
**WSDOT NPDES Municipal Stormwater Permit
Monitoring Status Report
Water Year 2022**

October 2023

Prepared by

Stormwater Monitoring and Research Program
Environmental Services Office
Washington State Department of Transportation



**Washington State
Department of Transportation**

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Stormwater Monitoring Report

Water Year 2022

Approved by:

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Date: _____

Tony Bush, Stormwater Branch Manager
WSDOT Environmental Services Office

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1 Introduction

1.1 Permit Overview

On March 6, 2019, the Washington State Department of Ecology (Ecology) reissued a National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge Municipal Stormwater General Permit (permit) (Ecology 2019) to the Washington State Department of Transportation (WSDOT), effective April 5, 2019, to April 5, 2024. Under Special Condition S7.D. of the permit, WSDOT must begin new facilities effectiveness studies that are approximately the same level of monitoring effort and cost as the previous studies that were reported on in October 2019.

Stormwater monitoring provides feedback to WSDOT for inclusion in its Highway Runoff Manual (HRM) (WSDOT, 2019). WSDOT's stormwater management approach utilizes Best Management Practices (BMPs) to help meet the permit requirement to "reduce pollutants in discharges to the maximum extent practicable" (Ecology, 2019). The monitoring program evaluates performance of BMPs using guidance in the Technology Assessment Protocol – Ecology (TAPE) (Ecology, 2018) as required by S7.C of the permit.

Under Special Conditions S7.H and S8.B. of the permit, monitoring reports are required for information collected at the department's stormwater monitoring sites. The following report is meant to satisfy these requirements and provides a summary of monitoring activities at facilities completed in Water Year 2022 (WY22) from October 1, 2021, through September 30, 2022.

2 Monitoring Program Implementation

2.1 Facility Study

WSDOT, in consultation with Ecology, selected compost-amended biofiltration swale (CABS) studies to fulfill the facility BMP effectiveness study permit requirements. The goal of the study is to test if shortened biofiltration swales, as compared to the minimum HRM swale length, will adequately treat runoff. The results may inform changes to the HRM specifications to allow for shortened swales that may be used in more locations without room for traditionally sized biofiltration swales. Program implementation during WY22 included site redesign at one facility and sample collection at a second facility.

WSDOT selected the two bioswales study sites, one facility is in Western Washington, and one is in Eastern Washington. The Eastern Washington CABS is testing a shortened swale with a sediment basin installed prior to the swale influent to remove excess sediment. The Western Washington CABS is also testing a shortened swale in a two-phase study.

The two CABS study sites (Figure 1) were selected based on the design guidelines listed below. Additional site selection criteria for this study, accounting for characteristics of both monitoring locations, are:

Facility CABS:

1. Safely accessible for WSDOT staff and provide access that will not put the traveling public at undue risk.
2. Within the WSDOT owned and operated facility.
3. CABS built to HRM standard except length (Eastern and Western Washington CABS) and pre-swale sedimentation basin (Eastern Washington CABS only).
4. At a location that regularly receives enough precipitation and subsequent stormwater runoff to maintain a reasonable monitoring timeline.
5. Inlet and outlet are monitorable for hydrology and chemistry without altering the function of the swale and moving it beyond HRM specification.
6. Facility activities represent standard maintenance activities and practices (see Table 2).

