Seasonal Progress Report #29
SR431 Treatment Vault Effectiveness Monitoring

Agreement Number: P211-23-019

Submitted by: Tahoe Resource Conservation District

Submitted to: Nevada Department of Transportation

Current Contract Term: July 1, 2023 – June 30, 2025

Water Year: 2025

Period: Spring Season, June 1, 2025 –Sept 30, 2025

Submission Date: October 31, 2025

Two stormwater filter vaults, a Contech Media Filtration System (MFS) and a Jellyfish Filter, were installed by the Nevada Department of Transportation (NDOT) on State Highway 431 (SR431) above Incline Village, Nevada in 2013. Monitoring equipment was installed at the inflows and outflows of these two vaults. The Tahoe Resource Conservation District (Tahoe RCD) continued the effectiveness monitoring efforts of the Desert Research Institute (DRI) at the four monitoring stations on May 1, 2015 and will continue to monitor through the spring of water year 2025 (May 31, 2025) and beyond if funding allows. New contracts have been executed continuously from May 1, 2015 through present, with the latest contract term being July 1, 2023 - June 30, 2025 to allow for this. Tahoe RCD follows sampling protocols outlined in the Regional Stormwater Monitoring Program Framework and Implementation Guidance document (RSWMP FIG Update, Tahoe RCD et al 2017). Tahoe RCD appreciates the opportunity to provide these water quality monitoring services for NDOT and looks forward to continuing the partnership.

Tasks and subtasks associated with this project and a summary of work completed to date are described below. Table 1 provides a summary of tasks, due dates and percent completion to date for the current agreement. ASWMR refers to the Annual Stormwater Monitoring Report submitted each year to the Nevada Division of Environmental Protection (NDEP) on March 31st as part of the IMP partnership.

Table 1 Summary of tasks, due dates, and percent completion to date.

Task	Description	Due Date	% Of Work Complete	Date Submitted
1	Project Administration			
1.1	Quarterly Invoices	10/31/23, 1/31/24, 4/30/24, 7/31/24, 10/31/24, 1/31/25, 4/30/25, 7/31/25, 10/31/25	ongoing	2/23/24, 6/3/24, 7/18/24, 11/12/24, 1/22/25, 5/1/25, 7/18/25
1.2	Seasonal Progress Reports	10/31/23, 3/31/24, 6/30/24, 10/31/24, 3/31/25, 6/30/25, 10/31/25	ongoing	10/26/23, 3/28/24, 6/25/24, 10/9/24, 3/21/25, 6/30/25, 10/17/25
2	Stormwater Monitoring			
2.1	Collect continuous flow and turbidity data at four monitoring stations	9/30/2025	ongoing	Available on Acuity
2.2	Collect stormwater runoff samples during eight events per year	9/30/2025	ongoing	NA
2.3	Collect three diurnal non-event snowmelt events if conditions allow	9/30/2025	ongoing	NA
2.4	Collect flow bypass data in both vaults	9/30/2025	ongoing	Available in Seasonal Progress Reports
2.5	Provide precipitation data to date	9/30/2025	ongoing	Available in Seasonal Progress Reports
2.6	Provide hydrograph, turbidity, and sample distribution graphs to date	9/30/2025	ongoing	Available in Seasonal Progress Reports
3	Condition Assessments			
3.1	Estimate Road RAM score prior to eight sampled events	Discontinued as of June 1, 2021	100%	NA
3.2	Measure depth of sediment in both vaults after sampled events	9/30/2025	ongoing	

				Available in Seasonal Progress Reports
4	Final Report			
4.1	Provide raw data	3/31/2024, 3/31/2025	ongoing	Available in Annual Stormwater Monitoring Report
4.2	Provide treatment effectiveness analysis	3/31/2024, 3/31/2025	ongoing	Available in Annual Stormwater Monitoring Report
4.3	Correlate Road RAM score to pollutant concentration and load	Discontinued WY20	100%	Available in Annual Stormwater Monitoring Report
4.4	Provide mass loading v. volume calculations for select events	6/30/2016	100%	3/31/16, 6/30/16

Task 1: Project Administration

1. Invoices

Quarterly invoices will be submitted for this project covering the following periods:

1) July 1, 2023 - December, 2023 (due January 31, 2024)
2) January 1, 2024 - March 31, 2024 (due April 30, 2024)
3) April 1, 2024 - June 30, 2024 (due July 31, 2024)
4) July 1, 2024 - September 30, 2024 (due October 31, 2024)
5) October 1, 2024 - December 31, 2024 (due January 31, 2025)
6) January 1, 2025 - March 31, 2025 (due April 30, 2025)
7) April 1, 2025 - June 30, 2025 (due July 31, 2025)
8) July 1, 2025 - September 30, 2025 (due October 31, 2025)
9) October 1, 2025 - December 31, 2025 (due January 31, 2026)
10) January 1, 2026 - March 31, 2026 (due April 30, 2026)
11) April 1, 2026 - June 30, 2026 (due July 31, 2026)
12) July 1, 2026 - September 30, 2026 (due October 31, 2026)
13) October 1, 2026 - December 31, 2026 (due January 31, 2027)
14) January 1, 2027 - March 31, 2027 (due April 30, 2027)
15) April 1, 2027 - June 30, 2027 (due July 31, 2027)
16) July 1, 2027 - September 30, 2027 (due October 31, 2027)
17) October 1, 2027 - December 31, 2027 (due January 31, 2028)
18) January 1, 2028 - March 31, 2028 (due April 30, 2028)
19) April 1, 2028 - June 30, 2028 (due July 31, 2028)

