--		1	U	--		--		--					
Di-n-octyl phthalate	ug/L	--		1	U	--		--		--					
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--					
Diuron	ug/L	--		--		--		--		0.1	U				
Glyphosate	ug/L	--		53.2		--		--		10	U				
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	6.9		--		7.9		--		--					
Diesel	mg/L	3.3		--		3.3	U	--		--					
Lube Oil	mg/L	3.6		--		4.6		--		--					
TPH-Gas (NWTPH-Gx)	mg/L	0.133	J	--		0.316	J	--		--					
Particle Size Distribution															
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	--		--		--		--		--					
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	--		--		--		--		--					
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	--		--		--		--		--					
Particle/Grain Size, Phi Scale 2 to 3 (125-250 um)	mg/L	--		--		--		--		--					
Particle/Grain Size, Phi Scale 3 to 4 (62.5-125 um)	mg/L	--		--		--		--		--					
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	--		--		--		--		--					
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	--		--		--		--		--					

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Appendix F:
Rainfall/Runoff Relationship Tables

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Rainfall-Runoff Relationship for WY 12-14 at Pilchuck 01.

Storm Event #	Start of Storm Event (PT)	End of Storm Event (PT)	Total Runoff Volume Drainage Area (gal.)	Total Precipitation of Storm Event (in.)	Hydrology Flag
1	6/22/12 12:00	6/23/12 7:45	859.4	0.88	j
2	7/13/12 8:55	7/13/12 21:40	193.4	0.29	j
3	7/20/12 4:15	7/20/12 11:35	182.2	0.27	j
4	8/28/12 21:50	8/28/12 22:20	160.5	0.1	C
5	9/9/12 21:00	9/10/12 4:15	190.7	0.15	C
6	10/12/12 10:20	10/12/12 12:55	58.1	0.08	j
7	10/18/12 17:30	10/19/12 3:45	268.4	0.95	j
8	10/21/12 17:55	10/21/12 22:15	87.7	0.1	j
9	10/26/12 10:55	10/26/12 20:45	225.2	0.29	j
10	11/2/12 18:30	11/3/12 5:35	363.0	0.16	j
11	11/7/12 0:35	11/7/12 2:30	74.8	0.15	j
12	11/11/12 13:00	11/12/12 0:25	235.1	0.46	j
13	11/16/12 18:00	11/17/12 9:45	601.2	0.29	j
14	11/22/12 23:45	11/23/12 13:30	482.7	0.18	
15	11/28/12 15:00	11/28/12 23:35	233.8	0.12	j
16	12/6/12 9:45	12/6/12 23:45	469.6	0.37	j
17	12/9/12 11:30	12/10/12 2:15	451.2	0.2	j
18	12/11/12 9:35	12/12/12 12:40	779.9	0.62	j
19	12/13/12 19:10	12/14/12 7:20	467.1	0.53	j
20	12/15/12 15:20	12/16/12 2:15	244.2	0.2	j
21	12/25/12 11:15	12/25/12 14:55	129.4	0.12	j
22	12/29/12 5:40	12/29/12 15:30	281.8	0.31	j
23	1/5/13 9:25	1/5/13 11:10	21.0	0.03	j
24	1/23/13 10:55	1/24/13 5:15	366.0	0.44	C
25	1/26/13 4:20	1/26/12 15:05	462.7	0.6	C
26	2/3/13 16:50	2/4/13 5:45	529.6	0.2	j
27	2/6/13 17:20	2/7/13 0:30	158.0	0.07	
28	2/9/13 6:40	2/9/13 17:35	133.8	0.09	j
29	2/11/13 9:50	2/12/13 2:00	374.1	0.14	j
30	2/16/13 7:30	2/16/13 15:15	216.9	0.24	j
31	2/21/13 2:25	2/21/13 21:30	351.4	0.16	
32	2/24/13 23:50	2/25/13 15:45	337.4	0.2	
33	2/28/13 16:35	2/28/13 18:00	347.1	0.41	
34	3/2/13 14:40	3/2/13 18:20	182.6	0.33	j
35	3/6/13 8:55	3/7/13 14:05	1010.5	0.7	j
36	3/16/13 2:05	3/16/13 9:45	296.7	0.24	j
37	3/20/13 0:00	3/20/13 10:10	373.7	0.27	
38	4/4/13 12:30	4/4/13 20:55	240.0	0.25	

39	4/12/13 14:00	4/13/13 0:00	371.6	0.34	
40	5/12/13 4:00	5/12/13 14:30	222.3	0.15	j
41	6/17/13 22:10	6/18/13 0:05	159.9	0.22	j
42	8/2/13 4:55	8/3/13 5:05	543.2	0.54	j
43	8/10/13 4:15	8/10/13 5:05	19.3	0.07	j
44	8/14/13 20:40	8/15/13 1:45	19.4	0.08	j
45	8/24/13 5:40	8/24/13 10:05	154.4	0.09	C
46	8/28/13 2:20	8/28/13 6:50	79.8	0.13	j
47	9/3/13 4:50	9/3/13 11:45	109.3	0.17	j
48	9/15/13 19:20	9/16/13 3:00	262.3	0.18	j
49	10/1/2013 17:10	10/2/2013 21:15	299.5	0.33	C
50	10/7/2013 8:50	10/7/2013 16:15	348.2	0.25	
51	10/27/2013 5:05	10/27/2013 8:50	138.9	0.3	
52	10/31/2013 3:50	10/31/2013 16:20	203.7	0.2	
53	11/2/2013 0:00	11/3/2013 2:00	799.8	1.16	
54	11/4/2013 22:55	11/5/2013 2:00	99.4	0.11	
55	11/6/2013 19:30	N/A	432.5	0.55	C
56	11/14/2013 12:05	N/A	136.3	0.06	C
57	11/29/2013 23:30	11/30/2013 2:50	142.3	0.07	C
58	12/12/2013 23:55	12/13/2013 0:55	36.1	0.09	j
59	12/20/2013 12:40	12/21/2013 5:45	763.1	0.84	
60	12/27/2013 11:40	12/27/2013 13:00	54.6	0.08	j
61	1/2/2014 4:40	1/2/2014 7:40	135.8	0.12	j
62	1/7/2014 3:20	1/8/2014 2:15	946.6	0.97	
63	1/28/2014 23:30	1/29/2014 19:30	474.8	0.62	C
64	2/10/2014 4:10	2/10/2014 8:05	155.2	0.24	
65	2/11/2014 20:55	2/12/2014 1:55	194.4	0.15	
66	2/21/2014 0:05	2/21/2014 3:50	156.4	0.11	
67	2/22/2014 10:15	2/25/2014 5:00	1230.3	1.87	C
68	3/2/2014 13:55	3/2/2014 22:50	69.2	0.1	j
69	3/8/2014 20:15	3/9/2014 4:50	275.3	0.19	
70	3/13/2014 23:35	3/14/2014 12:20	217.7	0.23	
71	3/15/2014 18:55	3/17/2014 2:50	1000.6	1.49	C
72	3/19/2014 1:40	3/19/2014 19:30	502.3	0.51	c
73	3/25/2014 9:25	3/26/2014 0:10	625.4	0.18	j
74	3/26/2014 19:20	3/26/2014 22:25	84.0	0.14	
75	4/8/2014 15:30	4/9/2014 2:30	148.7	0.33	j
76	4/16/2014 2:55	4/17/2014 20:45	910.0	1.34	C
77	4/19/2014 12:30	4/20/2014 1:45	301.7	0.5	j
78	4/21/2014 22:30	4/22/2014 4:40	323.7	0.37	C
79	4/26/2014 22:35	4/27/2014 6:30	178.6	0.13	C
80	5/2/2014 21:55	5/3/2014 4:20	131.0	0.2	j
81	5/8/2014 13:30	5/10/2014 7:30	1456.0	2.15	j

82	5/17/2014 8:35	5/17/2014 16:00	164.8	0.09	
83	5/18/2014 23:00	5/19/2014 10:15	95.0	0.08	
84	5/23/2014 6:55	5/23/2014 12:15	176.4	0.23	c
85	5/25/2014 15:30	5/25/2014 20:30	187.9	0.19	c
86	5/29/2014 2:40	5/29/2014 6:20	95.6	0.11	c
87	6/12/2014 21:35	6/13/2014 12:40	539.4	0.96	
88	6/13/2014 20:40	6/14/2014 0:30	126.9	0.13	
89	6/14/2014 23:30	6/15/2014 5:30	111.3	0.1	
90	6/16/2014 5:40	6/16/2014 8:55	127.5	0.15	
91	6/20/2014 1:55	N/A	130.3	0.05	C
92	6/27/2014 9:30	6/27/2014 10:20	38.7	0.08	j
93	6/28/2014 3:15	N/A	130.3	0.05	C
94	7/23/2014 7:20	7/23/2014 17:30	327.9	0.9	
95	7/24/2014 6:10	7/24/2014 9:45	135.7	0.25	
96	8/13/2014 0:40	8/13/2014 9:15	339.4	1.06	
97	8/14/2014 15:30	8/14/2014 15:40	12.4	0.06	j
98	8/30/2014 4:15	N/A	148.4	0.08	C
99	9/2/2014 14:10	9/3/2014 1:25	296.8	0.84	
100	9/17/2014 21:15	9/18/2014 14:30	488.1	0.31	
101	9/23/2014 21:10	9/24/2014 15:45	630.8	0.75	
102	9/25/2014 20:10	9/25/2014 22:00	45.6	0.05	c
103	9/26/2014 5:25	9/26/2014 15:45	400.8	0.42	
104	9/26/2014 16:30	9/27/2014 0:00	257.7	0.26	
105	9/29/2014 16:55	9/29/2014 22:45	148.7	0.07	

c-Hydrology data has been deemed acceptable after correction of the dataset either by a correction, substituted data or by a surrogate dataset.

j- Hydrology data does not fall within acceptable criteria or disrupts sample aliquot distribution and is therefore flagged as an estimate. May be appended with a < or > if this is known

C- The hydrology data is unusable because certain quality control criteria were not met. Runoff values calculated using the total event rainfall and existing relationship; C values do not contribute to the rainfall/runoff relationship.

N/A- An accurate runoff end time is not attainable due to unusable hydrology data.

Rainfall-Runoff Relationship for WY 12-14 at Everett 01.

Storm Event #	Start of Storm Event (PT)	End of Storm Event (PT)	Total Runoff Volume Drainage Area (gal.)	Total Precipitation of Storm Event (in.)	Hydrology Flag
1	6/22/12 11:45	6/23/12 10:00	939.4	0.9	j
2	7/3/12 0:45	N/A	481.9	0.57	C
3	7/20/12 4:00	7/20/12 16:05	146.0	0.28	j
4	9/10/12 1:10	9/10/12 5:50	83.8	0.13	j
5	10/18/12 18:40	10/18/12 22:35	209.6	0.65	
6	10/21/12 17:20	10/21/12 21:05	73.4	0.14	j
7	10/26/12 10:45	10/26/12 17:55	150.8	0.13	j
8	10/30/12 5:45	10/31/12 17:10	1019.9	1.6	j
9	11/2/12 18:45	11/3/12 1:05	54.2	0.11	j
10	11/6/12 22:35	11/7/12 3:10	281.2	0.47	
11	11/11/12 12:25	N/A	315.7	0.32	C
12	11/30/12 10:30	N/A	987.2	1.33	C
13	12/8/12 4:00	12/8/12 8:25	145.0	0.41	j
14	12/11/12 13:45	12/12/12 7:25	442.0	0.51	C
15	12/13/12 18:00	12/14/12 6:50	124.5	0.36	j
16	12/16/12 12:15	12/17/12 11:05	744.1	1.08	j
17	12/23/12 18:00	12/24/12 7:00	359.7	0.26	j
18	12/25/12 9:45	12/25/12 16:05	119.2	0.2	j
19	1/6/13 19:00	N/A	475.3	0.56	C
20	1/23/13 11:00	N/A	415.4	0.47	C
21	1/26/13 11:15	N/A	435.4	0.5	C
22	2/11/13 3:30	N/A	142.8	0.06	C
23	2/22/13 10:45	2/23/13 11:10	590.6	0.93	j
24	2/25/13 1:00	2/25/13 14:25	227.6	0.09	j
25	2/27/13 17:25	2/27/13 22:15	146.8	0.13	j
26	3/2/13 15:15	3/2/13 18:50	160.9	0.3	j
27	3/6/13 9:35	3/7/13 9:35	653.5	0.63	j
28	3/12/13 16:20	3/12/13 21:10	495.1	0.27	j
29	3/17/13 21:40	3/18/13 3:20	186.7	0.08	j
30	3/19/13 21:15	3/20/13 11:10	506.3	0.51	
31	4/4/13 11:55	4/5/13 11:30	782.5	0.46	
32	4/7/13 3:30	4/7/13 20:30	843.4	1.23	
33	4/10/13 9:50	4/10/13 17:45	224.3	0.13	
34	4/12/13 13:35	4/12/13 19:10	240.1	0.21	
35	4/27/13 19:50	4/28/13 9:25	552.3	0.34	j
36	4/30/13 5:30	N/A	136.2	0.05	C
37	5/12/13 4:10	5/12/13 11:45	246.3	0.17	j
38	5/21/13 3:15	5/22/13 6:15	922.2	0.72	

39	6/17/13 22:35	6/18/13 0:50	91.2	0.1	j
40	7/17/13 3:40	7/17/13 4:05	14.6	0.05	j
41	8/24/13 6:25	8/24/13 12:00	128.0	0.08	j
42	8/28/13 1:30	8/28/13 6:50	79.3	0.13	j
43	9/3/13 4:10	9/3/13 16:30	205.5	0.23	j
44	9/15/13 17:40	9/16/13 1:15	138.5	0.17	j
45	9/22/13 8:20	9/22/13 15:20	46.8	0.05	j
46	10/27/2013 6:05	10/27/2013 10:45	212.8	0.3	
47	10/31/2013 4:15	10/31/2013 14:05	185.9	0.08	
48	11/2/2013 1:40	11/2/2013 11:25	295.5	0.19	
49	11/4/2013 22:15	11/5/2013 3:20	182.0	0.1	
50	11/6/2013 19:25	11/7/2013 19:45	824.2	0.55	c
51	11/9/2013 18:10	11/10/2013 15:00	674.2	0.14	c
52	11/12/2013 6:20	11/12/2013 10:45	158.3	0.07	j
53	11/14/2013 6:05	11/14/2013 14:05	207.6	0.12	j
54	11/18/2013 12:05	11/19/2013 11:30	923.4	0.36	j
55	12/20/2013 12:10	12/21/2013 6:05	565.2	0.59	
56	12/27/2013 12:15	12/27/2013 13:45	46.2	0.06	j
57	12/30/2013 23:40	12/31/2013 2:15	142.8	0.06	C
58	1/2/2014 3:25	1/2/2014 6:25	162.8	0.09	C
59	1/7/2014 2:50	1/7/2014 21:50	642.6	0.81	
60	1/28/2014 21:20	1/29/2014 4:20	352.8	0.77	
61	2/9/2014 11:20	2/9/2014 18:30	99.9	0.13	j
62	2/11/2014 17:55	2/12/2014 0:50	184.6	0.26	
63	2/14/2014 2:20	2/14/2014 4:20	101.6	0.15	
64	2/15/2014 12:55	2/15/2014 19:10	287.7	0.41	
65	2/22/2014 9:50	2/24/2014 0:25	916.7	0.88	
66	3/1/2014 17:25	3/1/2014 23:30	126.5	0.06	
67	3/8/2014 12:45	3/9/2014 4:00	607.4	0.34	c
68	3/14/2014 0:00	3/14/2014 4:50	125.0	0.06	
69	3/15/2014 19:25	3/17/2014 9:00	1466.3	1.54	c
70	3/19/2014 3:15	3/19/2014 17:20	607.3	0.5	
71	3/25/2014 12:10	3/25/2014 23:05	288.4	0.07	j
72	3/26/2014 18:40	3/27/2014 1:00	234.4	0.12	
73	4/5/2014 15:25	4/6/2014 6:20	441.7	0.26	
74	4/8/2014 15:10	4/8/2014 23:15	287.0	0.31	
75	4/16/2014 6:55	4/16/2014 13:25	202.5	0.08	
76	4/19/2014 12:20	4/19/2014 20:00	223.3	0.08	c
77	4/21/2014 22:40	4/22/2014 7:10	427.4	0.39	
78	4/26/2014 22:45	4/27/2014 2:50	151.3	0.07	
79	5/2/2014 22:25	5/3/2014 5:30	63.9	0.11	c
80	5/17/2014 7:35	5/17/2014 15:50	174.9	0.11	c
81	5/18/2014 21:00	5/19/2014 6:45	399.5	0.4	

