Appendix A:
Storm Reports

This page intentionally left blank

APPENDIX A – Storm Reports

Pilchuck 01

PRECIPITATION						
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.08	10/12/2012 10:20	10/12/2012 12:20	2.00	726.75	0.03	0.03

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°)	
0	N/A	N/A	N/A	N/A	N/A	N/A	10.2	11.1	

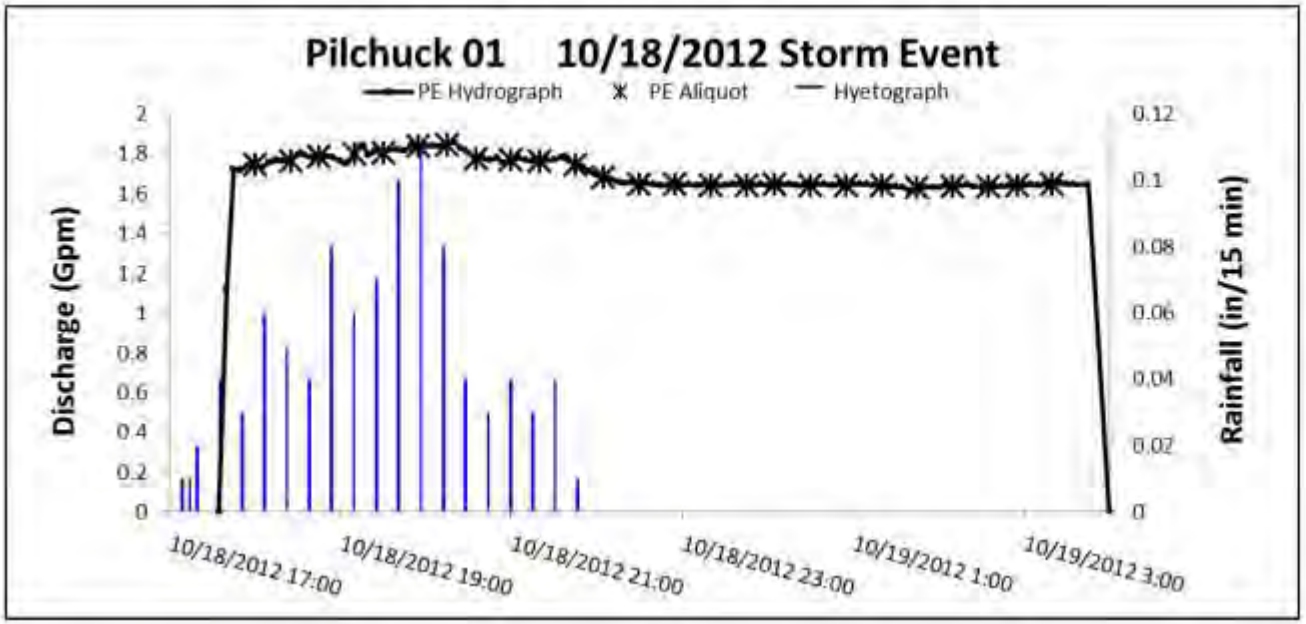
RUNOFF / DISCHARGE												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
0	10/12/2012 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 (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.95	10/18/2012 17:35	10/18/2012 21:50	4.25	62.74	0.19	0.34

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PDT)	End Time (PDT)	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)
0	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

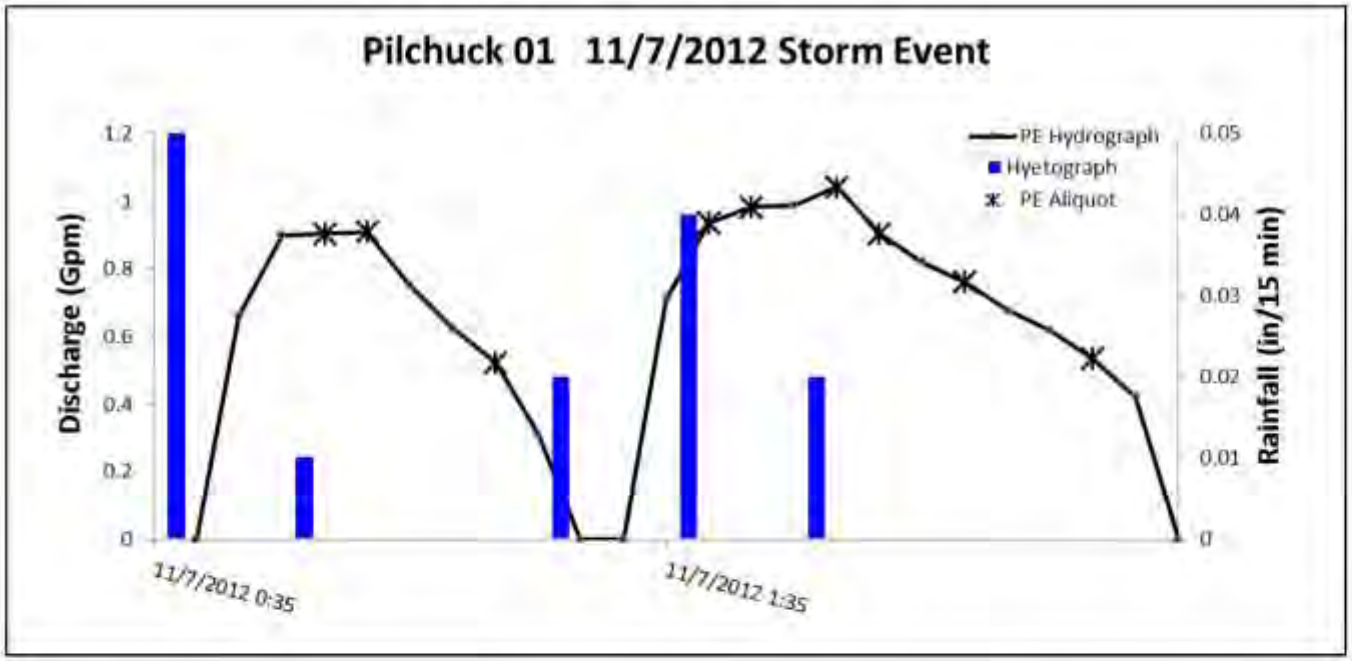


PRECIPITATION						
Total (in)	Start Time (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.15	11/7/2012 0:35	11/7/2012 3:25	2.83	49.5	0.04	0.06

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PST)	End Time (PST)	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)
0	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

Nonqualifying rainfall. First Pilchuck 01 nonqualifying event accepted.



PRECIPITATION									
Total (in)	Start Time (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity		Max Hourly Rainfall Intensity		
0.62	12/11/2012 9:35	12/12/2012 11:30	25.92	37.25	0.02		0.08		
ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PST)	End Time (PST)	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)
0	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 (PST)		End Time (PST)		Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity		Max Hourly Rainfall Intensity			
0.14	2/11/2013 9:50		2/11/2013 23:25		13.58	45.99	0.01		0.02			
ALIQUOTS								WATER TEMP		VALIDATION CODE		
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)		Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)			
0	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 (PST)	End Time (PST)	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)
0	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

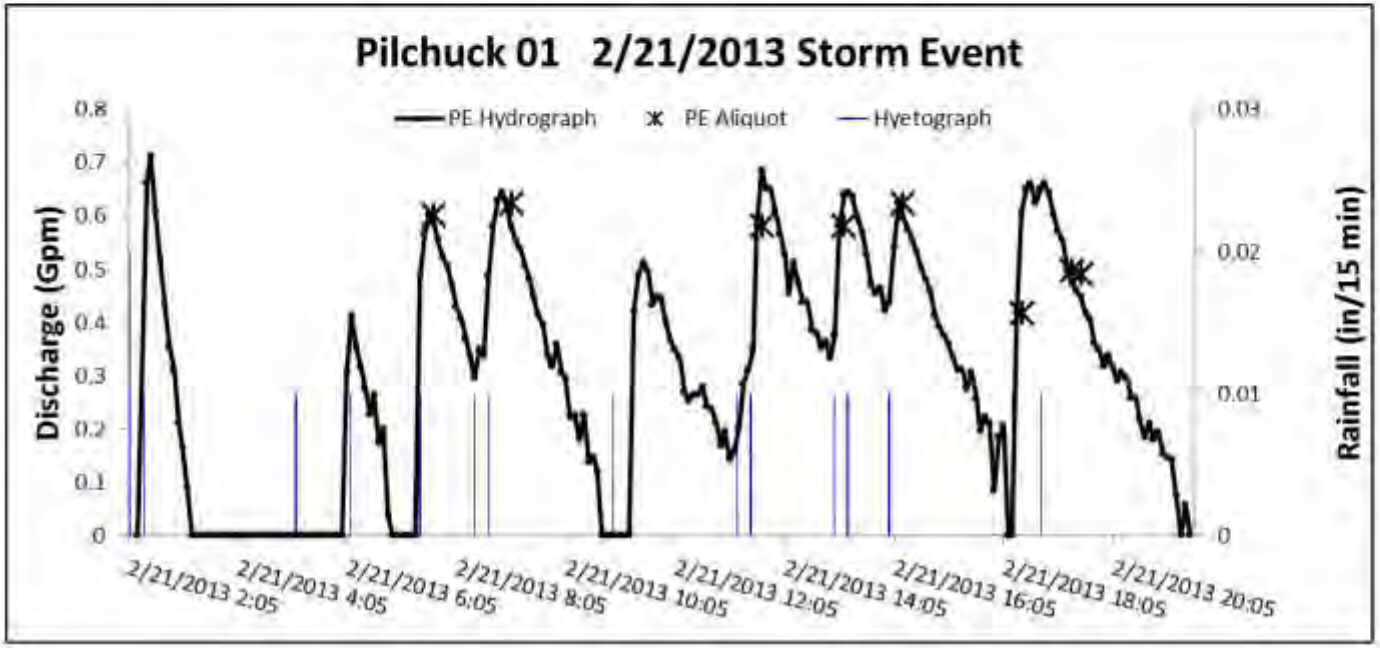
Only grab samples collected.

PRECIPITATION												
Total (in)	Start Time (PST)		End Time (PST)		Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity		Max Hourly Rainfall Intensity			
0.24	2/16/2013 7:15		2/16/2013 13:45		6.50	47.5	0.01		0.04			
ALIQUOTS								WATER TEMP		VALIDATION CODE		
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)		Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)			
0	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 (PST)	End Time (PST)	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)
0	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 (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity						
0.16	2/21/2013 2:25	2/21/2013 18:50	16.42	37.99	0.01	0.02						
ALIQUOTS							WATER TEMP		VALIDATION CODE			
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)				
0	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 (PST)	End Time (PST)	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)
0	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

Nonqualifying rainfall. Second Pilchuck 01 nonqualifying event accepted.

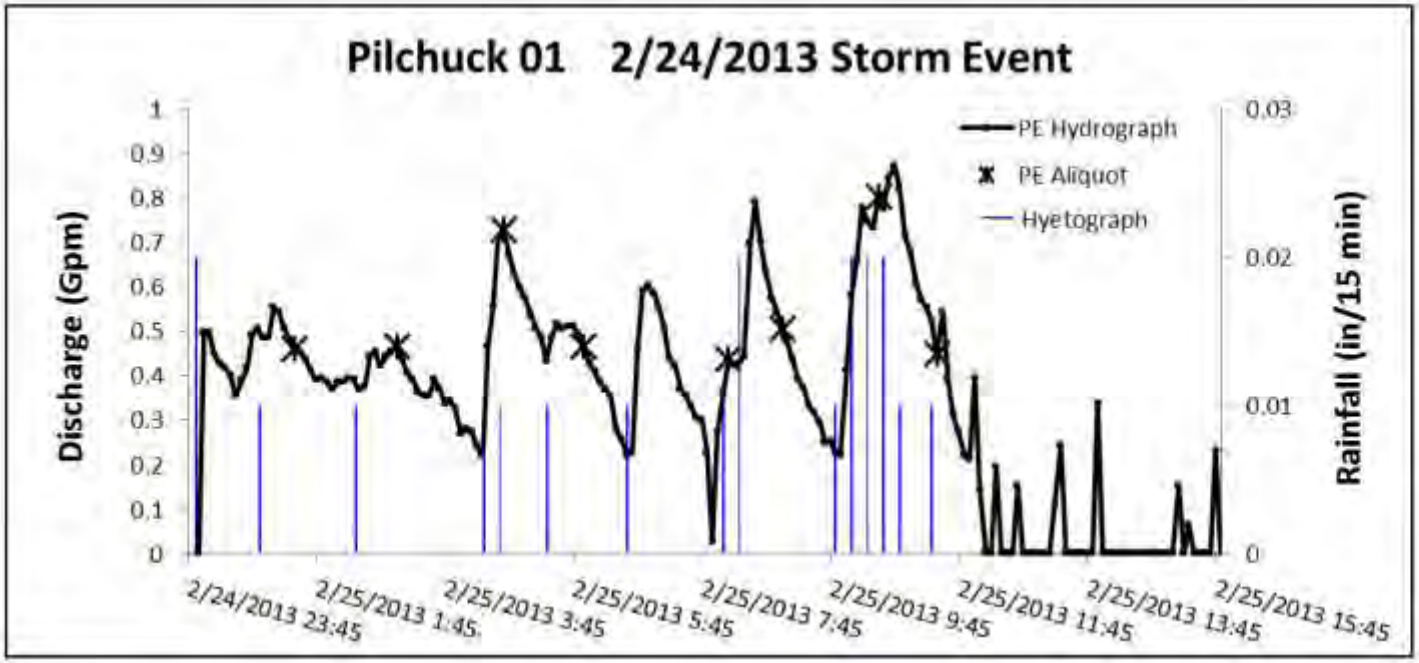


PRECIPITATION						
Total (in)	Start Time (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.20	2/24/2013 23:50	2/25/2013 11:25	11.58	38	0.02	0.08

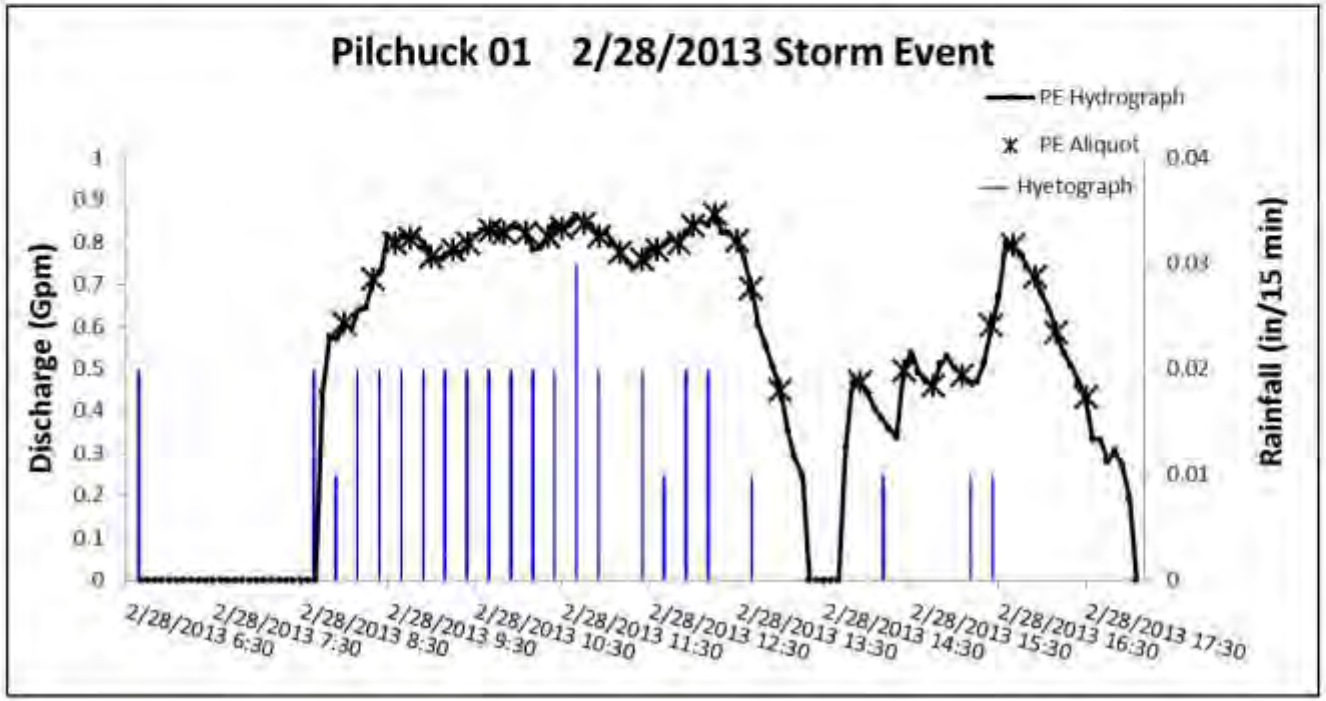
ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	8	2/25/2013 1:25	2/25/2013 11:25	10.00	250	2,000	4.74	5.21	J

RUNOFF / DISCHARGE												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (PST)	End Time (PST)	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)
0	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

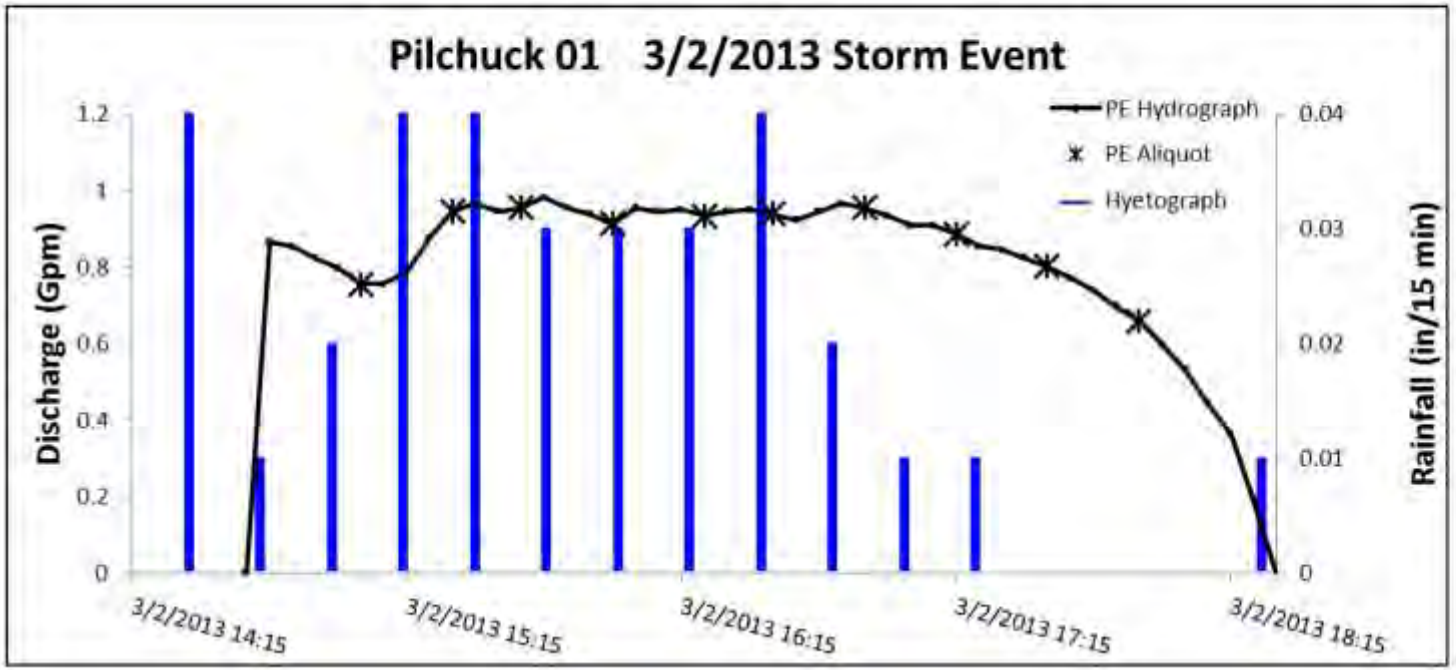
J=Estimate of Hydrology information



PRECIPITATION												
Total (in)	Start Time (PST)		End Time (PST)		Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity		Max Hourly Rainfall Intensity			
0.41	2/28/2013 6:40		2/28/2013 16:35		9.92	67.75	0.04		0.09			
ALIQUOTS								WATER TEMP		VALIDATION CODE		
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)		Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)			
0	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 (PST)	End Time (PST)	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)
0	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



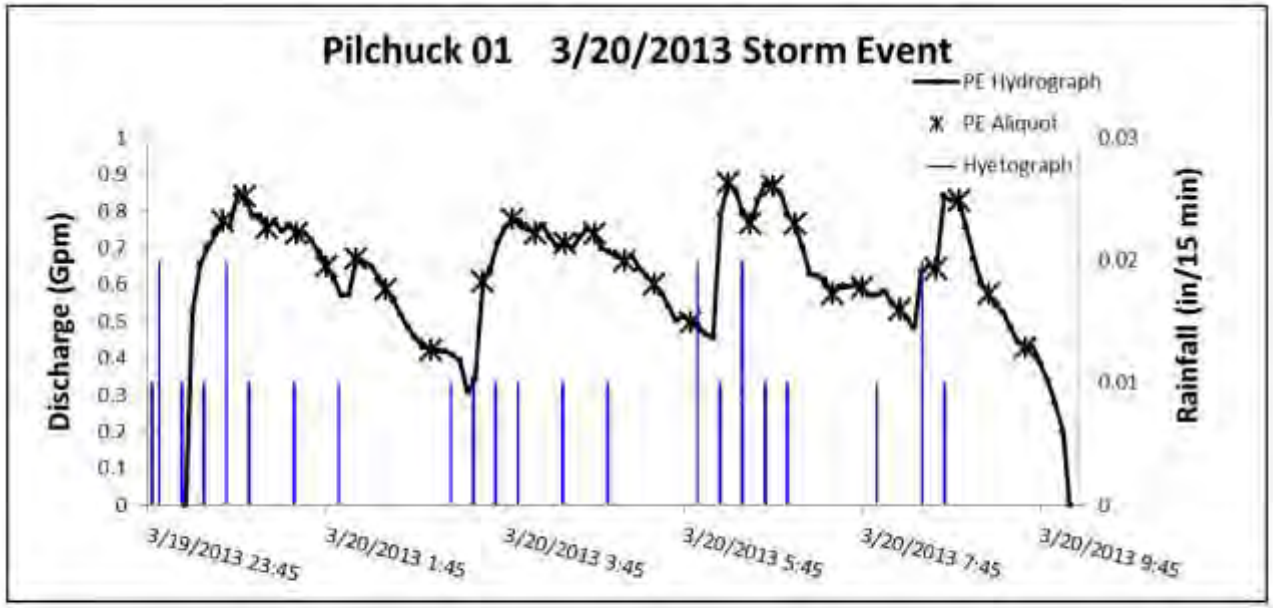
PRECIPITATION												
Total (in)	Start Time (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity						
0.33	3/2/2013 14:40	3/2/2013 18:30	3.83	46.24	0.07	0.12						
ALIQUOTS								WATER TEMP		VALIDATION CODE		
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)		Min (C°)	Max (C°)			
0	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 (PST)	End Time (PST)	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)
0	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



PRECIPITATION												
Total (in)	Start Time (PST)		End Time (PST)		Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity		Max Hourly Rainfall Intensity			
0.70	3/6/2013 8:55		3/7/2013 1:20		26.42	87.25	0.03		0.06			
ALIQUOTS								WATER TEMP		VALIDATION CODE		
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)		Min (C°)	Max (C°)			
0	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 (PST)	End Time (PST)	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)
0	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 (PDT)		End Time (PDT)		Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity		Max Hourly Rainfall Intensity			
0.27	3/20/2013 0:10		3/20/2013 8:50		8.67	42	0.03		0.05			
ALIQUOTS								WATER TEMP		VALIDATION CODE		
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)		Min (C°)	Max (C°)			
0	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 (PDT)	End Time (PDT)	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)
0	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



PRECIPITATION						
Total (in)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.34	4/12/2013 20:45	4/13/2013 6:00	9.25	48	0.01	0.04

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PDT)	End Time (PDT)	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)
0	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.