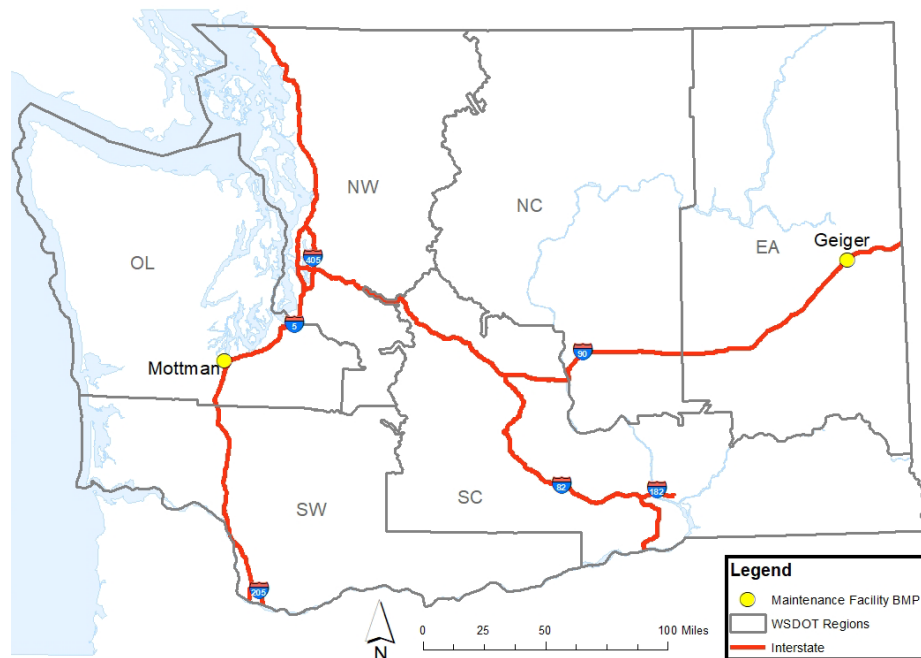


Figure 1. Facility study locations

Table 1. Maintenance facility monitoring locations and activities

Region	Facility	Activities														
		Galvanized Metals	Treated Lumber	Prewash Pad	Sand	Salt	Deicer	Highway Sweepings Storage	Landscaping	Truck Parking	Storage Buildings	Maintenance Buildings	Transportation Equipment Fund Shop	Offices	Fuel Island	Herbicide/Fertilizer
Olympic	Mottman	x		x	x	x		x		x	x	x		x		
Eastern	Geiger		x	x	x					x	x	x	x	x	x	x

Mottman

The Western Washington CABS is located at the Mottman Maintenance Facility (Mottman) at 2120 R.W. Johnson Blvd. SW in Tumwater. The Mottman CABS is a retrofit of an existing swale located at the facility.

The Mottman CABS is located east of the site's primary maintenance activities and receives runoff from a 1.23-acre drainage area highlighted in Figure 2. The delineated drainage area was ground-checked through multiple site observations during storm events, including heavy rain events. The CABS does not receive all the Mottman Maintenance Facility's stormwater runoff, which is directed to multiple points. This study only addresses the Mottman pollutants generated in the immediate drainage area.



Figure 2. Mottman CABS monitoring site and associated drainage

The previous swale at Mottman was removed and new soil, compost, and seed was installed. The effluent pipe that drains the swale to the nearby pond was lowered, this brought the swale into current HRM guidance for slope specifications (Figure 3).

Construction and installation of monitoring equipment took place during water year 21, and monitoring began in January of 2022.



Geiger

The Eastern Washington CABS is located at the Geiger Maintenance Facility near the Spokane International Airport at 7211 West Westbow Boulevard, west of the City of Spokane. The Geiger CABS is a retrofit of an existing swale with a siltation basin installed prior to the swale influent.

The CABS at Geiger receives runoff from a 1.89-acre drainage area. The delineated drainage area was ground-checked through multiple site observations during storm events, including heavy rain events. The CABS does not receive all the Geiger Maintenance Facility's stormwater runoff, which is directed to multiple points. This study only addresses the pollutants generated in the immediate drainage area (Figure 4).



Figure 4. Geiger CABS monitoring site and associated drainage area

A siltation basin was designed and installed by WSDOT (Figure 5). The swale was reconstructed to compensate for the loss of length because of the basin. New soil, compost, and seed were added to the swale. Site retrofits occurred in water year 22 to allow for regular flow in the site and for collection of rainfall/runoff data.



Figure 5. Geiger influent with siltation basin

2.2 Facility Study Results

WSDOT initiated hydrological, chemical, and meteorological data collection at the Mottman site in 2022. WSDOT mobilized 11 times for attempted storms chemistry and hydrology sampling. WSDOT successfully sampled 5 storms. No chemistry sampling was attempted at the Geiger site.

Table 2 contains the list of all storm sampling event attempts and outcomes at the Mottman site. Appendices A and B contain the storm reports and chemistry data associated with successful sampling events.

Table 2. Mottman sample attempts

Date	Influent	Effluent
1/31/2022	Accepted	Accepted
2/20/2022	Rainfall Inadequate	Rainfall Inadequate
2/14/2022	Rainfall Inadequate	Rainfall Inadequate
2/27/2022	Accepted	Accepted
3/13/2022	Equipment Failure	Equipment Failure
3/19/2022	Accepted	Accepted
3/21/2022	Less Volume Than Expected	Less Volume Than Expected
4/19/2022	Accepted	Accepted
4/30/2022	Accepted	Accepted
5/5/2022	Less Volume Than Expected	Less Volume Than Expected
6/5/2022	<75% hydrograph collected	<75% hydrograph collected

Literature Cited

Ecology. 2018. *Technical Guidance Manual for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE)*. September 2018 Revision. Washington State Department of Ecology, Olympia, WA. Publication no. 18-10-039.