82	5/23/2014 7:10	5/23/2014 16:30	298.4	0.16	c
83	5/25/2014 15:50	5/25/2014 23:50	237.8	0.11	c
84	6/12/2014 21:30	6/13/2014 12:15	801.4	0.8	
85	6/14/2014 20:35	6/15/2014 12:45	298.4	0.42	c
86	6/16/2014 6:55	6/16/2014 9:20	74.2	0.09	c
87	6/20/2014 0:40	6/20/2014 4:10	150.3	0.12	
88	6/27/2014 23:50	6/28/2014 5:35	158.8	0.08	
89	7/22/2014 23:50	7/23/2014 17:35	475.0	0.98	
90	7/24/2014 6:35	7/24/2014 10:10	144.5	0.21	
91	8/13/2014 0:05	8/13/2014 9:00	378.6	0.8	
92	8/30/2014 3:10	8/30/2014 4:50	76.9	0.17	
93	9/2/2014 14:55	9/3/2014 4:00	419.4	1.07	
94	9/17/2014 20:35	9/18/2014 7:15	235.9	0.2	C
95	9/18/2014 8:40	9/18/2014 14:40	169.4	0.1	C
96	9/23/2014 20:35	9/24/2014 12:05	780.1	0.65	
97	9/25/2014 7:50	9/25/2014 11:35	115.1	0.12	
98	9/25/2014 20:05	9/25/2014 20:55	315.7	0.32	C
99	9/26/2014 5:15	9/26/2014 11:20	295.6	0.73	
100	9/26/2014 18:40	9/26/2014 21:05	87.4	0.12	
101	9/30/2014 16:50	9/29/2014 22:45	112.6	0.11	
102	9/30/2014 9:50	N/A	136.2	0.05	C

c-Hydrology data has been deemed acceptable after correction of the dataset either by a correction, substituted data or by a surrogate dataset.

j- Hydrology data does not fall within acceptable criteria or disrupts sample aliquot distribution and is therefore flagged as an estimate. May be appended with a < or > if this is known

C- The hydrology data is unusable because certain quality control criteria were not met. Runoff values calculated using the total event rainfall and existing relationship; C values do not contribute to the rainfall/runoff relationship.

N/A- An accurate runoff end time is not attainable due to unusable hydrology data.

Rainfall-Runoff Relationship for WY 12-14 at Everett 04.

Storm Event #	Start of Storm Event (PT)	End of Storm Event (PT)	Total Runoff Volume Drainage Area (gal.)	Total Precipitation of Storm Event (in.)	Hydrology Flag
1	7/20/12 3:25	7/20/12 12:20	299.4	0.33	
2	7/22/12 18:50	7/23/12 3:50	236.7	0.23	
3	9/10/12 1:05	9/10/12 6:25	161.4	0.17	J
4	10/18/12 18:40	10/18/12 23:30	237.4	0.63	
5	10/21/12 17:20	10/21/12 18:55	56.5	0.13	
6	10/26/12 10:40	10/26/12 15:05	173.6	0.14	
7	10/30/12 5:50	10/31/12 18:10	1972.5	1.52	
8	11/2/12 18:20	11/2/12 22:05	149.7	0.12	J
9	11/6/12 22:25	11/7/12 10:55	313.0	0.48	
10	11/11/12 12:25	11/12/12 5:30	700.0	0.29	J
11	11/16/12 16:55	11/17/12 7:20	612.8	0.34	J
12	11/23/12 1:10	N/A	423.8	0.38	C
13	11/28/12 14:15	11/29/12 1:25	460.6	0.17	J
14	12/6/12 14:30	12/6/12 21:25	303.2	0.19	J
15	12/9/12 11:50	12/10/12 1:10	595.7	0.21	J
16	12/11/12 13:45	12/12/12 7:40	519.5	0.53	
17	12/13/12 19:10	12/14/12 6:50	440.7	0.32	
18	12/15/12 14:05	12/16/12 1:05	191.5	0.22	J
19	12/25/12 10:25	12/25/12 14:50	319.4	0.14	J
20	12/29/12 6:30	12/29/12 14:45	141.0	0.21	J
21	1/3/13 19:50	1/4/13 1:00	152.4	0.1	J
22	1/5/13 21:45	1/6/13 2:35	40.3	0.07	J
23	1/23/13 11:35	N/A	475.8	0.44	C
24	1/26/13 5:45	N/A	493.1	0.46	C
25	2/13/13 1:50	2/13/13 13:30	134.0	0.05	J
26	2/16/13 7:45	2/16/13 19:45	542.2	0.23	J
27	2/22/13 16:35	N/A	830.9	0.85	C
28	2/25/13 1:05	2/25/13 7:45	198.0	0.05	J
29	2/27/13 17:30	2/27/13 23:25	228.8	0.14	J
30	3/2/13 15:15	3/2/13 22:00	310.3	0.27	J
31	3/6/13 9:35	N/A	588.4	0.57	C
32	3/12/13 16:40	N/A	276.6	0.21	C
33	3/17/13 22:00	N/A	163.9	0.08	C
34	3/19/13 21:30	3/20/13 11:05	550.1	0.45	
35	4/4/13 12:15	4/4/13 21:20	327.7	0.3	J
36	4/7/13 3:35	4/7/13 20:00	714.6	1.19	J
37	4/10/13 9:55	4/10/13 11:45	52.7	0.12	J
38	4/12/13 13:45	4/12/13 16:50	122.5	0.17	J

39	4/18/13 17:00	4/19/13 19:30	868.2	0.61	
40	4/27/13 19:50	4/28/13 7:30	231.4	0.31	J
41	4/30/13 5:25	4/30/13 11:45	154.2	0.05	J
42	5/12/13 4:10	5/12/13 5:55	72.2	0.15	J
43	5/21/13 3:10	5/22/13 5:55	801.6	0.66	J
44	6/17/13 22:20	6/17/13 23:35	57.6	0.13	J
45	8/24/13 7:10	8/24/13 10:35	94.0	0.08	J
46	9/3/13 4:20	9/3/13 11:45	251.4	0.21	J
47	9/15/13 17:40	9/15/13 21:15	142.0	0.16	J
48	9/22/13 10:10	9/22/13 14:45	49.5	0.06	J
49	10/7/13 10:05	10/7/13 17:00	284.4	0.22	
50	10/27/13 6:00	10/27/13 11:15	294.7	0.3	
51	10/31/13 5:00	10/31/13 10:00	128.3	0.05	
52	11/2/13 2:25	11/3/13 9:15	1541.0	1.05	
53	11/4/13 22:15	11/5/13 1:40	198.7	0.1	
54	11/6/13 19:15	11/7/13 16:30	519.1	0.49	C
55	11/9/13 19:20	11/10/13 9:15	198.6	0.12	C
56	11/12/13 6:50	11/12/13 14:00	337.9	0.06	c
57	11/14/13 6:05	11/14/13 18:30	353.4	0.12	c
58	11/18/13 13:00	11/18/13 22:30	297.7	0.1	j
59	11/30/13 22:10	11/30/13 16:00	207.3	0.13	C
60	12/20/13 11:45	12/21/13 7:45	890.5	0.52	
61	12/27/13 12:00	12/28/13 15:35	163.5	0.07	
62	12/30/13 22:30	12/31/13 3:55	265.4	0.06	c
63	1/2/14 3:45	1/2/14 12:00	210.8	0.09	c
64	1/7/14 2:15	1/8/14 0:45	884.9	0.77	
65	1/11/14 23:50	1/11/14 20:00	1076.7		
66	1/28/14 21:30	1/29/14 9:30	467.2	0.71	j
67	2/9/14 11:10	2/9/14 16:20	181.3	0.1	C
68	2/11/14 17:35	2/12/14 5:15	505.9	0.24	c
69	2/22/14 10:20	2/24/14 4:45	1252.8	0.81	c
70	3/1/14 17:30	3/1/14 23:30	53.7	0.05	c
71	3/8/14 14:00	3/9/14 3:25	435.9	0.32	c
72	3/14/14 0:05	N/A	138.0	0.05	C
73	3/15/14 19:40	3/16/14 4:40	1208.5	1.47	
74	3/19/14 3:10	3/19/14 21:45	483.5	0.49	c
75	3/25/14 13:30	N/A	146.6	0.06	C
76	3/26/14 18:40	N/A	198.6	0.12	C
77	4/5/14 15:30	4/6/14 7:15	531.1	0.26	
78	4/8/14 15:15	4/9/14 2:35	406.1	0.3	
79	4/16/14 6:35	4/16/14 13:50	212.8	0.07	
80	4/19/14 12:20	4/19/14 20:30	142.7	0.09	
81	4/21/14 22:40	4/22/14 11:00	572.7	0.38	

82	4/26/14 22:30	4/27/14 5:45	207.3	0.07	c
83	5/2/14 22:15	5/3/14 1:50	111.3	0.11	
84	5/8/14 13:45	5/9/14 11:20	654.2	0.55	
85	5/17/14 7:30	5/17/14 11:25	97.1	0.1	
86	5/18/14 20:40	5/19/14 3:50	283.5	0.51	
87	6/12/14 21:30	6/13/14 12:20	691.0	0.78	
88	6/14/14 20:50	6/15/14 8:00	242.5	0.26	
89	6/15/14 11:50	6/16/14 13:00	241.9	0.17	C
90	6/16/14 5:20	6/16/14 9:25	138.3	0.1	c
91	6/19/14 23:15	6/20/14 3:30	140.9	0.12	c
92	6/28/14 1:00	6/28/14 3:50	82.5	0.07	
93	7/20/14 2:35	N/A	138.0	0.05	C
94	7/23/14 6:55	7/23/14 21:20	643.9	0.96	c
95	7/24/14 6:15	7/24/14 13:55	266.7	0.22	
96	8/13/14 0:05	8/13/14 13:50	509.0	0.8	
97	8/30/14 3:10	8/30/14 9:50	287.4	0.17	
98	9/2/14 14:55	9/3/14 6:10	556.7	1.05	j
99	9/17/14 20:35	9/18/14 4:25	237.2	0.19	c
100	9/18/14 8:30	9/18/14 10:05	82.1	0.1	c
101	9/23/14 18:40	9/24/14 12:20	916.4	0.64	
102	9/25/14 7:20	9/25/14 14:05	356.6	0.12	j
103	9/25/14 20:05	9/26/14 2:05	52.0	0.31	c
104	9/26/14 5:00	9/26/14 11:00	338.8	0.73	c
105	9/26/14 18:50	9/27/14 1:00	198.6	0.12	C
106	9/29/14 16:50	9/29/14 22:50	189.9	0.11	C
107	9/30/14 5:45	9/30/14 9:00	138.0	0.05	C

c-Hydrology data has been deemed acceptable after correction of the dataset either by a correction, substituted data or by a surrogate dataset.
j- Hydrology data does not fall within acceptable criteria or disrupts sample aliquot distribution and is therefore flagged as an estimate. May be appended with a < or > if this is known
C- The hydrology data is unusable because certain quality control criteria were not met. Runoff values calculated using the total event rainfall and existing relationship; C values do not contribute to the rainfall/runoff relationship.
N/A- An accurate runoff end time is not attainable due to unusable hydrology data.

Rainfall-Runoff Relationship for WY 12-14 at SR 09.

Storm Event #	Start of Storm Event (PT)	End of Storm Event (PT)	Total Runoff Volume Drainage Area (gal.)	Total Precipitation of Storm Event (in.)	Hydrology Flag
1	5/20/12 11:15	5/21/12 0:30	354.6	0.23	j
2	5/28/12 10:30	5/28/12 12:50	89.0	0.22	j
3	6/12/12 13:10	6/13/12 9:05	1116.4	1	j
4	6/16/12 7:30	N/A	134.2	0.09	C
5	6/22/12 11:35	6/23/12 2:25	186.2	0.9	j
6	6/30/12 1:30	6/30/12 12:00	102.4	0.26	j
7	7/13/12 8:35	7/13/12 14:45	172.5	0.06	j
8	7/20/12 4:00	7/20/12 12:15	213.0	0.31	j
9	10/13/12 7:30	N/A	247.0	0.23	C
10	10/18/12 18:45	10/19/12 4:00	372.4	0.69	j
11	10/28/12 0:00	10/28/12 8:05	144.7	0.32	j
12	10/30/12 3:30	10/31/12 18:55	1357.6	1.56	j
13	11/6/12 22:00	11/7/12 1:15	628.0	0.68	j
14	11/11/12 16:00	11/12/12 1:30	312.0	0.32	j
15	11/17/12 2:25	11/17/12 7:05	65.9	0.37	j
16	11/23/12 0:30	11/24/12 7:50	442.6	0.49	j
17	12/11/12 13:45	12/12/12 11:15	1085.2	1.27	C
18	2/13/13 1:50	N/A	118.1	0.07	C
19	2/16/13 7:45	2/16/13 16:40	399.0	0.34	j
20	2/21/13 5:40	2/21/13 12:30	93.9	0.06	
21	2/25/13 0:50	2/25/13 6:55	168.6	0.07	
22	3/2/13 15:20	3/2/13 23:45	287.0	0.32	j
23	3/6/13 9:55	3/7/13 12:50	1164.4	0.75	j
24	3/12/13 16:05	N/A	625.8	0.7	C
25	3/17/13 20:40	3/18/13 0:15	144.4	0.09	j
26	3/19/13 19:55	3/20/13 12:40	721.2	0.55	j
27	4/4/13 12:05	4/5/13 8:25	670.5	0.56	
28	4/10/13 10:00	4/10/13 17:30	108.7	0.13	j
29	4/12/13 13:55	4/12/13 22:15	237.2	0.19	j
30	4/18/13 16:50	4/19/13 19:20	995.3	0.75	j
31	4/27/13 19:55	4/28/13 11:35	352.5	0.39	j
32	4/30/13 5:30	4/30/13 12:05	102.3	0.09	j
33	5/12/13 4:15	5/12/13 8:50	125.3	0.18	j
34	5/15/13 19:45	N/A	110.0	0.06	C
35	5/19/13 3:25	N/A	101.9	0.05	C
36	5/21/13 2:15	N/A	625.8	0.7	C
37	5/26/13 9:05	N/A	101.9	0.05	C
38	5/27/13 14:35	N/A	118.1	0.07	C