Everett 01

PRECIPITATION						
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.04	10/12/2012 19:45	10/12/2012 12:40	2.92	291.25	0.01	0.03

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°)	
0	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)
0	N/A	N/A	N/A			N/A	N/A	N/A	N/A	N/A	N/A	N/A

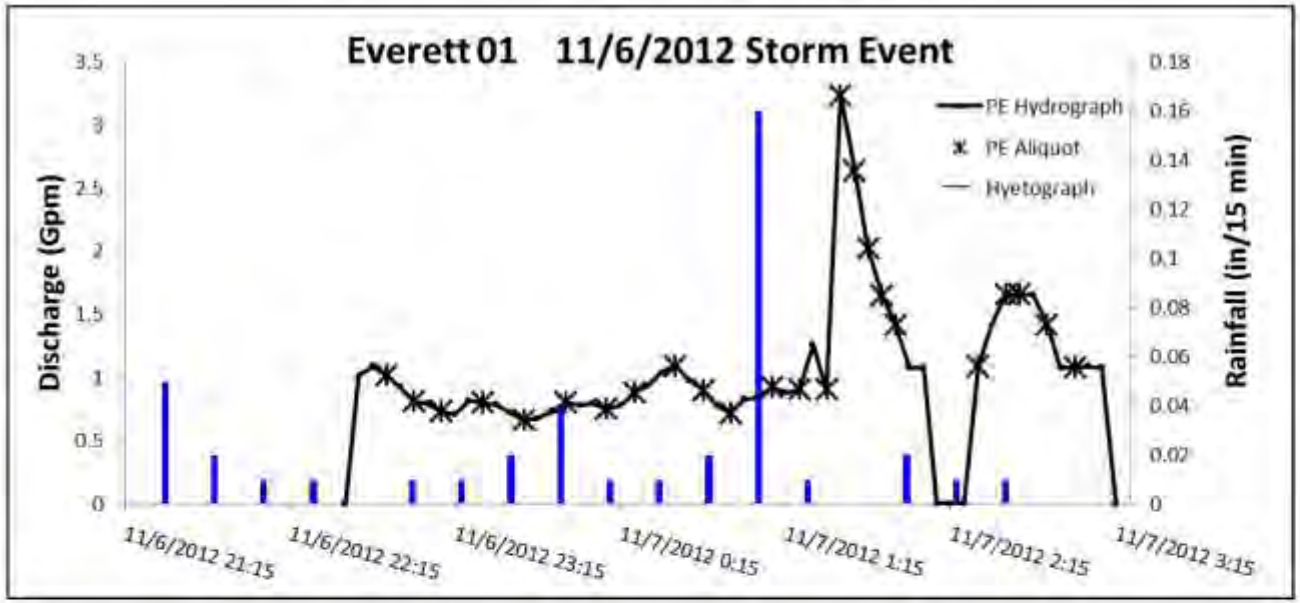
Only grab samples collected.

PRECIPITATION						
Total (in)	Start Time (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.47	11/6/2012 22:35	11/7/2012 11:15	12.67	47.74	0.04	0.16

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PST)	End Time (PST)	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)
0	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



PRECIPITATION						
Total (in)	Start Time (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.51	12/11/2012 13:45	12/12/2012 7:00	17.25	78	0.03	0.06

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PST)	End Time (PST)	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)
0	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 (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.06	2/11/2013 8:30	2/11/2013 13:15	4.75	44	0.01	0.02

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PST)	End Time (PST)	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)
0	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 (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.93	2/22/2013 10:45	2/23/2013 10:25	23.67	30.24	0.04	0.28

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	N/A	N/A	N/A	N/A	N/A	N/A	0.06	7.21	

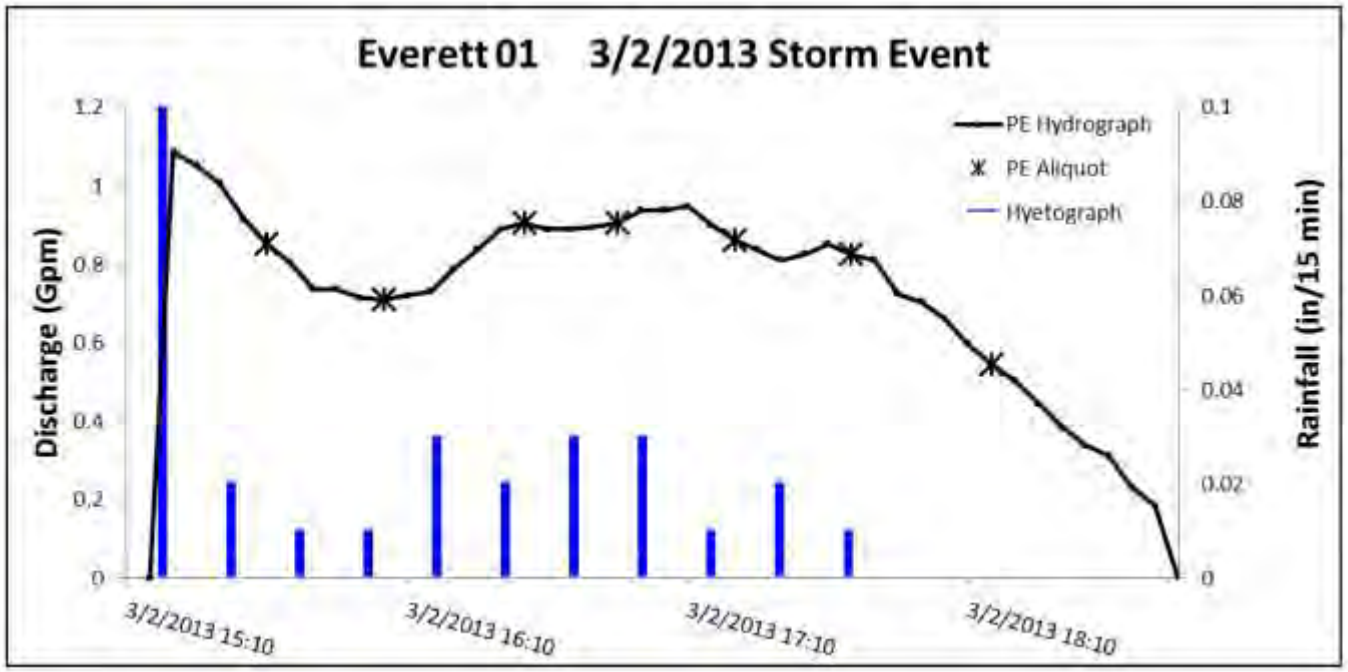
RUNOFF / DISCHARGE												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (PST)	End Time (PST)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
0	2/22/2013 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 (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.30	3/2/2013 15:15	3/2/2013 20:30	5.25	45	0.05	0.11

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PST)	End Time (PST)	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)
0	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



PRECIPITATION						
Total (in)	Start Time (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.63	3/6/2013 9:35	3/7/2013 9:40	24.08	76.25	0.03	0.05

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PST)	End Time (PST)	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)
0	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

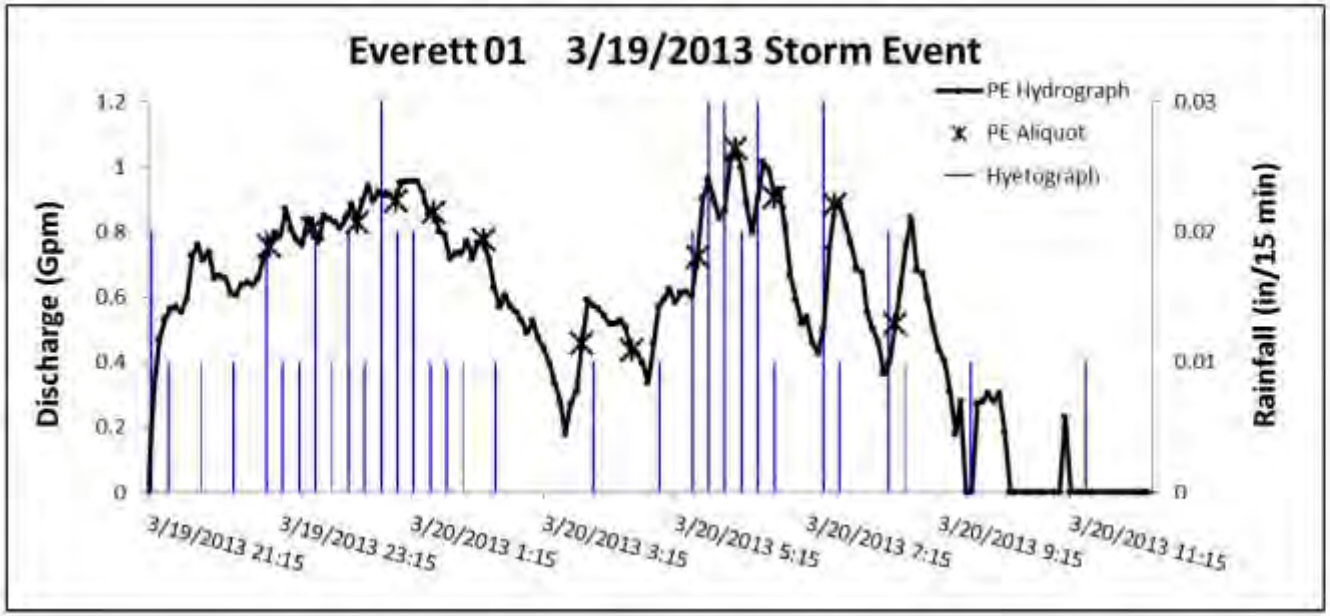
Only grab samples collected.

PRECIPITATION						
Total (in)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.51	3/19/2013 21:15	3/20/2013 11:40	14.42	38.25	0.03	0.09

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PDT)	End Time (PDT)	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)
0	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

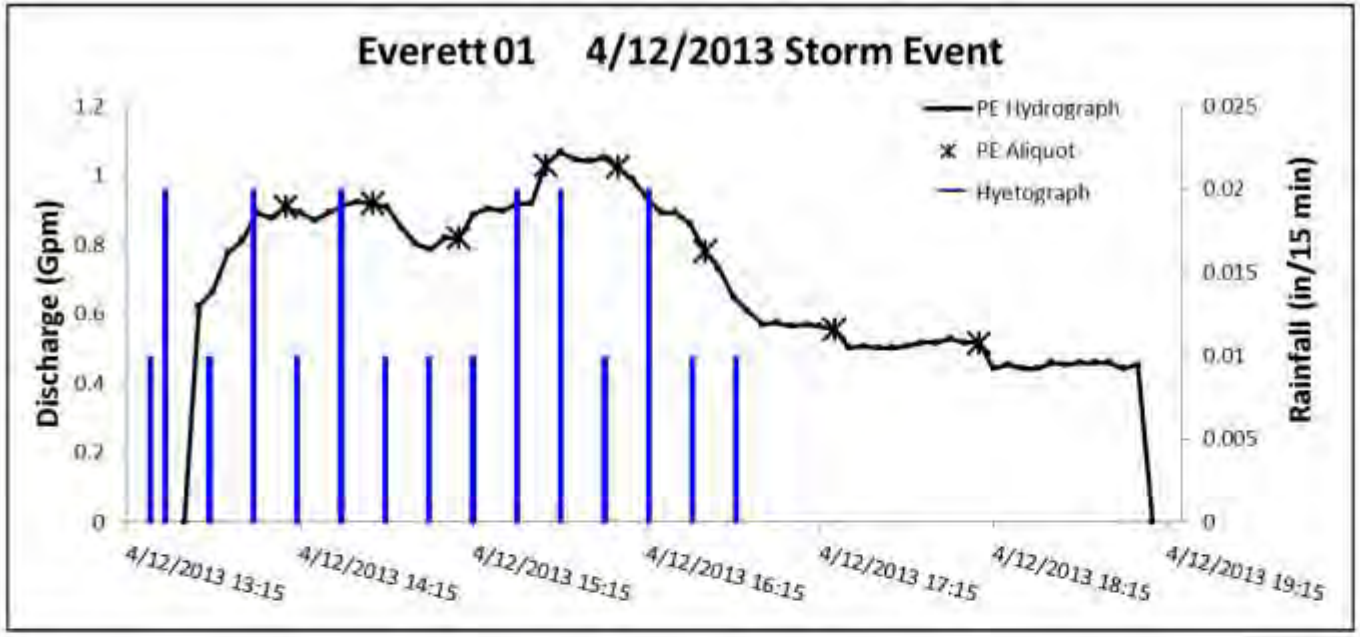


PRECIPITATION						
Total (in)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.21	4/12/2013 13:35	4/12/2013 16:55	3.33	32	0.05	0.06

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PDT)	End Time (PDT)	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)
0	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

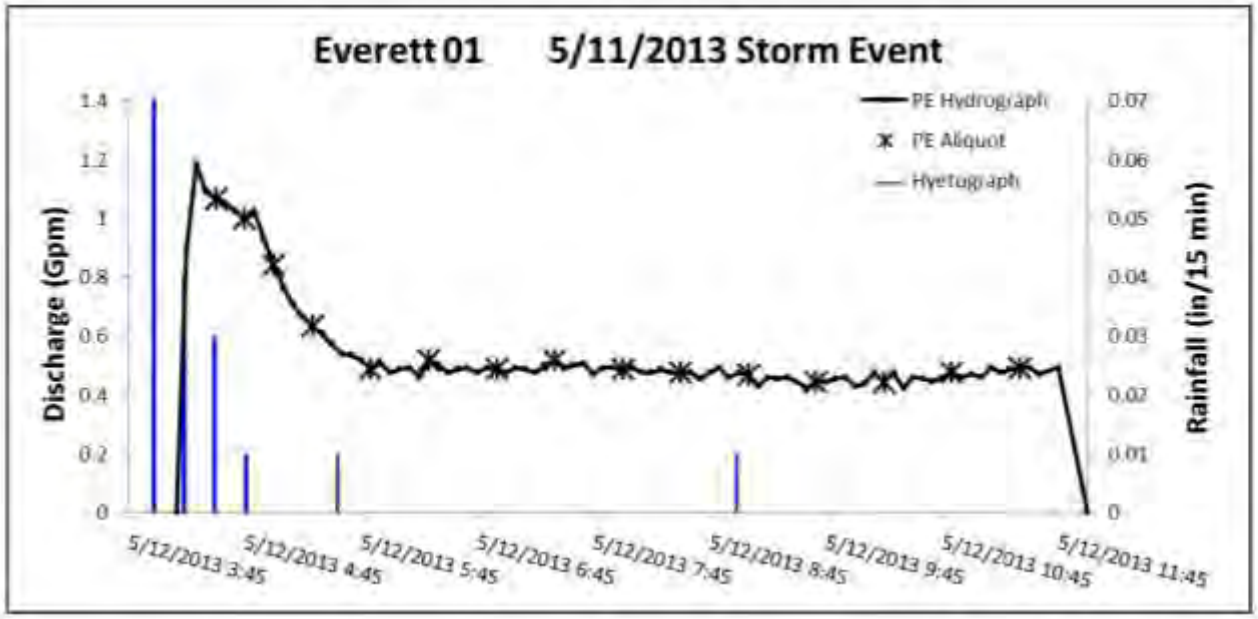
J=Estimate of Hydrology information



PRECIPITATION								
Total (in)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity		Max Hourly Rainfall Intensity	
0.17	5/11/2013 22:10	5/12/2013 9:05	4.92	286.5	0.03		0.12	
ALIQUOTS						WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)
0	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 (PDT)	End Time (PDT)	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)
0	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

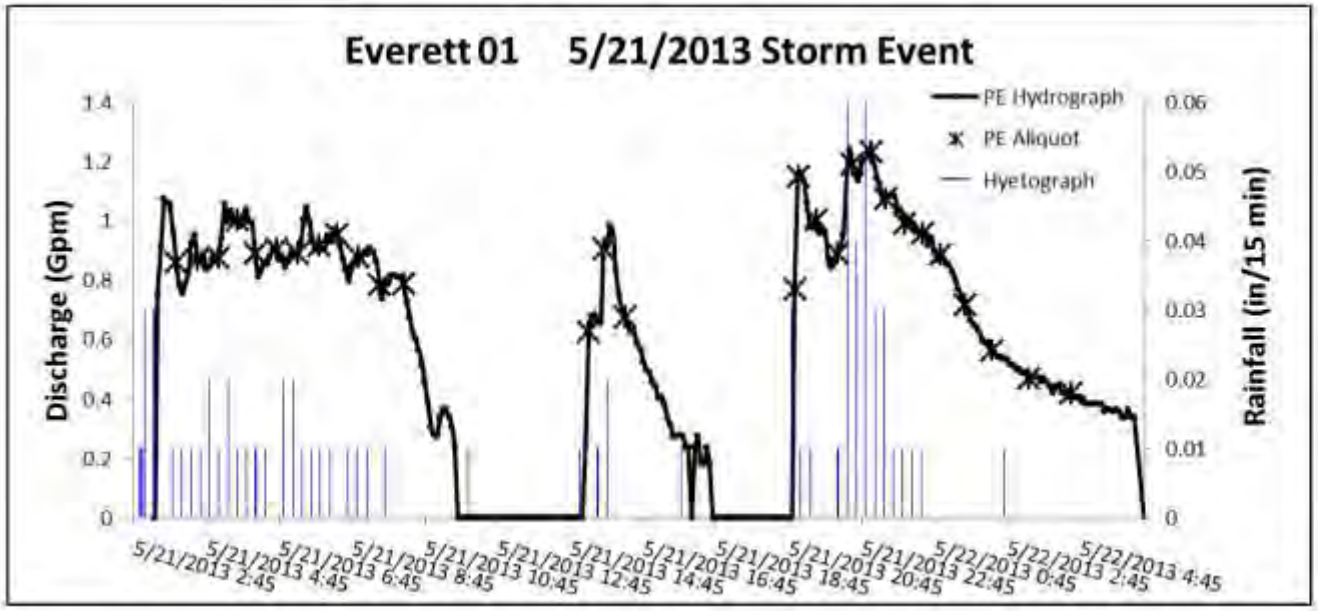
Nonqualifying rainfall. First Everett 01 nonqualifying event accepted.