2. Progress Reports

Progress reports are not concurrent with quarterly invoices. Seasonal progress reports will be submitted for this project covering the following periods (report number is consistent with prior agreement's reports beginning May 2015):

#23: Summer: June 1, 2023 - September 30, 2023 (due October 31, 2023)
#24: Fall/winter: October 1, 2023 - February 29, 2024 (due March 31, 2024)
#25: Spring: March 1, 2024 - May 31, 2024 (due June 30, 2024)
#26: Summer: June 1, 2024 - September 30, 2024 (due October 31, 2024)
#27: Fall/winter: October 1, 2024 - February 29, 2025 (due March 31, 2025)
#28: Spring: March 1, 2025 - May 31, 2025 (due June 30, 2025)
#29: Summer: June 1, 2025 - September 30, 2025 (due October 31, 2025)
#30: Fall/winter: October 1, 2025 - February 29, 2024 (due March 31, 2026)
#31: Spring: March 1, 2026 - May 31, 2026 (due June 30, 2026)
#32: Summer: June 1, 2026 - September 30, 2026 (due October 31, 2026)
#33: Fall/winter: October 1, 2026 - February 29, 2027 (due March 31, 2027)
#34: Spring: March 1, 2027 - May 31, 2027 (due June 30, 2027)
#35: Summer: June 1, 2027 - September 30, 2027 (due October 31, 2027)
#36: Fall/winter: October 1, 2027 - February 29, 2028 (due March 31, 2028)
#37: Spring: March 1, 2028 - May 31, 2028 (due June 30, 2028)

Please accept this report as seasonal progress report #29 for the summer season of water year 2025.

Task 2: Stormwater Monitoring

1. Maintain four stormwater monitoring stations to collect continous flow and turbidity data

The summer season of WY25 began on June 1, 2025 and ended September 30, 2025. Continuous flow and turbidity were successfully monitored during this time period.

2. Collect stormwater runoff samples at four monitoring sites during eight runoff events per year

During the summer of WY25, three events were successfully sampled at Contech Inflow (CI), Jellyfish Inflow (JI), Contech Outflow (CO), and Jellyfish Outflow (JO) (thunderstorm events on August 23, 2025, August 25, 2025, and September 2, 2025, see Appendix A, Figure 7 - Figure 18 at the end of this report for hydrographs, continous turbidity, and sample distributions for the event sampled). The successful samples were composited and sent to the lab for analysis. This brings the water year total to eight sampled events at Contech Inflow, Jellyfish Inflow, Contech Outflow, and Jellyfish Outflow.

3. If conditions allow for non-event snowmelt sampling, analyze one composite consisting of three diurnals

This task is typically only applicable during the spring season and counts as one of the eight required events.

4. Install a pressure transducer in each treatment vault to identify bypass flow

New pressure transducers were installed in June 2016 and linked to the remote access data management system currently used at the SR431 monitoring site. Data indicate that during the summer of WY25 the Contech MFS cartridge filters were bypassed five times (during thunderstorm events on June 24, 2025, July 25, 2025, August 23, 2025, August 26, 2025, and August 27, 2025) (Figure 1), and the Jellyfish filters bypassed zero times (Figure 2).