39	6/11/13 17:15	6/11/13 22:10	179.3	0.19	j
40	6/12/13 23:40	6/13/13 8:35	302.3	0.29	j
41	6/17/13 22:40	6/18/13 2:40	9.6	0.09	j
42	7/31/13 18:05	7/31/13 18:45	27.3	0.05	j
43	8/10/13 3:10	N/A	101.9	0.05	C
44	8/15/13 14:30	N/A	118.1	0.07	C
45	8/24/13 6:00	N/A	110.0	0.06	C
46	10/1/2013 9:15	10/1/2013 10:40	63.1	0.08	
47	10/7/2013 0:30	10/7/2013 3:25	61.8	0.05	
48	10/12/2013 5:20	10/12/2013 7:10	98.0	0.05	c
49	10/27/2013 5:45	10/27/2013 13:30	278.4	0.28	
50	11/2/2013 1:25	11/3/2013 7:05	1007.5	1.28	
51	11/4/2013 22:45	11/5/2013 5:45	196.2	0.1	
52	11/6/2013 19:15	11/7/2013 17:10	780.1	0.63	
53	11/9/2013 18:25	11/10/2013 9:15	498.3	0.13	
54	11/12/2013 6:45	11/12/2013 14:30	184.3	0.08	c
55	11/14/2013 6:30	11/14/2013 17:55	228.8	0.06	
56	11/18/2013 11:35	11/19/2013 8:05	931.7	0.47	c
57	12/20/2013 13:40	12/21/2013 8:00	730.6	0.83	C
58	12/27/2013 12:15	12/27/2013 17:00	88.0	0.09	
59	12/30/2013 22:45	12/31/2013 4:05	180.5	0.08	
60	1/2/2014 2:50	1/2/2014 8:10	170.0	0.11	
61	1/7/2014 2:45	1/7/2014 21:55	449.6	0.96	
62	1/28/2014 21:20	1/29/2014 6:55	429.6	0.69	
63	2/9/2014 11:50	2/9/2014 19:15	206.7	0.18	C
64	2/11/2014 17:00	2/12/2014 4:40	411.4	0.32	
65	2/14/2014 2:30	2/14/2014 5:40	114.1	0.11	
66	2/22/2014 10:10	2/24/2014 1:40	1522.0	1.04	
67	3/1/2014 16:50	3/1/2014 20:35	93.5	0.09	
68	3/8/2014 14:20	3/9/2014 9:35	498.6	0.46	
69	3/13/2014 23:25	3/14/2014 4:55	238.5	0.14	
70	3/15/2014 18:50	3/17/2014 13:30	2054.4	1.92	
71	3/19/2014 3:00	3/19/2014 17:55	692.8	0.64	
72	3/25/14 9:55	3/25/14 21:05	401.3	0.14	c
73	4/3/2014 15:55	4/3/2014 19:25	78.2	0.05	c
74	4/5/2014 15:15	4/6/2014 5:50	476.3	0.41	
75	4/8/2014 15:05	4/8/2014 22:45	292.9	0.44	
76	4/16/2014 4:05	4/16/2014 12:50	222.4	0.12	
77	4/16/2014 16:45	4/18/2014 0:35	1078.8	1.16	
78	4/19/2014 12:10	4/19/2014 14:50	101.7	0.12	c

79	4/21/2014 21:10	4/22/2014 8:05	453.9	0.48	
80	4/22/2014 20:45	4/23/2014 2:25	208.4	0.14	
81	4/23/2014 18:35	4/24/2014 7:15	439.0	0.39	
82	4/26/2014 22:35	4/27/2014 2:35	139.7	0.09	
83	4/27/2014 15:40	4/28/2014 0:30	207.9	0.43	
84	5/2/2014 22:15	5/3/2014 1:30	77.1	0.09	
85	5/3/2014 14:45	5/4/2014 1:15	349.7	0.59	
86	5/4/2014 9:10	5/5/2014 2:50	427.9	0.47	
87	5/5/2014 7:40	5/5/2014 14:50	247.1	0.36	
88	5/8/2014 13:40	5/9/2014 1:45	351.8	0.49	
89	5/9/2014 7:00	5/9/2014 9:25	51.1	0.09	
90	5/9/2014 22:20	5/10/2014 7:00	264.5	0.3	
91	5/18/2014 23:55	5/19/2014 6:10	100.6	0.12	
92	5/23/2014 7:00	5/23/2014 13:00	241.1	0.18	
93	5/25/2014 15:20	5/25/2014 22:25	254.7	0.15	
94	5/26/2014 9:30	5/26/2014 16:05	156.6	0.1	
95	5/28/2014 7:05	5/28/2014 13:00	142.7	0.06	
96	6/12/2014 20:20	6/13/2014 16:40	993.4	1.2	c
97	6/14/2014 20:30	6/15/2014 2:25	159.1	0.06	c
98	6/15/2014 2:40	6/15/2014 2:50	101.9	0.05	C
99	6/15/2014 3:30	6/15/2014 18:15	389.9	0.26	j
100	6/16/2014 5:30	6/16/2014 11:35	235.4	0.12	c
101	6/17/2014 2:05	6/17/2013 6:10	137.3	0.05	c
102	6/19/2014 23:00	6/20/2014 5:10	303.0	0.18	c
103	6/28/2014 0:50	6/28/2014 4:20	79.8	0.06	j
104	7/19/2014 21:00	7/20/2014 1:25	118.2	0.09	
105	7/23/2014 6:55	7/23/2014 22:10	651.5	1.25	c
106	7/24/2014 5:30	7/24/2014 14:10	284.6	0.23	
107	8/2/2014 14:35	8/2/2014 14:55	18.9	0.06	j
108	8/12/2014 23:05	8/13/2014 8:45	364.0	0.75	c
109	8/16/2014 2:45	8/16/2014 4:55	67.9	0.07	c
110	8/30/2014 3:20	8/30/2014 9:25	189.1	0.18	c
111	8/30/2014 10:35	8/30/2014 13:05	60.9	0.07	c
112	9/2/2014 14:55	9/3/2014 4:20	420.7	1.07	
113	9/17/2014 20:35	9/18/2014 3:40	199.7	0.15	
114	9/18/2014 7:30	9/18/2014 11:35	133.6	0.12	
115	9/23/2014 18:30	9/24/2014 13:45	773.4	0.65	
116	9/25/2014 4:25	9/25/2014 12:20	303.9	0.13	
117	9/25/2014 19:50	9/25/2014 21:35	70.0	0.11	

118	9/26/2014 4:50	9/26/2014 16:00	375.3	0.83	
119	9/26/2014 18:25	9/26/2014 23:55	193.3	0.09	
120	9/29/2014 16:45	9/29/2014 23:30	171.6	0.12	
121	9/30/2014 3:30	9/30/2014 8:45	148.3	0.06	

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C- The hydrology data is unusable because certain quality control criteria were not met. Runoff values calculated using the total event rainfall and existing relationship; C values do not contribute to the rainfall/runoff relationship.
N/A- An accurate runoff end time is not attainable due to unusable hydrology data.

Rainfall-Runoff Relationship for WY 12-14 at Pines 01.

Storm Event #	Start of Storm Event (PT)	End of Storm Event (PT)	Total Runoff Volume Drainage Area (gal.)	Total Precipitation of Storm Event (in.)	Hydrology Flag
1	6/26/12 9:05	N/A	666.7	0.56	C
2	8/21/12 8:40	N/A	71.5	0.05	C
3	10/22/12 16:15	10/22/12 22:05	234.6	0.14	j
4	10/25/12 1:30	N/A	94.8	0.07	C
5	11/1/12 8:55	11/1/12 15:15	143.1	0.1	
6	11/3/12 10:05	11/3/12 18:00	311.9	0.2	j
7	11/8/12 17:30	N/A	83.2	0.06	C
8	11/12/12 9:45	N/A	386.6	0.32	C
9	11/17/12 15:40	11/18/12 2:25	353.2	0.16	j
10	11/19/12 2:35	11/20/12 22:00	2038.4	1.22	
11	11/23/12 17:10	11/24/12 5:30	666.5	0.25	j
12	11/28/12 18:40	11/28/12 23:15	243.9	0.08	j
13	12/4/12 4:45	12/4/12 12:00	175.4	0.12	
14	12/7/12 8:05	12/7/12 14:00	140.3	0.07	j
15	12/11/12 12:10	N/A	83.2	0.06	C
16	12/12/12 0:40	N/A	199.9	0.16	C
17	12/16/12 11:35	N/A	409.9	0.34	C
18	12/20/12 8:35	N/A	153.2	0.12	C
19	12/22/12 12:55	N/A	94.8	0.07	C
20	1/6/13 11:20	N/A	94.8	0.07	C
21	1/7/13 13:50	N/A	655.0	0.55	C
22	1/19/13 13:40	N/A	71.5	0.05	C
23	1/23/13 19:30	N/A	141.5	0.11	C
24	1/28/13 10:30	N/A	94.8	0.07	C
25	1/30/13 5:40	N/A	176.5	0.14	C
26	2/7/13 23:10	N/A	106.5	0.08	C
27	2/19/13 8:55	N/A	129.8	0.1	C
28	2/25/13 9:05	N/A	199.9	0.16	C
29	3/12/13 6:00	3/12/13 8:05	96.8	0.06	j
30	3/16/13 18:05	3/17/13 0:15	112.8	0.07	j
31	3/20/13 1:05	3/20/13 17:55	502.8	0.58	
32	4/4/13 13:45	4/5/13 0:15	416.8	0.12	j
33	4/6/13 4:25	4/6/13 10:45	252.3	0.06	j
34	4/10/13 13:20	4/10/13 21:30	213.1	0.1	j
35	4/12/13 20:00	4/12/13 23:15	133.1	0.11	j
36	4/19/13 1:35	4/19/13 11:40	133.1	0.24	
37	4/21/13 13:05	4/21/13 16:45	113.9	0.27	
38	5/13/13 15:50	N/A	106.5	0.08	C

39	5/21/13 18:20	5/21/13 21:00	127.8	0.2	
40	6/2/13 8:45	6/2/13 22:30	582.1	0.64	
41	6/18/13 3:50	6/18/13 7:00	87.7	0.11	j
42	6/19/13 6:30	6/19/13 14:15	116.6	0.13	j
43	6/24/13 5:40	6/24/13 7:20	70.5	0.07	j
44	6/29/13 5:55	6/29/13 14:00	69.2	0.1	j
45	8/2/13 4:15	8/2/13 16:25	692.7	0.76	
46	8/25/13 21:00	8/25/13 22:20	55.3	0.1	j
47	9/5/13 5:15	9/5/13 10:35	233.3	0.15	j
48	9/7/13 18:35	9/7/13 20:40	106.9	0.09	j
49	9/15/13 22:35	9/16/13 5:30	198.1	0.17	j
50	9/17/13 22:35	9/18/13 1:20	107.4	0.09	j
51	9/24/13 6:00	N/A	141.5	0.11	C
52	9/25/13 14:45	9/25/13 21:45	74.4	0.05	j
53	10/1/2013 12:45	10/1/2013 21:00	427.6	0.1	j
54	10/7/2013 15:10	10/7/2013 21:30	374.2	0.1	j
55	10/27/2013 7:35	10/27/2013 12:10	161.1	0.07	
56	11/2/2013 4:15	11/2/2013 12:35	439.1	0.31	j
57	11/5/2013 10:50	11/5/2013 18:30	201.6	0.11	
58	11/7/2013 2:50	11/7/2013 17:10	797.2	0.38	j
59	11/15/2013 14:25	11/16/2013 8:05	764.0	0.31	j
60	11/18/2013 22:20	11/19/2013 1:05	121.0	0.12	
61	11/30/2013 10:05	11/30/2013 17:00	83.2	0.06	C
62	12/22/2013 14:55	N/A	479.9	0.4	C
63	1/8/2014 14:55	N/A	608.3	0.51	C
64	1/11/2014 0:35	N/A	141.5	0.11	C
65	2/11/2014 10:00	2/11/2014 17:30	161.1	0.14	
66	2/14/2014 7:45	2/14/2014 12:35	95.6	0.05	
67	2/15/2014 14:15	2/15/2014 23:10	349.8	0.31	
68	2/18/2014 14:55	2/18/2014 19:35	232.2	0.29	
69	2/20/2014 7:55	2/20/2014 8:55	19.0	0.05	j
70	2/25/2014 10:45	2/25/2014 18:30	118.2	0.09	C
71	3/3/2014 9:40	3/3/2014 18:35	386.6	0.32	C
72	3/5/2014 6:00	3/5/2014 15:45	304.9	0.25	C
73	3/8/2014 20:35	3/9/2014 7:10	473.7	0.27	
74	3/14/2014 8:50	3/14/14 15:30	180.2	0.15	
75	3/17/2014 1:20	3/17/2014 4:40	142.7	0.12	
76	3/19/2014 17:50	3/19/2014 18:35	36.1	0.05	j
77	3/28/2014 14:10	3/28/2014 21:40	242.1	0.19	j
78	4/17/2014 6:30	4/17/2014 21:55	539.7	0.41	
79	4/22/2014 5:30	4/22/2014 9:40	98.7	0.13	

80	4/24/2014 2:35	4/24/2014 8:55	263.6	0.28	
81	4/27/2014 6:45	4/27/2014 12:40	114.9	0.12	
82	5/4/2014 5:30	5/4/2014 6:15	34.6	0.09	
83	5/4/2014 20:30	5/4/2014 21:20	34.3	0.09	
84	5/5/2014 16:00	5/5/2014 16:55	34.4	0.05	
85	5/9/2014 1:15	5/9/2014 7:50	243.9	0.38	
86	5/28/2014 18:15	5/28/2014 18:45	21.5	0.06	
87	6/2/2014 20:55	6/3/2014 3:00	116.0	0.18	j
88	6/3/2014 17:30	6/3/2014 18:50	82.6	0.28	j
89	6/14/2014 7:15	6/14/2014 10:15	39.2	0.09	
90	6/17/2014 7:00	6/18/2014 11:10	1169.2	1.29	c
91	6/26/2014 16:35	6/26/2014 17:10	25.9	0.06	
92	6/27/2014 6:10	6/27/2014 10:40	37.2	0.07	
93	6/27/2014 22:30	6/28/2014 3:25	108.1	0.14	
94	7/14/2014 17:30	7/14/2014 18:40	53.3	0.08	
95	7/22/2014 10:30	7/22/2014 14:20	63.5	0.05	
96	8/12/2014 19:00	8/12/2014 20:05	45.5	0.07	
97	8/14/2014 3:40	8/14/2014 4:50	54.7	0.06	j
98	8/20/2014 19:00	8/20/2014 19:45	31.9	0.06	
99	8/22/2014 8:05	8/22/2014 9:15	51.6	0.13	
100	9/3/2014 7:45	9/3/2014 12:25	114.7	0.2	

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C- The hydrology data is unusable because certain quality control criteria were not met. Runoff values calculated using the total event rainfall and existing relationship; C values do not contribute to the rainfall/runoff relationship.
N/A- An accurate runoff end time is not attainable due to unusable hydrology data.