Ecology. 2019. *Washington State Department of Transportation National Pollutant Elimination System and State Waste Discharge Municipal Stormwater General Permit*. Washington State Department of Ecology. Olympia, Washington. Permit No. WAR043000A. Issuance Date April 5, 2019.

WSDOT. 2019. *Highway Runoff Manual*. Washington State Department of Transportation. Olympia, WA. Publication Number M 31-16.05.

Appendix A Chemistry Data

Date	Sample Point	TSS (mg/L)	Hardness (mg/L)	Total Phosphorous (mg/L)	Orthophos (mg/L)	TKN (mg/L)	Nitrate-Nitrite (mg/L)	Total Cu (ug/L)	Diss Cu (ug/L)
1/31/2022	Influent	56 M	36	0.074	0.092	0.679	0.095	6.8	14.4
	Effluent	33 M	33	0.086	0.078	0.557	0.17	4.85	13.4
2/27/2022	Influent	38	39	0.065	0.067	7.83	0.107	6.89	12.7
	Effluent	23	27	0.059	0.069	0.483	0.121	4.78	11.7
3/19/2022	Influent	14	9.4	0.074	0.072	0.408	0.024	8.97	3.74
	Effluent	6	9.8	0.108	0.105	0.438	<0.02 U	8.17	3.28
4/19/2022	Influent	33	29	0.113	<0.006 U	1.11	0.124	12.7	7.81
	Effluent	21	34	0.133	<0.006 U	1.61	0.106	8.69	8.61
4/30/2022	Influent	9 R	1.8	0.066	0.006 R	0.782	<0.02 U	4.49	2.94
	Effluent	8 R	1.8	0.062	0.02 R	0.71	<0.02 U	3.66	3.4

Date	Sample Point	Total Zn (ug/L)	Diss Zn (ug/L)	PSD					
				>1000 um	1000-500um	250-500 um	125-250 um	62.5-125 um	62.5-1 um
1/31/2022	Influent	53.4	14.4	0	3	5	6	3	54.6
	Effluent	41.6	13.4	0	4	3	2	2	26.4
2/27/2022	Influent	52.7	36.3	0	0	0	0	0	0
	Effluent	33.8	23	0	0	0	0	0	0
3/19/2022	Influent	45.6	43.5	0	0.5	0.5	1	6.3	7.6
	Effluent	27	14.1	0	0	0	0.5	2.5	2.5
4/19/2022	Influent	50.4	32.5	0	3	3	7	16	11
	Effluent	48.1	34.1	0	1	2	9	13	9
4/30/2022	Influent	26.5	17.9	0	2.5	2.9	3.8	5	5.8
	Effluent	16.2	13.2	0	1	1.5	1.8	2.7	3.4

All data is preliminary needing to go through 3rd party validation.

R=Rejected

U=Undetected

Appendix B Storm Reports

Download 22 Mottman

Lat: 47.028280N Long: -122.937610W

Drainage Area (acres):

Precipitation				
Total (in)	Start Time (Pacific)	End Time (Pacific)	Duration (hrs)	Antecedent Dry (hrs)
0.38	01/30/2022 14:45	01/30/2022 23:00	8.25	240

Aliquots								Water Temp	
Sample Point (m)	Sample Point Name	Aliquots Collected	First Aliquot Time (Pacific)	Last Aliquot Time (Pacific)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (°C)	Max (°C)
1	MOT-In	19	01/30/2022 15:00	01/30/2022 17:40	2.67	250	4,750	7.40	7.50
2	MOT-Out	18	01/30/2022 15:35	01/30/2022 17:15	1.67	250	4,500	7.40	7.50

Runoff / Discharge														
		Runoff Time			Volume			Sampled		Flow			Stage	
Sample Point (m)	Sample Point Name	Start Time (Pacific)	End Time (Pacific)	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)	Hydrology Validation Code
1	MOT-In	01/30/2022 14:50	01/30/2022 23:25	8.58	6,295.2	733.7	6,295.2	6,031.4	95.80	75.64	0.01	14.31	0.337	
2	MOT-Out	01/30/2022 15:20	01/30/2022 18:00	2.67	3,959.0	1482.8	3,958.1	3,805.6	96.10	67.42	0.05	23.28	0.235	