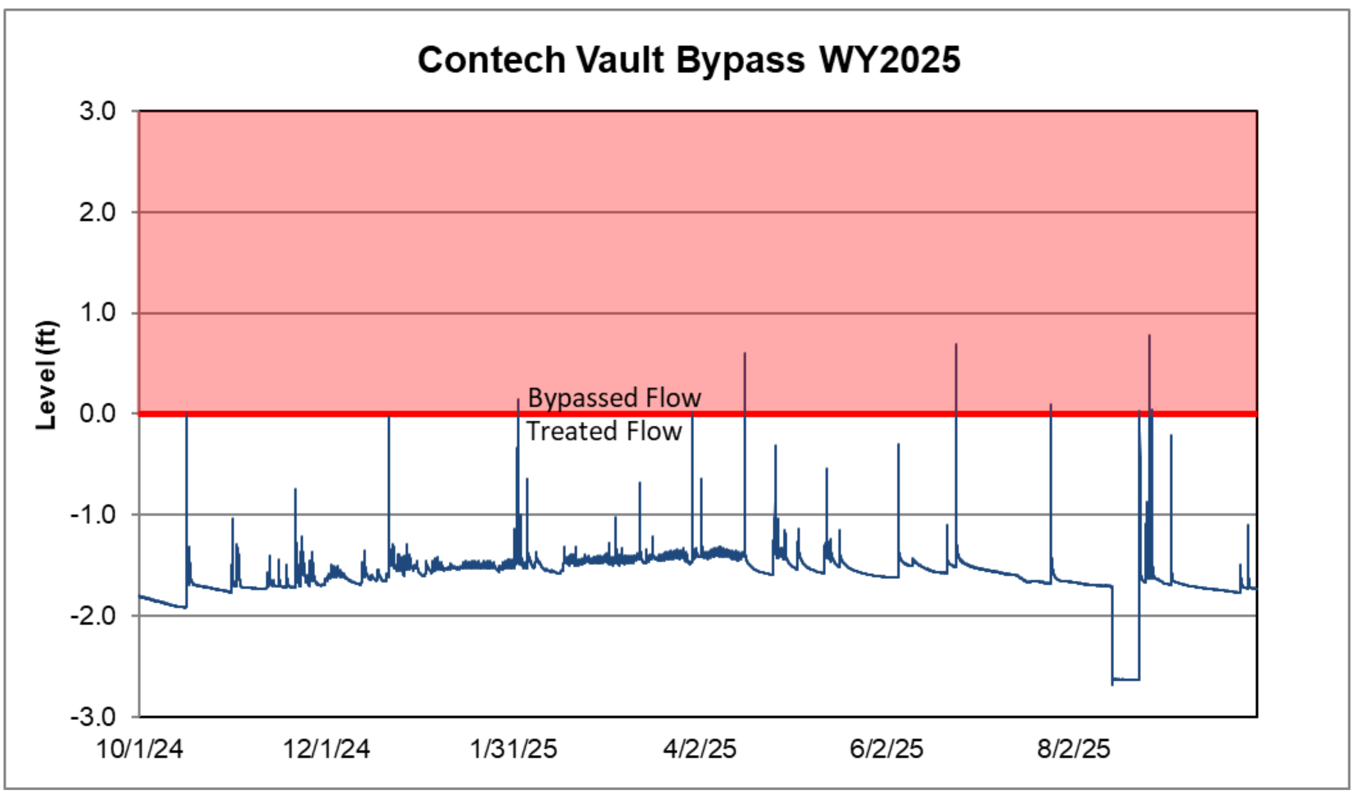

Figure 1 Bypassed flow in the Contech MFS vault for fall/winter, spring, and summer WY25.