Appendix G:
Pollutant Loading Tables

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Annual and Seasonal Pollutant Loading Tables

The following tables report water year 2013 and 2014 (WY13-WY14) annual, wet, and dry season pollutant loads for the five highway runoff monitoring sites included in this study. Both sampled and unsampled events are included for each water year. The five sites identified by highway, milepost (MP), and their permit-defined annual average daily traffic (AADT) designations are:

- I-5 Pilchuck (Pilchuck 01), MP 210.71, “urbanized”
- I-5 Everett (Everett 01), MP 197.27, “highly urbanized”
- I-5 Everett (Everett 04), MP 197.35, “highly urbanized”
- SR 9 Marysville (SR9 01), MP 17.92, “rural”
- I-90 Pines (Pines 01), MP 289.55, “urbanized” eastern Washington

Table G-1 WY13 Pilchuck 01 Pollutant Loads from Sampling Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	0.90	29	NS	NS	0.90	29
Chloride	0.21	6.7	NS	NS	0.21	6.7
Hardness as $CaCO_3$	0.57	18	NS	NS	0.57	18
Nutrients						
Total Phosphorous	2.2E-03	7.1E-05	NS	NS	2.2E-03	7.1E-05
Orthophosphate	2E-03	7E-05	NS	NS	2E-03	7E-05
Total Kjeldahl Nitrogen	0.011	0.35	NS	NS	0.011	0.35
Nitrate-Nitrite	3.2E-03	0.10	NS	NS	3.2E-03	0.10
Metals						
Total Recoverable Copper	3.8E-04	0.012	NS	NS	3.8E-04	0.012
Dissolved Copper	1.1E-04	3.4E-03	NS	NS	1.1E-04	3.4E-03
Total Recoverable Lead	--	--	NS	NS	--	--
Dissolved Lead	--	--	NS	NS	--	--
Total Recoverable Cadmium	--	--	NS	NS	--	--
Dissolved Cadmium	--	--	NS	NS	--	--
Total Recoverable Zinc	1.2E-03	0.039	NS	NS	1.2E-03	0.039
Dissolved Zinc	3.5E-04	0.011	NS	NS	3.5E-04	0.011
PAH Compounds						
Acenaphthene	ND	ND	NS	NS	ND	ND
Acenaphthylene	ND	ND	NS	NS	ND	ND
Anthracene	6E-07	2E-05	NS	NS	6E-07	2E-05
Benzo(a)anthracene	3.0E-07	9.8E-06	NS	NS	3.0E-07	9.8E-06
Benzo(b)fluoranthene	4E-07	1E-05	NS	NS	4E-07	1E-05
Benzo(k)fluoranthene	3E-07	9E-06	NS	NS	3E-07	9E-06
Benzo(ghi)perylene	1E-06	4E-05	NS	NS	1E-06	4E-05

Table G-1 WY13 Pilchuck 01 Pollutant Loads from Sampling Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
PAH Compounds						
Benzo(a)pyrene	5.7E-07	1.8E-05	NS	NS	5.7E-07	1.8E-05
Chrysene	7E-07	2E-05	NS	NS	7E-07	2E-05
Dibenzo(a,h)anthracene	1E-07	4E-06	NS	NS	1E-07	4E-06
Fluoranthene	1.6E-06	5.2E-05	NS	NS	1.6E-06	5.2E-05
Fluorene	2E-07	7E-06	NS	NS	2E-07	7E-06
Indeno(1,2,3-cd)pyrene	2.9E-07	9.5E-06	NS	NS	2.9E-07	9.5E-06
Naphthalene	3E-07	1E-05	NS	NS	3E-07	1E-05
Phenanthrene	9.1E-07	2.9E-05	NS	NS	9.1E-07	2.9E-05
Pyrene	2E-06	7E-05	NS	NS	2E-06	7E-05
Phthalates						
bis(2-Ethylhexyl)phthalate	8E-05	3E-03	NS	NS	8E-05	3E-03
Butyl benzyl phthalate	3E-06	1E-04	NS	NS	3E-06	1E-04
Di-n-butyl phthalate	ND	ND	NS	NS	ND	ND
Diethyl phthalate	ND	ND	NS	NS	ND	ND
Dimethyl phthalate	ND	ND	NS	NS	ND	ND
Di-n-octyl phthalate	1.3E-05	4.2E-04	NS	NS	1.3E-05	4.2E-04
Herbicides						
Glyphosate	ND	ND	NS	NS	ND	ND
Petroleum Hydrocarbons (TPH)						
Diesel	ND	ND	NS	NS	ND	ND
Lube Oil	0.1	4	NS	NS	0.1	4
TPH-Gas (NWTPH-Gx)	ND	ND	NS	NS	ND	ND

NS Not sampled.
-- No samples were collected.
ND Sample parameter was never detected.

Table G-2 WY13 Everett 01 Pollutant Loads from Sampling Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	0.25	4.5	0.59	11	0.84	15
Chloride	3.29E-02	0.598	2.70E-02	0.491	5.99E-02	1.09
Hardness as $CaCO_3$	9.67E-02	1.76	0.141	2.56	0.238	4.32
Nutrients						
Total Phosphorous	9.67E-02	1.76	1.21E-03	2.20E-02	1.82E-03	3.31E-02
Orthophosphate	1e-05	2e-04	2e-03	0.04	2e-03	0.04
Total Kjeldahl Nitrogen	4.7E-03	0.085	0.017	0.31	0.022	0.39
Nitrate-Nitrite	1.73E-03	3.15E-02	6.75E-03	0.123	8.48E-03	0.154
Metals						
Total Recoverable Copper	5.09E-05	9.26E-04	0.385	7.01	0.436	7.94

Table G-2 WY13 Everett 01 Pollutant Loads from Sampling Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Metals						
Dissolved Copper	1.42E-05	2.58E-04	1.55E-04	2.81E-03	1.69E-04	3.07E-03
Total Recoverable Lead	--	--	--	--	--	--
Dissolved Lead	--	--	--	--	--	--
Total Recoverable Cadmium	--	--	--	--	--	--
Dissolved Cadmium	--	--	--	--	--	--
Total Recoverable Zinc	1.51E-04	2.75E-03	1.19E-03	2.17E-02	1.34E-03	2.44E-02
Dissolved Zinc	6.50E-05	1.18E-03	4.62E-04	8.40E-03	4.62E-04	8.40E-03
PAH Compounds						
Acenaphthene	2E-08	4E-07	3E-07	5E-06	3E-07	6E-06
Acenaphthylene	ND	ND	ND	ND	ND	ND
Anthracene	2E-08	4E-07	2E-07	3E-06	2E-07	3E-06
Benzo(a)anthracene	9.1E-08	1.7E-06	2.0E-07	3.6E-06	2.9E-07	5.3E-06
Benzo(b)fluoranthene	2E-07	3E-06	3E-07	6E-06	5E-07	9E-06
Benzo(k)fluoranthene	9.3E-08	1.7E-06	2.0E-07	3.6E-06	2.9E-07	5.3E-06
Benzo(ghi)perylene	3.1E-07	5.6E-06	4.2E-07	7.7E-06	7.3E-07	1.3E-05
Benzo(a)pyrene	1.1E-07	2.1E-06	2.5E-07	4.5E-06	3.6E-07	6.5E-06
Chrysene	2.3E-07	4.1E-06	5.5E-07	9.9E-06	7.7E-07	1.4E-05
Dibenzo(a,h)anthracene	2E-08	4E-07	1E-07	2E-06	2E-08	4E-07
Fluoranthene	3E-07	6E-06	7E-07	1E-05	1E-06	2E-05
Fluorene	2E-08	4E-07	3E-07	5E-06	3E-07	5E-06
Indeno(1,2,3-cd)pyrene	1E-07	3E-06	2E-07	4E-06	4E-07	7E-06
Naphthalene	8.0E-08	1.4E-06	1.4E-07	2.5E-06	2.2E-07	4.0E-06
Phenanthrene	1.8E-07	3.4E-06	8.5E-07	1.5E-05	1.0E-06	1.9E-05
Pyrene	4.8E-07	8.8E-06	1.1E-06	2.0E-05	1.6E-06	2.8E-05
Phthalates						
bis(2-Ethylhexyl)phthalate	1E-05	2E-04	4E-05	8E-04	5E-05	1E-03
Butyl benzyl phthalate	6E-07	1E-05	3E-06	5E-05	3E-06	6E-05
Di-n-butyl phthalate	ND	ND	ND	ND	ND	ND
Diethyl phthalate	9E-07	2E-05	8E-07	1E-05	2E-06	3E-05
Dimethyl phthalate	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	6E-07	1E-05	2E-06	5E-05	3E-06	6E-05
Herbicides						
Glyphosate	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons (TPH)						
Diesel	ND	ND	ND	ND	ND	ND
Lube Oil	0.1	2	0.06	1	0.2	3
TPH-Gas (NWTPH-Gx)	ND	ND	ND	ND	ND	ND

--- No samples were collected.
ND Sample parameter was never detected.

Table G-3 WY13 Everett 04 Pollutant Loads from Sampling Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	1.5	28	0.46	8.4	2.0	36
Chloride	0.200	3.63	3.01E-02	0.547	0.230	4.18
Hardness as $CaCO_3$	0.427	7.76	0.112	2.04	0.539	9.80
Nutrients						
Total Phosphorous	2.5E-03	0.045	9.5E-04	0.017	3.4E-03	0.062
Orthophosphate	1E-05	2E-04	1E-04	2E-03	1E-04	2E-03
Total Kjeldahl Nitrogen	0.015	0.28	0.010	0.18	0.025	0.46
Nitrate-Nitrite	1.02E-02	0.185	4.52E-03	8.22E-02	1.47E-02	0.267
Metals						
Total Recoverable Copper	5.12E-05	9.31E-04	3.08E-04	5.60E-03	3.59E-04	6.54E-03
Dissolved Copper	1.55E-05	2.82E-04	1.25E-04	2.28E-03	1.41E-04	2.56E-03
Total Recoverable Lead	--	--	--	--	--	--
Dissolved Lead	--	--	--	--	--	--
Total Recoverable Cadmium	--	--	--	--	--	--
Dissolved Cadmium	--	--	--	--	--	--
Total Recoverable Zinc	2.85E-04	5.18E-03	1.35E-03	2.46E-02	1.64E-03	2.98E-02
Dissolved Zinc	1.92E-04	3.49E-03	6.34E-04	1.15E-02	8.26E-04	1.50E-02
PAH Compounds						
Acenaphthene	ND	ND	--	--	ND	ND
Acenaphthylene	ND	ND	--	--	ND	ND
Anthracene	1E-07	3E-06	--	--	1E-07	3E-06
Benzo(a)anthracene	6E-07	1E-05	--	--	6E-07	1E-05
Benzo(b)fluoranthene	1.2E-06	2.2E-05	--	--	1.2E-06	2.2E-05
Benzo(k)fluoranthene	5.8E-07	1.1E-05	--	--	5.8E-07	1.1E-05
Benzo(ghi)perylene	1.3E-06	2.3E-05	--	--	1.3E-06	2.3E-05
Benzo(a)pyrene	6.7E-07	1.2E-05	--	--	6.7E-07	1.2E-05
Chrysene	2E-06	3E-05	--	--	2E-06	3E-05
Dibenzo(a,h)anthracene	2E-07	3E-06	--	--	2E-07	3E-06
Fluoranthene	2.0E-06	3.7E-05	--	--	2.0E-06	3.7E-05
Fluorene	1E-07	2E-06	--	--	1E-07	2E-06
Indeno(1,2,3-cd)pyrene	6.0E-07	1.1E-05	--	--	6.0E-07	1.1E-05
Naphthalene	3.5E-07	6.3E-06	--	--	3.5E-07	6.3E-06
Phenanthrene	1.0E-06	1.9E-05	--	--	1.0E-06	1.9E-05
Pyrene	3.2E-06	5.8E-05	--	--	3.2E-06	5.8E-05
Phthalates						
bis(2-Ethylhexyl)phthalate	1E-04	0.002	--	--	1E-04	0.002
Butyl benzyl phthalate	ND	ND	--	--	ND	ND
Di-n-butyl phthalate	ND	ND	--	--	ND	ND
Diethyl phthalate	8E-06	1E-04	--	--	8E-06	1E-04
Dimethyl phthalate	2E-06	4E-05	--	--	2E-06	4E-05

Table G-3 WY13 Everett 04 Pollutant Loads from Sampling Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Phthalates						
Di-n-octyl phthalate	5E-06	9E-05	--	--	5E-06	9E-05
Herbicides						
Glyphosate	3.1E-04	5.6E-03	8.4E-05	1.5E-03	3.9E-04	7.1E-03
Petroleum Hydrocarbons (TPH)						
Diesel	ND	ND	ND	ND	ND	ND
Lube Oil	0.11	1.9	0.021	0.39	0.13	2.3
TPH-Gas (NWTPH-Gx)	ND	ND	ND	ND	ND	ND

--- No samples were collected.
ND Sample parameter was never detected.