PRECIPITATION							
Total (in)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity	
0.72	5/21/2013 3:15	5/22/2013 2:45	23.50	43.75	0.03	0.19	

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (U PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PDT)	End Time (PDT)	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)
0	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 04

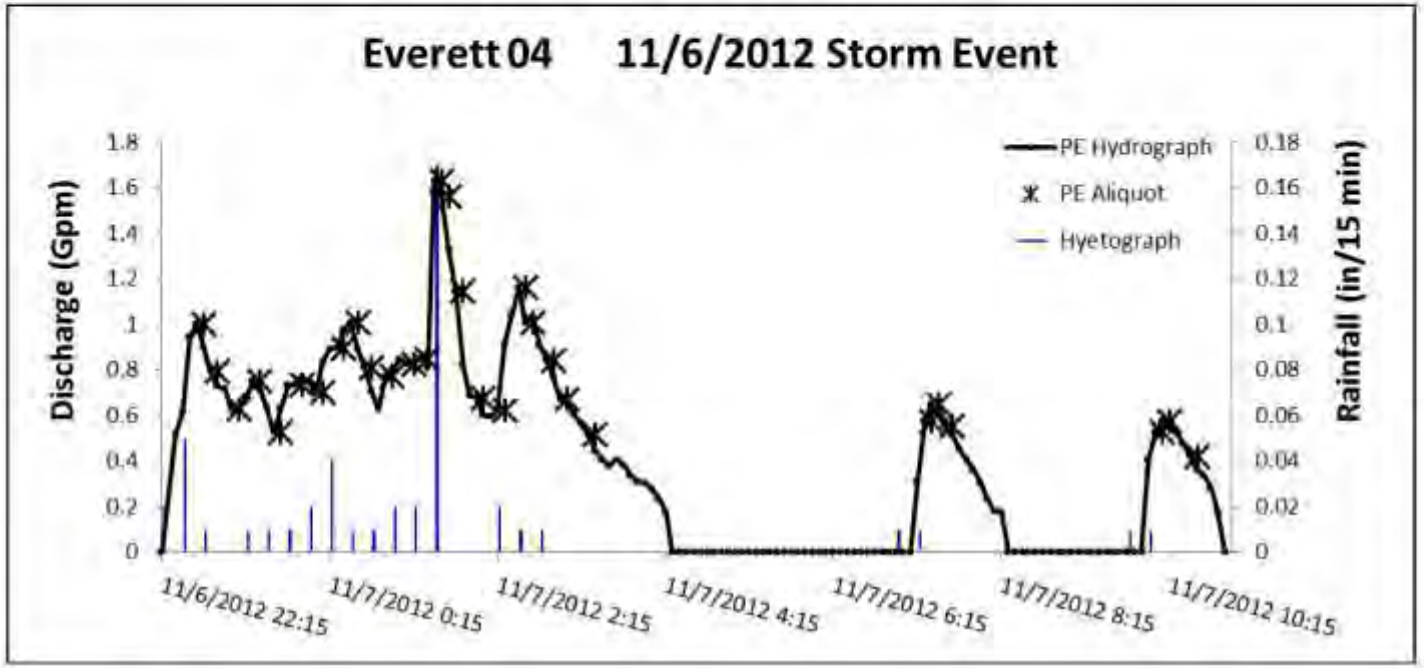
PRECIPITATION						
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.03	10/12/2012 9:35	10/12/2012 9:45	0.17	724.99	0.03	0.02

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°)	
0	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)
0	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 (PST)		End Time (PST)		Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity		Max Hourly Rainfall Intensity			
0.48	11/6/2012 22:25		11/7/2012 10:15		11.83	48.25	0.04		0.19			
ALIQUOTS								WATER TEMP		VALIDATION CODE		
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)		Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)			
0	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 (PST)	End Time (PST)	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)
0	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



PRECIPITATION						
Total (in)	Start Time (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.53	12/11/2012 13:45	12/12/2012 6:55	17.17	42.24	0.03	0.07

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	N/A	N/A	N/A	N/A	N/A	N/A	5.29	6.50	

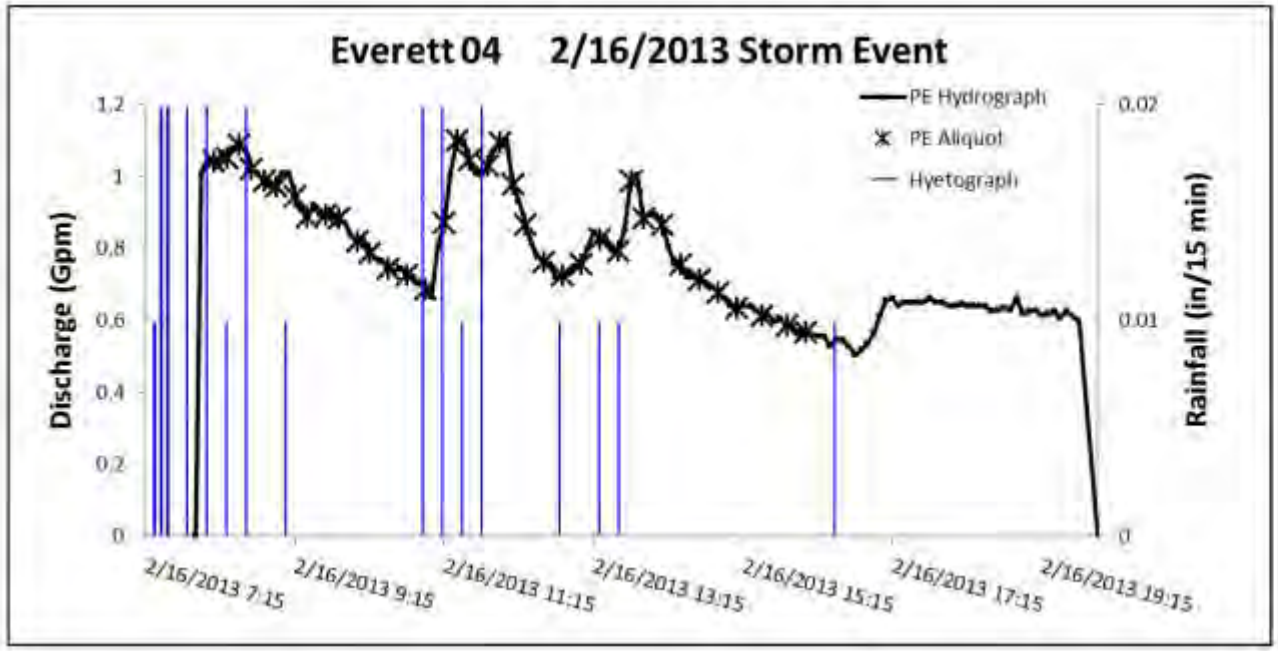
RUNOFF / DISCHARGE												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (PST)	End Time (PST)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
0	12/11/2012 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 (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.23	2/16/2013 7:45	2/16/2013 16:30	8.75	47.74	0.03	0.07

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PST)	End Time (PST)	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)
0	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



PRECIPITATION							
Total (in)	Start Time (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity	
0.85	2/22/2013 16:35	2/23/2013 8:05	15.50	37.24	0.05	0.36	

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PST)	End Time (PST)	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)
0	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 (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.27	3/2/2013 15:15	3/2/2013 17:50	2.58	51.49	0.09	0.1

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PST)	End Time (PST)	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)
0	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 (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.57	3/6/2013 9:35	3/7/2013 10:45	25.17	37.5	0.02	0.04

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	N/A	N/A	N/A	N/A	N/A	N/A	4.55	6.78	

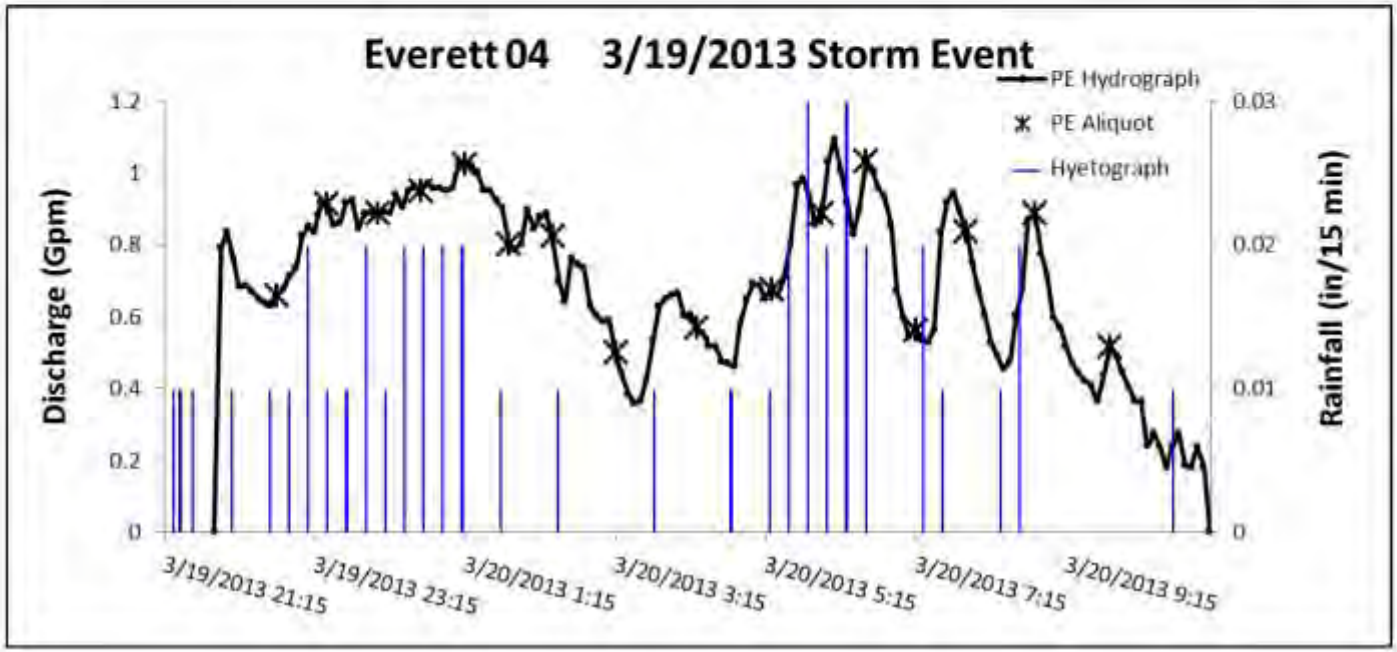
RUNOFF / DISCHARGE												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (PST)	End Time (PST)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
0	3/6/2013 9:40	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 (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.45	3/19/2013 21:30	3/20/2013 10:40	13.17	38.74	0.03	0.1

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PDT)	End Time (PDT)	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)
0	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

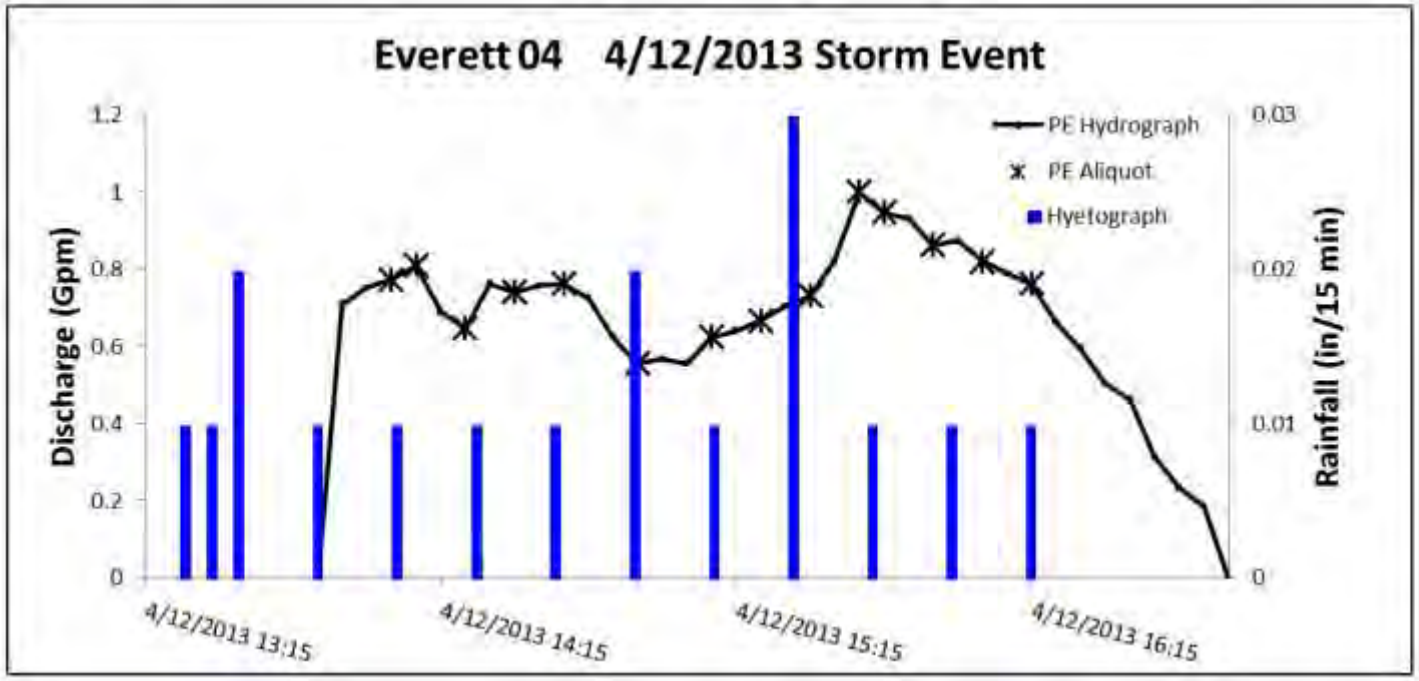


PRECIPITATION						
Total (in)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.17	4/12/2013 13:45	4/12/2013 16:20	2.58	32.5	0.06	0.07

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	14	4/12/2013 14:05	4/12/2013 16:20	2.25	250	3,500	6.14	7.62	R

RUNOFF / DISCHARGE												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (PDT)	End Time (PDT)	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)
0	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

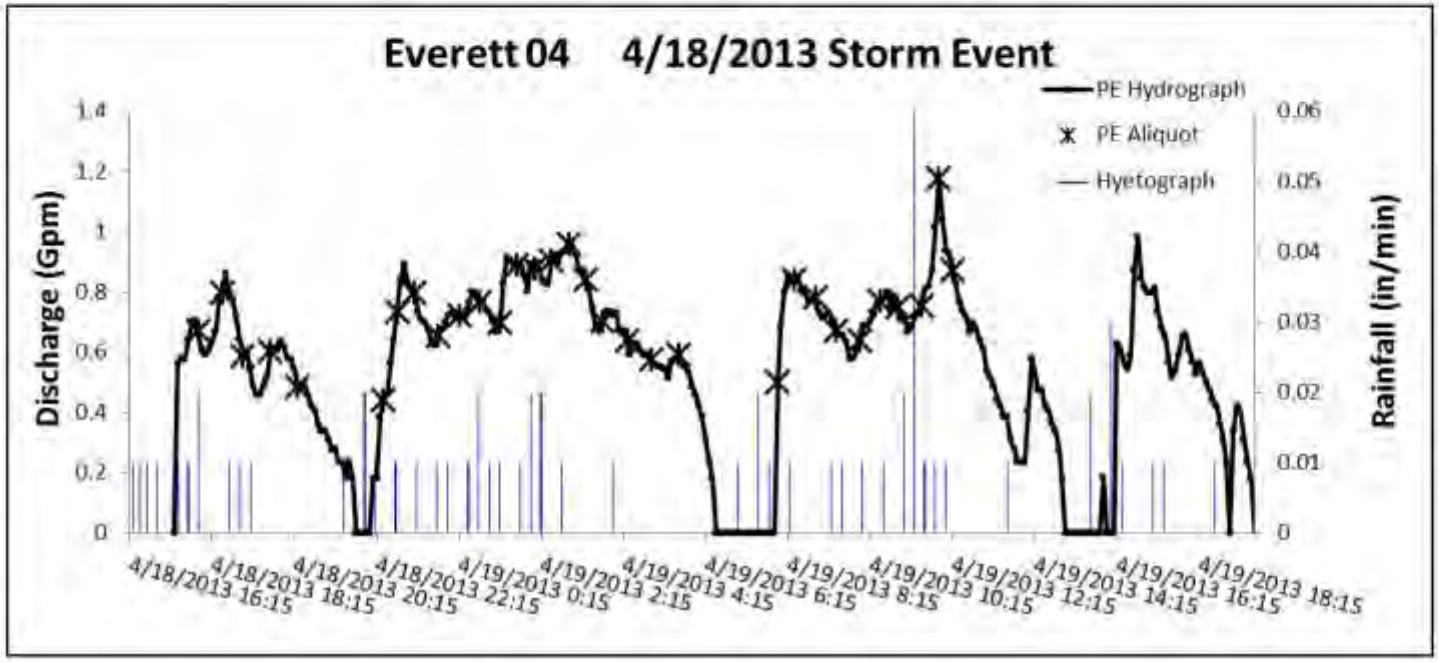
Non-qualifying rainfall. First Everett 04 non-qualifying event accepted.



PRECIPITATION							
Total (in)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity	
0.61	4/18/2013 16:45	4/19/2013 19:15	26.25	108.49	0.02	0.1	

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PDT)	End Time (PDT)	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)
0	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

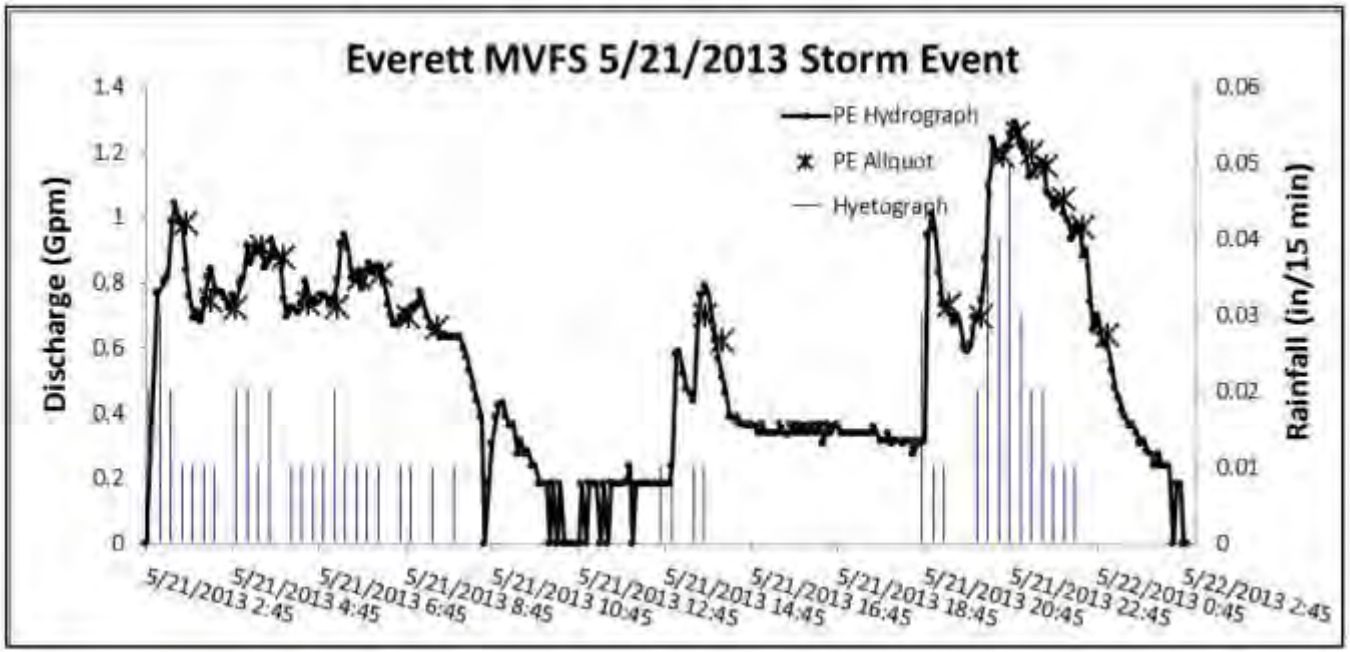


PRECIPITATION						
Total (in)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.66	5/21/2013 3:10	5/22/2013 0:25	21.25	44.75	0.03	0.16

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PDT)	End Time (PDT)	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)
0	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

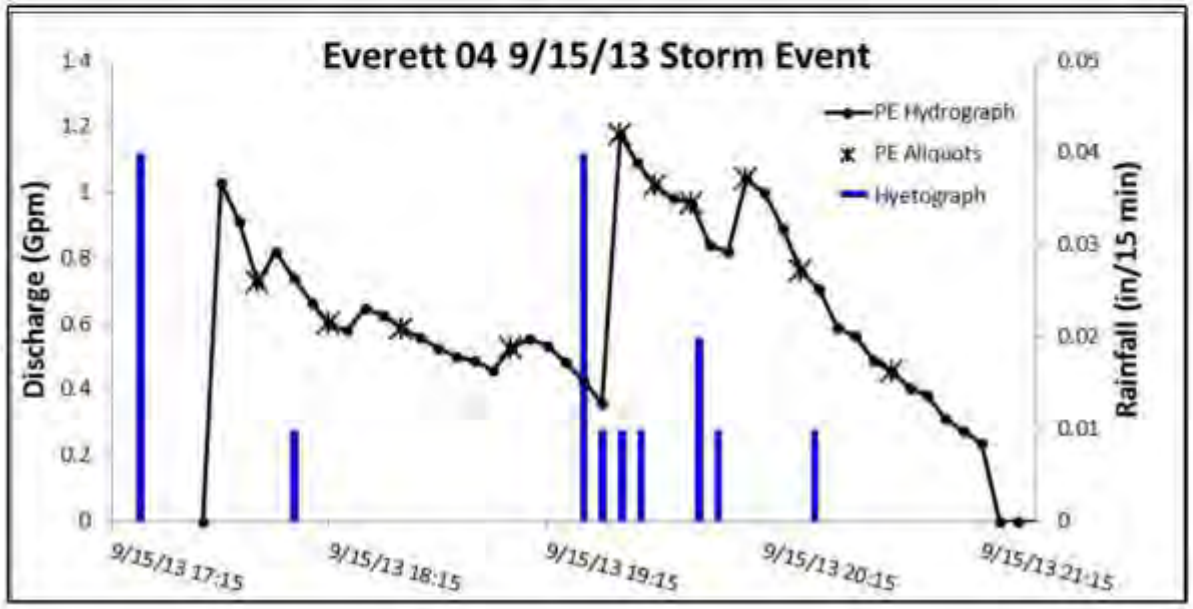


PRECIPITATION						
Total (in)	Start Time (UTC)	End Time (UTC)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.16	9/15/2013 17:40	9/15/2013 20:35	2.92	174.75	0.04	0.06

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°)	
0	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)
0	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

Nonqualifying rainfall. Second Everett 04 nonqualifying event accepted.