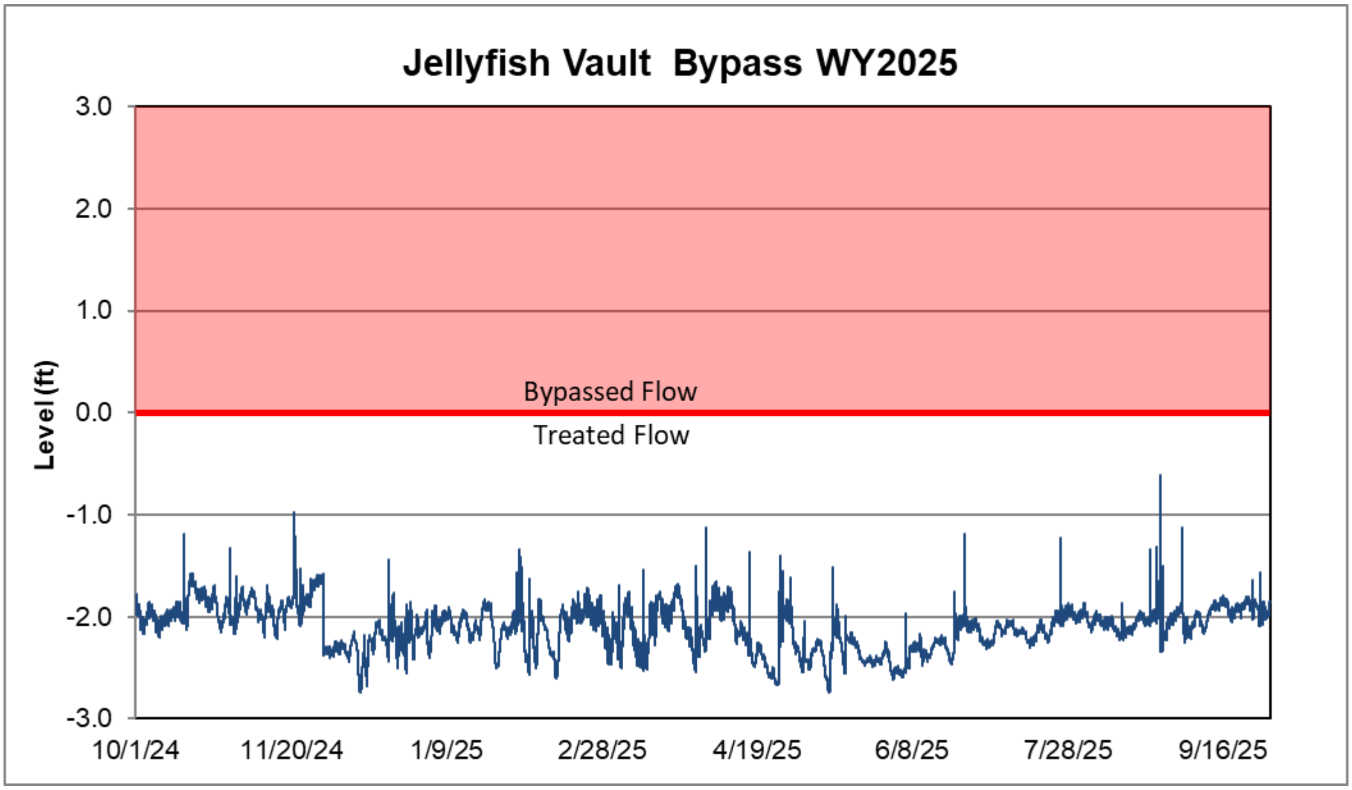

Figure 2 Bypassed flow in the Jellyfish vault for fall/winter, spring, and summer WY25.

5. Provide precipitation data to date

Table 2 provides summary data for all 51 fall/winter, spring, and summer WY25 precipitation events recorded at the NDOT meteorological station including event start and end dates, total precipitation, peak precipitation, minimum and maximum temperature, and precipitation type. Because of its high elevation, precipitation often falls in the form of snow during fall/winter and spring and thus does not always generate sufficient runoff for sampling. In general, events consisting of less than 0.5 inches of rain do not produce sufficient runoff for sampling. However, some events less than 0.5 inches can be successfully sampled.

Table 2 Summary of fall/winter, spring, and summer precipitation events at SR431 for WY25. Highlighted rows indicate events that were sampled.