Table G-4 WY13 SR9 01 Pollutant Loads from Sampling Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	2.7	140	NS	NS	2.7	140
Chloride	0.43	23	NS	NS	0.43	23
Hardness as $CaCO_3$	0.690	36.3	NS	NS	0.690	36.3
Nutrients						
Total Phosphorous	2.8E-03	0.15	NS	NS	2.8E-03	0.15
Orthophosphate	ND	ND	NS	NS	ND	ND
Total Kjeldahl Nitrogen	0.025	1.3	NS	NS	0.025	1.3
Nitrate-Nitrite	5.16E-03	0.271	NS	NS	5.16E-03	0.271
Metals						
Total Recoverable Copper	1.6E-04	8.5E-03	NS	NS	1.6E-04	8.5E-03
Dissolved Copper	7.3E-06	3.9E-04	NS	NS	7.3E-06	3.9E-04
Total Recoverable Lead	5.74E-05	3.02E-03	NS	NS	5.74E-05	3.02E-03
Dissolved Lead	5.1E-07	2.7E-05	NS	NS	5.1E-07	2.7E-05
Total Recoverable Cadmium	1.1E-06	6.0E-05	NS	NS	1.1E-06	6.0E-05
Dissolved Cadmium	ND	ND	NS	NS	ND	ND
Total Recoverable Zinc	6.37E-04	3.35E-02	NS	NS	6.37E-04	3.35E-02
Dissolved Zinc	1.16E-04	6.10E-03	NS	NS	1.16E-04	6.10E-03
PAH Compounds						
Acenaphthene	ND	ND	NS	NS	ND	ND
Acenaphthylene	ND	ND	NS	NS	ND	ND
Anthracene	2E-07	9E-06	NS	NS	2E-07	9E-06
Benzo(a)anthracene	5E-07	3E-05	NS	NS	5E-07	3E-05
Benzo(b)fluoranthene	1.2E-06	6.1E-05	NS	NS	1.2E-06	6.1E-05
Benzo(k)fluoranthene	6E-07	3E-05	NS	NS	6E-07	3E-05
Benzo(ghi)perylene	2E-06	1E-04	NS	NS	2E-06	1E-04
Benzo(a)pyrene	7.9E-07	4.2E-05	NS	NS	7.9E-07	4.2E-05

Table G-4 WY13 SR9 01 Pollutant Loads from Sampling Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
PAH Compounds						
Chrysene	2.0E-06	1.1E-04	NS	NS	2.0E-06	1.1E-04
Dibenzo(a,h)anthracene	2E-07	1E-05	NS	NS	2E-07	1E-05
Fluoranthene	2.3E-06	1.2E-04	NS	NS	2.3E-06	1.2E-04
Fluorene	ND	ND	NS	NS	ND	ND
Indeno(1,2,3-cd)pyrene	7.6E-07	4.0E-05	NS	NS	7.6E-07	4.0E-05
Naphthalene	5.2E-07	2.8E-05	NS	NS	5.2E-07	2.8E-05
Phenanthrene	1E-06	6E-05	NS	NS	1E-06	6E-05
Pyrene	3.9E-06	2.1E-04	NS	NS	3.9E-06	2.1E-04
Phthalates						
bis(2-Ethylhexyl)phthalate	8E-05	4E-03	NS	NS	8E-05	4E-03
Butyl benzyl phthalate	ND	ND	NS	NS	ND	ND
Di-n-butyl phthalate	ND	ND	NS	NS	ND	ND
Diethyl phthalate	1E-05	6E-04	NS	NS	1E-05	6E-04
Dimethyl phthalate	ND	ND	NS	NS	ND	ND
Di-n-octyl phthalate	7E-06	4E-04	NS	NS	7E-06	4E-04
Herbicides						
Glyphosate	7.2E-04	0.019	NS	NS	7.2E-04	0.019
Petroleum Hydrocarbons (TPH)						
Diesel	ND	ND	ND	ND	ND	ND
Lube Oil	0.079	4.2	0.020	1.1	0.10	5.2
TPH-Gas (NWTPH-Gx)	6.6E-04	0.035	1.9E-04	0.010	8.5E-04	0.045

NS Not sampled.
ND Sample parameter was never detected.

Table G-5 WY13 Pines 01 Pollutant Loads from Sampling Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	0.77	9.0	0.31	3.6	1.1	13
Chloride	0.172	2.00	5.13E-02	5.96E-01	0.223	2.60
Hardness as $CaCO_3$	0.204	2.37	0.183	2.13	0.387	4.50
Nutrients						
Total Phosphorous	1.44E-03	1.68E-02	9.02E-04	1.05E-02	2.34E-03	2.72E-02
Orthophosphate	--	--	--	--	--	--
Total Kjeldahl Nitrogen	5.8E-03	0.068	4.2E-03	0.048	1.0E-02	0.12
Nitrate-Nitrite	2.01E-03	2.34E-02	2.10E-03	2.45E-02	4.12E-03	4.79E-02
Metals						
Total Recoverable Copper	1.70E-04	1.98E-03	1.19E-04	1.38E-03	2.89E-04	3.36E-03
Dissolved Copper	7.16E-05	8.33E-04	5.34E-05	6.21E-04	1.25E-04	1.45E-03
Total Recoverable Lead	5.66E-05	6.58E-04	3.16E-05	3.68E-04	8.82E-05	1.03E-03

Table G-5 WY13 Pines 01 Pollutant Loads from Sampling Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Metals						
Dissolved Lead	3.3E-06	3.8E-05	1.6E-06	1.9E-05	4.9E-06	5.7E-05
Total Recoverable Cadmium	1.2E-06	1.4E-05	8.1E-07	9.4E-06	2.0E-06	2.3E-05
Dissolved Cadmium	ND	ND	ND	ND	ND	ND
Total Recoverable Zinc	7.98E-04	9.28E-03	5.45E-04	6.34E-03	1.34E-03	1.56E-02
Dissolved Zinc	2.20E-04	2.56E-03	2.46E-04	2.86E-03	4.66E-04	5.42E-03
PAH Compounds						
Acenaphthene	9E-08	1E-06	3E-08	3E-07	1E-07	1E-06
Acenaphthylene	ND	ND	ND	ND	ND	ND
Anthracene	5E-08	6E-07	3E-08	3E-07	8E-08	1E-06
Benzo(a)anthracene	2E-07	2E-06	4E-08	4E-07	2E-07	3E-06
Benzo(b)fluoranthene	5E-07	5E-06	2E-07	2E-06	6E-07	7E-06
Benzo(k)fluoranthene	2E-07	3E-06	9E-08	1E-06	3E-07	4E-06
Benzo(ghi)perylene	8E-07	9E-06	4E-07	5E-06	1E-06	1E-05
Benzo(a)pyrene	3E-07	4E-06	2E-07	2E-06	5E-07	6E-06
Chrysene	9.8E-07	1.1E-05	5.4E-07	6.3E-06	1.5E-06	1.8E-05
Dibenzo(a,h)anthracene	1E-07	2E-06	9E-08	1E-06	2E-07	3E-06
Fluoranthene	9E-07	1E-05	3E-07	3E-06	1E-06	1E-05
Fluorene	2.1E-07	2.5E-06	2.9E-08	3.3E-07	2.4E-07	2.8E-06
Indeno(1,2,3-cd)pyrene	3.4E-07	3.9E-06	7.8E-08	9.1E-07	4.2E-07	4.8E-06
Naphthalene	3E-07	3E-06	1E-07	1E-06	4E-07	5E-06
Phenanthrene	8.0E-07	9.3E-06	2.1E-07	2.5E-06	1.0E-06	1.2E-05
Pyrene	1.4E-06	1.6E-05	5.4E-07	6.3E-06	1.9E-06	2.2E-05
Phthalates						
bis(2-Ethylhexyl)phthalate	5E-05	5E-04	3E-05	3E-04	7E-05	9E-04
Butyl benzyl phthalate	3E-06	4E-05	2E-06	2E-05	5E-06	6E-05
Di-n-butyl phthalate	ND	ND	ND	ND	ND	ND
Diethyl phthalate	2E-06	2E-05	6E-07	7E-06	2E-06	3E-05
Dimethyl phthalate	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	8E-06	9E-05	7E-06	8E-05	1E-05	2E-04
Herbicides						
Glyphosate	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons (TPH)						
Diesel	ND	ND	NS	NS	ND	ND
Lube Oil	0.02	0.3	NS	NS	0.02	0.3
TPH-Gas (NWTPH-Gx)	ND	ND	NS	NS	ND	ND

-- No samples were collected.
ND Sample parameter was never detected.
NS Not sampled.

Table G-6 WY13 Pilchuck 01 Pollutant Loads from Unsampled Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	2.7	87	NS	NS	2.7	87
Chloride	0.57	19	NS	NS	0.57	19
Hardness as $CaCO_3$	1.6	53	NS	NS	1.6	53
Nutrients						
Total Phosphorous	5.1E-03	0.16	NS	NS	5E-03	0.16
Orthophosphate	5E-04	0.02	NS	NS	5E-04	0.02
Total Kjeldahl Nitrogen	0.038	1.2	NS	NS	0.038	1.2
Nitrate-Nitrite	0.013	0.41	NS	NS	0.013	0.41
Metals						
Total Recoverable Copper	1.2E-03	0.039	NS	NS	1.2E-03	0.039
Dissolved Copper	3.5E-04	0.011	NS	NS	3.5E-04	0.011
Total Recoverable Lead	--	--	NS	NS	--	--
Dissolved Lead	--	--	NS	NS	--	--
Total Recoverable Cadmium	--	--	NS	NS	--	--
Dissolved Cadmium			NS	NS		
Total Recoverable Zinc	--	--	NS	NS	--	--
Dissolved Zinc	1.2E-03	0.039	NS	NS	1.2E-03	0.039
PAH Compounds						
Acenaphthene	ND	ND	NS	NS	ND	ND
Acenaphthylene	ND	ND	NS	NS	ND	ND
Anthracene	1E-06	3E-05	NS	NS	1E-06	3E-05
Benzo(a)anthracene	1.3E-06	4.0E-05	NS	NS	1.3E-06	4.0E-05
Benzo(b)fluoranthene	2E-06	6E-05	NS	NS	2E-06	6E-05
Benzo(k)fluoranthene	1E-06	4E-05	NS	NS	1E-06	4E-05
Benzo(ghi)perylene	3E-06	1E-04	NS	NS	3E-06	1E-04
Benzo(a)pyrene	1.5E-06	5.0E-05	NS	NS	1.5E-06	5.0E-05
Chrysene	3E-06	8E-05	NS	NS	3E-06	8E-05
Dibenzo(a,h)anthracene	4E-07	1E-05	NS	NS	4E-07	1E-05
Fluoranthene	5.1E-06	1.6E-04	NS	NS	5.1E-06	1.6E-04
Fluorene	5E-07	2E-05	NS	NS	5E-07	2E-05
Indeno(1,2,3-cd)pyrene	1.1E-06	3.4E-05	NS	NS	1.1E-06	3.4E-05
Naphthalene	9E-07	3E-05	NS	NS	9E-07	3E-05
Phenanthrene	2.8E-06	9.0E-05	NS	NS	2.8E-06	9.0E-05
Pyrene	7E-06	2E-04	NS	NS	7E-06	2E-04
Phthalates						
bis(2-Ethylhexyl)phthalate	2E-04	7E-03	NS	NS	2E-04	7E-03
Butyl benzyl phthalate	8E-06	3E-04	NS	NS	8E-06	3E-04
Di-n-butyl phthalate	ND	ND	NS	NS	ND	ND
Diethyl phthalate	ND	ND	NS	NS	ND	ND
Dimethyl phthalate	ND	ND	NS	NS	ND	ND

Table G-6 WY13 Pilchuck 01 Pollutant Loads from Unsampled Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Phthalates						
Di-n-octyl phthalate	3.7E-05	1.2E-03	NS	NS	3.7E-05	1.2E-03
Herbicides						
Glyphosate	ND	ND	NS	NS	ND	ND
Petroleum Hydrocarbons (TPH)						
Diesel	ND	ND	NS	NS	ND	ND
Lube Oil	0.2	6	NS	NS	0.2	6
TPH-Gas (NWTPH-Gx)	ND	ND	NS	NS	ND	ND

-- No samples were collected.
ND Sample parameter was never detected.
NS Not sampled.

Table G-7 WY13 Everett 01 Pollutant Loads from Unsampled Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	6.1	110	0.31	5.6	6.5	120
Chloride	0.357	6.49	2.06E-02	0.375	0.378	6.86
Hardness as $CaCO_3$	1.07	19.4	0.107	1.95	1.18	21.4
Nutrients						
Total Phosphorous	6.23E-03	0.113	9.22E-04	1.68E-02	7.16E-03	0.130
Orthophosphate	4E-04	0.01	1E-04	2E-03	5E-04	0.01
Total Kjeldahl Nitrogen	0.050	0.91	0.015	0.27	0.065	1.2
Nitrate-Nitrite	2.13E-02	0.388	3.68E-03	6.69E-02	2.50E-02	0.455
Metals						
Total Recoverable Copper	1.66E-03	3.01E-02	2.28E-04	4.14E-03	1.88E-03	3.43E-02
Dissolved Copper	4.62E-04	8.40E-03	1.20E-04	2.18E-03	5.82E-04	1.06E-02
Total Recoverable Lead	--	--	--	--	--	--
Dissolved Lead	--	--	--	--	--	--
Total Recoverable Cadmium	--	--	--	--	--	--
Dissolved Cadmium	--	--	--	--	--	--
Total Recoverable Zinc	4.92E-03	8.95E-02	6.47E-04	1.18E-02	5.57E-03	1.01E-01
Dissolved Zinc	2.11E-03	3.85E-02	3.34E-04	6.07E-03	2.45E-03	4.45E-02
PAH Compounds						
Acenaphthene	4E-07	7E-06	2E-07	4E-06	6E-07	1E-05
Acenaphthylene	ND	ND	ND	ND	ND	ND
Anthracene	4E-07	7E-06	1E-07	2E-06	5E-07	9E-06
Benzo(a)anthracene	1.6E-06	3.0E-05	1.5E-07	2.8E-06	1.8E-06	3.3E-05
Benzo(b)fluoranthene	3E-06	5E-05	2E-07	4E-06	3E-06	6E-05
Benzo(k)fluoranthene	1.7E-06	3.1E-05	1.5E-07	2.8E-06	1.8E-06	3.3E-05
Benzo(ghi)perylene	5.5E-06	9.9E-05	3.2E-07	5.9E-06	5.8E-06	1.1E-04

Table G-7 WY13 Everett 01 Pollutant Loads from Unsampled Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
PAH Compounds						
Benzo(a)pyrene	2.0E-06	3.6E-05	1.9E-07	3.4E-06	2.2E-06	4.0E-05
Chrysene	4.1E-06	7.5E-05	4.2E-07	7.6E-06	4.5E-06	8.3E-05
Dibenzo(a,h)anthracene	4E-07	7E-06	9E-08	2E-06	5E-07	9E-06
Fluoranthene	6E-06	7E-06	9E-08	2E-06	6E-06	9E-06
Fluorene	4E-07	7E-06	2E-07	4E-06	6E-07	1E-05
Indeno(1,2,3-cd)pyrene	2E-06	5E-05	2E-07	3E-06	3E-06	5E-05
Naphthalene	1.4E-06	2.6E-05	1.1E-07	1.9E-06	1.5E-06	2.8E-05
Phenanthrene	3.4E-06	6.1E-05	6.5E-07	1.2E-05	4.0E-06	7.3E-05
Pyrene	8.7E-06	1.6E-04	8.2E-07	1.5E-05	9.6E-06	1.7E-04
Phthalates						
bis(2-Ethylhexyl)phthalate	3E-04	5E-03	3E-05	6E-04	3E-04	5.E-03
Butyl benzyl phthalate	1E-05	2E-04	2E-06	4E-05	1E-05	2E-04
Di-n-butyl phthalate	ND	ND	ND	ND	ND	ND
Diethyl phthalate	2E-05	3E-04	6E-07	1E-05	2E-05	3E-04
Dimethyl phthalate	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	5E-05	3E-04	6E-07	1E-05	5E-05	3E-04
Herbicides						
Glyphosate	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons (TPH)						
Diesel	ND	ND	ND	ND	ND	ND
Lube Oil	0.7	10	0.04	0.8	0.7	10
TPH-Gas (NWTPH-Gx)	ND	ND	ND	ND	ND	ND

-- No samples were collected.
ND Sample parameter was never detected.