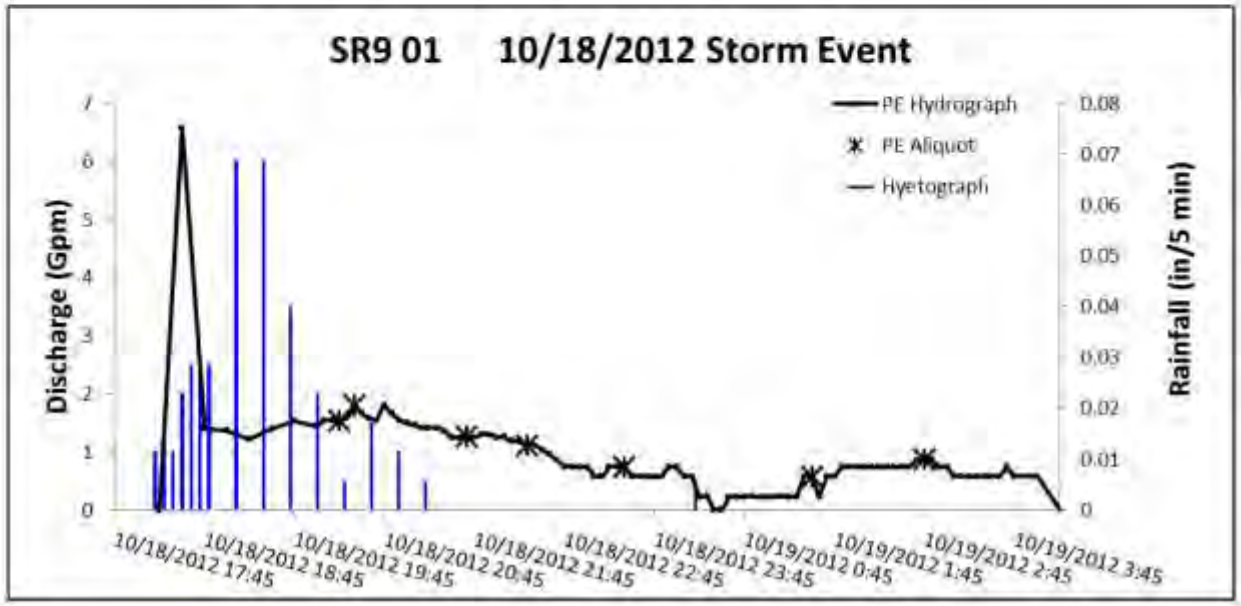
SR9 01

PRECIPITATION						
Total (in)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.69	10/18/2012 18:45	10/19/2012 0:35	5.83	52.5	0.12	0.39

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PDT)	End Time (PDT)	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)
0	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



PRECIPITATION						
Total (in)	Start Time (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.68	11/6/2012 22:00	11/7/2012 10:55	12.92	46.24	0.05	0.26

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PST)	End Time (PST)	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)
0	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 (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
1.27	12/11/2012 21:45	12/12/2012 14:45	17.00	41	0.08	0.08

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PST)	End Time (PST)	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)
0	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 (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.06	2/21/2013 5:40	2/21/2013 11:45	6.08	101.25	0.01	0.02

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PST)	End Time (U PST)	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)
0	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 (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.32	3/2/2013 15:20	3/2/2013 18:00	2.67	47.74	0.11	0.13

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PST)	End Time (PST)	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)
0	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 (PST)	End Time (U PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity	
0.75	3/6/2013 9:55	3/7/2013 12:10	26.25	76.24	0.03	0.06	

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	N/A	N/A	N/A	N/A	N/A	N/A	5.40	7.70	

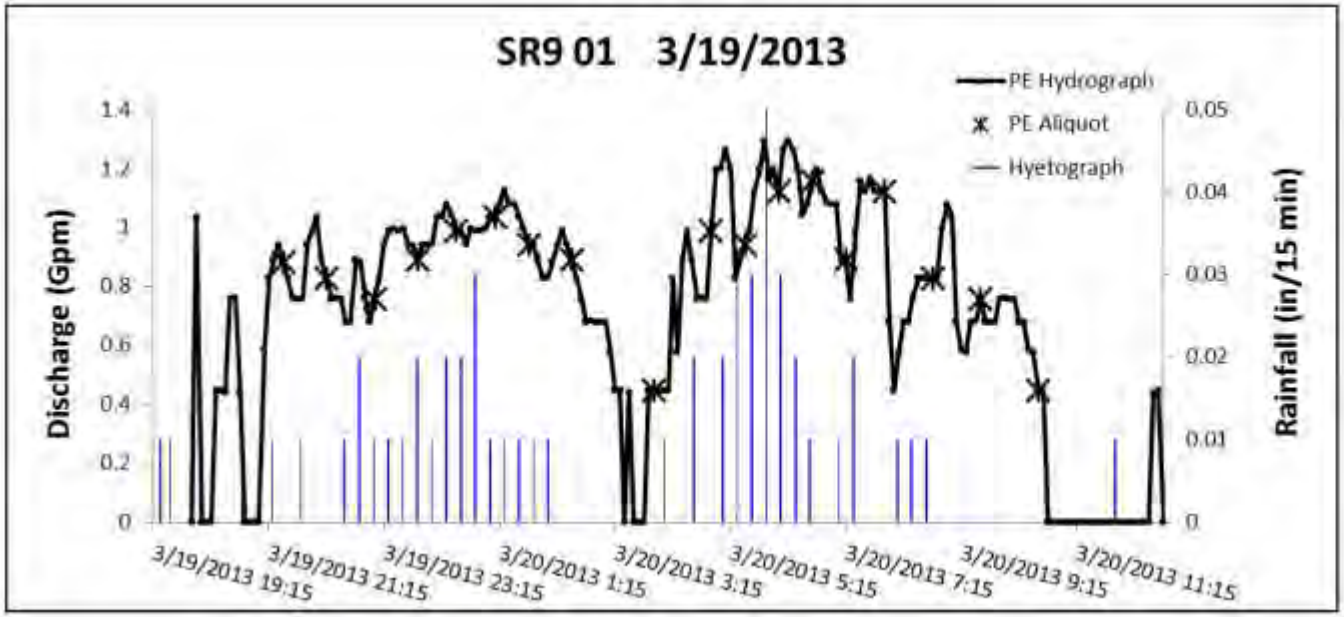
RUNOFF / DISCHARGE												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (PST)	End Time (PST)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
0	3/6/2013 10:00	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 (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity	
0.55	3/19/2013 19:55	3/19/2013 12:20	16.42	37.24	0.03	0.13	

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	18	3/19/2013 21:30	3/20/2013 10:35	13.08	250	4,500	5.60	9.50	

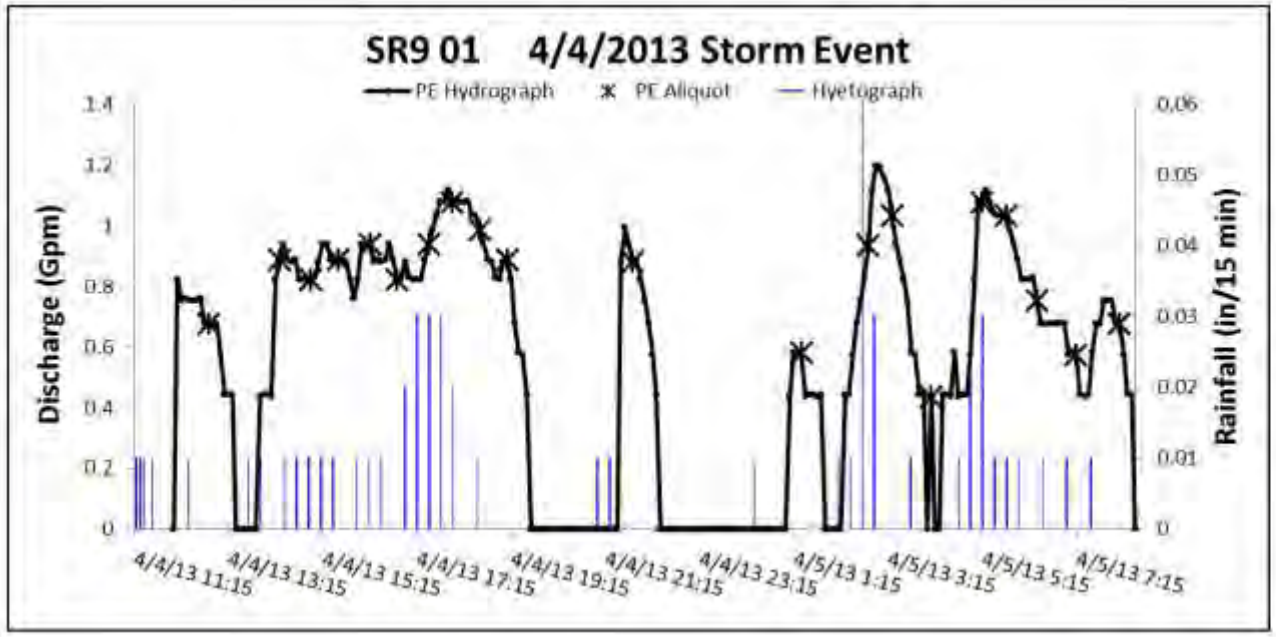
RUNOFF / DISCHARGE												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
0	3/19/2013 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



PRECIPITATION						
Total (in)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.56	4/4/2013 11:45	4/5/2013 7:45	20.00	311.49	0.03	0.08

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	20	4/4/2013 12:50	4/5/2013 8:10	19.33	250	5,000	9.70	14.60	

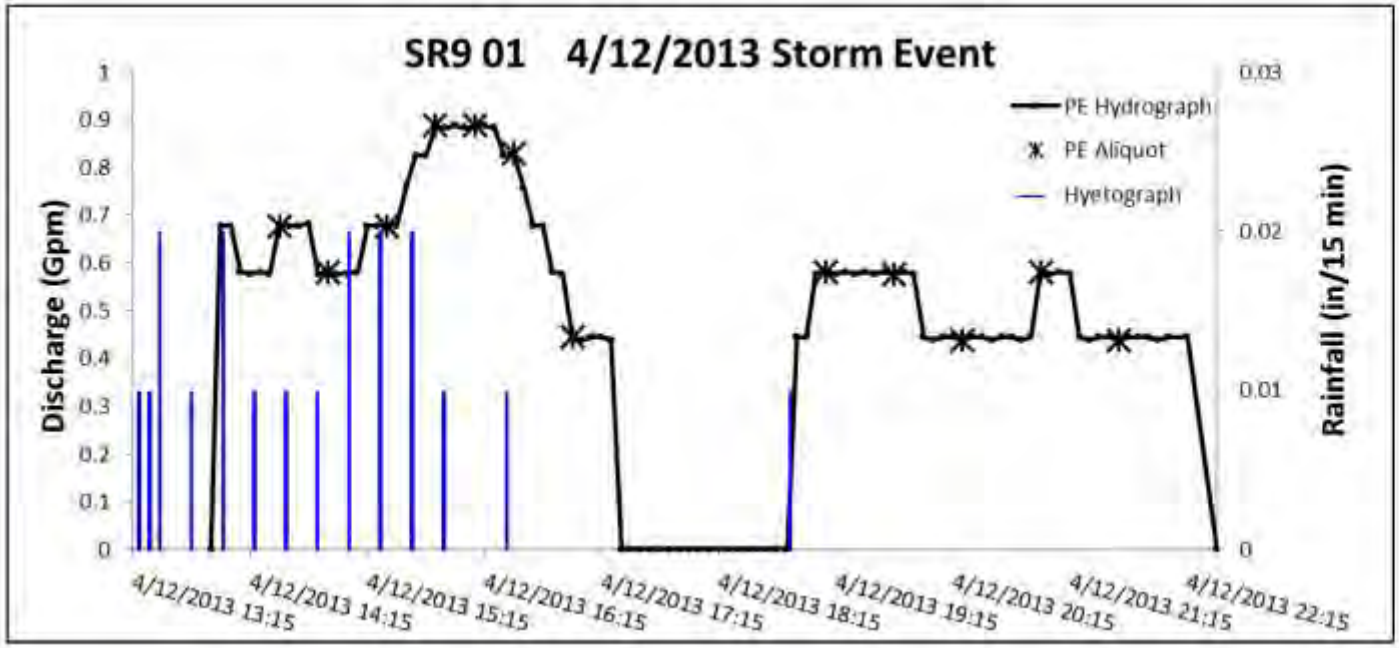
RUNOFF / DISCHARGE												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
0	4/4/2013 12:10	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



PRECIPITATION									
Total (in)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity		Max Hourly Rainfall Intensity		
0.19	4/12/2013 13:55	4/12/2013 19:05	5.17	32.49	0.03		0.06		
ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PDT)	End Time (PDT)	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)
0	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

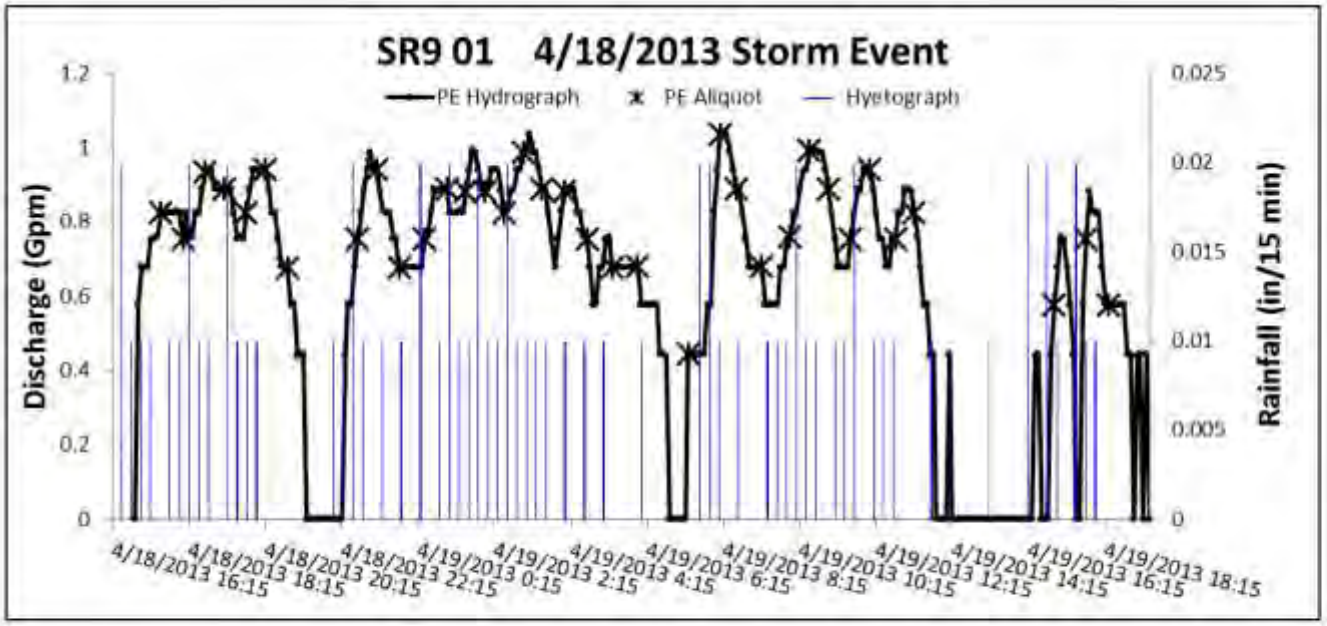
Nonqualifying rainfall. First SR9 01 nonqualifying event accepted.



PRECIPITATION						
Total (in)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.75	4/18/2013 16:50	4/19/2013 18:15	25.42	50.74	0.03	0.05

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PDT)	End Time (PDT)	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)
0	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



PRECIPITATION						
Total (in)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.70	5/21/2013 2:15	5/22/2013 0:30	22.25	46.5	0.03	0.14

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PDT)	End Time (PDT)	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)
0	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.

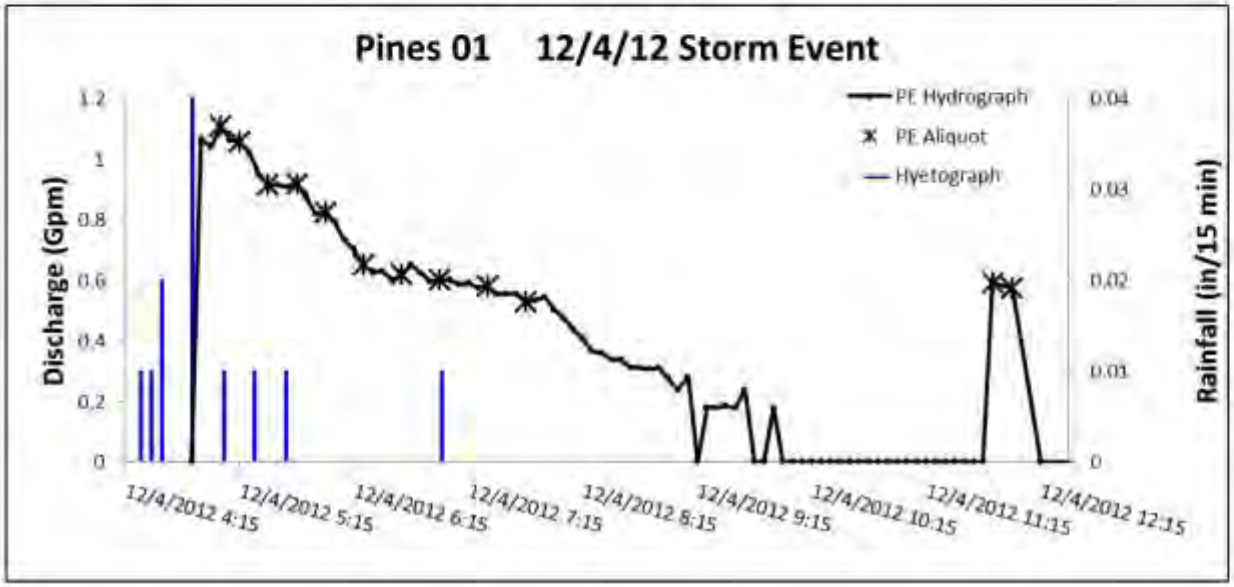
Pines 01

PRECIPITATION						
Total (in)	Start Time (PST)	End Time (PST)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.12	12/4/2012 4:45	12/4/2012 7:10	2.42	45.75	0.04	0.08

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PST)	Last Aliquot Time (PST)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	12	12/4/2012 5:05	12/4/2012 12:00	6.92	250	3,000	4.56	6.65	

RUNOFF / DISCHARGE												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (PST)	End Time (PST)	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)
0	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

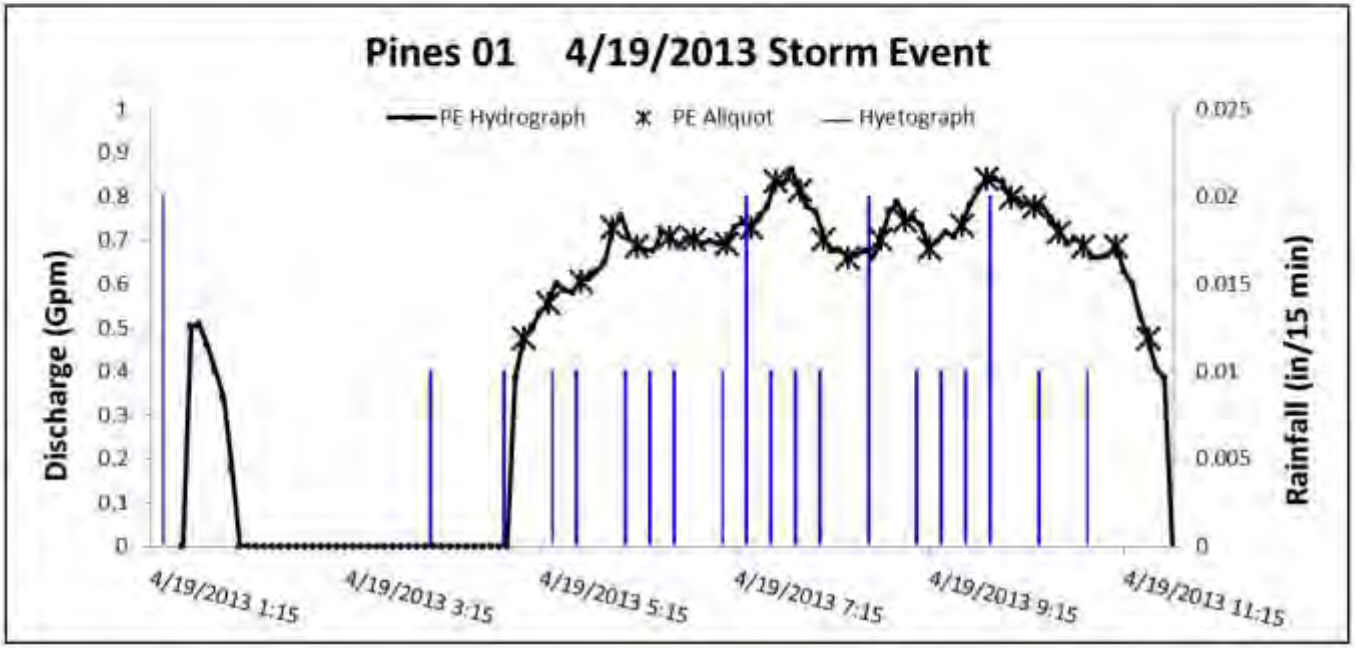
Nonqualifying rainfall. First Pines 01 nonqualifying event accepted.



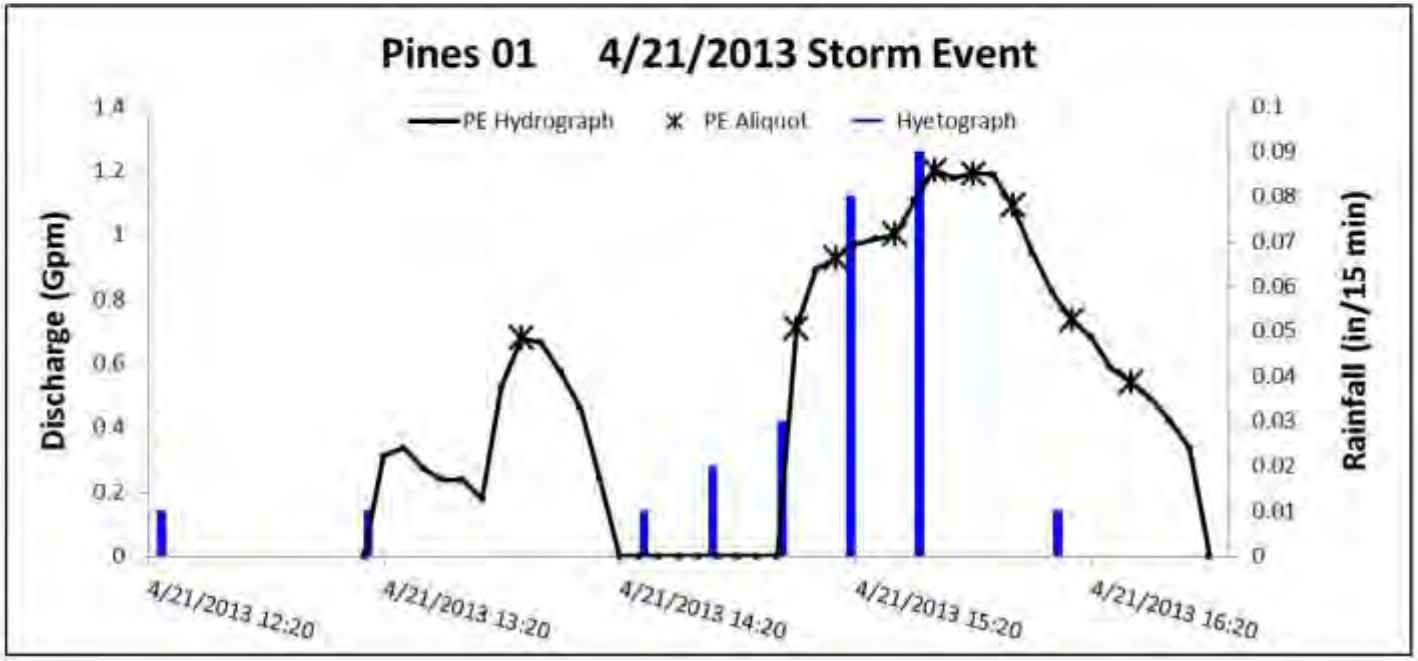
PRECIPITATION						
Total (in)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.24	4/19/2013 1:35	4/19/2013 11:10	9.58	147.75	0.02	0.04

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PDT)	End Time (PDT)	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)
0	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