Station ID	Precip Event (#)	Precipitation event start (PST)	Event end (PST)	Event duration (days)	Interevent duration (days)	Event precipitation (inches)	Event peak precipitation (inch/5min)	Event minimum temp (°C)	Event maximum temp (°C)	Type of Precipitation
NDOT	--	--	5/13/2024 18:25	--	--	--	--	--	--	--
NDOT	NDOT-25-01	10/16/2024 10:20	10/17/2024 16:45	1.267	155.7	0.4190	0.055	0	8	Rain
NDOT	NDOT-25-02	10/28/2024 21:55	10/28/2024 21:55	0.000	11.2	0.0040	0.004	-1	-1	Snow
NDOT	NDOT-25-03	10/31/2024 5:00	10/31/2024 10:50	0.243	2.3	0.1000	0.008	-1	1	Rain
NDOT	NDOT-25-04	11/1/2024 21:30	11/3/2024 8:35	1.462	1.4	0.2720	0.008	-2	3	Snow
NDOT	NDOT-25-05	11/11/2024 12:40	11/12/2024 9:05	0.851	8.2	0.1320	0.012	-7	0	Rain/Snow
NDOT	NDOT-25-06	11/13/2024 18:00	11/15/2024 3:25	1.392	1.4	0.0160	0.004	-4	4	Rain/Snow
NDOT	NDOT-25-07	11/18/2024 3:55	11/18/2024 3:55	0.000	3.0	0.0040	0.004	-3	-3	Snow
NDOT	NDOT-25-08	11/20/2024 19:55	11/21/2024 8:05	0.507	2.7	0.3280	0.012	-1	3	Rain/Snow
NDOT	NDOT-25-09	11/22/2024 21:35	11/23/2024 18:30	0.872	1.6	0.5560	0.016	-3	2	Rain, Snow
NDOT	NDOT-25-10	11/25/2024 9:35	11/26/2024 7:25	0.910	1.6	0.3600	0.008	-2	1	Rain/Snow
NDOT	NDOT-25-11	12/12/2024 6:50	12/17/2024 17:00	5.424	16.0	2.0000	0.012	-10	4	Snow, Rain
NDOT	NDOT-25-12	12/21/2024 11:50	12/23/2024 2:40	1.618	3.8	0.3060	0.023	1	6	Rain
NDOT	NDOT-25-13	12/24/2024 7:40	12/27/2024 6:45	2.962	1.2	1.0920	0.008	-7	2	Rain/Snow
NDOT	NDOT-25-14	12/28/2024 9:10	12/31/2024 13:50	3.194	1.1	0.9400	0.012	-9	5	Rain/Snow
NDOT	NDOT-25-15	1/3/2025 12:55	1/6/2025 22:00	3.378	3.0	0.5400	0.012	-7	5	Snow, Rain
NDOT	NDOT-25-16	1/26/2025 1:15	1/26/2025 1:15	0.000	19.1	0.0040	0.004	-8	-8	Snow
NDOT	NDOT-25-17	1/31/2025 11:45	2/2/2025 18:50	2.295	5.4	2.1140	0.027	-1	4	Snow, Rain
NDOT	NDOT-25-18	2/4/2025 1:10	2/7/2025 16:25	3.635	1.3	2.6820	0.019	-10	3	Rain, Snow
NDOT	NDOT-25-19	2/11/2025 17:40	2/11/2025 17:40	0.000	4.1	0.0040	0.004	-5	-5	Rain
NDOT	NDOT-25-20	2/13/2025 1:20	2/16/2025 11:35	3.427	1.3	1.5470	0.019	-10	1	Rain, Snow
NDOT	NDOT-25-21	2/19/2025 2:00	2/19/2025 19:50	0.743	2.6	0.0400	0.004	-1	5	Rain, Snow
NDOT	NDOT-25-22	3/2/2025 3:20	3/3/2025 10:50	1.313	10.3	0.0760	0.004	-5	1	Snow
NDOT	NDOT-25-23	3/5/2025 7:30	3/6/2025 18:25	1.455	1.9	0.4160	0.008	-8	-1	Snow
NDOT	NDOT-25-24	3/12/2025 5:05	3/15/2025 10:35	3.229	5.4	0.7040	0.008	-10	4	Snow
NDOT	NDOT-25-25	3/16/2025 23:25	3/17/2025 15:50	0.684	1.5	0.7440	0.012	-6	0	Snow
NDOT	NDOT-25-26	3/27/2025 13:00	3/27/2025 20:30	0.313	9.9	0.0120	0.004	-1	4	Rain, Snow
NDOT	NDOT-25-27	3/30/2025 6:55	4/2/2025 15:00	3.337	2.4	1.7320	0.012	-8	3	Rain, Snow
NDOT	NDOT-25-28	4/3/2025 15:30	4/3/2025 15:30	0.000	1.0	0.0040	0.004	-2	-2	Snow
NDOT	NDOT-25-29	4/7/2025 13:00	4/7/2025 13:00	0.000	3.9	0.0040	0.004	3	3	Snow
NDOT	NDOT-25-30	4/16/2025 17:05	4/16/2025 18:15	0.049	9.2	0.1570	0.027	3	5	Rain
NDOT	NDOT-25-31	4/26/2025 1:40	4/27/2025 13:10	1.479	9.3	0.9680	0.012	-3	0	Snow
NDOT	NDOT-25-32	4/29/2025 18:05	4/29/2025 20:20	0.094	2.2	0.0360	0.008	6	9	Rain
NDOT	NDOT-25-33	5/3/2025 18:55	5/5/2025 7:30	1.524	3.9	0.1040	0.008	1	8	Rain
NDOT	NDOT-25-34	5/12/2025 14:00	5/14/2025 19:30	2.229	7.3	0.1360	0.012	-2	9	Rain, Snow
NDOT	NDOT-25-35	5/17/2025 14:25	5/17/2025 15:45	0.056	2.8	0.0480	0.008	3	4	Snow
NDOT	NDOT-25-36	6/5/2025 16:05	6/5/2025 18:00	0.080	19.0	0.1680	0.016	9	16	Thunderstorm
NDOT	NDOT-25-37	6/21/2025 13:20	6/21/2025 13:55	0.024	15.8	0.0280	0.008	1	1	Thunderstorm
NDOT	NDOT-25-38	6/24/2025 17:05	6/24/2025 18:40	0.066	3.1	0.3830	0.082	9	17	Thunderstorm
NDOT	NDOT-25-39	7/23/2025 17:00	7/23/2025 17:00	0.000	28.9	0.0040	0.004	19	19	Thunderstorm
NDOT	NDOT-25-40	7/25/2025 15:35	7/25/2025 20:00	0.184	1.9	0.0970	0.066	9	14	Thunderstorm
NDOT	NDOT-25-41	7/30/2025 0:10	7/30/2025 2:05	0.080	4.2	0.0120	0.004	12	14	Thunderstorm
NDOT	NDOT-25-42	8/23/2025 12:55	8/23/2025 18:45	0.243	24.5	0.1720	0.039	14	23	Thunderstorm
NDOT	NDOT-25-43	8/24/2025 9:35	8/24/2025 11:55	0.097	0.6	0.0240	0.008	15	17	Thunderstorm
NDOT	NDOT-25-44	8/25/2025 15:30	8/25/2025 17:40	0.090	1.1	0.1560	0.016	12	16	Thunderstorm
NDOT	NDOT-25-45	8/26/2025 14:25	8/26/2025 19:05	0.194	0.9	2.0050	0.191	5	17	Thunderstorm
NDOT	NDOT-25-46	8/27/2025 2:10	8/27/2025 22:50	0.861	0.3	0.1730	0.035	9	19	Thunderstorm
NDOT	NDOT-25-47	9/2/2025 15:55	9/2/2025 20:15	0.181	5.7	0.1660	0.019	11	16	Thunderstorm
NDOT	NDOT-25-48	9/10/2025 11:30	9/10/2025 11:35	0.003	7.6	0.012	0.008	10	11	Thunderstorm
NDOT	NDOT-25-49	9/18/2025 23:20	9/19/2025 13:35	0.594	8.5	0.0160	0.004	11	17	Rain
NDOT	NDOT-25-50	9/25/2025 8:25	9/25/2025 14:00	0.233	5.8	0.0280	0.004	10	20	Thunderstorm
NDOT	NDOT-25-51	9/27/2025 21:15	9/28/2025 1:00	0.156	2.3	0.0600	0.016	10	13	Thunderstorm

6. Provide hydrograph, continuous turbidity, and sample distribution graphs for each sampled event

See Appendix A Figure 7 - Figure 18 at the end of this report for hydrographs, continous turbidity, and sample distributions for the events sampled in the summer season of WY25.