Table G-8 WY13 Everett 04 Pollutant Loads from Unsampled Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	6.2	110	0.30	5.4	6.5	120
Chloride	1.01	18.3	1.81E-02	0.329	1.02	18.6
Hardness as $CaCO_3$	1.59	28.9	7.36E-02	1.34	1.66	30.3
Nutrients						
Total Phosphorous	9.8E-03	0.18	6.2E-04	0.011	0.010	0.19
Orthophosphate	4E-04	0.01	8E-05	1E-03	5E-04	0.01
Total Kjeldahl Nitrogen	0.090	1.6	6.6E-03	0.12	0.10	1.8
Nitrate-Nitrite	3.68E-02	0.669	2.96E-03	5.38E-02	3.98E-02	0.723
Metals						
Total Recoverable Copper	1.70E-03	3.10E-02	2.18E-04	3.96E-03	1.92E-03	3.49E-02
Dissolved Copper	5.15E-04	9.36E-03	9.15E-05	1.66E-03	6.07E-04	1.10E-02

Table G-8 WY13 Everett 04 Pollutant Loads from Unsampled Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Metals						
Total Recoverable Lead	--	--	--	--	--	--
Dissolved Lead	--	--	--	--	--	--
Total Recoverable Cadmium	--	--	--	--	--	--
Dissolved Cadmium	--	--	--	--	--	--
Total Recoverable Zinc	9.47E-03	0.172	9.06E-04	1.65E-02	1.04E-02	0.189
Dissolved Zinc	6.38E-03	0.116	4.16E-04	7.57E-03	6.80E-03	0.124
PAH Compounds						
Acenaphthene	ND	ND	--	--	ND	ND
Acenaphthylene	ND	ND	--	--	ND	ND
Anthracene	7E-07	1E-05	--	--	7E-07	1E-05
Benzo(a)anthracene	2E-06	5E-05	--	--	2E-06	5E-05
Benzo(b)fluoranthene	5.7E-06	1.0E-04	--	--	5.7E-06	1.0E-04
Benzo(k)fluoranthene	2.6E-06	4.8E-05	--	--	2.6E-06	4.8E-05
Benzo(ghi)perylene	6.2E-06	1.1E-04	--	--	6.2E-06	1.1E-04
Benzo(a)pyrene	3.1E-06	5.7E-05	--	--	3.1E-06	5.7E-05
Chrysene	7E-06	1E-04	--	--	7E-06	1E-04
Dibenzo(a,h)anthracene	8E-07	1E-05	--	--	8E-07	1E-05
Fluoranthene	9.1E-06	1.7E-04	--	--	9.1E-06	1.7E-04
Fluorene	6E-07	1E-05	--	--	6E-07	1E-05
Indeno(1,2,3-cd)pyrene	3.3E-06	5.9E-05	--	--	3.3E-06	5.9E-05
Naphthalene	1.5E-06	2.8E-05	--	--	1.5E-06	2.8E-05
Phenanthrene	4.7E-06	8.5E-05	--	--	4.7E-06	8.5E-05
Pyrene	1.4E-05	2.6E-04	--	--	1.4E-05	2.6E-04
Phthalates						
bis(2-Ethylhexyl)phthalate	5E-04	8E-03	--	--	5E-04	8E-03
Butyl benzyl phthalate	ND	ND	--	--	ND	ND
Di-n-butyl phthalate	ND	ND	--	--	ND	ND
Diethyl phthalate	3E-05	6E-04	--	--	3E-05	6E-04
Dimethyl phthalate	9E-06	2E-04	--	--	9E-06	2E-04
Di-n-octyl phthalate	2E-05	4E-04	--	--	2E-05	4E-04
Herbicides						
Glyphosate	1.2E-03	0.021	5.5E-05	1.0E-03	1.2E-03	0.022
Petroleum Hydrocarbons (TPH)						
Diesel	ND	ND	ND	ND	ND	ND
Lube Oil	0.46	8.3	0.014	0.25	0.47	8.5
TPH-Gas (NWTPH-Gx)	ND	ND	ND	ND	ND	ND

-- No samples were collected.
ND Sample parameter was never detected.

Table G-9 WY13 SR9 01 Pollutant Loads from Unsampled Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	4.2	220	NS	NS	4.2	220
Chloride	0.63	33	NS	NS	0.63	33
Hardness as $CaCO_3$	1.23	64.7	NS	NS	1.23	64.7
Nutrients						
Total Phosphorous	5.1E-03	0.27	NS	NS	5.1E-03	0.27
Orthophosphate	2.E-04	0.01	NS	NS	2.E-04	0.01
Total Kjeldahl Nitrogen	0.045	2.4	NS	NS	0.045	2.4
Nitrate-Nitrite	9.42E-03	4.96E-01	NS	NS	9.42E-03	4.96E-01
Metals						
Total Recoverable Copper	9.0E-04	0.048	NS	NS	9.0E-04	0.048
Dissolved Copper	6.6E-05	3.5E-03	NS	NS	6.6E-05	3.5E-03
Total Recoverable Lead	3.19E-04	1.68E-02	NS	NS	3.19E-04	1.68E-02
Dissolved Lead	4.6E-06	2.4E-04	NS	NS	4.6E-06	2.4E-04
Total Recoverable Cadmium	6.4E-06	3.4E-04	NS	NS	6.4E-06	3.4E-04
Dissolved Cadmium	5E-07	2E-05	NS	NS	5E-07	2E-05
Total Recoverable Zinc	3.55E-03	0.187	NS	NS	3.55E-03	0.187
Dissolved Zinc	1.04E-03	5.499E-02	NS	NS	1.04E-03	5.499E-02
PAH Compounds						
Acenaphthene	ND	ND	NS	NS	ND	ND
Acenaphthylene	ND	ND	NS	NS	ND	ND
Anthracene	4E-07	2E-05	NS	NS	4E-07	2E-05
Benzo(a)anthracene	1E-06	5E-05	NS	NS	1E-06	5E-05
Benzo(b)fluoranthene	2.0E-06	1.1E-04	NS	NS	2.0E-06	1.1E-04
Benzo(k)fluoranthene	1E-06	6E-05	NS	NS	1E-06	6E-05
Benzo(ghi)perylene	4E-06	2E-04	NS	NS	4E-06	2E-04
Benzo(a)pyrene	1.4E-06	7.4E-05	NS	NS	1.4E-06	7.4E-05
Chrysene	3.6E-06	1.9E-04	NS	NS	3.6E-06	1.9E-04
Dibenzo(a,h)anthracene	4E-07	2E-05	NS	NS	4E-07	2E-05
Fluoranthene	4.2E-06	2.2E-04	NS	NS	4.2E-06	2.2E-04
Fluorene	ND	ND	NS	NS	ND	ND
Indeno(1,2,3-cd)pyrene	1.4E-06	7.3E-05	NS	NS	1.4E-06	7.3E-05
Naphthalene	1.0E-06	5.3E-05	NS	NS	1.0E-06	5.3E-05
Phenanthrene	2E-06	1E-04	NS	NS	2E-06	1E-04
Pyrene	7.1E-06	3.7E-04	NS	NS	7.1E-06	3.7E-04
Phthalates						
bis(2-Ethylhexyl)phthalate	1E-04	0.01	NS	NS	1E-04	0.01
Butyl benzyl phthalate	ND	ND	NS	NS	ND	ND
Di-n-butyl phthalate	ND	ND	NS	NS	ND	ND
Diethyl phthalate	2E-05	1E-03	NS	NS	2E-05	1E-03
Dimethyl phthalate	ND	ND	NS	NS	ND	ND

Table G-9 WY13 SR9 01 Pollutant Loads from Unsampled Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Phthalates						
Di-n-octyl phthalate	1E-05	6E-04	NS	NS	1E-05	6E-04
Herbicides						
Glyphosate	1.0E-03	0.054	NS	NS	1.0E-03	0.054
Petroleum Hydrocarbons (TPH)						
Diesel	ND	ND	ND	ND	ND	ND
Lube Oil	0.14	7.4	0.039	2.0	0.18	9.4
TPH-Gas (NWTPH-Gx)	ND	ND	ND	ND	ND	ND

ND Sample parameter was never detected.
NS Not sampled.

Table G-10 WY13 Pines 01 Pollutant Loads from Unsampled Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	7.2	84	0.41	4.8	7.6	88
Chloride	1.86	21.6	6.88E-02	0.800	1.93	22.4
Hardness as $CaCO_3$	2.97	34.5	0.246	2.86	3.21	37.3
Nutrients						
Total Phosphorous	1.67E-02	0.195	1.21E-03	1.41E-02	1.79E-02	0.209
Orthophosphate	--	--	--	--	--	--
Total Kjeldahl Nitrogen	0.10	1.1	5.6E-03	0.065	0.10	1.2
Nitrate-Nitrite	2.73E-02	0.318	2.82E-03	3.28E-02	3.01E-02	0.350
Metals						
Total Recoverable Copper	2.11E-03	2.46E-02	1.60E-04	1.86E-03	2.27E-03	2.64E-02
Dissolved Copper	9.54E-04	1.11E-02	7.17E-05	8.33E-04	1.03E-03	1.19E-02
Total Recoverable Lead	6.51E-04	7.57E-03	4.24E-05	4.93E-04	6.93E-04	8.06E-03
Dissolved Lead	3.0E-05	3.5E-04	2.2E-06	2.5E-05	3.2E-05	3.8E-04
Total Recoverable Cadmium	1.5E-05	1.8E-04	1.1E-06	1.3E-05	1.6E-05	1.9E-04
Dissolved Cadmium	ND	ND	ND	ND	ND	ND
Total Recoverable Zinc	1.01E-02	0.118	7.32E-04	8.51E-03	1.08E-02	0.126
Dissolved Zinc	2.53E-03	2.95E-02	3.30E-04	3.84E-03	2.87E-03	3.33E-02
PAH Compounds						
Acenaphthene	8E-07	1E-05	4E-08	4E-07	9E-07	1E-05
Acenaphthylene	ND	ND	ND	ND	ND	ND
Anthracene	1E-06	2E-05	4E-08	4E-07	1E-06	2E-05
Benzo(a)anthracene	2E-06	2E-05	5E-08	6E-07	2E-06	2E-05
Benzo(b)fluoranthene	5E-06	5E-05	2E-07	3E-06	5E-06	6E-05
Benzo(k)fluoranthene	2E-06	3E-05	1E-07	1E-06	3E-06	3E-05
Benzo(ghi)perylene	7E-06	8E-05	5E-07	6E-06	7-06	9E-05
Benzo(a)pyrene	3E-06	3E-05	2E-07	3E-06	3E-06	4E-05

Table G-10 WY13 Pines 01 Pollutant Loads from Unsampled Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
PAH Compounds						
Chrysene	9.5E-06	1.1E-04	7.2E-07	8.4E-06	1.0E-05	1.2E-04
Dibenzo(a,h)anthracene	1E-06	1E-05	1E-07	1E-06	1E-06	1E-05
Fluoranthene	1E-05	1E-04	4E-07	5E-06	1E-05	1E-04
Fluorene	2.7E-06	3.1E-05	3.8E-08	4.5E-07	2.7E-06	3.1E-05
Indeno(1,2,3-cd)pyrene	2.9E-06	3.4E-05	1.0E-07	1.2E-06	3.0E-06	3.5E-05
Naphthalene	3E-06	3E-05	2E-07	2E-06	3E-06	4E-05
Phenanthrene	8.2E-06	9.5E-05	2.9E-07	3.3E-06	8.5E-06	9.9E-05
Pyrene	1.4E-05	1.6E-04	7.3E-07	8.5E-06	1.5E-05	1.7E-04
Phthalates						
bis(2-Ethylhexyl)phthalate	4E-04	5E-03	4E-05	5E-04	5E-04	0.01
Butyl benzyl phthalate	3E-05	3E-04	3E-06	3E-05	3E-05	3E-04
Di-n-butyl phthalate	ND	ND	ND	ND	ND	ND
Diethyl phthalate	2E-05	2E-04	8E-07	9E-06	2E-05	2E-04
Dimethyl phthalate	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	6E-05	7E-04	9E-06	1E-04	7E-05	8E-04
Herbicides						
Glyphosate	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons (TPH)						
Diesel	ND	ND	NS	NS	ND	ND
Lube Oil	0.3	4	NS	NS	0.3	4
TPH-Gas (NWTPH-Gx)	ND	ND	NS	NS	ND	ND

-- No samples were collected.
ND Sample parameter was never detected.
NS Not sampled.

Table G-11 WY14 Pilchuck 01 Pollutant Loads from Sampling Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	0.99	32	1.1	35	2.1	67
Chloride	0.25	7.9	0.025	0.81	0.27	8.8
Hardness as $CaCO_3$	0.52	17	0.45	15	0.98	31
Nutrients						
Total Phosphorous	2E-03	0.06	2E-03	0.06	4E-03	0.1
Orthophosphate	8E-05	0.00	2E-04	0.01	2E-04	0.01
Total Kjeldahl Nitrogen	0.013	0.40	0.017	0.55	0.030	0.96
Nitrate-Nitrite	3.1E-03	0.10	2.5E-03	0.080	6E-03	0.18
Metals						
Total Recoverable Copper	3.31E-04	1.07E-02	2.13E-04	6.88E-03	5.44E-04	1.76E-02
Dissolved Copper	6.87E-05	2.22E-03	6.26E-05	2.02E-03	1.31E-04	4.24E-03
Total Recoverable Lead	NS	NS	9.69E-05	3.12E-03	9.69E-05	3.12E-03
Dissolved Lead	NS	NS	1.82E-06	5.87E-05	1.82E-06	5.87E-05
Total Recoverable Cadmium	NS	NS	8.92E-06	2.88E-04	8.92E-06	2.88E-04
Dissolved Cadmium	NS	NS	2.38E-07	7.7E-06	2.38E-07	7.7E-06
Total Recoverable Zinc	1.6E-03	0.050	7.92E-04	0.026	2.35E-03	0.076
Dissolved Zinc	2.72E-04	8.76E-03	1.52E-04	4.91E-03	4.24E-04	1.37E-02
PAH Compounds						
Acenaphthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Acenaphthylene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Anthracene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(a)anthracene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(b)fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(k)fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(ghi)perylene	1E-06	3E-05	5E-07	2E-05	1E-06	5E-05
Benzo(a)pyrene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Chrysene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Dibenzo(a,h)anthracene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Fluorene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Indeno(1,2,3-cd)pyrene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Naphthalene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Phenanthrene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Pyrene	3E-06	9E-05	5E-07	2E-05	3E-06	1E-04
Phthalates						
bis(2-Ethylhexyl)phthalate	6.7E-05	2.1E-03	2.7E-05	8.8E-04	9.4E-05	3.0E-03
Butyl benzyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Di-n-butyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Diethyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Dimethyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL

Table G-11 WY14 Pilchuck 01 Pollutant Loads from Sampling Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Phthalates						
Di-n-octyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Herbicides						
Glyphosate	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons (TPH)						
Diesel	2.0E-03	6.5E-02	0.030	0.96	3.2E-02	1.0
Lube Oil	0.1	3	0.1	3	0.20	6
TPH-Gas (NWTPH-Gx)	9E-04	0.03	1E-03	0.04	2E-03	0.07

NS Not sampled.
ND Sample parameter was never detected.
≤RL Analyte was not detected at a level greater than or equal to the level of the reporting limit.