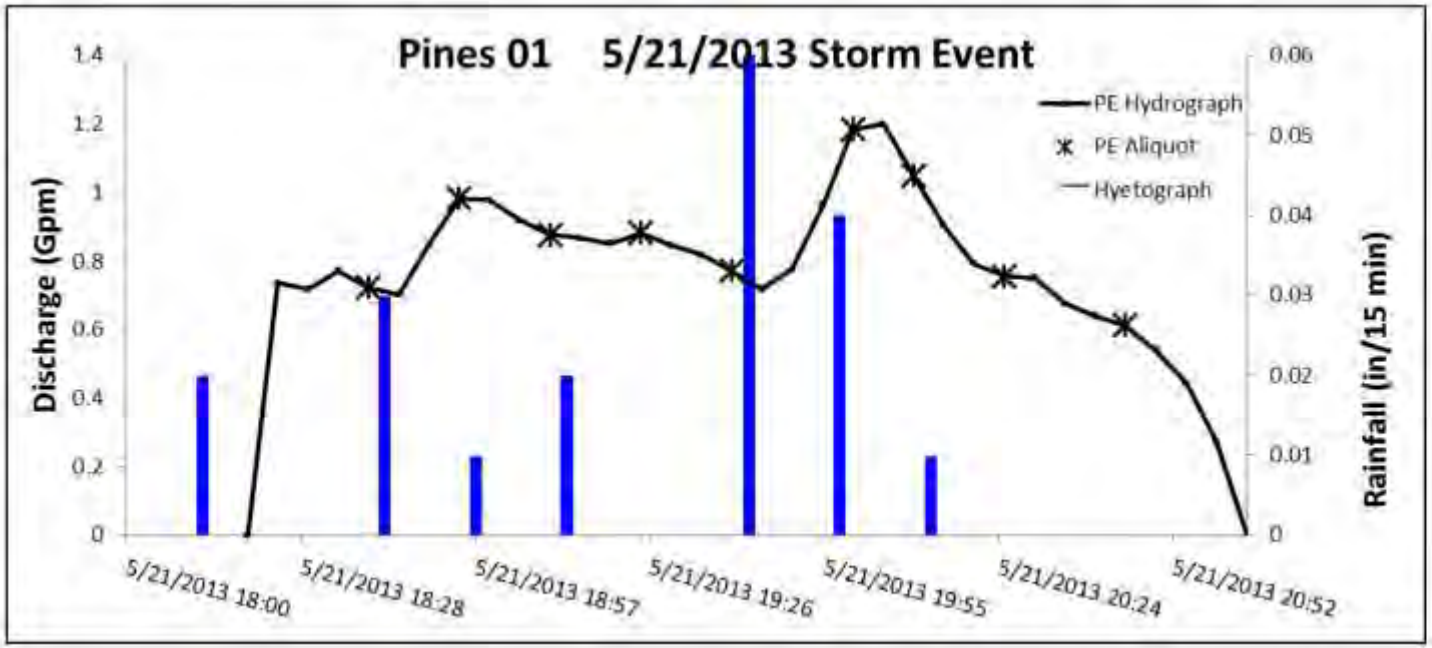
PRECIPITATION												
Total (in)	Start Time (UTC)		End Time (UTC)		Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity		Max Hourly Rainfall Intensity			
0.27	4/21/2013 13:05		4/21/2013 16:20		3.25	49.74	0.07		0.22			
ALIQUOTS								WATER TEMP		VALIDATION CODE		
Sample Point (m)	Aliquots Collected	First Aliquot Time (UTC)		Last Aliquot Time (UTC)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)			
0	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)
0	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



PRECIPITATION						
Total (in)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.20	5/21/2013 18:20	5/21/2013 20:25	2.08	193.99	0.07	0.11

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	9	5/21/2013 18:40	5/21/2013 20:45	2.08	250	2,250	10.79	13.37	

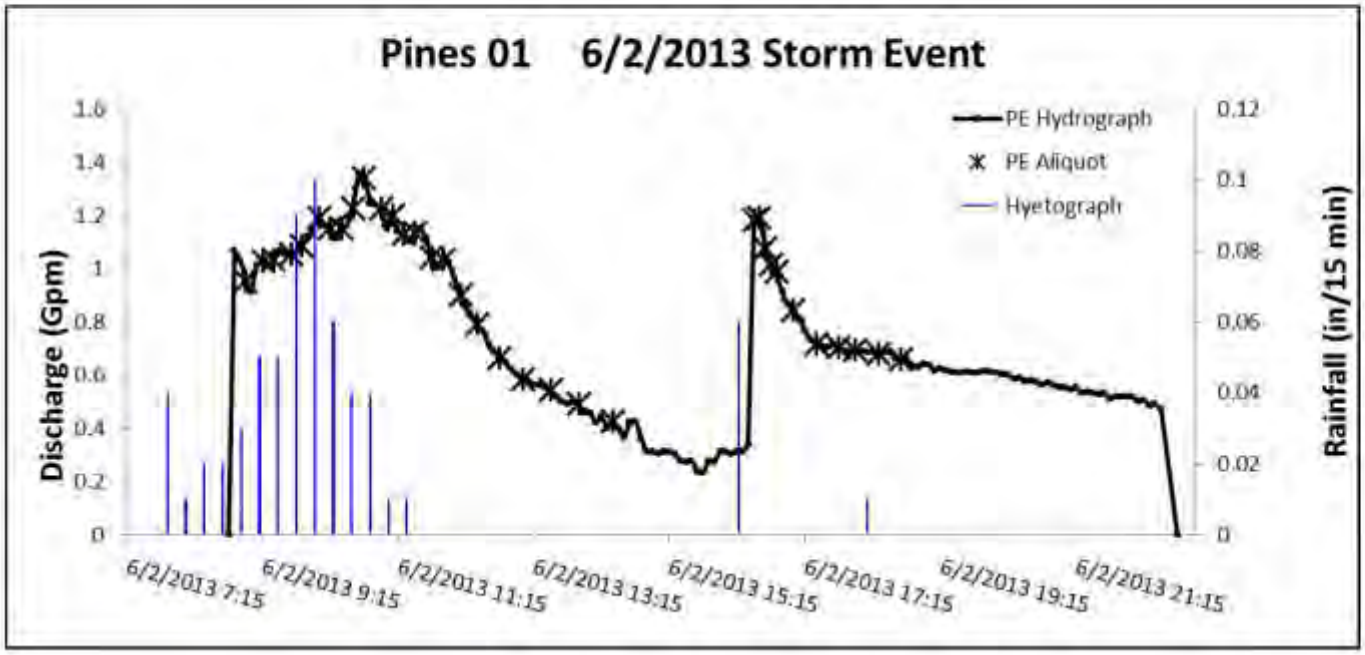
RUNOFF / DISCHARGE												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
0	5/21/2013 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



PRECIPITATION						
Total (in)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.64	6/2/2013 8:45	6/2/2013 18:25	9.67	67.74	0.06	0.26

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PDT)	End Time (PDT)	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)
0	6/2/2013 8:50	6/2/2013 18:40	13.67	450.49	42.58	450.49	491.12	76.8	1.36	0.23	0.71	0.181



PRECIPITATION						
Total (in)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.17	6/3/2013 12:00	6/3/2013 19:00	7	19.50	0.02	0.12

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PDT)	End Time (PDT)	Duration (hrs)	Total (gal)	Max (ft)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
0	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 (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.13	6/19/2013 6:30	6/19/2013 15:05	8.35	24.17	0.02	0.04

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	N/A	N/A	N/A	N/A	N/A	N/A	10.10	14.20	

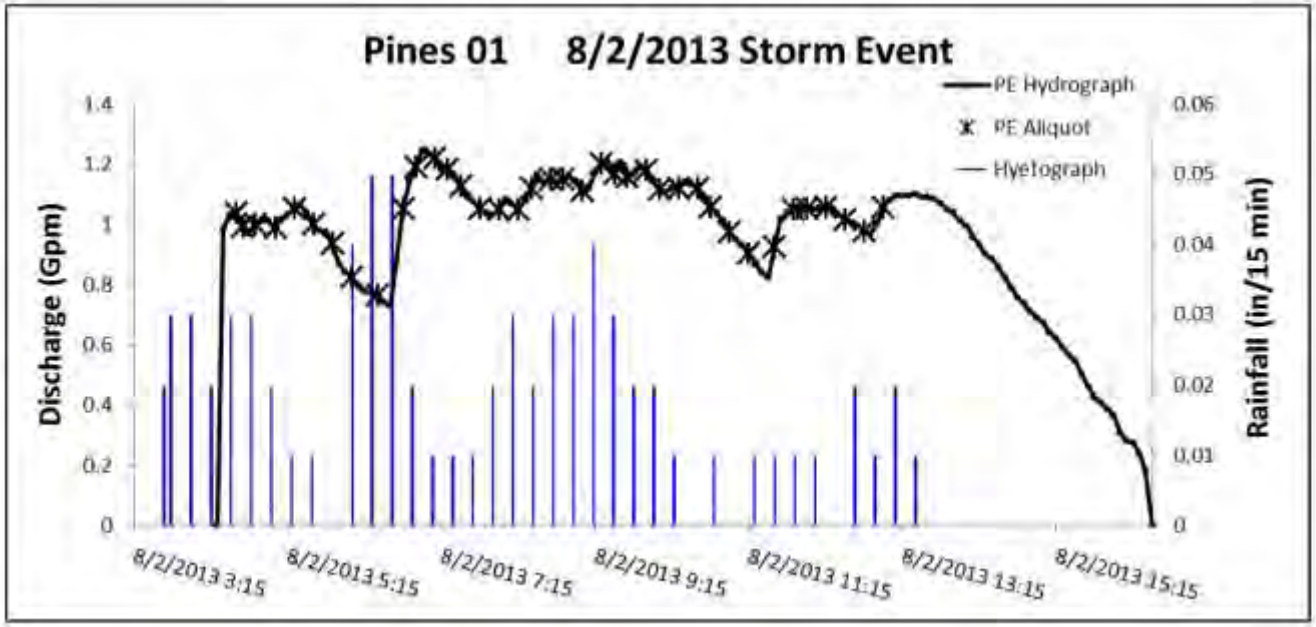
RUNOFF / DISCHARGE												
	Runoff Time			Volume			Sampled		Flow			Stage
Sample Point (m)	Start Time (PDT)	End Time (PDT)	Duration (hrs)	Total (gal)	Intensity (gal/hr)	First 24Hrs (gal)	Discharge Total Volume Sampled (gal)	% Hydrograph Sampled	Peak (gpm)	Min (gpm)	Mean (gpm)	Max (ft)
0	6/19/2013 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 (PDT)	End Time (PDT)	Duration (hrs)	Antecedent (hrs)	Avg Hourly Rainfall Intensity	Max Hourly Rainfall Intensity
0.76	8/2/2013 4:15	8/2/2013 19:00	14.75	759	0.05	0.14

ALIQUOTS							WATER TEMP		VALIDATION CODE
Sample Point (m)	Aliquots Collected	First Aliquot Time (PDT)	Last Aliquot Time (PDT)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (C°)	Max (C°)	
0	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 (PDT)	End Time (PDT)	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)
0	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



This page intentionally left blank

Appendix B:
Analytical Data Quality Assessment Report

This page intentionally left blank

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, 2012 through July 10, 2013

Prepared for:

Cardno
2825 Eastlake Avenue East, Suite 300
Seattle, WA 98102

Prepared by:

Pyron Environmental, Inc.
3530 32nd Way NW
Olympia, WA 98502

September 16, 2014

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 2013 (October 18, 2012 through July 10, 2013) 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 94 stormwater, six sediment, and 21 toxicity-evaluation stormwater samples were collected during this monitoring period. Sample analyses were primarily performed by the Washington State Department of Ecology (Ecology) Manchester Environmental Laboratory (MEL) with specialty analyses performed by AmTest Laboratories, Inc. (fecal coliform), and TestAmerica Laboratories, Inc. (total Kjeldahl nitrogen [TKN] and glyphosate).

A Stage 2A and 2B data validation was performed on 90 percent of the analytical data, and a Stage 3+4 validation 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 99.8 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. The reporting limits (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 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.

3. The initial calibration verification (ICV) analysis (using a second source standard) was not performed for herbicides (Triclopyr, 2,4-D, clopyralid, and picloram) analyses with SW846 Method 8270D. The laboratory instead reported the back-calculated recovery of each initial calibration standard. The second-source verification was evaluated with the laboratory control sample (LCS) and LCS duplicate (LCSD) results reported for each sample preparation batch. The lack of ICV analysis was noted as a deviation from analytical procedures and subject to a corrective action for method compliance.

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 in a great number of samples - particularly benzo(a)anthracene (17 water samples; one sediment sample), benzo(a)pyrene (19 water samples; four sediment samples), and di-*n*-octylphthalate (12 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.

Table of Contents

Executive Summary 1
Acronyms and Abbreviations 5

1.0 SAMPLE COLLECTION AND ANALYTICAL PROGRAM 7

1.1 Field Sampling Program 7

1.2 Laboratory Analysis Program 7

2.0 DATA VERIFICATION AND VALIDATION 8

2.1 Data Quality Objectives 8

2.2 Data Verification Procedures 8

2.3 Data Validation Procedures 8

2.4 Data Assessment Results 8

3.0 DATA QUALITY AND USABILITY ASSESSMENT 10

3.1 Accuracy 10
3.1.1 Sample Preservation and Holding Times 10
3.1.2 Calibration Verification 10
3.1.3 Blanks 11
3.1.4 Laboratory Control Sample Recovery 12
3.1.5 Matrix Spike and MS Duplicate Recovery 12
3.1.6 Surrogate Spike Recovery 13

3.2 Precision 13
3.2.1 Laboratory Duplicates 13
3.2.2 Field Duplicates 14

3.3 Representativeness 14

3.4 Comparability 15

3.5 Sensitivity 15
3.5.1 Sample Matrix Interference 15
3.5.2 Sample-Specific Quantitation Limits 16

3.6 Completeness and Data Usability 16

3.6.1 Overall Data Completeness 16
REFERENCES 17
TABLES 18
Table 1-1 Sample Analysis Schedule 19
Table 3-1 Quality Control Parameters Corresponding to Measurement Quality Objectives 21
Table 3-2 Data Affected by Sample Preservation and Holding Time Anomalies 22
Table 3-3 Data Affected by Calibration Verification Outliers 23
Table 3-4 Data Affected by Detections in Blanks 24
Table 3-5 Data Affected by Laboratory Control Sample Outliers 25
Table 3-6 Data Affected by Matrix Spike Recovery Outliers 28
Table 3-7 Data Affected by Surrogate Spike Recovery Outliers 29
Table 3-8 Data Affected by Precision Outliers 30
Table 3-9 Data Affected by Sample Matrix Interference 31

Acronyms and Abbreviations

%D	percent difference
%D_f	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	recovery of 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
MDL	method detection limit
MEL	Washington State Department of Ecology Manchester Environmental Laboratory
MQO	measurement quality objective
MS	matrix spike
MSD	matrix spike duplicate
NPDES	National Pollution Discharge Elimination System
OP	*ortho*-phosphate
PAH	polycyclic aromatic hydrocarbon
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 during October 18, 2012 through July 10, 2013 by WSDOT personnel, following the *Quality Assurance Project Plan* (QAPP; WSDOT 2011). A total of 94 stormwater samples, six sediment samples, and 21 toxicity-evaluation stormwater samples were collected during this period of monitoring.

1.2 Laboratory Analysis Program

Sample analyses were primarily performed by the Washington State Department of Ecology (Ecology) Manchester Environmental Laboratory (MEL) for polycyclic aromatic hydrocarbons (PAHs), phthalates, pesticides (triclopyr, 2,4-D, clopyralid, and picloram), herbicides (diuron and dichlobenil), 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 AmTest Laboratories, Inc. (surfactants), TestAmerica Laboratories, Inc. (total Kjeldahl nitrogen [TKN] and 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 2011).

2.2 Data Verification Procedures

Data verification was performed to ensure completeness of the hardcopy and electronic analytical data 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 2A and 2B data validation was performed on 90 percent of the data, and a Stage 3+4 validation 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 (USEPA 2008–Organics; USEPA 2010–Inorganics), with modifications to accommodate program and analytical method requirements as specified in the WSDOT Stormwater Monitoring Chemical Data Validation Guidance and Criteria, Version 1.2 (WSDOT 2013).

2.4 Data Assessment Results

As a result of the data validation, data qualifiers were appended to the affected data as:

- J - The result is an estimated quantity. The associated numerical value is 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 (RL).
- **UJ** - The analyte was analyzed for, but not detected. The method detection limit (MDL) and practical quantitation limit (PQL) are estimated values.

Detailed scope of the data validation, validation findings, and data qualification were 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 2013. 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 with a known reference. Analytical accuracy is evaluated via the percent recovery (%R), percent difference (%D), or percent drift ($\%D_f$) values of initial and continuing calibration, internal standards, surrogate spikes, matrix spike (MS)/matrix spike duplicate (MSD), 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 temperature of the coolers containing sample PINES-01-A004 arrived at the analytical laboratory exceeding the control criteria (>6°C); PAHs, phthalates, chloride, TP, TSS, and nitrate/nitrite results for this sample were qualified as estimated.

- The OP analysis for sample PIL-01-VEP-A002 and TPH-Gasoline analysis for sample PIL-01-VEP-A037 were performed past the method recommended holding times. These results were qualified as estimated values.

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 total cadmium for sample SR9-01-A004 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%).

- PAH results for water samples that were more frequently affected by biased-high CCV recovery included benzo(a)anthracene, benzo(a)pyrene, and fluoranthene; four stormwater samples were affected in this manner.

- Benzyl alcohol results were affected by biased-low CCV recovery for sediment samples (two out of the six samples).

- Herbicides results, specifically dichlobenil and picloram, in water samples were more frequently affected by biased-low CCV recovery; 13 samples were affected in this manner.

- The recovery of CS1 was biased-low for fluorene in one of the initial calibrations. As a conservative measure, fluorene results for the five samples quantitated against this ICAL were qualified as estimated.

Data usability affected by outlying CS1, ICV, and CCV results was summarized in **Table 3-3**.

3.1.3 Blanks

Two types of blanks, method blanks and calibration blanks (for metals and inorganic constituents only), 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. As a result, the accuracy of the results may be skewed.

- TKN was detected in selected method blanks and/or calibration blanks at levels greater than their MDLs but less than their RLs. 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 RLs.

Data qualified due to detections in method blanks and calibration blanks are summarized in **Table 3-4**.

3.1.4 Laboratory Control Sample Recovery

- The TKN result for sample Pine-01-A031 was qualified (R) and rejected because the LCS %R value was less than the lower control limit (LCL), and TKN was not detected in this sample. Results for two samples were qualified estimated because TKN were detected in these samples.

- Diesel and lube oil results for nine water samples were qualified as estimated due to low recovery of LCS and LCSD.

- *bis*(2-Ethylehxyl)phthalate, di-*n*-octylphthalate, and diethylphthalate for up to 12 stormwater samples were qualified as estimated as a result of low-bias LCS/LCSD recovery.

- The %R value for benzoic acid was less than 10% for the LCS associated with sediment samples SED-PILCHUCK-01-A001 and SED-PILCHUCK-01-A001; benzoic acid was not detected in these samples and results for both samples were qualified (R) and rejected. For the same LCS, %R values for benzyl alcohol, phenol, 2,4-dimethylphenol, 2,-methylphenol, and pentachlorophenol were less than their LCLs. These compounds were not detected in any of the sediment samples; results were therefore qualified as estimated for the two sediment samples.

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 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 lead in the MS/MSD analyses performed on sediment sample SED-PILCHUCK-01-A001 were less than the lower control limit (75-125%); copper and lead results for the two samples associated with this MS/MSD pair 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 analysis in one sample, and lube oil analysis in another sample was less than the LCL; the diesel and lube oil results for the sample were qualified as estimated.

- Surrogate spike %R values for lube oil analyses were less than the LCL in sediment samples SED-PILCHUCK-01-A001 and SED-PILCHUCK-01-A002. Lube oil results for both samples 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:

- Benzyl alcohol, naphthalene, and phenol results for two sediment samples were qualified as estimated due to the elevated variability (RPD value was >20%) for the LCS/LCSD 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.

- Lead results in sediment field duplicate pair SED-PILCHUCK-01-A001 and SED-PILCHUCK-01-A002 showed significant variability (RPD >35%). Lead results for both samples 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 2013 were analyzed using standardized analytical methodologies. Data generated in monitoring year 2012 and from upcoming stormwater monitoring events are expected to be comparable to data generated in 2013. For data to be collected, this will hold true 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 QAPPs. 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.

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.

- As noted by the laboratory, detections of selected PAHs and phthalates in a great number of samples–particularly benzo(a)anthracene (17 water samples; one sediment sample), benzo(a)pyrene (19 water samples; four sediment samples), and di-*n*-

octylphthalate (12 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.

- The TSS result for sample SR9-01-A002 was qualified as estimated due to the presence of sandy materials in this sample, which prevented accurate quantitation of the analyte.

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 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.

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 1,660 data points (1330 for baseline stormwater; 264 for sediment, and 66 for toxicity-evaluation stormwaater samples) were collected, within which three of the data points were qualified (R) and rejected. The overall analytical data completeness for WSDOT's NPDES Stormwater Monitoring Program, Baseline Monitoring of Highway Run-off during monitoring year 2013 was calculated at 99.8 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

USEPA 1996. *USEPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, December 1996.

USEPA 2008. *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*, Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, June 2008, EPA-540-R-08-01.

USEPA 2010. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review*, Office of Superfund Remediation and Technical Innovation, U.S. Environmental Protection Agency, January 2010, USEPA 540/R-10/011.

Washington Department of Transportation (WSDOT) 2011. *Quality Assurance Project Plan for Baseline Monitoring of WSDOT Highway Run-off*. Working draft, February 2011.

WSDOT 2013. *Stormwater Monitoring: Chemical Data Validation Guidance and Criteria, Version 1.2*. Pyron Environmental, Inc., April 24, 2013.