Task 3: Condition Assessments

1. Estimate Road RAM score prior to monitored runoff events

This task was initiated in November 2015 following a meeting between Tahoe RCD and NDOT where it was decided that determining a Road RAM score prior to runoff events was valuable. However, after five and a half years of collecting this data, it was clear that there is no relationship between Road RAM score and event mean sediment concentration at the SR431 site and this task was discontinued beginning June 1, 2021 (summer season of WY21).

2. Measure depth of sediment in vaults after eight monitored runoff events

This task was initiated November 2015 following the meeting between Tahoe RCD and NDOT mentioned above where it was determined that post event sediment depth was valuable information. The depths shown in Table 3 represent the average depth in each vault in feet. All clean-outs restored sediment depth in the respective vaults to near zero. Summer and fall of WY18 were dry and minimal sediment accumulation occurred by January of 2019 (~0.1 feet for both the Contech MFS and the Jellyfish). No sediment accumulation measurements were conducted during the lapse of funding that occurred July 2018-December 2018. February 2019 was the snowiest month on record for many areas in the Tahoe basin, and therefore it was not possible to conduct sediment accumulation until May 2019 due to lack of access to the vaults. By May 2019, substantial sediment had entered the system and a cleanout was performed in June 2019, restoring the sediment depth to zero. A small amount of sediment accumulation occurred by the end of summer WY19 due to a series of thunderstorms in September. Little to no sediment accumulation occurred during the fall/winter of WY20. Some sediment accumulation was observed during the spring of WY20. Both vaults were vactored on May 12, 2020. Little to no sediment accumulation was observed at the Contech vault over the summer of WY20, possibly due to the fact that sediment accumulation in the splitter chamber was preferentially routing flow to the Jellyfish. The Jellyfish vault saw 0.13 feet of summertime sediment accumulation (from 0.11 feet in June 2020 to 0.24 feet in September 2020). Little to no sediment accumulation occurred during the fall/winter of WY21 in either vault. Both the Contech and the Jellyfish vaults were vactored on March 8, 2021. A small amount of sediment accumulation occurred during the spring of WY21. The pipes from the splitter vault to the outflows were cleaned with a pressure washer by Tahoe RCD on May 11, 2021. Minimal sediment accumulation occurred over the summer of WY21. The system was fully vactored and rinsed on October 21, 2021, and the filters to both the Contech MFS and the Jellyfish were replaced. There was minimal sediment accumulation during the fall/winter and spring of WY22. In the summer of WY22 there was minimal sediment accumulation in the Jellyfish vault and some accumulation in the Contech vault. On November 17, 2022 NDOT rinsed the Contech MFS filters and vactored the hydrodynamic separator, the splitter vault, splitter to inflow pipes, and Contech MFS vault. In the record-breaking fall/winter and spring of WY23, manhole access to the vaults was inaccessible, so sediment depth was not recorded after the sampled events in the spring season. Vaults were accessible on June 4, 2023, so a sediment depth was taken in both vaults then. During the summer of WY23, construction activities made manhole access challenging, but sediment depth was taken on June 18, 2023. Sediment depth was measured on August 21, 2023 and had decreased. There is no record of maintenance between these two dates, but it's possible that NDOT maintained the vault system and didn't inform us. Sediment depth increased minimally in the Contech MFS vault and remained stable in the Jellyfish vault as of November 1, 2023. Sediment increased in the Jellyfish vault and remained the same in the Contech MFS vault as of May 6, 2024. Both vaults were vactored by NDOT on June 11, 2024 and sediment level measured zero on August 1, 2024. Sediment increased slightly as of September 25, 2024. No sediment depth measurements were taken during the fall/winter of WY25. Sediment didn't accumulate in the Contech MFS and increased slightly in the Jellyfish as of March 25, 2025. Sediment accumulated in the vault by June 10, 2025. NDOT maintenance crews cleaned out the splitter vault, Jellyfish and Contech vaults on August 14, 2025 – they did not contact Tahoe RCD before performing this maintenance. Sediment was measured on September 18, 2025 and minimal sediment accumulation was observed.

Table 3 Average depth of sediment in vaults.

Date Time	Contech MFS (ft)	Jellyfish (ft)
12/30/2015	0.33	0.92
3/16/2016	0.58	1.14
4/15/2016	0.61	na
4/22/2016	0.56	na
6/3/2016	0.75	2.17
8/3/2016	1.10	2.05
10/20/2016	na	1.92
12/30/2016	0.10	0.05
4/3/2016	1.00	2.30
4/20/2017	1.90	2.85
5/1/2017	0.10	0.43
5/18/2017	0.08	0.37
5/22/2017	0.10	0.46
6/19/2017	0.12	0.38
8/19/2017	0.00	0.00
9/21/2017	0.01	0.10
10/5/2017	0.03	0.15
10/24/2017	0.00	0.04
11/14/2017	0.10	1.19
11/17/2017	0.00	0.10
2/2/2018	0.17	0.30
4/7/2018	0.00	0.05
5/17/2018	0.08	0.36
1/2/2019	0.10	0.09
5/8/2019	0.25	0.38
6/25/2019	0.00	0.00
10/21/2019	0.10	0.09
2/26/2020	0.10	0.12
4/22/2020	0.19	0.38

Table 3 Continued.