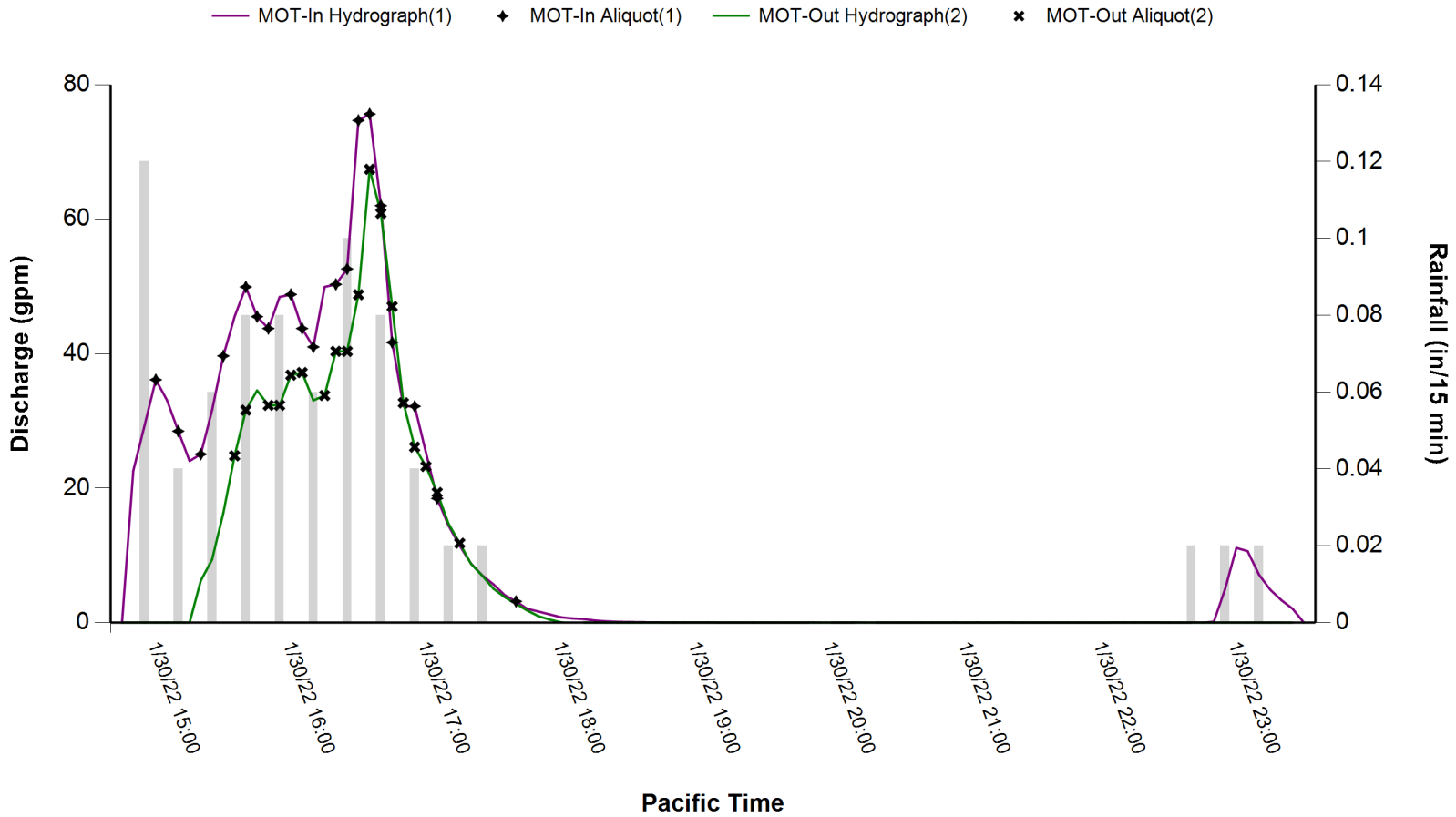
No comments added for this event

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Lat: 47.028280N Long: -122.937610W

Drainage Area (acres):

22 Mottman 1/30/2022 Storm Event



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Lat: 47.028280N Long: -122.937610W

Drainage Area (acres):

Precipitation				
Total (in)	Start Time (Pacific)	End Time (Pacific)	Duration (hrs)	Antecedent Dry (hrs)
0.62	02/26/2022 13:25	02/27/2022 01:20	11.92	161.50