TABLES

Table 1-1 Sample Analysis Schedule

Stormwater (Baseline)			
Parameter	**Analytical Method**	**Number of Samples**	**Analytical Laboratory**
Total Chloride	EPA 300.0	36	Washington State Department of Ecology, Manchester Environmental Laboratory (MEL), Manchester, WA
Total Suspended Solids (TSS)	SM 2540D	39	
Nitrate/Nitrite	SM 4500 NO_3-I	34	
Ortho-phosphate (OP)	SM 4500 P-G	16	
Total Phosphorus (TP)	SM 4500 P-F	35	
Total & Dissolved Metals (Cd, Cu, Pb, Zn)	EPA 200.8	22[A]	
Hardness	SM 2340B	33	
TPH-Diesel & Motor Oil	NWTPH-Dx	31	
TPH-Gasoline	NWTPH-Gx	32	
Polycyclic Aromatic Hydrocarbons (PAHs)	SW8270D-SIM	32	
Phthalates	SW8270D-SIM	32	
Diuron & Dichlobenil	SW8270D	2	
Glyphosate (non-aquatic formula)	USEPA 547	35	TestAmerica Laboratories, Inc. (TAL) – Savannah, GA
Total Kjeldahl Nitrogen (TKN)	USEPA 351.2	33	TAL – Denver, CO
Fecal Coliform	SM 9222D	21	AmTest Laboratories, Inc. Kirkland, Washington
Toxicity-Evaluation Stormwater			
Total Chloride	EPA 300.0	3	MEL - Manchester, WA
Total Suspended Solids (TSS)	SM 2540D	1	
Nitrate/Nitrite	SM 4500 NO_3-I	1	
Ortho-phosphate (OP)	SM 4500 P-G	1	
Total & Dissolved Metals (Cd, Cu, Pb, Zn)	EPA 200.8	3[A]	
Hardness	SM 2340B	2	
TPH-Diesel & Motor Oil	NWTPH-Dx	10	
TPH-Gasoline	NWTPH-Gx	10	
Triclopyr (total formula), 2,4-D, Clopyralid, Picloram	SW8270D	1	
Diuron & Dichlobenil	SW8270D	1	
Glyphosate (non-aquatic formula)	USEPA 547	2	TAL - Savannah, GA
Total Kjeldahl Nitrogen (TKN)	USEPA 351.2	1	TAL - Denver, CO
Fecal Coliform	SM 9222D	8	AmTest Laboratories, Inc. Kirkland, Washington

Sediment			
Parameter	**Analytical Method**	**Number of Samples**	**Analytical Laboratory**
Grain Size	ASTM D422	6	TAL – Seattle, WA
Total Solids	SM 2540G	6	MEL – Manchester, WA
Total Organic Carbon (TOC)	PSEP Protocols	6	
Metals (Cd, Cu, Pb, Zn)	EPA 200.8	6	
TPH-Diesel & Motor Oil	NWTPH-Dx	6	
Triclopyr (total formula) & Picloram	SW8270D-SIM	4	
SVOCs (SMS compounds)	SW8270D-SIM	6	

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.

SM – *Standard Methods for the Examination of Water and Wastewater*, American Public Health Association, 20th Edition, 1995

EPA Methods – *USEPA Methods for Chemical Analysis of Water and Wastes*, EPA–600/4-79-020, March 1983 Revision

SW Methods – *USEPA Test Methods for Evaluating Solid Waste; Physical/Chemical Methods*, SW-846, Third Edition, December 1996

NWTPH - *Analytical Methods for Petroleum Hydrocarbons*, ECY 97-602, Washington State Department of Ecology, June 1997

ASTM – American Society of Testing and Materials

PSEP – Puget Sound Estuary Program

SIM – Selective ion monitoring

SMS – Washington State Sediment Management Standards

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 $\%D_t$ 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
$\%D_t$ – 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
PINES-01-A004	1306051-04	W	Chloride	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Total Suspended Solids	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Nitrite-Nitrate	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Total Phosphorus	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Acenaphthene	UJ	Cooler Temperature
PINES-01-A004	1306051-04	W	Acenaphthylene	UJ	Cooler Temperature
PINES-01-A004	1306051-04	W	Anthracene	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Benzo(a)anthracene	UJ	Cooler Temperature
PINES-01-A004	1306051-04	W	Benzo(a)pyrene	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Benzo(b)fluoranthene	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Benzo(ghi)perylene	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Benzo(k)fluoranthene	J	Cooler Temperature
PINES-01-A004	1306051-04	W	*bis*(2-Ethylhexyl) Phthalate	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Butyl benzyl phthalate	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Chrysene	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Dibenzo(a,h)anthracene	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Diethyl phthalate	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Dimethyl phthalate	UJ	Cooler Temperature
PINES-01-A004	1306051-04	W	Di-N-Butylphthalate	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Di-N-Octyl Phthalate	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Fluoranthene	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Fluorene	UJ	Cooler Temperature
PINES-01-A004	1306051-04	W	Indeno(1,2,3-cd)pyrene	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Naphthalene	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Phenanthrene	J	Cooler Temperature
PINES-01-A004	1306051-04	W	Pyrene	J	Cooler Temperature
PIL-01-VEP-A002	1210072-16	W	*Ortho*-phosphate	J	Holding Time
PIL-01-VEP-A037	580-37288-9	W	Gasoline	UJ	Holding Time

Notes:

Cooler Temperature – 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.

Holding Time – 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

Table 3-3 Data Affected by Calibration Verification Outliers

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Comment
SR9-01-A004	1307055-02	W	Cadmium, Total	UJ	CCV biased low
PIL-01-VEP-A002	1210072-16	W	*bis*(2-Ethylhexyl) Phthalate	J	CCV biased high
PIL-01-VEP-A002	1210072-16	W	Butyl benzyl phthalate	J	CCV biased high
PIL-01-VEP-A002	1210072-16	W	Di-N-Octyl Phthalate	J	CCV biased high
SR9-01-A044	1304048-04	W	Benzo(a)anthracene	J	CCV biased high
SR9-01-A050	1304068-05	W	Benzo(a)anthracene	J	CCV biased high
EV-01-VEP-A032	1304068-06	W	Benzo(a)anthracene	J	CCV biased high
EV-01-VEP-A036	1304068-07	W	Benzo(a)anthracene	J	CCV biased high
PIL-01-VEP-A080	1304068-08	W	Benzo(a)anthracene	J	CCV biased high
SR9-01-A050	1304068-05	W	Benzo(a)pyrene	J	CCV biased high
EV-01-VEP-A032	1304068-06	W	Benzo(a)pyrene	J	CCV biased high
EV-01-VEP-A036	1304068-07	W	Benzo(a)pyrene	J	CCV biased high
PIL-01-VEP-A080	1304068-08	W	Benzo(a)pyrene	J	CCV biased high
SR9-01-A050	1304068-05	W	Fluoranthene	J	CCV biased high
EV-01-VEP-A032	1304068-06	W	Fluoranthene	J	CCV biased high
EV-01-VEP-A036	1304068-07	W	Fluoranthene	J	CCV biased high
PIL-01-VEP-A080	1304068-08	W	Fluoranthene	J	CCV biased high
PIL-01-VEP-A004	1307053-02	W	*bis*(2-Ethylhexyl) Phthalate	UJ	CCV biased low
PIL-01-VEP-A002	1210072-16	W	Benzo(a)pyrene	J	CS1 biased low
PIL-01-VEP-A002	1210072-16	W	Fluorene	J	CS1 biased low
PINES-01-A031	1306051-02	W	Fluorene	UJ	CS1 biased low
SR9-01-A004	1307055-02	W	Fluorene	UJ	CS1 biased low
EV-01-VEP-A004	1307055-05	W	Fluorene	UJ	CS1 biased low
EV-04-MEP-A004	1307055-09	W	Fluorene	UJ	CS1 biased low
SED-PILCHUCK-01-A001	1306058-02	S	Benzyl Alcohol	UJ	CCV biased low
SED-PILCHUCK-01-A002	1306058-03	S	Benzyl Alcohol	UJ	CCV biased low

Notes:

Calibration verification outliers include violation of initial calibration verification (ICV), exceedance of continuing calibration verification (CCV) percent difference (%D) values (±10% for inorganics, ±20% for organics), and failure in meeting the percent recovery (70-130%) for the first (lowest) initial calibration standard (CS1) for organic analyses.

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

Notes:

CB – Analyte was detected in initial and/or continuing calibration 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
PINES-01-A004	580-38769-2	W	Nitrogen, Total Kjeldahl	J	LCS %R <LCL
PINES-01-A031	580-38769-3	W	Nitrogen, Total Kjeldahl	R	LCS %R <LCL
PIL-01-VEP-A004	580-39221-7	W	Nitrogen, Total Kjeldahl	J	LCS %R <LCL
PINES-01-A007	1212030-01	W	#2 Diesel	UJ	LCS %R <LCL
PIL-01-VEP-A019	1302034-01	W	#2 Diesel	UJ	LCS %R <LCL
PIL-01-A067	1303041-04	W	#2 Diesel	UJ	LCS %R <LCL
SR09-A037	1303041-05	W	#2 Diesel	UJ	LCS %R <LCL
EV-01-A031	1303041-02	W	#2 Diesel	UJ	LCS %R <LCL
EV-04-A037	1303041-03	W	#2 Diesel	UJ	LCS %R <LCL
EV-01-VEP-A049	1305079-05	W	#2 Diesel	UJ	LCS %R <LCL
EV-04-MEP-A055	1305079-01	W	#2 Diesel	UJ	LCS %R <LCL
SR9-01-A061	1305079-08	W	#2 Diesel	UJ	LCS %R <LCL
PINES-01-A007	1212030-01	W	Lube Oil	UJ	LCS %R <LCL
PIL-01-VEP-A019	1302034-01	W	Lube Oil	J	LCS %R <LCL
EVERETT-01-A013	1302034-02	W	Lube Oil	J	LCS %R <LCL
PIL-01-A067	1303041-04	W	Lube Oil	J	LCS %R <LCL
SR09-A037	1303041-05	W	Lube Oil	J	LCS %R <LCL
EV-04-A037	1303041-03	W	Lube Oil	J	LCS %R <LCL
EV-01-VEP-A049	1305079-05	W	Lube Oil	J	LCS %R <LCL
EV-04-MEP-A055	1305079-01	W	Lube Oil	J	LCS %R <LCL
SR9-01-A061	1305079-08	W	Lube Oil	J	LCS %R <LCL
PIL-01-VEP-A026	1302054-04	W	*bis*(2-Ethylhexyl) Phthalate	J	LCS/LCSD %R <LCL
EV-04-MEP-A014	1302054-02	W	*bis*(2-Ethylhexyl) Phthalate	J	LCS/LCSD %R <LCL
PIL-01-VEP-A050	1303033-01	W	*bis*(2-Ethylhexyl) Phthalate	J	LCS %R <LCL
PINES-01-A026	1305081-01	W	*bis*(2-Ethylhexyl) Phthalate	J	LCS %R >UCL
PINES-01-A004	1306051-04	W	*bis*(2-Ethylhexyl) Phthalate	J	LCS %R <LCL
PINES-01-A031	1306051-02	W	*bis*(2-Ethylhexyl) Phthalate	J	LCS %R <LCL
SR9-01-A004	1307055-02	W	*bis*(2-Ethylhexyl) Phthalate	UJ	LCS/LCSD %R <LCL
EV-01-VEP-A004	1307055-05	W	*bis*(2-Ethylhexyl) Phthalate	UJ	LCS/LCSD %R <LCL
EV-04-MEP-A004	1307055-09	W	*bis*(2-Ethylhexyl) Phthalate	UJ	LCS/LCSD %R <LCL
PIL-01-VEP-A050	1303033-01	W	Diethyl phthalate	UJ	LCS %R <LCL
PINES-01-A004	1306051-04	W	Diethyl phthalate	J	LCS %R <LCL

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Comment
SR9-01-A004	1307055-02	W	Diethyl phthalate	UJ	LCS/LCSD %R <LCL
EV-01-VEP-A004	1307055-05	W	Diethyl phthalate	UJ	LCS/LCSD %R <LCL
EV-04-MEP-A004	1307055-09	W	Diethyl phthalate	J	LCS/LCSD %R <LCL
PINES-01-A080	1308053-01	W	Diethyl phthalate	UJ	LCS %R <LCL
PIL-01-VEP-A050	1303033-01	W	Dimethyl phthalate	UJ	LCS %R <LCL
SR9-01-A004	1307055-02	W	Di-*n*-Butylphthalate	UJ	LCS/LCSD %R <LCL
EV-01-VEP-A004	1307055-05	W	Di-*n*-Butylphthalate	UJ	LCS/LCSD %R <LCL
EV-04-MEP-A004	1307055-09	W	Di-*n*-Butylphthalate	UJ	LCS/LCSD %R <LCL
PIL-01-VEP-A026	1302054-04	W	Di-*n*-Butylphthalate	J	LCS/LCSD %R <LCL
EV-04-MEP-A014	1302054-02	W	Di-*n*-Butylphthalate	J	LCS/LCSD %R <LCL
PIL-01-VEP-A050	1303033-01	W	Di-*n*-Butylphthalate	J	LCS %R <LCL
PINES-01-A026	1305081-01	W	Di-*n*-Butylphthalate	J	LCS %R >UCL
PINES-01-A004	1306051-04	W	Di-*n*-Butylphthalate	J	LCS %R <LCL
PINES-01-A031	1306051-02	W	Di-*n*-Butylphthalate	UJ	LCS %R <LCL
SR9-01-A004	1307055-02	W	Di-*n*-Butylphthalate	UJ	LCS/LCSD %R <LCL
EV-01-VEP-A004	1307055-05	W	Di-*n*-Butylphthalate	UJ	LCS/LCSD %R <LCL
EV-04-MEP-A004	1307055-09	W	Di-*n*-Butylphthalate	UJ	LCS/LCSD %R <LCL
EV-01-VEP-A032	1304068-06	W	Fluoranthene	J	LCS %R >UCL
EV-01-VEP-A036	1304068-07	W	Fluoranthene	J	LCS %R >UCL
SR9-01-A050	1304068-05	W	Fluoranthene	J	LCS %R >UCL
PIL-01-VEP-A080	1304068-08	W	Fluoranthene	J	LCS %R >UCL
PINES-01-A008	1212030-02	W	Indeno(1,2,3-cd)pyrene	J	LCS %R >UCL
SED-PILCHUCK-01-A001	1306058-02	S	Benzyl Alcohol	UJ	LCS %R <LCL
SED-PILCHUCK-01-A001	1306058-02	S	2,4-Dimethylphenol	UJ	LCS %R <LCL
SED-PILCHUCK-01-A001	1306058-02	S	Phenol	UJ	LCS %R <LCL
SED-PILCHUCK-01-A001	1306058-02	S	Benzoic Acid	R	LCS <10%
SED-PILCHUCK-01-A001	1306058-02	S	Pentachlorophenol	UJ	LCS %R <LCL
SED-PILCHUCK-01-A001	1306058-02	S	Naphthalene	UJ	LCS %R <LCL
SED-PILCHUCK-01-A001	1306058-02	S	2-Methylphenol	UJ	LCS %R <LCL
SED-PILCHUCK-01-A002	1306058-03	S	Benzyl Alcohol	UJ	LCS %R <LCL
SED-PILCHUCK-01-A002	1306058-03	S	2,4-Dimethylphenol	UJ	LCS %R <LCL
SED-PILCHUCK-01-A002	1306058-03	S	Phenol	UJ	LCS %R <LCL
SED-PILCHUCK-01-A002	1306058-03	S	Benzoic Acid	R	LCS <10%
SED-PILCHUCK-01-A002	1306058-03	S	Pentachlorophenol	UJ	LCS %R <LCL
SED-PILCHUCK-01-A002	1306058-03	S	Naphthalene	UJ	LCS %R <LCL

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Comment
SED-PILCHUCK-01-A002	1306058-03	S	2-Methylphenol	UJ	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
LCS – Laboratory control sample duplicate
R – The 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

27

Table 3-6 Data Affected by Matrix Spike Recovery Outliers

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Comment
EV-01-VEP-A038	580-38446-1	W	Nitrogen, Total Kjeldahl	J	Matrix spike %R >UCL
EV-01-VEP-A042	580-38446-2	W	Nitrogen, Total Kjeldahl	J	Matrix spike %R >UCL
EV-04-MEP-A056	580-38618-4	W	Nitrogen, Total Kjeldahl	J	Matrix spike %R <LCL
EV-01-VEP-A050	580-38618-2	W	Nitrogen, Total Kjeldahl	J	Matrix spike %R <LCL
EV-01-VEP-A054	580-38618-3	W	Nitrogen, Total Kjeldahl	J	Matrix spike %R <LCL
SR9-01-A050	1304068-05	W	Total Phosphorus	J	Matrix spike %R <LCL
PIL-01-VEP-A080	1304068-08	W	Total Phosphorus	J	Matrix spike %R <LCL
EV-04-MEP-A050	1304068-03	W	Total Phosphorus	J	Matrix spike %R <LCL
SED-PILCHUCK-01-A001	1306058-02	S	Lead	J	Matrix spike %R <LCL
SED-PILCHUCK-01-A001	1306058-02	S	Copper	J	Matrix spike %R <LCL
SED-PILCHUCK-01-A002	1306058-03	S	Lead	J	Matrix spike %R <LCL
SED-PILCHUCK-01-A002	1306058-03	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

Table 3-7 Data Affected by Surrogate Spike Recovery Outliers

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Comment
EVERETT-01-A013	1302034-02	W	#2 Diesel	UJ	Surrogate spike %R <LCL
EV-01-A031	1303041-02	W	Lube Oil	J	Surrogate spike %R <LCL
SED-PILCHUCK-01-A001	1306058-02	S	Lube Oil	J	Surrogate spike %R >UCL
SED-PILCHUCK-01-A002	1306058-03	S	Lube Oil	J	Surrogate spike %R >UCL

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
SED-PILCHUCK-01-A001	1306058-02	S	Benzyl Alcohol	UJ	LCS/LCSD RPD >20%
SED-PILCHUCK-01-A001	1306058-02	S	Phenol	UJ	LCS/LCSD RPD >20%
SED-PILCHUCK-01-A001	1306058-02	S	Naphthalene	UJ	LCS/LCSD RPD >20%
SED-PILCHUCK-01-A002	1306058-03	S	Benzyl Alcohol	UJ	LCS/LCSD RPD >20%
SED-PILCHUCK-01-A002	1306058-03	S	Phenol	UJ	LCS/LCSD RPD >20%
SED-PILCHUCK-01-A002	1306058-03	S	Naphthalene	UJ	LCS/LCSD RPD >20%
SED-PILCHUCK-01-A001	1306058-02	S	Lead	J	Field Duplicate RPD >35%
SED-PILCHUCK-01-A002	1306058-03	S	Lead	J	Field Duplicate RPD >35%

Notes:

J – The analyte was detected in the sample and the reported value was considered as estimated.

LCS – Laboratory control sample

LCS – Laboratory control sample duplicate

RPD – Relative percent difference

S – Sediment

UJ – The analyte was not detected in the sample, and the reported quantitation limit associated with this analyte was considered as estimated.

Table 3-9 Data Affected by Sample Matrix Interference

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Comment
PIL-01-VEP-A050	1303033-01	W	Anthracene	J	
EV-04-MEP-A026	1303082-20	W	Anthracene	J	
PINES-01-A026	1305081-01	W	Anthracene	J	
PINES-01-A004	1306051-04	W	Anthracene	J	
SR9-01-A032	1303082-01	W	Benzo(a)anthracene	J	
SR9-01-A036	1303082-02	W	Benzo(a)anthracene	J	
PIL-01-VEP-A074	1303082-05	W	Benzo(a)anthracene	J	
EV-04-MEP-A026	1303082-20	W	Benzo(a)anthracene	J	
EV-04-MEP-A030	1303082-21	W	Benzo(a)anthracene	J	
SR9-01-A044	1304048-04	W	Benzo(a)anthracene	J	
SR9-01-A050	1304068-05	W	Benzo(a)anthracene	J	
EV-01-VEP-A032	1304068-06	W	Benzo(a)anthracene	J	
EV-01-VEP-A036	1304068-07	W	Benzo(a)anthracene	J	
PIL-01-VEP-A080	1304068-08	W	Benzo(a)anthracene	J	
EV-04-MEP-A044	1304078-01	W	Benzo(a)anthracene	J	
SR9-01-A056	1304078-02	W	Benzo(a)anthracene	J	
PINES-01-A020	1304078-04	W	Benzo(a)anthracene	J	
PINES-01-A014	1304079-02	W	Benzo(a)anthracene	J	
PINES-01-A018	1304079-03	W	Benzo(a)anthracene	J	
EV-01-VEP-A050	1305079-06	W	Benzo(a)anthracene	J	
PIL-01-VEP-A004	1307053-02	W	Benzo(a)anthracene	J	
PIL-01-VEP-A050	1303033-01	W	Benzo(a)pyrene	J	
SR9-01-A032	1303082-01	W	Benzo(a)pyrene	J	
SR9-01-A036	1303082-02	W	Benzo(a)pyrene	J	
PIL-01-VEP-A074	1303082-05	W	Benzo(a)pyrene	J	
EV-04-MEP-A026	1303082-20	W	Benzo(a)pyrene	J	
EV-04-MEP-A030	1303082-21	W	Benzo(a)pyrene	J	
SR9-01-A044	1304048-04	W	Benzo(a)pyrene	J	
SR9-01-A050	1304068-05	W	Benzo(a)pyrene	J	
EV-01-VEP-A032	1304068-06	W	Benzo(a)pyrene	J	
EV-01-VEP-A036	1304068-07	W	Benzo(a)pyrene	J	
PIL-01-VEP-A080	1304068-08	W	Benzo(a)pyrene	J	
EV-04-MEP-A044	1304078-01	W	Benzo(a)pyrene	J	

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Comment
SR9-01-A056	1304078-02	W	Benzo(a)pyrene	J	
PINES-01-A020	1304078-04	W	Benzo(a)pyrene	J	
PINES-01-A014	1304079-02	W	Benzo(a)pyrene	J	
PINES-01-A018	1304079-03	W	Benzo(a)pyrene	J	
EV-01-VEP-A050	1305079-06	W	Benzo(a)pyrene	J	
PINES-01-A026	1305081-01	W	Benzo(a)pyrene	J	
PINES-01-A080	1308053-01	W	Benzo(a)pyrene	J	
PIL-01-VEP-A050	1303033-01	W	Benzo(k)fluoranthene	J	
PIL-01-VEP-A074	1303082-05	W	Benzo(k)fluoranthene	J	
PIL-01-VEP-A080	1304068-08	W	Benzo(k)fluoranthene	J	
PINES-01-A026	1305081-01	W	Butyl benzyl phthalate	J	
SR9-01-A044	1304048-04	W	Dibenzo(a,h)anthracene	J	
PINES-01-A080	1308053-01	W	Dibenzo(a,h)anthracene	J	
SR9-01-A032	1303082-01	W	Diethyl phthalate	J	
SR9-01-A036	1303082-02	W	Diethyl phthalate	J	
EV-01-VEP-A032	1304068-06	W	Diethyl phthalate	J	
EV-01-VEP-A036	1304068-07	W	Diethyl phthalate	J	
SR9-01-A056	1304078-02	W	Diethyl phthalate	J	
PINES-01-A004	1306051-04	W	Diethyl phthalate	J	
PIL-01-VEP-A050	1303033-01	W	Di-*n*-Octyl Phthalate	J	
SR9-01-A032	1303082-01	W	Di-*n*-Octyl Phthalate	J	
SR9-01-A036	1303082-02	W	Di-*n*-Octyl Phthalate	J	
PIL-01-VEP-A074	1303082-05	W	Di-*n*-Octyl Phthalate	J	
EV-04-MEP-A026	1303082-20	W	Di-*n*-Octyl Phthalate	J	
EV-04-MEP-A030	1303082-21	W	Di-*n*-Octyl Phthalate	J	
EV-01-VEP-A032	1304068-06	W	Di-*n*-Octyl Phthalate	J	
EV-01-VEP-A036	1304068-07	W	Di-*n*-Octyl Phthalate	J	
EV-04-MEP-A044	1304078-01	W	Di-*n*-Octyl Phthalate	J	
PINES-01-A014	1304079-02	W	Di-*n*-Octyl Phthalate	J	
PINES-01-A018	1304079-03	W	Di-*n*-Octyl Phthalate	J	
EV-01-VEP-A050	1305079-06	W	Di-*n*-Octyl Phthalate	J	
EV-01-VEP-A036	1304068-07	W	Fluorene	J	
SR9-01-A002	1210072-08	W	Total Suspended Solids	J	Sandy material present
SED-PILCHUCK-01-A001	1306058-02	S	Benzo(a)anthracene	J	
SED-EVERETT-01-A001	1305065-01	S	Benzo(a)pyrene	J	

Field Sample ID	Laboratory Sample ID	Sample Matrix	Analyte	Qualifier	Comment
SED-EVERETT-04-A001	1306058-01	S	Benzo(a)pyrene	J	
SED-PILCHUCK-01-A001	1306058-02	S	Benzo(a)pyrene	J	
SED-PILCHUCK-01-A002	1306058-03	S	Benzo(a)pyrene	J	
SED-PILCHUCK-01-A001	1306058-02	S	Benzo(b)fluoranthene	J	
SED-PILCHUCK-01-A002	1306058-03	S	Benzo(b)fluoranthene	J	
SED-PILCHUCK-01-A001	1306058-02	S	Benzo(k)fluoranthene	J	
SED-PILCHUCK-01-A002	1306058-03	S	Benzo(k)fluoranthene	J	

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.