Table G-12 WY14 Everett 01 Pollutant Loads from Sampling Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	1.2	22	0.74	13	1.9	35
Chloride	0.51	9.3	0.060	1.1	0.57	10
Hardness as $CaCO_3$	0.45	8.2	0.35	6.4	0.80	15
Nutrients						
Total Phosphorous	1.9E-03	0.035	1.8E-03	0.033	3.7E-03	0.068
Orthophosphate	1.6E-04	2.9E-03	2.2E-04	4.1E-03	3.8E-04	7.0E-03
Total Kjeldahl Nitrogen	0.025	0.46	0.037	0.68	0.063	1.1
Nitrate-Nitrite	7.9E-03	0.14	4.2E-03	0.077	0.012	0.22
Metals						
Total Recoverable Copper	4.97E-04	9.03E-03	4.31E-04	7.84E-03	9.28E-04	1.69E-02
Dissolved Copper	1.62E-04	2.94E-03	1.61E-04	2.93E-03	3.23E-04	5.87E-03
Total Recoverable Lead	--	--	--	--	--	--
Dissolved Lead	--	--	--	--	--	--
Total Recoverable Cadmium	--	--	--	--	--	--
Dissolved Cadmium	--	--	--	--	--	--
Total Recoverable Zinc	1.9E-03	0.035	1.1E-03	0.020	3.0E-03	0.055
Dissolved Zinc	6.3E-04	0.012	4.8E-04	8.8E-03	1.1E-03	0.020
PAH Compounds						
Acenaphthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Acenaphthylene	7E-08	1E-06	3E-06	5E-05	3E-06	5E-05
Anthracene	1E-06	2E-05	9E-07	2E-05	2E-06	4E-05
Benzo(a)anthracene	1E-06	2E-05	9E-07	2E-05	2E-06	4E-05
Benzo(b)fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(k)fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(ghi)perylene	2E-06	3E-05	9E-07	2E-05	3E-06	5E-05

Table G-12 WY14 Everett 01 Pollutant Loads from Sampling Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
PAH Compounds						
Benzo(a)pyrene	4E-07	7E-06	9E-07	2E-05	1E-06	2E-05
Chrysene	1E-05	2E-05	9E-07	2E-05	2E-06	4E-05
Dibenzo(a,h)anthracene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Fluoranthene	2E-06	4E-05	9E-07	2E-05	3E-06	6E-05
Fluorene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Indeno(1,2,3-cd)pyrene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Naphthalene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Phenanthrene	1E-06	3E-05	9E-07	2E-05	2E-06	4E-05
Pyrene	4E-06	7E-05	1E-06	2E-05	5E-06	9E-05
Phthalates						
bis(2-Ethylhexyl)phthalate	8.9E-05	1.6E-03	1.2E-04	2.2E-03	2.1E-04	3.9E-03
Butyl benzyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Di-n-butyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Diethyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Dimethyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Di-n-octyl phthalate	7E-06	1E-04	9E-06	2E-04	2E-05	3E-04
Herbicides						
Glyphosate	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons (TPH)						
Diesel	0.003	0.05	0.04	0.8	0.04	0.8
Lube Oil	0.1	2	0.1	2	0.3	5
TPH-Gas (NWTPH-Gx)	0.001	0.02	0.002	0.04	0.003	0.05

-- No samples were collected.
ND Sample parameter was never detected.
≤RL Analyte was not detected at a level greater than or equal to the level of the reporting limit.

Table G-13 WY14 Everett 04 Pollutant Loads from Sampling Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	1.7	31	1.2	21	2.9	52
Chloride	0.50	9.1	0.066	1.2	0.57	10
Hardness as $CaCO_3$	0.78	14	0.36	6.6	1.1	21
Nutrients						
Total Phosphorous	3.0E-03	0.054	2.5E-03	0.045	5.5E-03	0.10
Orthophosphate	2E-04	0.003	1E-04	0.002	3E-04	0.01
Total Kjeldahl Nitrogen	0.030	0.55	0.051	0.93	0.081	1.5
Nitrate-Nitrite	8E-03	0.14	0.011	0.21	0.019	0.35
Metals						
Total Recoverable Copper	9.9E-04	1.8E-02	4.8E-04	8.7E-03	1.5E-03	2.7E-02

Table G-13 WY14 Everett 04 Pollutant Loads from Sampling Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Metals						
Dissolved Copper	3.6E-04	6.6E-03	1.8E-04	3.2E-03	5.4E-04	9.8E-03
Total Recoverable Lead	5.44E-05	9.88E-04	3.19E-05	5.80E-04	8.62E-05	1.57E-03
Dissolved Lead	1.7E-06	3.1E-05	1.2E-06	2.2E-05	2.9E-06	5.3E-05
Total Recoverable Cadmium	3.8E-06	6.8E-05	1.6E-06	2.9E-05	5.3E-06	9.7E-05
Dissolved Cadmium	1.4E-06	2.6E-05	7.1E-07	1.3E-05	2.2E-06	3.9E-05
Total Recoverable Zinc	4.45E-03	8.09E-02	2.10E-03	3.83E-02	6.55E-03	1.19E-01
Dissolved Zinc	1.98E-03	3.59E-02	1.20E-03	2.18E-02	3.17E-03	5.77E-02
PAH Compounds						
Acenaphthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Acenaphthylene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Anthracene	2E-06	3E-05	1E-06	2E-05	3E-06	5E-05
Benzo(a)anthracene	2E-06	3E-05	1E-06	2E-05	3E-06	5E-05
Benzo(b)fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(k)fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(ghi)perylene	2E-06	4E-05	1E-06	2E-05	4E-06	7E-05
Benzo(a)pyrene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Chrysene	2E-06	3E-05	1E-06	2E-05	3E-06	6E-05
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND
Fluoranthene	3E-06	6E-05	1E-06	2E-05	5E-06	8E-05
Fluorene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Indeno(1,2,3-cd)pyrene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Naphthalene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Phenanthrene	2E-06	3E-05	1E-06	2E-05	3E-06	6E-05
Pyrene	5E-06	9E-05	1E-06	2E-05	6E-06	1E-04
Phthalates						
bis(2-Ethylhexyl)phthalate	1.4E-04	2.6E-03	1.5E-04	2.8E-03	3.0E-04	5.4E-03
Butyl benzyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Di-n-butyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Diethyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Dimethyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Di-n-octyl phthalate	3E-05	5E-04	1E-05	2E-04	4E-05	7E-04
Herbicides						
Glyphosate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Petroleum Hydrocarbons (TPH)						
Diesel	2.5E-03	0.046	0.026	0.48	0.046	0.84
Lube Oil	0.2	0.01	0.1	2	0.3	5
TPH-Gas (NWTPH-Gx)	7.E-04	0.01	2.E-03	0.04	0.003	0.05

ND Sample parameter was never detected.
≤RL Analyte was not detected at a level greater than or equal to the level of the reporting limit.

Table G-14 WY14 SR9 01 Pollutant Loads from Sampling Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	1.6	82	0.84	44	2.4	130
Chloride	0.1	7	0.03	2	0.2	9
Hardness as $CaCO_3$	0.25	13	0.18	9.7	0.43	23
Nutrients						
Total Phosphorous	2.2E-03	0.12	2.1E-03	0.11	4.4E-03	0.23
Orthophosphate	2E-04	1E-02	2E-04	1E-02	4E-04	2E-02
Total Kjeldahl Nitrogen	0.03	1	0.05	3	0.08	4
Nitrate-Nitrite	4.9E-03	0.26	6.2E-03	0.33	0.011	0.58
Metals						
Total Recoverable Copper	4.2E-04	0.022	2.4E-04	1.3E-02	6.6E-04	0.035
Dissolved Copper	1.1E-04	5.9E-03	9.7E-05	5.1E-03	2.1E-04	1.1E-02
Total Recoverable Lead	3.5E-05	1.8E-03	4.4E-05	2.3E-03	7.8E-05	4.1E-03
Dissolved Lead	7.7E-07	4.0E-05	1.6E-06	8.6E-05	2.4E-06	1.3E-04
Total Recoverable Cadmium	7E-07	4E-05	1E-06	6E-05	2E-06	1E-04
Dissolved Cadmium	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Total Recoverable Zinc	2.0E-03	0.103	7.7E-04	0.041	2.7E-03	0.14
Dissolved Zinc	6.5E-04	0.034	4.1E-04	0.022	1.1E-03	0.056
PAH Compounds						
Acenaphthene	ND	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(b)fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(k)fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(ghi)perylene	3E-06	2E-04	1E-06	7E-05	4E-06	2E-04
Benzo(a)pyrene	1E-06	5E-05	1E-06	7E-05	2E-06	1E-04
Chrysene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND
Fluoranthene	3E-06	1E-04	1E-06	7E-05	4E-06	2E-04
Fluorene	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Naphthalene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Phenanthrene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Pyrene	4E-06	2E-04	1E-06	7E-05	6E-06	3E-04
Phthalates						
bis(2-Ethylhexyl)phthalate	8E-05	4E-03	8E-05	4E-03	2E-04	9E-03
Butyl benzyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Di-n-butyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Diethyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Dimethyl phthalate	ND	ND	ND	ND	ND	ND

Table G-14 WY14 SR9 01 Pollutant Loads from Sampling Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Phthalates						
Di-n-octyl phthalate	ND	ND	ND	ND	ND	ND
Herbicides						
Glyphosate	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons (TPH)						
Diesel	0.002	0.1	0.02	1	0.03	1
Lube Oil	0.1	6	0.06	3	0.2	9
TPH-Gas (NWTPH-Gx)	0.001	0.06	0.002	0.08	0.003	0.1

ND Sample parameter was never detected

≤RL Analyte was not detected at a level greater than or equal to the level of the reporting limit.

Table G-15 WY14 Pines 01 Pollutant Loads from Sampling Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	0.44	5.1	0.054	0.62	0.49	5.7
Chloride	0.256	2.98	2.92E-02	0.339	0.285	3.32
Hardness as $CaCO_3$	0.21	2.4	0.042	0.49	0.25	2.9
Nutrients						
Total Phosphorous	1.5E-03	0.018	2.6E-04	3.0E-03	1.8E-03	0.021
Orthophosphate	NS	NS	NS	NS	NS	NS
Total Kjeldahl Nitrogen	3.1E-03	0.036	3.4E-03	0.040	6.5E-03	0.076
Nitrate-Nitrite	1.8E-03	0.021	5.9E-04	6.9E-03	2.4E-03	0.028
Metals						
Total Recoverable Copper	1.0E-04	1.2E-03	2.6E-05	3.0E-04	1.3E-04	1.5E-03
Dissolved Copper	4.91E-05	5.71E-04	NS	NS	4.91E-05	5.71E-04
Total Recoverable Lead	2.00E-05	2.33E-04	6.09E-06	7.08E-05	2.61E-05	3.03E-04
Dissolved Lead	ND	ND	NS	NS	ND	ND
Total Recoverable Cadmium	6.8E-07	7.9E-06	1.5E-07	1.8E-06	8.3E-07	9.6E-06
Dissolved Cadmium	ND	ND	NS	NS	ND	ND
Total Recoverable Zinc	3.57E-04	4.15E-03	1.07E-04	1.25E-03	4.64E-04	5.40E-03
Dissolved Zinc	7.07E-05	8.22E-04	NS	NS	7.07E-05	8.22E-04
PAH Compounds						
Acenaphthene	≤RL	≤RL	NS	NS	≤RL	≤RL
Acenaphthylene	≤RL	≤RL	NS	NS	≤RL	≤RL
Anthracene	≤RL	≤RL	NS	NS	≤RL	≤RL
Benzo(a)anthracene	3E-07	3E-06	NS	NS	3E-07	3E-06
Benzo(b)fluoranthene	≤RL	≤RL	NS	NS	≤RL	≤RL
Benzo(k)fluoranthene	≤RL	≤RL	NS	NS	≤RL	≤RL
Benzo(ghi)perylene	≤RL	≤RL	NS	NS	≤RL	≤RL
Benzo(a)pyrene	≤RL	≤RL	NS	NS	≤RL	≤RL

Table G-15 WY14 Pines 01 Pollutant Loads from Sampling Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
PAH Compounds						
Chrysene	≤RL	≤RL	NS	NS	≤RL	≤RL
Dibenzo(a,h)anthracene	≤RL	≤RL	NS	NS	≤RL	≤RL
Fluoranthene	≤RL	≤RL	NS	NS	≤RL	≤RL
Fluorene	≤RL	≤RL	NS	NS	≤RL	≤RL
Indeno(1,2,3-cd)pyrene	≤RL	≤RL	NS	NS	≤RL	≤RL
Naphthalene	≤RL	≤RL	NS	NS	≤RL	≤RL
Phenanthrene	≤RL	≤RL	NS	NS	≤RL	≤RL
Pyrene	2E-06	2E-05	NS	NS	2E-06	2E-05
Phthalates						
bis(2-Ethylhexyl)phthalate	4E-05	5E-04	NS	NS	4E-05	5E-04
Butyl benzyl phthalate	≤RL	≤RL	NS	NS	≤RL	≤RL
Di-n-butyl phthalate	≤RL	≤RL	NS	NS	≤RL	≤RL
Diethyl phthalate	4E-06	4E-05	NS	NS	4E-06	4E-05
Dimethyl phthalate	≤RL	≤RL	NS	NS	≤RL	≤RL
Di-n-octyl phthalate	1E-05	1E-04	NS	NS	1E-05	1E-04
Herbicides						
Glyphosate	2E-04	2E-03	1E-05	1E-04	2E-04	2E-03
Petroleum Hydrocarbons (TPH)						
Diesel	0.037	0.42	NS	NS	0.037	0.42
Lube Oil	0.1	1	NS	NS	0.1	1
TPH-Gas (NWTPH-Gx)	3.7E-03	0.043	NS	NS	3.7E-03	0.043

NS Not sampled
≤RL Analyte was not detected at a level greater than or equal to the level of the reporting limit.

Table G-16 WY14 Pilchuck 01 Pollutant Loads from Unsampled Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	3.6	1.2E+02	2.2	71	5.8	1.9E+02
Chloride	0.81	26	0.050	1.6	0.86	28
Hardness as $CaCO_3$	2.01	64.89	0.89	28.85	2.91	93.74
Nutrients						
Total Phosphorous	0.01	0.2	0.004	0.1	0.01	0.3
Orthophosphate	0.001	0.02	0.001	0.02	0.001	0.03
Total Kjeldahl Nitrogen	0.071	2.3	0.044	1.4	0.11	3.7
Nitrate-Nitrite	0.020	0.64	4.9E-03	0.16	0.025	0.80
Metals						
Total Recoverable Copper	1.59E-03	5.12E-02	6.66E-04	0.021	2.25E-03	7.26E-02
Dissolved Copper	3.83E-04	1.24E-02	1.96E-04	6.31E-03	5.79E-04	1.87E-02
Total Recoverable Lead	NS	NS	8.92E-04	0.029	8.92E-04	2.88E-02

Table G-16 WY14 Pilchuck 01 Pollutant Loads from Unsampled Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Phthalates						
Dissolved Lead	NS	NS	1.68E-05	5.40E-04	1.68E-05	5.40E-04
Total Recoverable Cadmium	NS	NS	8.21E-05	2.65E-03	8.21E-05	2.65E-03
Dissolved Cadmium	NS	NS	0.00	0.00	0.00	7.1E-05
Total Recoverable Zinc	7.2E-03	0.23	2.5E-03	0.080	0.010	0.31
Dissolved Zinc	1.32E-03	4.27E-02	4.78E-04	1.54E-02	1.80E-03	5.81E-02
PAH Compounds						
Acenaphthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Acenaphthylene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Anthracene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(a)anthracene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(b)fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(k)fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(ghi)perylene	5E-06	2E-04	1E-06	4E-05	6E-06	2E-04
Benzo(a)pyrene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Chrysene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Dibenzo(a,h)anthracene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Fluorene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Indeno(1,2,3-cd)pyrene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Naphthalene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Phenanthrene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Pyrene	1E-05	4E-04	1E-06	4E-05	1E-05	4E-04
Phthalates						
bis(2-Ethylhexyl)phthalate	2.8E-04	9.1E-03	7.7E-05	2.5E-03	3.6E-04	1.2E-02
Butyl benzyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Di-n-butyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Diethyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Dimethyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Di-n-octyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Herbicides						
Glyphosate	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons (TPH)						
Diesel	5.3E-03	0.17	0.036	1.2	0.041	1.3
Lube Oil	0.3	1E+01	0.1	3	0.4	1E+01
TPH-Gas (NWTPH-Gx)	0.002	0.08	0.003	0.1	0.01	0.2

ND Sample parameter was never detected.
NS Not sampled.
≤RL Analyte was not detected at a level greater than or equal to the level of the reporting limit.