Date Time	Contech MFS (ft)	Jellyfish (ft)
6/17/2020	0.10	0.11
8/7/2020	0.10	0.13
9/3/2020	0.10	0.24
11/4/2020	0.08	0.22
2/16/2021	0.06	0.22
3/22/2021	0.06	0.09
5/11/2021	0.10	0.11
6/9/2021	0.10	0.03
10/13/2021	0.06	0.09
10/26/2021	0.06	0.09
1/27/2022	0.00	0.09
3/30/2022	0.06	0.07
4/22/2022	0.06	0.09
5/18/2022	0.06	0.09
9/29/2022	0.15	0.09
10/25/2022	0.10	0.09
6/4/2023	0.10	0.00
6/18/2023	0.12	0.22
8/21/2023	0.08	0.09
11/1/2023	0.10	0.09
4/29/2024	0.10	0.11
5/6/2024	0.10	0.13
8/1/2024	0.00	0.00
9/25/2024	0.10	0.09
3/25/2025	0.10	0.11
6/10/2025	0.19	0.18
9/18/2025	0.10	0.09

Figure 3 Equipment housing and meteorological station in excellent condition on 9/24/25.

Figure 4 Pavement free of excessive sediment accumulation on 9/24/25.

Task 4: Final Report

1. Provide raw data

Final reporting for each water year is provided as part of the Annual Stormwater Monitoring Report (due March 31st of each year), but raw data can be viewed at any time on Acuity.

2. Provide treatment effectiveness analysis following formats outlined in the RSWMP FIG

Final reporting for each water year is provided as part of the Annual Stormwater Monitoring Report (due March 31st of each year) which includes treatment effectiveness evaluations for FSP, TN, and TP on a seasonal and annual basis as well as for sampled events. The data for FSP in the Annual Stormwater Monitoring Report is based on water quality samples and continuous turbidity. However, treatment effectiveness for FSP for WY25 is provided for all events to date for the Contech MFS in Table 4 and the Jellyfish in Table 5 based on continuous turbidity, a proxy measurement for FSP (2NDNATURE et al 2014). Removal efficiencies in red indicate that FSP was flushed from the system or that outflow turbidity sensors were inundated with accumulated sediment. A removal efficiency of 100% indicates no outflow from the Contech MFS vault, which occurs when influent volumes are less than 3,000 cubic feet (the approximate storage capacity of the Contech MFS vault) and the vault can accommodate the new flow. Sometimes the vault is full from a previous event and even small inflow volumes will result in outflow. The holding capacity of the Contech MFS is likely what allows it to generally be more efficient than the Jellyfish; not only because it often doesn't outflow, but also because sediment has the opportunity to settle out during the longer residence time in the vault.

During the summer season of WY25, Contech MFS FSP removal efficiencies ranged from 36% to 92% (Table 4). The event with the poorest FSP removal efficiency was the thunderstorm on August 26, 2025.

During the summer season of WY25, Jellyfish FSP removal efficiencies ranged from -420% to 91% (Table 5). The event with the poorest FSP removal efficiency was the thunderstorm on June 5, 2025 where the outflow FSP was greater than the inflow FSP. The system had not had a full clean-out for a year at that time, so it’s possible that outflow was dirtier than inflow. It is also possible that the sensors need to be cleaned. Sensors were cleaned June

10, 2025 which may explain why the event with the greatest FSP removal efficiency was the thunderstorm on June 21, 2025.

Table 4 Contech MFS FSP removal efficiency for each event of fall/winter, spring, and summer WY25.