W – Water

S – Sediment

J – The analyte was detected in the sample and the reported value was considered as estimated.

Appendix C:
Water Year 2013 Highway Storm Attempt Record

This page intentionally left blank

Water Year 2013 Highway Storm Attempt Record

Station	Storm Start Date	Attempt	Rainfall Qualified?	Grab samples collected?	Notes
EVERETT 01	10/12/2012	Successful	NO	YES	Only grabs samples collected
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	5/12/2013	Successful	NO	NO	Grabs missed due to lack of available staff
EVERETT 01	5/20/2013	Successful	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	Only grabs samples collected
EVERETT 04	10/12/2012	Successful	NO	YES	Only grabs samples collected
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

Station	Storm Start Date	Attempt	Rainfall Qualified?	Grab samples collected?	Notes
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	Successful	N/A	N/A	Sediment sample collection
EVERETT 04	9/15/2013	Successful	NO	NO	
EVERETT 04	10/12/2013	Successful	NO	YES	Only grabs samples collected
PILCHUCK 01	10/12/2012	Successful	NO	YES	Only grabs samples collected
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	Successful	N/A	N/A	Sediment sample collection
PILCHUCK 01	9/15/2013	Failed	NO	NO	
PILCHUCK 01	10/7/2013	Not Attempted	YES	NO	Staff unavailable
PILCHUCK 01	10/12/2013	Successful	NO	YES	Only grabs samples collected
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

Station	Storm Start Date	Attempt	Rainfall Qualified?	Grab samples collected?	Notes
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	Successful	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
SR9 01	10/12/2012	Successful	NO	YES	Only grabs samples collected
SR9 01	10/18/2012	Successful	YES	YES	
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	Successful	N/A	N/A	Sediment sample collection
SR9 01	5/12/2013	Failed	NO	NO	Equipment failure

Station	Storm Start Date	Attempt	Rainfall Qualified?	Grab samples collected?	Notes
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	Only grabs samples collected
SR9 01	10/30/2013	Successful	NO	NO	Grabs missed due to lack of available staff

Appendix D:
Analytical Data

This page intentionally left blank

EVERETT 01		STORM EVENT											
PARAMETER	**UNITS**	**11/7/2012**		**12/11/2012**		**2/11/2013**		**2/22/2013**		**3/2/2013**		**3/6/2013**	
Conventionals													
TSS	mg/L	29		--		--		--		132		--	
Chloride	mg/L	3.51		--		--		--		--		--	
Hardness as $CaCO_3$	mg/L	11.5		--		--		--		--		--	
Bacteria													
Fecal coliform	cfu/100ml	--		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	--		--		--		--		--	
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	--		--		--		--		--		--	
2,4-D	ug/L	--		--		--		--		--		--	
Clopyralid	ug/L	--		--		--		--		--		--	
Picloram	ug/L	--		--		--		--		--		--	
Triclopyr	ug/L	--		--		--		--		--		--	
Glyphosate	ug/L	25	U	--		--		--		--		--	
TPH													
TPH-Diesel (NWTPH-Dx)	mg/L	--		12.15		21.15		4.35		--		4.75	
Diesel	mg/L	--		0.15	U	0.15	UJ	0.15	U	--		0.15	UJ
Lube Oil	mg/L	--		12		21	J	4.2		--		4.6	J
TPH-Gas (NWTPH-Gx)	mg/L	--		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	mg/L	17.11		--		--		--		--		--	

Scale >10 (<1.0 um)													
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		--		--		--		--		--	

EVERETT 01		**STORM EVENT**							
PARAMETER	**UNITS**	**3/20/2013**		**4/12/2013**		**5/12/2013**		**5/21/2013**	
Conventionals									
TSS	mg/L	--		--		38		67	
Chloride	mg/L	5.84		--		--		3.51	
Hardness as $CaCO_3$	mg/L	16.5		--		--		18.3	
Bacteria									
Fecal coliform	cfu/100ml	--		--		--		3400	
Nutrients									
Total Phosphorous	mg/L	0.121		--		--		0.157	
Orthophosphate	mg/L	--		--		1.12		0.0189	
Total Kjeldahl Nitrogen	mg/L	0.85	J	--		3.8	J	1.2	J
Nitrate-Nitrite	mg/L	0.224		--		0.513		0.74	
Metals									
Total Recoverable Copper	ug/L	--		--		37.4		40.1	
Dissolved Copper	ug/L	--		--		28.4		12.5	
Total Recoverable Lead	ug/L	--		--		--		--	
Dissolved Lead	ug/L	--		--		--		--	
Total Recoverable	ug/L	--		--		--		--	

Cadmium									
Dissolved Cadmium	ug/L	--		--		--		--	
Total Recoverable Zinc	ug/L	--		--		89.3		131	
Dissolved Zinc	ug/L	--		--		73.2		40.5	
PAH Compounds									
Acenaphthene	ug/L	--		0.01	U	--		0.037	
Acenaphthylene	ug/L	--		0.01	U	--		0.01	U
Anthracene	ug/L	--		0.01	U	--		0.022	
Benzo(a)anthracene	ug/L	--		0.029	J	--		0.026	J
Benzo(b)fluoranthene	ug/L	--		0.035		--		0.04	
Benzo(k)fluoranthene	ug/L	--		0.029		--		0.026	
Benzo(ghi)perylene	ug/L	--		0.082		--		0.055	
Benzo(a)pyrene	ug/L	--		0.027	J	--		0.032	
Chrysene	ug/L	--		0.075		--		0.071	
Dibenzo(a,h)anthracene	ug/L	--		0.011	U	--		0.016	
Fluoranthene	ug/L	--		0.11	J	--		0.088	
Fluorene	ug/L	--		0.01	U	--		0.036	
Indeno(1,2,3-cd)pyrene	ug/L	--		0.024		--		0.03	
Naphthalene	ug/L	--		0.021		--		0.018	
Phenanthrene	ug/L	--		0.064		--		0.11	
Pyrene	ug/L	--		0.16		--		0.14	
Phthalates									
bis(2-Ethylhexyl)phthalate	ug/L	--		6.5		--		5.4	
Butyl benzyl phthalate	ug/L	--		0.39	U	--		0.37	
Di-n-butyl phthalate	ug/L	--		0.62	U	--		0.45	U
Diethyl phthalate	ug/L	--		0.33	J	--		0.21	U
Dimethyl phthalate	ug/L	--		0.2	U	--		0.21	U
Di-n-octyl phthalate	ug/L	--		1.3	J	--		0.79	
Herbicides									
Dichlobenil	ug/L	--		--		--		--	
Diuron	ug/L	--		--		--		--	
2,4-D	ug/L	--		--		--		--	

Clopyralid	ug/L	--		--		--		--	
Picloram	ug/L	--		--		--		--	
Triclopyr	ug/L	--		--		--		--	
Glyphosate	ug/L	--		--		25	U	25	U
TPH									
TPH-Diesel (NWTPH-Dx)	mg/L	--		--		--		7.45	
Diesel	mg/L	--		--		--		0.15	UJ
Lube Oil	mg/L	--		--		--		7.3	J
TPH-Gas (NWTPH-Gx)	mg/L	--		--		--		0.07	U
Particle Size Distribution									
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	9.82		--		--		15.96	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	10.76		--		--		29.86	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	8.25		--		--		13.62	
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	0.01	U	--		--		0.01	U
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	57.94		--		--		8.11	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	12.3		--		--		24.89	

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

EVERETT 04		STORM EVENT											
PARAMETER	UNITS	11/7/2012		12/11/2012		2/17/2013		2/22/2013		3/2/2013		3/6/2013	
Conventionals													
TSS	mg/L	51	J	--		74		--		100		--	
Chloride	mg/L	3.91		--		25.9		--		10.1		--	
Hardness as $CaCO_3$	mg/L	13.5		--		29.2		--		17.3		--	
Bacteria													
Fecal coliform	cfu/100ml	--		400		--		--		--		--	
Nutrients													
Total Phosphorous	mg/L	0.0817		--		0.129		--		0.107		--	
Orthophosphate	mg/L	0.01	U	--		--		--		--		--	
Total Kjeldahl Nitrogen	mg/L	1.1		--		1.5	J	--		1.1		--	
Nitrate-Nitrite	mg/L	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	0.01	U	--		0.01	U	--		--		--	
Acenaphthylene	ug/L	0.01	U	--		0.01	U	--		--		--	
Anthracene	ug/L	0.01	U	--		0.018		--		--		--	
Benzo(a)anthracene	ug/L	0.01	U	--		0.047		--		--		--	
Benzo(b)fluoranthene	ug/L	0.053		--		0.097		--		--		--	
Benzo(k)fluoranthene	ug/L	0.019		--		0.029		--		--		--	
Benzo(ghi)perylene	ug/L	0.092		--		0.029		--		--		--	
Benzo(a)pyrene	ug/L	0.028		--		0.046		--		--		--	
Chrysene	ug/L	0.047		--		0.1		--		--		--	
Dibenzo(a,h)anthracene	ug/L	0.028	UJ	--		0.01	U	--		--		--	

Fluoranthene	ug/L	0.056		--		0.14		--		--		--	
Fluorene	ug/L	0.01	U	--		0.013		--		--		--	
Indeno(1,2,3-cd)pyrene	ug/L	0.066	J	--		0.025		--		--		--	
Naphthalene	ug/L	0.014	UJ	--		0.034		--		--		--	
Phenanthrene	ug/L	0.029		--		0.078		--		--		--	
Pyrene	ug/L	0.094		--		0.23		--		--		--	
Phthalates													
bis(2-Ethylhexyl)phthalate	ug/L	0.2	U	--		6.9	J	--		--		--	
Butyl benzyl phthalate	ug/L	0.2	U	--		0.36	UJ	--		--		--	
Di-n-butyl phthalate	ug/L	0.2	U	--		0.46	UJ	--		--		--	
Diethyl phthalate	ug/L	0.2	U	--		0.42		--		--		--	
Dimethyl phthalate	ug/L	0.2	U	--		0.11	J	--		--		--	
Di-n-octyl phthalate	ug/L	0.2	U	--		1.7	J	--		--		--	
Herbicides													
Dichlobenil	ug/L	--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--	
2,4-D	ug/L	--		--		--		--		--		--	
Clopyralid	ug/L	--		--		--		--		--		--	
Picloram	ug/L	--		--		--		--		--		--	
Triclopyr	ug/L	--		--		--		--		--		--	
Glyphosate	ug/L	25	U	--		25	U	--		25	U	--	
TPH													
TPH-Diesel (NWTPH-Dx)	mg/L	--		6.55		--		5.75		--		7.05	
Diesel	mg/L	--		0.15	U	--		0.15	U	--		0.15	UJ
Lube Oil	mg/L	--		6.4		--		5.6		--		6.9	J
TPH-Gas (NWTPH-Gx)	mg/L	--		0.07	U	--		0.05	U	--		0.05	U
Particle Size Distribution													
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	1.96		--		0.6		--		--		--	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	4		--		12.45		--		--		--	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	2.82		--		0.69		--		--		--	

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	0.01	U	--		0.01	U	--		--		--	
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	30.07		--		42.59		--		--		--	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	4.78		--		16.91		--		--		--	

EVERETT 04		STORM EVENT											
PARAMETER	**UNITS**	**3/20/2013**		**4/12/2013**		**4/19/2013**		**5/21/2013**		**9/15/13**			
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					
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	--			
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	--		--		--		--			
2,4-D	ug/L	--		--		--		--			
Clopyralid	ug/L	--		--		--		--			
Picloram	ug/L	--		--		--		--			
Triclopyr	ug/L	--		--		--		--			
Glyphosate	ug/L	25	U	--		18	J	25	U		

TPH											
TPH-Diesel (NWTPH-Dx)	mg/L	--		--		--		3.35			
Diesel	mg/L	--		--		--		0.15	UJ		
Lube Oil	mg/L	--		--		--		3.2	J		
TPH-Gas (NWTPH-Gx)	mg/L	--		--		--		0.07	U		
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			

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

PILCHUCK 01		STORM EVENT											
PARAMETER	**UNITS**	**10/18/12**		**11/7/2012**		**12/11/2012**		**2/11/2013**		**2/16/2013**		**2/21/2013**	
Conventionals													
TSS	mg/L	31		21		--		--		50		--	
Chloride	mg/L	0.92		2.77		--		--		13.7		27.6	
Hardness as $CaCO_3$	mg/L	17		17.4		--		--		31.4		--	
Bacteria													
Fecal coliform	cfu/100ml	18		--		110000		2000		--		1200	
Nutrients													
Total Phosphorous	mg/L	0.0687		0.0562		--		--		0.0886		0.115	
Orthophosphate	mg/L	0.0163	J	0.0142		--		--		--		0.01	U
Total Kjeldahl Nitrogen	mg/L	--		--		--		--		0.84	U	0.99	U
Nitrate-Nitrite	mg/L	--		--		--		--		0.566		0.351	
Metals													
Total Recoverable Copper	ug/L	16		11.4		--		--		--		28.1	
Dissolved Copper	ug/L	3.99		4.51	J	--		--		--		9.9	
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	--		--		--		128	
Dissolved Zinc	ug/L	16.8		26	J	--		--		--		32.1	
PAH Compounds													
Acenaphthene	ug/L	0.011	U	--		--		--		0.0098	U	--	
Acenaphthylene	ug/L	0.011	U	--		--		--		0.0098	U	--	
Anthracene	ug/L	0.055		--		--		--		0.0098	U	--	
Benzo(a)anthracene	ug/L	0.011	U	--		--		--		0.021		--	
Benzo(b)fluoranthene	ug/L	0.011	U	--		--		--		0.05		--	
Benzo(k)fluoranthene	ug/L	0.011	U	--		--		--		0.019		--	
Benzo(ghi)perylene	ug/L	0.043		--		--		--		0.021		--	
Benzo(a)pyrene	ug/L	0.033	J	--		--		--		0.024		--	

Chrysene	ug/L	0.011	U	--		--		--		0.052		--	
Dibenzo(a,h)anthracene	ug/L	0.011	U	--		--		--		0.0098	U	--	
Fluoranthene	ug/L	0.062		--		--		--		0.073		--	
Fluorene	ug/L	0.015	J	--		--		--		0.0098	U	--	
Indeno(1,2,3-cd)pyrene	ug/L	0.011	U	--		--		--		0.018		--	
Naphthalene	ug/L	0.018		--		--		--		0.022		--	
Phenanthrene	ug/L	0.041		--		--		--		0.048		--	
Pyrene	ug/L	0.063		--		--		--		0.12		--	
Phthalates													
bis(2-Ethylhexyl)phthalate	ug/L	4.1	J	--		--		--		4	J	--	
Butyl benzyl phthalate	ug/L	0.22	J	--		--		--		0.2	U	--	
Di-n-butyl phthalate	ug/L	0.25	UJ	--		--		--		0.34	UJ	--	
Diethyl phthalate	ug/L	0.22	U	--		--		--		0.2	UJ	--	
Dimethyl phthalate	ug/L	0.22	U	--		--		--		0.2	UJ	--	
Di-n-octyl phthalate	ug/L	0.75	J	--		--		--		0.89	J	--	
Herbicides													
Dichlobenil	ug/L	--		--		--		--		--		--	
Diuron	ug/L	--		--		--		--		--		--	
2,4-D	ug/L	--		--		--		--		--		--	
Clopyralid	ug/L	--		--		--		--		--		--	
Picloram	ug/L	--		--		--		--		--		--	
Triclopyr	ug/L	--		--		--		--		--		--	
Glyphosate	ug/L	--		25	U	--		--		25	U	25	U
TPH													
TPH-Diesel (NWTPH-Dx)	mg/L	1.05		--		8.65		3.95		--		2.55	
Diesel	mg/L	0.05	U	--		0.15	U	0.15	UJ	--		0.15	U
Lube Oil	mg/L	1		--		8.5		3.8	J	--		2.4	
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	0.01	U	--		--		--		0.49		--	
Particle/Grain Size, Phi	mg/L	4.04		--		--		--		8.12		--	

Scale >10 (<1.0 um)													
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	0.01	U	--		--		--		1.19		--	
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	0.01	U	--		--		--		0.01	U	--	
Particle/Grain Size, Phi Scale 4-8 (3.9-62.5 um)	mg/L	21.85		--		--		--		18.01		--	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	5.96		--		--		--		12.18		--	

PILCHUCK 01		STORM EVENT											
PARAMETER	**UNITS**	**2/25/2013**		**2/28/2013**		**3/2/2013**		**3/6/2013**		**3/20/2013**		**4/12/2013**	
Conventionals													
TSS	mg/L	32		66		77		--		53		54	
Chloride	mg/L	19.5		--		5.39		--		7.09		4.66	
Hardness as $CaCO_3$	mg/L	46.5		29.7		22.8		--		36		31.3	
Bacteria													
Fecal coliform	cfu/100ml	--		--		--		--		--		--	
Nutrients													
Total Phosphorous	mg/L	0.0659		0.104		0.0947		--		--		0.132	J
Orthophosphate	mg/L	--		0.01	U	--		--		0.01	U	--	
Total Kjeldahl Nitrogen	mg/L	--		1.1	J	0.57	J	--		0.66	J	0.78	J
Nitrate-Nitrite	mg/L	--		0.089		0.078		--		0.115		0.144	
Metals													
Total Recoverable Copper	ug/L	--		30.7		--		--		22.3		--	
Dissolved Copper	ug/L	--		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	--		130		--		--		87.9		--	
Dissolved Zinc	ug/L	--		15.6		--		--		16.2		--	
PAH Compounds													
Acenaphthene	ug/L	--		0.01	U	--		--		0.01	U	0.01	U
Acenaphthylene	ug/L	--		0.01	U	--		--		0.01	U	0.01	U
Anthracene	ug/L	--		0.015		--		--		0.0078	J	0.01	U
Benzo(a)anthracene	ug/L	--		0.047		--		--		0.015		0.023	J
Benzo(b)fluoranthene	ug/L	--		0.051		--		--		0.027		0.036	
Benzo(k)fluoranthene	ug/L	--		0.037		--		--		0.02		0.024	
Benzo(ghi)perylene	ug/L	--		0.091		--		--		0.06		0.084	
Benzo(a)pyrene	ug/L	--		0.033		--		--		0.021		0.026	J
Chrysene	ug/L	--		0.068		--		--		0.047		0.06	
Dibenzo(a,h)anthracene	ug/L	--		0.011		--		--		0.01	U	0.01	U
Fluoranthene	ug/L	--		0.17		--		--		0.065		0.081	J
Fluorene	ug/L	--		0.012		--		--		0.01	UJ	0.01	U
Indeno(1,2,3-cd)pyrene	ug/L	--		0.031		--		--		0.016		0.024	
Naphthalene	ug/L	--		0.014		--		--		0.013	U	0.02	
Phenanthrene	ug/L	--		0.078		--		--		0.033		0.047	
Pyrene	ug/L	--		0.2		--		--		0.099		0.12	
Phthalates													
bis(2-Ethylhexyl)phthalate	ug/L	--		3.8	J	--		--		3.9		4.6	
Butyl benzyl phthalate	ug/L	--		0.2	U	--		--		0.24	UJ	0.39	U
Di-n-butyl phthalate	ug/L	--		0.24	UJ	--		--		0.31	U	0.5	U
Diethyl phthalate	ug/L	--		0.2	UJ	--		--		0.2	U	0.2	U
Dimethyl phthalate	ug/L	--		0.2	UJ	--		--		0.2	UJ	0.2	U
Di-n-octyl phthalate	ug/L	--		0.61	J	--		--		0.62		0.84	U
Herbicides													
Dichlobenil	ug/L	--		--		--		--		--		--	