Aliquots								Water Temp	
Sample Point (m)	Sample Point Name	Aliquots Collected	First Aliquot Time (Pacific)	Last Aliquot Time (Pacific)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (°C)	Max (°C)
1	MOT-In	24	02/26/2022 14:05	02/26/2022 20:05	6.00	250	6,000	4.70	5.70
2	MOT-Out	31	02/26/2022 15:00	02/26/2022 20:40	5.67	250	7,750	4.70	5.60

Runoff / Discharge														
		Runoff Time			Volume			Sampled		Flow			Stage	
Sample Point (m)	Sample Point Name	Start Time (Pacific)	End Time (Pacific)	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)	Hydrology Validation Code
1	MOT-In	02/26/2022 13:30	02/27/2022 01:45	12.25	11,749.2	959.1	11,749.2	11,462.8	97.60	52.61	0.06	15.88	0.284	
2	MOT-Out	02/26/2022 13:30	02/27/2022 01:45	12.25	10,012.0	817.3	10,012.0	9,835.7	98.20	50.10	0.31	13.53	0.199	

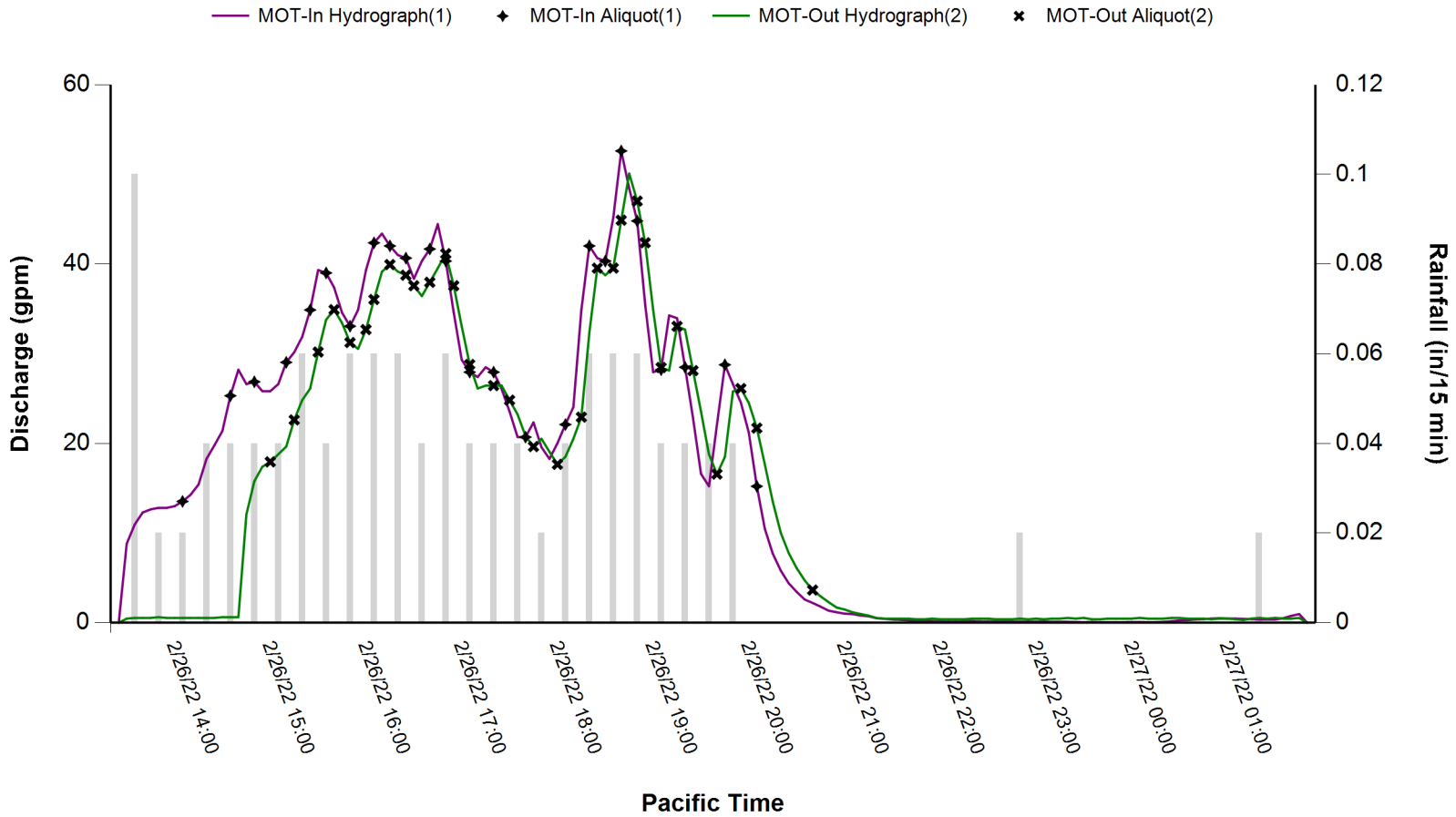
No comments added for this event

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Lat: 47.028280N Long: -122.937610W

Drainage Area (acres):

22 Mottman 2/27/2022 Storm Event



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Lat: 47.028280N Long: -122.937610W