Table G-17 WY14 Everett 01 Pollutant Loads from Unsampled Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	5.2	94	1.3	24	6.5	1.2E+02
Chloride	2.3	42	0.19	3.4	2.5	46
Hardness as $CaCO_3$	2.3	41	0.86	16	3.1	57
Nutrients						
Total Phosphorous	8.3E-03	0.15	4.1E-03	0.074	0.012	0.22
Orthophosphate	1.0E-03	0.019	6.3E-04	0.011	1.7E-03	0.031
Total Kjeldahl Nitrogen	0.11	2.0	0.10	1.7	0.20	3.7
Nitrate-Nitrite	0.034	0.61	0.012	0.21	0.045	0.82
Metals						
Total Recoverable Copper	3.00E-03	5.46E-02	1.37E-03	2.50E-02	4.38E-03	7.96E-02
Dissolved Copper	1.03E-03	1.88E-02	5.09E-04	9.25E-03	1.54E-03	2.80E-02
Total Recoverable Lead	--	--	--	--	--	--
Dissolved Lead	--	--	--	--	--	--
Total Recoverable Cadmium	--	--	--	--	--	--
Dissolved Cadmium	--	--	--	--	--	--
Total Recoverable Zinc	1.2E-02	0.21	3.2E-03	0.058	0.015	0.27
Dissolved Zinc	3.9E-03	0.071	1.7E-03	0.030	5.6E-03	0.10
PAH Compounds						
Acenaphthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Acenaphthylene	4E-07	7E-06	4E-06	7E-05	4E-06	8E-05
Anthracene	5E-06	9E-05	2E-06	3E-05	7E-06	1E-04
Benzo(a)anthracene	5E-06	1E-04	2E-06	3E-05	8E-06	1E-04
Benzo(b)fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(k)fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(ghi)perylene	8E-06	2E-04	2E-06	3E-05	1E-05	2E-04
Benzo(a)pyrene	2E-06	3E-05	2E-06	3E-05	4E-06	6E-05
Chrysene	6E-06	1E-04	2E-06	3E-05	8E-06	1E-04
Dibenzo(a,h)anthracene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Fluoranthene	1E-05	2E-04	2E-06	3E-05	1E-05	2E-04
Fluorene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Indeno(1,2,3-cd)pyrene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Naphthalene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Phenanthrene	7E-06	1E-04	2E-06	3E-05	9E-06	2E-04
Pyrene	2E-05	3E-04	2E-06	4E-05	2E-05	4E-04
Phthalates						
bis(2-Ethylhexyl)phthalate	0.00	0.01	0.00	0.00	0.00	0.01
Butyl benzyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Di-n-butyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Diethyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Dimethyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL

Table G-17 WY14 Everett 01 Pollutant Loads from Unsampled Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Phthalates						
Di-n-octyl phthalate	4E-05	6E-04	2E-05	3E-04	5E-05	9E-04
Herbicides						
Glyphosate	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons (TPH)						
Diesel	0.02	0.3	0.06	1	0.08	1
Lube Oil	0.4	8	0.2	3	0.6	1E+01
TPH-Gas (NWTPH-Gx)	0.003	0.05	0.004	0.07	0.01	0.1

-- No samples were collected.
ND Sample parameter was never detected.
≤RL Analyte was not detected at a level greater than or equal to the level of the reporting limit.

Table G-18 WY14 Everett 04 Pollutant Loads from Unsampled Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	5.2	95	1.9	34	7.1	1.3E+02
Chloride	1.7	31	0.11	1.9	1.8	33
Hardness as $CaCO_3$	2.3	43	0.59	11	2.9	53
Nutrients						
Total Phosphorous	0.010	0.19	4.0E-03	0.072	0.014	0.26
Orthophosphate	7E-04	0.01	4E-04	0.01	0.001	0.02
Total Kjeldahl Nitrogen	0.11	2.0	0.11	2.0	0.22	4.0
Nitrate-Nitrite	0.029	0.53	0.017	0.30	0.046	0.83
Metals						
Total Recoverable Copper	3.3E-03	0.059	1.5E-03	0.027	4.7E-03	0.086
Dissolved Copper	1.3E-03	0.024	5.5E-04	0.010	1.9E-03	0.034
Total Recoverable Lead	6.56E-04	1.19E-02	1.60E-04	2.91E-03	8.16E-04	1.48E-02
Dissolved Lead	2.0E-05	3.7E-04	6.0E-06	1.1E-04	2.6E-05	4.8E-04
Total Recoverable Cadmium	4.5E-05	8.3E-04	7.9E-06	1.4E-04	5.3E-05	9.7E-04
Dissolved Cadmium	1.7E-05	3.2E-04	3.6E-06	6.5E-05	2.1E-05	3.8E-04
Total Recoverable Zinc	1.43E-02	0.261	6.32E-03	0.115	2.07E-02	0.376
Dissolved Zinc	6.51E-03	0.118	3.51E-03	6.38E-02	1.00E-02	0.182
PAH Compounds						
Acenaphthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Acenaphthylene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Anthracene	5E-06	9E-05	2E-06	3E-05	7E-06	1E-04
Benzo(a)anthracene	5E-06	1E-04	2E-06	3E-05	7E-06	1E-04
Benzo(b)fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(k)fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(ghi)perylene	8E-06	1E-04	2E-06	3E-05	1E-05	2E-04

Table G-18 WY14 Everett 04 Pollutant Loads from Unsampled Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Phthalates						
Benzo(a)pyrene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Chrysene	6E-06	1E-04	2E-06	3E-05	8E-06	1E-04
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND
Fluoranthene	1.E-05	2.E-04	2.E-06	3.E-05	1.E-05	2.E-04
Fluorene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Indeno(1,2,3-cd)pyrene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Naphthalene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Phenanthrene	6E-06	1E-04	2E-06	3E-05	8E-06	2E-04
Pyrene	2E-05	3E-04	2E-06	3E-05	2E-05	3E-04
Phthalates						
bis(2-Ethylhexyl)phthalate	5.0E-04	9.1E-03	2.6E-04	4.7E-03	7.6E-04	1.4E-02
Butyl benzyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Di-n-butyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Diethyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Dimethyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Di-n-octyl phthalate	8E-05	2E-03	2E-05	3E-04	1E-04	2E-03
Herbicides						
Glyphosate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Petroleum Hydrocarbons (TPH)						
Diesel	0.032	0.57	0.053	0.95	0.084	1.5
Lube Oil	0.6	1E+01	0.2	3	0.7	1E+01
TPH-Gas (NWTPH-Gx)	0.003	0.06	0.01	0.1	0.01	0.2

ND Sample parameter was never detected.
≤RL Analyte was not detected at a level greater than or equal to the level of the reporting limit.

Table G-19 WY14 SR9 01 Pollutant Loads from Unsampled Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	4.1	210	1.6	86	5.7	300
Chloride	0.3	20	0.06	3	0.4	20
Hardness as $CaCO_3$	0.62	33	0.35	18	0.97	51
Nutrients						
Total Phosphorous	5.6E-03	0.29	3.9E-03	0.20	9.5E-03	0.50
Orthophosphate	5E-04	0.03	6E-04	0.03	0.001	0.06
Total Kjeldahl Nitrogen	0.07	4	0.1	6	0.2	10
Nitrate-Nitrite	0.018	0.97	0.012	0.63	0.030	1.6
Metals						
Total Recoverable Copper	1.2E-03	0.066	8.0E-04	0.042	2.1E-03	0.11
Dissolved Copper	3.7E-04	0.019	3.3E-04	0.017	6.9E-04	0.036

Table G-19 WY14 SR9 01 Pollutant Loads from Unsampled Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
PAH Compounds						
Total Recoverable Lead	4.1E-04	0.022	1.5E-04	7.7E-03	5.6E-04	0.029
Dissolved Lead	1.0E-05	5.3E-04	5.5E-06	2.9E-04	1.6E-05	8.2E-04
Total Recoverable Cadmium	8E-06	4E-04	4E-06	2E-04	1E-05	6E-04
Dissolved Cadmium	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Total Recoverable Zinc	5.7E-03	0.30	2.6E-03	0.14	8.3E-03	0.44
Dissolved Zinc	1.8E-03	0.095	1.4E-03	0.074	3.2E-03	0.17
PAH Compounds						
Acenaphthene	ND	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(b)fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(k)fluoranthene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Benzo(ghi)perylene	7E-06	4E-04	2E-06	1E-04	9E-06	5E-04
Benzo(a)pyrene	2E-06	1E-04	2E-06	1E-04	5E-06	3E-04
Chrysene	≤RL	≤RL	≤RL	≤RL	0.00	0.00
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND
Fluoranthene	6E-06	3E-04	2E-06	1E-04	8E-06	4E-04
Fluorene	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Naphthalene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Phenanthrene	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Pyrene	1E-05	5E-04	2E-06	1E-04	1E-05	7E-04
Phthalates						
bis(2-Ethylhexyl)phthalate	2E-04	0.01	2E-04	0.01	3E-04	0.02
Butyl benzyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Di-n-butyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Diethyl phthalate	≤RL	≤RL	≤RL	≤RL	≤RL	≤RL
Dimethyl phthalate	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	ND	ND	ND	ND	ND	ND
Herbicides						
Glyphosate	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons (TPH)						
Diesel	0.01	0.3	0.06	3	0.06	3
Lube Oil	0.4	20	0.1	8	0.5	30
TPH-Gas (NWTPH-Gx)	0.003	0.1	0.01	0.3	0.01	0.5

ND Sample parameter was never detected
≤RL Analyte was not detected at a level greater than or equal to the level of the reporting limit.

Table G-20 WY14 Pines 01 Pollutant Loads from Unsampled Events

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Conventionals						
TSS	2.6	30	0.14	1.6	2.7	32
Chloride	1.53	17.7	7.65E-02	0.889	1.60	18.6
Hardness as $CaCO_3$	2.2	26	0.11	1.3	2.3	27
Nutrients						
Total Phosphorous	7.7E-03	9.0E-02	6.8E-04	7.9E-03	8.4E-03	0.10
Orthophosphate	NS	NS	NS	NS	NS	NS
Total Kjeldahl Nitrogen	0.041	0.47	9.0E-03	0.10	0.050	0.58
Nitrate-Nitrite	0.024	0.28	1.6E-03	0.018	0.025	0.29
Metals						
Total Recoverable Copper	1.3E-03	0.015	6.8E-05	7.9E-04	1.4E-03	0.016
Dissolved Copper	6.45E-04	7.50E-03	NS	NS	6.45E-04	7.50E-03
Total Recoverable Lead	2.63E-04	0.00	0.00	0.00	2.79E-04	3.24E-03
Dissolved Lead	ND	ND	NS	NS	ND	ND
Total Recoverable Cadmium	8.9E-06	1.0E-04	4.0E-07	4.6E-06	9.3E-06	1.1E-04
Dissolved Cadmium	ND	ND	NS	NS	ND	ND
Total Recoverable Zinc	4.69E-03	5.45E-02	2.81E-04	3.27E-03	4.97E-03	5.78E-02
Dissolved Zinc	9.29E-04	1.08E-02	NS	NS	0.00	1.08E-02
PAH Compounds						
Acenaphthene	≤RL	≤RL	NS	NS	≤RL	≤RL
Acenaphthylene	≤RL	≤RL	NS	NS	≤RL	≤RL
Anthracene	≤RL	≤RL	NS	NS	≤RL	≤RL
Benzo(a)anthracene	2e-06	2e-05	NS	NS	2e-06	2e-05
Benzo(b)fluoranthene	≤RL	≤RL	NS	NS	≤RL	≤RL
Benzo(k)fluoranthene	≤RL	≤RL	NS	NS	≤RL	≤RL
Benzo(ghi)perylene	≤RL	≤RL	NS	NS	≤RL	≤RL
Benzo(a)pyrene	≤RL	≤RL	NS	NS	≤RL	≤RL
Chrysene	≤RL	≤RL	NS	NS	≤RL	≤RL
Dibenzo(a,h)anthracene	≤RL	≤RL	NS	NS	≤RL	≤RL
Fluoranthene	≤RL	≤RL	NS	NS	≤RL	≤RL
Fluorene	≤RL	≤RL	NS	NS	≤RL	≤RL
Indeno(1,2,3-cd)pyrene	≤RL	≤RL	NS	NS	≤RL	≤RL
Naphthalene	≤RL	≤RL	NS	NS	≤RL	≤RL
Phenanthrene	≤RL	≤RL	NS	NS	≤RL	≤RL
Pyrene	6e-06	7e-05	NS	NS	6e-06	7e-05
Phthalates						
bis(2-Ethylhexyl)phthalate	2e-04	2e-03	NS	NS	2e-04	2e-03
Butyl benzyl phthalate	≤RL	≤RL	NS	NS	≤RL	≤RL
Di-n-butyl phthalate	≤RL	≤RL	NS	NS	≤RL	≤RL
Diethyl phthalate	4E-05	5E-04	NS	NS	4E-05	5E-04
Dimethyl phthalate	≤RL	≤RL	NS	NS	≤RL	≤RL

Table G-20 WY14 Pines 01 Pollutant Loads from Unsampled Events (cont.)

Analyte Name	Wet Season Storm Load (LB)	Wet Season Storm Load (LB/acre)	Dry Season Storm Load (LB)	Dry Season Storm Load (LB/acre)	Annual Storm Load (LB)	Annual Storm Load (LB/acre)
Phthalates						
Di-n-octyl phthalate	5E-05	6E-04	NS	NS	5E-05	6E-04
Herbicides						
Glyphosate	2E-03	2E-02	3E-05	3E-04	2E-03	2E-02
Petroleum Hydrocarbons (TPH)						
Diesel	0.052	0.61	NS	NS	0.052	0.61
Lube Oil	0.2	2	NS	NS	0.2	2
TPH-Gas (NWTPH-Gx)	4.9E-03	0.057	NS	NS	4.9E-03	0.057

ND Sample parameter was never detected
NS Not sampled
≤RL Analyte was not detected at a level greater than or equal to the level of the reporting limit.