Diuron	ug/L	--		--		--		--		--		--	
2,4-D	ug/L	--		--		--		--		--		--	
Clopyralid	ug/L	--		--		--		--		--		--	
Picloram	ug/L	--		--		--		--		--		--	
Triclopyr	ug/L	--		--		--		--		--		--	
Glyphosate	ug/L	25	U	--		25		--		25	U	25	U
TPH													
TPH-Diesel (NWTPH-Dx)	mg/L	1.75		--		--		4.05		--		--	
Diesel	mg/L	0.15	U	--		--		0.15	UJ	--		--	
Lube Oil	mg/L	1.6		--		--		3.9	J	--		--	
TPH-Gas (NWTPH-Gx)	mg/L	0.05	UJ	--		--		0.05	U	--		--	
Particle Size Distribution													
Particle/Grain Size, Phi Scale <1 (>500 um)	mg/L	--		0.7		--		--		1		0.6	
Particle/Grain Size, Phi Scale >10 (<1.0 um)	mg/L	--		12.3		--		--		8.21		15.19	
Particle/Grain Size, Phi Scale 1-2 (250-500 um)	mg/L	--		0.56		--		--		6.68		7.34	
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	--		30.69		--		--		36.06		24.29	
Particle/Grain Size, Phi Scale 8-10 (1.0-3.9 um)	mg/L	--		16.14		--		--		10.12		15.35	

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

PINES 01		STORM EVENT													
PARAMETER	UNITS	12/4/2012		4/19/2013		4/20/2013		5/21/2013		6/2/2013		6/19/2013		8/2/2013	
Conventionals															
TSS	mg/L	102	J	48		--		--		117	J	--		53	
Chloride	mg/L	21.7		29.9		22.9		--		17.6	J	--		8.87	
Hardness as $CaCO_3$	mg/L	--		40.8		--		--		32.6		--		31.7	
pH		--		--		--		--		--		--		--	
Temperature	degrees C	--		--		--		--		--		--		--	
Bacteria															
Fecal coliform	cfu/100ml	--		--		--		--		--		--		--	
Nutrients															
Total Phosphorous	mg/L	--		0.152		--		--		0.262	J	--		0.156	
Orthophosphate	mg/L	--		--		--		--		--		--		--	
Total Kjeldahl Nitrogen	mg/L	--		--		--		--		1.2	J	--		0.72	J
Nitrate-Nitrite	mg/L	--		0.339		--		--		0.337	J	--		0.364	
Metals															
Total Recoverable Copper	ug/L	--		18.6		--		37.2		22.6		--		20.6	
Dissolved Copper	ug/L	--		10.8		--		15.8		8.81		--		9.24	
Total Recoverable Lead	ug/L	--		3.97		--		12.1		8.09		--		5.47	
Dissolved Lead	ug/L	--		0.17		--		0.4		0.55		--		0.28	
Total Recoverable Cadmium	ug/L	--		0.11		--		0.29		0.16		--		0.14	
Dissolved Cadmium	ug/L	--		0.1	UJ	--		0.1	U	0.1	U	--		0.1	U
Total Recoverable Zinc	ug/L	--		79.6		--		192		104		--		94.3	
Dissolved Zinc	ug/L	--		22.7		--		40.1		31.3		--		42.6	
PAH Compounds															
Acenaphthene	ug/L	0.026		0.011	U	0.01	U	0.019	U	0.011	UJ	--		0.0099	U
Acenaphthylene	ug/L	0.0099	U	0.011	U	0.01	U	0.019	U	0.011	UJ	--		0.0099	U
Anthracene	ug/L	0.028		0.011	U	0.01	U	0.027		0.015	J	--		0.0099	U
Benzo(a)anthracene	ug/L	0.051		0.013		0.026		0.035	U	0.02	UJ	--		0.025	UJ
Benzo(b)fluoranthene	ug/L	0.092		0.03		0.07		0.066		0.033	J	--		0.031	
Benzo(k)fluoranthene	ug/L	0.031		0.018		0.04		0.041		0.021	J	--		0.016	
Benzo(ghi)perylene	ug/L	0.11	J	0.054		0.08		0.1		0.08	J	--		0.068	
Benzo(a)pyrene	ug/L	0.053		0.019		0.032		0.05		0.027	J	--		0.029	
Chrysene	ug/L	0.11		0.081		0.15		0.16		0.086	J	--		0.093	

Dibenzo(a,h)anthracene	ug/L	0.016	J	0.011	U	0.01	U	0.025		0.016	J	--		0.015	
Fluoranthene	ug/L	0.16		0.09		0.17		0.11		0.062	J	--		0.051	
Fluorene	ug/L	0.034		0.011	U	0.011		0.019	UJ	0.011	UJ	--		0.0099	UJ
Indeno(1,2,3-cd)pyrene	ug/L	0.069	J	0.012		0.023		0.046		0.031	J	--		0.027	U
Naphthalene	ug/L	0.048		0.035		0.032		0.042		0.02	J	--		0.021	
Phenanthrene	ug/L	0.15		0.084		0.13		0.091		0.053	J	--		0.037	
Pyrene	ug/L	0.23		0.13		0.23		0.19		0.092	J	--		0.094	
Phthalates															
bis(2-Ethylhexyl)phthalate	ug/L	6	J	4.3		5		5.8	J	4.3	J	--		5.1	
Butyl benzyl phthalate	ug/L	0.34		0.49	UJ	0.2	U	0.56		0.35	J	--		0.34	
Di-n-butyl phthalate	ug/L	0.52	UJ	0.71	U	0.33	U	0.72	U	0.46	J	--		0.63	U
Diethyl phthalate	ug/L	0.2	U	0.3	J	0.21	UJ	0.35	J	0.15	J	--		0.2	UJ
Dimethyl phthalate	ug/L	0.2	U	0.23	UJ	0.2	UJ	0.37	U	0.22	UJ	--		0.2	U
Di-n-octyl phthalate	ug/L	0.2	U	0.94	UJ	1.1	J	1.3	J	0.93	J	--		1.2	
Herbicides															
Dichlobenil	ug/L	--		--		--		--		--		--		0.034	U
Diuron	ug/L	--		--		--		--		--		--		0.051	U
2,4-D	ug/L	--		--		--		--		--		--		--	
Clopyralid	ug/L	--		--		--		--		--		--		--	
Picloram	ug/L	--		--		--		--		--		--		--	
Triclopyr	ug/L	--		--		--		--		--		--		--	
Glyphosate	ug/L	25	U	--		--		--		25	U	--		25	U
TPH															
TPH-Diesel (NWTPH-Dx)	mg/L	0		--		--		--		4.24		4.15		--	
Diesel	mg/L		R	--		--		--		0.44	U	0.15	U	--	
Lube Oil	mg/L		R	--		--		--		3.8		4		--	
TPH-Gas (NWTPH-Gx)	mg/L	0.07	U	--		--		--		0.07	U	0.07	U	--	

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

SR9		STORM EVENT											
PARAMETER	**UNITS**	**10/18/2012**		**11/7/2012**		**12/11/2012**		**2/21/2013**		**3/2/2013**		**3/6/2013**	
Conventionals													
TSS	mg/L	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	12		--		200		2400		--		--	
Nutrients													
Total Phosphorous	mg/L	--		0.0936		--		--		--		--	
Orthophosphate	mg/L	--		0.01	U	--		--		--		--	
Total Kjeldahl Nitrogen	mg/L	--		0.9	U	--		--		--		--	
Nitrate-Nitrite	mg/L	--		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	--		--		--		--	

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	--		--		--		--		--		--	
2,4-D	ug/L	--		--		--		--		--		--	
Clopyralid	ug/L	--		--		--		--		--		--	
Picloram	ug/L	--		--		--		--		--		--	
Triclopyr	ug/L	--		--		--		--		--		--	
Glyphosate	ug/L	--		25	U	--		--		--		--	
TPH													
TPH-Diesel (NWTPH-Dx)	mg/L	0.71		--		3.65		6.75		--		4.05	
Diesel	mg/L	0.05	U	--		0.15	U	0.15	U	--		0.15	UJ
Lube Oil	mg/L	0.66		--		3.5		6.6		--		3.9	J
TPH-Gas (NWTPH-Gx)	mg/L	0.07	U	--		0.07	U	0.05	U	--		0.014	J

SR9		STORM EVENT									
PARAMETER	**UNITS**	**3/20/2013**		**4/5/2013**		**4/12/2013**		**4/19/2013**		**5/21/2013**	
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	
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	--	

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	--		--		--		--		--	
2,4-D	ug/L	--		--		--		--		--	
Clopyralid	ug/L	--		--		--		--		--	
Picloram	ug/L	--		--		--		--		--	
Triclopyr	ug/L	--		--		--		--		--	
Glyphosate	ug/L	25	U	25	U	25	U	58		--	
TPH											
TPH-Diesel (NWTPH-Dx)	mg/L	--		--		--		--		3.95	
Diesel	mg/L	--		--		--		--		0.15	UJ
Lube Oil	mg/L	--		--		--		--		3.8	J
TPH-Gas (NWTPH-Gx)	mg/L	--		--		--		--		0.07	U

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

This page intentionally left blank

Appendix E:
Sediment Data

Appendix E – Sediment 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	0.530	0.73	0.752	1.04	0.161
Total Recoverable Zinc	mg/Kg dw	260	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

Appendix F:
Rainfall/Runoff Relationship Data

Appendix F – Rainfall/Runoff Relationship Data

Table F-1 Rainfall/Runoff Relationship for WY 12 & WY 13 at Pilchuck 01

Storm Event #	Start of Storm Event (Pacific)	End of Storm Event (Pacific)	Total Runoff Volume Drainage Area (gallons)	Total Precipitation of Storm Event (inches)	Water Quality Sample Collected/Analyzed?	Hydrology Flag
1	6/22/12 12:00	6/23/12 7:45	859.4	0.88	Y	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	Y	J
4	8/28/12 21:50	N/A	147.3	0.10		C
5	9/9/12 21:00	N/A	197.2	0.15		C
6	10/12/12 10:20	10/12/12 12:55	58.1	0.08	Y	J
7	10/18/12 17:30	10/19/12 3:45	1025.6	0.95	Y	
8	10/21/12 17:55	10/21/12 22:15	87.7	0.10		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	0.16		J
11	11/7/12 0:35	11/7/12 2:30	74.8	0.15	Y	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	0.20		J
18	12/11/12 9:35	12/12/12 12:40	779.9	0.62	Y	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	0.20		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	0.03		J
24	1/23/13 10:55	N/A	487.0	0.44		C
25	1/26/13 4:20	N/A	646.8	0.60		C
26	2/3/13 16:50	2/4/13 5:45	529.6	0.20		J
27	2/6/13 17:20	2/7/13 0:30	158	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	Y	J
30	2/16/13 7:30	2/16/13 15:15	216.9	0.24	Y	J
31	2/21/13 2:25	2/21/13 21:30	351.4	0.16	Y	
32	2/24/13 23:50	2/25/13 15:45	337.4	0.20	Y	

33	2/28/13 16:35	2/28/13 18:00	347.1	0.41	Y	
34	3/2/13 14:40	3/2/13 18:20	182.6	0.33	Y	J
35	3/6/13 8:55	3/7/13 14:05	1010.5	0.70	Y	J
36	3/16/13 2:05	3/16/13 9:45	296.7	0.24		J
37	3/20/13 0:10	3/20/13 10:10	373.7	0.27	Y	
38	4/4/13 12:30	4/4/13 20:55	240	0.25		
39	4/12/13 14:00	4/13/13 0:00	371.6	0.34	Y	
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	N/A	137.3	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

Notes:

Hydrology flag 'J' denotes an estimated runoff volume

Hydrology flag 'C' denotes a calculated runoff voume that is not considered in the rainfall/runoff relationship

Table F-2 Rainfall/Runoff Relationship for WY 12 & WY 13 at Everett 01

Storm Event #	Start of Storm Event (Pacific)	End of Storm Event (Pacific)	Total Runoff Volume Drainage Area (gallons)	Total Precipitation of Storm Event (inches)	Water Quality Sample Collected/Analyzed?	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	462.1	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	10/12/12 09:45	N/A	99.6	.04	Y	C
6	10/18/12 18:40	10/18/12 22:35	209.6	0.65		
7	10/21/12 17:20	10/21/12 21:05	73.4	0.14		J
8	10/26/12 10:45	10/26/12 17:55	150.8	0.13		J
9	10/30/12 5:45	10/31/12 17:10	1019.9	1.6		J
10	11/2/12 18:45	11/3/12 1:05	54.2	0.11		J
11	11/6/12 22:35	11/7/12 3:10	281.2	0.47	Y	
12	11/11/12 12:25	N/A	291.1	0.32		C
13	11/30/12 10:30	N/A	981.7	1.33		C
14	12/8/12 4:00	12/8/12 8:25	145.0	0.41		J
15	12/11/12 13:45	N/A	525.2	0.51	Y	C
16	12/13/12 18:00	12/14/12 6:50	124.5	0.36		J

17	12/16/12 12:15	12/17/12 11:05	744.1	1.08		J
18	12/23/12 18:00	12/24/12 7:00	359.7	0.26		J
19	12/25/12 9:45	12/25/12 16:05	119.2	0.2		J
20	1/6/13 19:00	N/A	455.2	0.56		C
21	1/23/13 11:00	N/A	393.7	0.47		C
22	1/26/13 11:15	N/A	414.2	0.5		C
23	2/11/13 03:30	N/A	113.3	.06	Y	C
24	2/21/13 7:40	2/21/13 10:15	47.0	0.03		J
25	2/22/13 10:45	2/23/13 11:10	590.6	0.93	Y	J
26	2/25/13 1:00	2/25/13 14:25	227.6	0.09		J
27	2/27/13 17:25	2/27/13 22:15	146.8	0.13		J
28	3/2/13 15:15	3/2/13 18:50	160.9	0.3	Y	J
29	3/6/13 9:35	3/7/13 9:35	653.5	0.63	Y	J
30	3/12/13 16:20	3/12/13 21:10	495.1	0.27		J
31	3/17/13 21:40	3/18/13 3:20	186.7	0.08		J
32	3/19/13 21:15	3/20/13 11:10	506.3	0.51	Y	
33	4/4/13 11:55	4/5/13 11:30	782.5	0.46		
34	4/7/13 3:30	4/7/13 20:30	843.4	1.23		
35	4/10/13 9:50	4/10/13 17:45	224.3	0.13		
36	4/12/13 13:35	4/12/13 19:10	240.1	0.21	Y	
37	4/27/13 19:50	4/28/13 9:25	552.3	0.34		J
38	4/30/13 5:30	N/A	106.5	0.05		C
39	5/12/13 3:15	5/12/13 11:45	246.3	0.17	Y	J
40	5/21/13 3:15	5/22/13 6:15	922.2	0.72	Y	
41	6/17/13 22:35	6/18/13 0:50	91.2	0.1		J
42	7/17/13 3:40	7/17/13 4:05	14.6	0.05		J
43	8/24/13 6:25	8/24/13 12:00	128.0	0.08		J
44	8/28/13 1:30	8/28/13 6:50	79.3	0.13		J
45	9/3/13 4:10	9/3/13 16:30	205.5	0.23		J
46	9/15/13 17:40	9/16/13 1:15	138.5	0.17		J
47	9/22/13 8:20	9/22/13 15:20	46.8	0.05		J

Notes:

Hydrology flag 'J' denotes an estimated runoff volume

Hydrology flag 'C' denotes a calculated runoff voume that is not considered in the rainfall/runoff relationship

Table F-3 Rainfall/Runoff Relationship for WY 12 & WY 13 at Everett 04

Storm Event #	Start of Storm Event (Pacific)	End of Storm Event (Pacific)	Total Runoff Volume Drainage Area (gallons)	Total Precipitation of Storm Event (inches)	Water Quality Sample Collected/Analyzed?	Hydrology Flag
1	7/20/12 3:25	7/20/12 12:20	299.4	0.33	Y	
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	10/12/12 09:35	N/A	83.7	.03	Y	C
5	10/18/12 18:40	10/18/12 23:30	237.4	0.63		
6	10/21/12 17:20	10/21/12 18:55	56.5	0.13		
7	10/26/12 10:40	10/26/12 15:05	173.6	0.14		
8	10/30/12 5:50	10/31/12 18:10	1972.5	1.52		
9	11/2/12 18:20	11/2/12 22:05	149.7	0.12		J
10	11/6/12 22:25	11/7/12 10:55	313.0	0.48	Y	
11	11/11/12 12:25	11/12/12 5:30	700.0	0.29		J
12	11/16/12 16:55	11/17/12 7:20	612.8	0.34		J
13	11/23/12 1:10	N/A	428.8	0.38		C
14	11/28/12 14:15	11/29/12 1:25	460.6	0.17		J
15	12/6/12 14:30	12/7/12 21:25	303.2	0.19		J
16	12/9/12 11:50	12/10/12 9:10	595.7	0.21		J
17	12/11/12 13:45	12/12/12 7:40	519.5	0.53	Y	
18	12/13/12 19:10	12/14/12 6:50	440.7	0.32		
19	12/15/12 14:05	12/16/12 1:05	191.5	0.22		J
20	12/25/12 10:25	12/25/12 14:50	319.4	0.14		J
21	12/29/12 6:30	12/29/12 14:45	141.0	0.21		J
22	1/3/13 19:50	1/4/13 1:00	152.4	0.1		J
23	1/5/13 21:45	1/6/13 2:35	40.3	0.07		J
24	1/23/13 11:35	N/A	487.9	0.44		C
25	1/26/13 5:45	N/A	507.6	0.46		C
26	2/13/13 1:50	2/13/13 13:30	134.0	0.05		J
27	2/16/13 7:45	2/17/13 19:45	542.2	0.23	Y	J
28	2/22/13 16:35	N/A	892.2	0.85	Y	C
29	2/25/13 1:05	2/25/13 7:45	198.0	0.05		J
30	2/27/13 17:30	2/28/13 23:25	228.8	0.14		J
31	3/2/13 15:15	3/2/13 22:00	310.3	0.27	Y	J
32	3/6/13 9:35	N/A	616.1	0.57		C
33	3/12/13 16:40	N/A	261.1	0.21		C
34	3/17/13 22:00	N/A	133.0	0.08		C
35	3/19/13 21:30	3/20/13 11:05	550.1	0.45	Y	
36	4/4/13 19:15	4/4/13 21:20	327.7	0.3		J
37	4/7/13 3:35	4/7/13 20:00	714.6	1.19		J
38	4/10/13 9:55	4/10/13 11:45	52.7	0.12		J

39	4/12/13 13:45	4/12/13 16:50	122.5	0.17	Y	J
40	4/18/13 17:00	4/19/13 19:30	868.2	0.61	Y	
41	4/27/13 19:50	4/28/13 7:30	231.4	0.31		J
42	4/30/13 5:25	4/30/13 11:45	154.2	0.05		J
43	5/12/13 4:10	5/12/13 5:55	72.2	0.15		J
44	5/21/13 3:10	5/22/13 5:55	801.6	0.66	Y	J
45	6/17/13 22:20	6/17/13 23:35	57.6	0.13		J
46	8/24/13 7:10	8/24/13 10:35	94.0	0.08		J
47	9/3/13 4:20	9/3/13 11:45	251.4	0.21		J
48	9/15/13 17:40	9/15/13 21:15	142.0	0.16		J
49	9/22/13 10:10	9/22/13 14:45	49.5	0.06		J

Notes:

Hydrology flag 'J' denotes an estimated runoff volume

Hydrology flag 'C' denotes a calculated runoff voume that is not considered in the rainfall/runoff relationship

Table F-4 Rainfall Runoff Relationship for WY 12 & WY 13 at SR9 01

Storm Event #	Start of Storm Event (Pacific)	End of Storm Event (Pacific)	Total Runoff Volume Drainage Area (gallons)	Total Precipitation of Storm Event (inches)	Water Quality Sample Collected/Analyzed?	Hydrology Flag
1	5/20/12 11:30	5/21/12 0:30	354.6	0.23	Y	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	95.2	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	220.3	0.23	Y	C
10	10/18/12 18:45	10/19/12 4:00	372.4	0.69	Y	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 13:15	628.0	0.68	Y	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	N/A	1150.0	1.27	Y	C
18	2/13/13 1:50	N/A	77.3	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	Y	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	640.5	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	Y	J
27	4/4/13 12:05	4/5/13 8:25	670.5	0.56	Y	
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	Y	J
30	4/18/13 16:50	4/19/13 19:20	995.3	0.75	Y	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	68.4	0.06		C
35	5/19/13 3:25	N/A	59.4	0.05		C
36	5/21/13 2:15	N/A	640.5	0.7		C
37	5/26/13 9:05	N/A	59.4	0.05		C
38	5/27/13 14:35	N/A	77.3	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	59.4	0.05		C
44	8/15/13 14:30	N/A	77.3	0.07		C
45	8/24/13 6:00	N/A	68.4	0.06		C

Notes:

Hydrology flag 'J' denotes an estimated runoff volume

Hydrology flag 'C' denotes a calculated runoff voume that is not considered in the rainfall/runoff relationship

Table F-5 Rainfall/Runoff Relationship for WY 12 & WY 13 at Pines 01

Storm Event #	Start of Storm Event (Pacific)	End of Storm Event (Pacific)	Total Runoff Volume Drainage Area (gallons)	Total Precipitation of Storm Event (inches)	Water Quality Sample Collected/Analyzed?	Hydrology Flag
1	6/26/12 9:05	N/A	742.9	0.56		C
2	8/21/12 8:40	N/A	75.5	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	101.7	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	88.6	0.06		C
8	11/12/12 9:45	N/A	428.8	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	Y	
14	12/7/12 8:05	12/7/12 14:00	140.3	0.07		J
15	12/11/12 12:10	N/A	88.6	0.06		C
16	12/12/12 0:40	N/A	219.4	0.16		C
17	12/16/12 11:35	N/A	455.0	0.34		C
18	12/20/12 8:35	N/A	167.1	0.12		C
19	12/22/12 12:55	N/A	101.7	0.07		C
20	1/6/13 11:20	N/A	101.7	0.07		C
21	1/7/13 13:50	N/A	724.0	0.55		C
22	1/19/13 13:40	N/A	75.5	0.05		C
23	1/23/13 19:30	N/A	154.0	0.11		C
24	1/28/13 10:30	N/A	101.7	0.07		C
25	1/30/13 5:40	N/A	193.3	0.14		C
26	2/7/13 23:10	N/A	114.8	0.08		C
27	2/19/13 8:55	N/A	140.9	0.1		C
28	2/25/13 9:05	N/A	219.4	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	Y	
37	4/21/13 13:05	4/21/13 16:45	113.9	0.27	Y	
38	5/13/13 15:50	N/A	114.8	0.08		C
39	5/21/13 18:20	5/21/13 21:00	127.8	0.2	Y	
40	6/2/13 8:45	6/2/13 22:30	582.1	0.64	Y	
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	Y	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	Y	
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	154.0	0.11		C
52	9/25/13 14:45	9/25/13 21:45	74.4	0.05		J

Notes:

Hydrology flag 'J' denotes an estimated runoff volume

Hydrology flag 'C' denotes a calculated runoff voume that is not considered in the rainfall/runoff relationship