Drainage Area (acres):

Precipitation				
Total (in)	Start Time (Pacific)	End Time (Pacific)	Duration (hrs)	Antecedent Dry (hrs)
0.36	03/18/2022 19:45	03/19/2022 10:40	14.92	38.58

Aliquots								Water Temp	
Sample Point (m)	Sample Point Name	Aliquots Collected	First Aliquot Time (Pacific)	Last Aliquot Time (Pacific)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (°C)	Max (°C)
1	MOT-In	13	03/18/2022 21:40	03/19/2022 06:35	8.92	250	3,250	7.60	8.90
2	MOT-Out	37	03/18/2022 20:35	03/19/2022 06:00	9.42	250	9,250	7.90	9.30

Runoff / Discharge														
		Runoff Time			Volume			Sampled		Flow			Stage	
Sample Point (m)	Sample Point Name	Start Time (Pacific)	End Time (Pacific)	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)	Hydrology Validation Code
1	MOT-In	03/18/2022 19:50	03/19/2022 11:20	15.50	6,290.9	405.9	6,290.9	6,185.7	98.30	35.49	0.01	6.88	0.235	
2	MOT-Out	03/18/2022 22:00	03/19/2022 07:15	9.25	3,991.9	431.6	0.0	3,853.0						

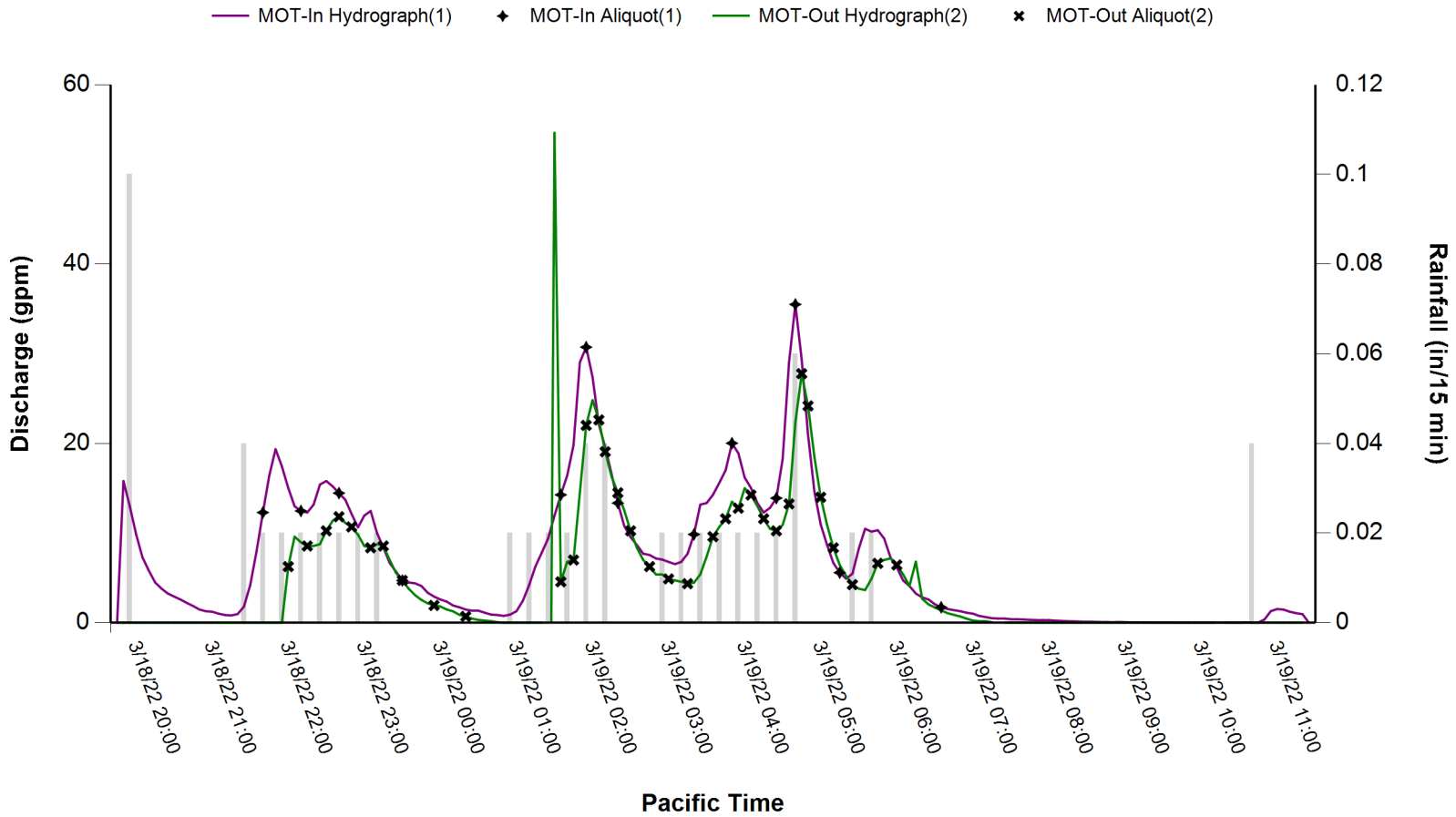
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Lat: 47.028280N Long: -122.937610W

Drainage Area (acres):

22 Mottman 3/19/2022 Storm Event



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Lat: 47.028280N Long: -122.937610W

Drainage Area (acres):

Precipitation															
Total (in)	Start Time (Pacific)			End Time (Pacific)			Duration (hrs)		Antecedent Dry (hrs)						
0.53	04/18/2022 02:00			04/18/2022 17:15			15.25		49.12						
Aliquots										Water Temp					
Sample Point (m)	Sample Point Name	Aliquots Collected	First Aliquot Time (Pacific)			Last Aliquot Time (Pacific)			Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (°C)	Max (°C)		
1	MOT-In	18	04/18/2022 02:45			04/18/2022 17:10			14.42	250	4,500	7.40	11.90		
2	MOT-Out	24	04/18/2022 03:50			04/18/2022 17:40			13.83	250	6,000	7.40	11.90		
Runoff / Discharge															
		Runoff Time			Volume			Sampled		Flow			Stage		
Sample Point (m)	Sample Point Name	Start Time (Pacific)	End Time (Pacific)	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)	Hydrology Validation Code	
1	MOT-In	04/18/2022 02:05	04/18/2022 22:45	20.67	8,970.8	434.0	8,970.8	8,626.1	96.20	30.16	0.01	7.32	0.217		
2	MOT-Out	04/18/2022 02:35	04/18/2022 18:50	16.25	7,734.5	476.0	7,716.4	7,619.0	98.70	26.78	0.05	7.05	0.139		

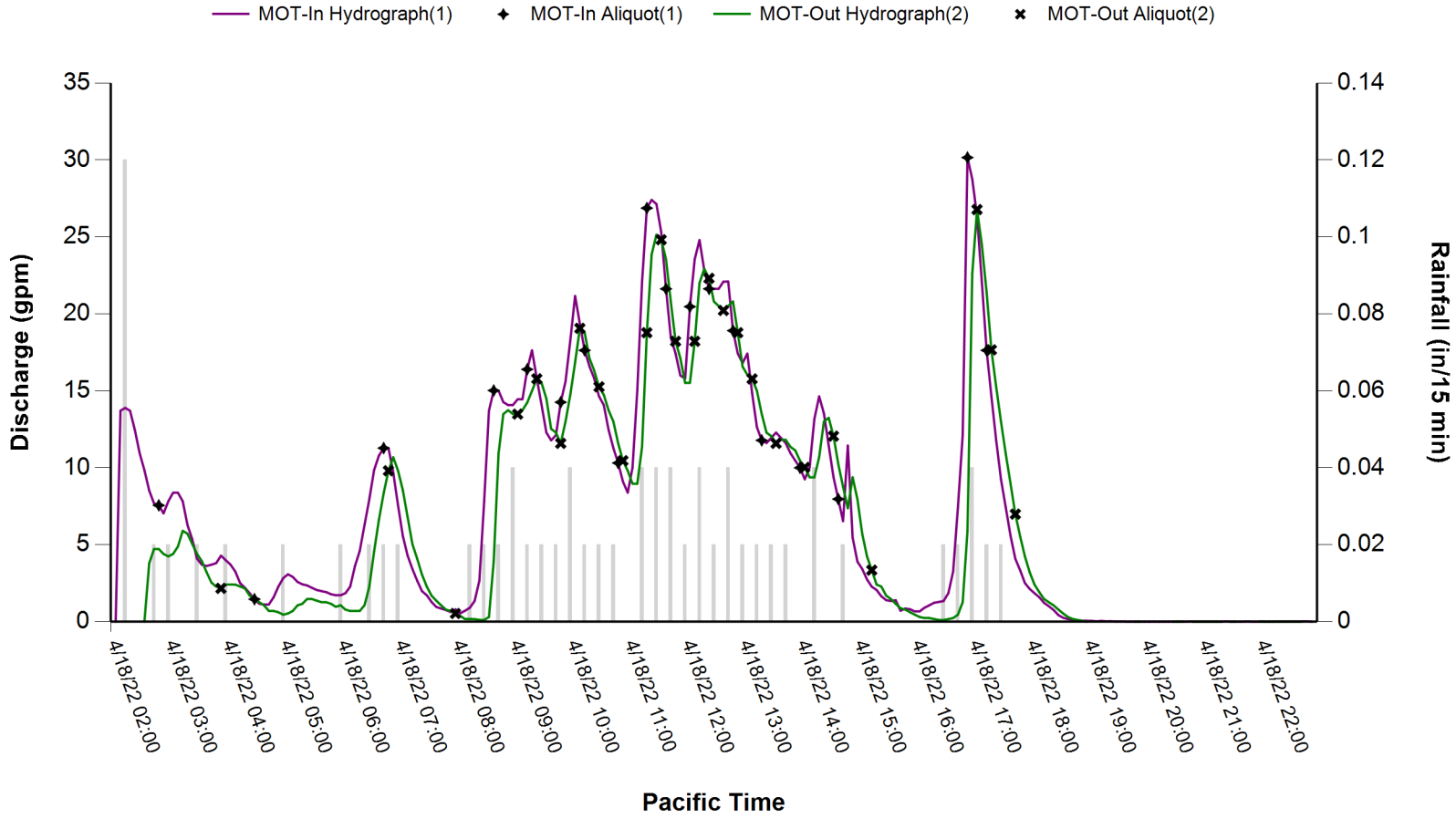
No comments added for this event

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Lat: 47.028280N Long: -122.937610W

Drainage Area (acres):

22 Mottman 4/18/2022 Storm Event



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Lat: 47.028280N Long: -122.937610W

Drainage Area (acres):

Precipitation				
Total (in)	Start Time (Pacific)	End Time (Pacific)	Duration (hrs)	Antecedent Dry (hrs)
0.45	04/29/2022 21:35	04/30/2022 06:10	8.58	53.66

Aliquots								Water Temp	
Sample Point (m)	Sample Point Name	Aliquots Collected	First Aliquot Time (Pacific)	Last Aliquot Time (Pacific)	Sampling Duration (hrs)	Volume (mL)	Total Sample Volume (mL)	Min (°C)	Max (°C)
1	MOT-In	14	04/29/2022 22:05	04/30/2022 04:50	6.75	250	3,500	9.90	10.60
2	MOT-Out	12	04/29/2022 22:55	04/30/2022 04:20	5.42	250	3,000	9.90	10.40

Runoff / Discharge														
		Runoff Time			Volume			Sampled		Flow			Stage	
Sample Point (m)	Sample Point Name	Start Time (Pacific)	End Time (Pacific)	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)	Hydrology Validation Code
1	MOT-In	04/29/2022 21:40	04/30/2022 10:00	12.33	7,596.2	616.1	7,596.2	7,402.4	97.40	46.60	0.08	10.20	0.268	
2	MOT-Out	04/29/2022 22:05	04/30/2022 05:45	7.67	5,795.0	755.5	5,792.7	5,415.4	93.50	38.36	0.06	12.07	0.171	

No comments added for this event

Download 22 Mottman

Lat: 47.028280N Long: -122.937610W

Drainage Area (acres):

22 Mottman 4/30/2022 Storm Event