CONTECH MFS WY25									
Runoff Start Date Time	Runoff End Date Time	Runoff Type	Event Duration	Influent Volume (cf)	Effluent Volume (cf)	Influent FSP (lbs)	Effluent FSP (lbs)	FSP Removal Efficiency	Volume Retained
10/16/24 10:40	10/16/24 13:20	Rain	2:40	366	245	1.474	1.443	2%	33%
10/17/24 11:30	10/17/24 12:25	Rain	0:55	17	3	0.036	0.005	87%	82%
10/31/24 5:05	10/31/24 10:35	Rain/Snow	5:30	148	84	1.753	0.702	60%	43%
11/1/24 22:00	11/2/24 11:05	Rain/Snow	13:05	117	34	0.329	0.113	66%	71%
11/20/24 23:45	11/21/24 12:30	Rain	12:45	328	250	2.411	1.978	18%	24%
11/22/24 21:40	11/23/24 16:00	Rain, Snow	18:20	195	114	0.886	0.658	26%	42%
11/26/24 13:00	11/26/24 13:45	Event Snowmelt	0:45	13	1	0.053	0.002	96%	95%
12/13/24 12:20	12/13/24 13:50	Event Snowmelt	1:30	34	14	0.282	0.069	75%	59%
12/21/24 14:15	12/23/24 0:40	Rain	34:25	377	253	4.413	2.480	44%	33%
12/24/24 15:35	12/24/24 16:40	Rain	1:05	11	3	0.067	0.010	85%	76%
12/27/24 8:40	12/27/24 12:25	Snow, Rain	3:45	123	84	0.780	0.485	38%	32%
1/31/25 13:30	2/2/25 18:15	Rain on Snow	52:45	3,627	3,241	10.130	15.184	-50%	11%
2/4/25 16:45	2/4/25 19:40	Rain on Snow	2:55	278	236	0.522	0.734	-41%	15%
2/16/25 13:55	2/16/25 15:00	Event Snowmelt	1:05	17	3	0.041	0.009	78%	84%
2/20/25 11:00	2/20/25 12:15	Event Snowmelt	1:15	19	1	0.008	0.007	12%	92%
3/3/25 11:05	3/3/25 12:10	Non-event Snowmelt	1:05	33	18	0.010	0.067	-574%	44%
3/5/25 10:45	3/5/25 16:55	Event Snowmelt	6:10	166	131	0.024	0.888	-3575%	21%
3/7/25 11:05	3/7/25 11:55	Non-event Snowmelt	0:50	7	0	0.001	0.000	100%	100%
3/13/25 11:15	3/13/25 14:35	Event Snowmelt	3:20	213	197	0.039	1.023	-2513%	7%
3/17/25 11:40	3/17/25 15:45	Event Snowmelt	4:05	42	18	0.008	0.048	-531%	58%
3/30/25 10:35	3/30/25 20:00	Rain on Snow	9:25	381	283	21.792	1.401	94%	26%
3/31/25 15:20	3/31/25 18:30	Post-event Snowmelt	3:10	8	0	0.160	0.000	100%	100%
4/2/25 11:50	4/2/25 17:25	Non-event Snowmelt	5:35	303	199	8.280	0.480	94%	34%
4/16/25 16:55	4/16/25 18:10	Thunderstorm	1:15	342	300	19.326	1.138	94%	12%
4/26/25 1:35	4/27/25 15:40	Event Snowmelt	38:05	1,102	623	12.426	0.757	94%	43%
4/29/25 18:25	4/29/25 21:00	Thunderstorm	2:35	51	26	0.817	0.024	97%	50%
5/3/25 21:20	5/4/25 8:45	Rain	11:25	82	38	0.294	0.023	92%	54%
5/12/25 14:00	5/13/25 20:20	Event Snowmelt	30:20	193	100	1.419	0.078	95%	48%
5/14/25 19:00	5/14/25 19:50	Post-event Snowmelt	0:50	23	4	0.051	0.002	95%	83%
5/17/25 15:20	5/17/25 16:15	Non-event Snowmelt	0:55	46	23	0.093	0.011	88%	50%
6/5/25 16:15	6/5/25 18:35	Thunderstorm	2:20	271	189	1.104	0.083	92%	30%
6/21/25 13:20	6/21/25 14:15	Thunderstorm	0:55	47	21	0.648	0.064	90%	56%
6/24/25 17:10	6/24/25 19:10	Thunderstorm	2:00	773	707	11.610	6.610	43%	9%
7/25/25 15:40	7/25/25 16:25	Thunderstorm	0:45	175	116	4.269	1.185	72%	34%
8/23/25 13:10	8/23/25 14:45	Thunderstorm	1:35	253	100	2.115	0.715	66%	60%
8/25/25 15:55	8/25/25 18:15	Thunderstorm	2:20	217	52	0.573	0.128	78%	76%
8/26/25 14:25	8/26/25 19:50	Thunderstorm	5:25	3,454	2,877	22.534	14.457	36%	17%
8/27/25 12:10	8/27/25 13:40	Thunderstorm	1:30	295	144	1.930	0.560	71%	51%
9/2/25 17:10	9/2/25 20:05	Thunderstorm	2:55	324	115	1.069	0.292	73%	65%

Table 5 Jellyfish FSP removal efficiency for each event of fall/winter, spring, and summer WY25.

JELLYFISH WY25									
Runoff Start Date Time	Runoff End Date Time	Runoff Type	Event Duration	Influent Volume (cf)	Effluent Volume (cf)	Influent FSP (lbs)	Effluent FSP (lbs)	Removal Efficiency	Volume Retained
10/16/24 10:40	10/16/24 13:40	Rain	3:00	398	330	2.007	1.424	29%	17%
10/17/24 11:30	10/17/24 12:45	Rain	1:15	27	11	0.063	0.015	77%	61%
10/31/24 4:55	10/31/24 11:35	Rain/Snow	6:40	191	121	2.436	0.208	91%	36%
11/1/24 22:00	11/2/24 13:05	Rain/Snow	15:05	205	97	0.898	0.312	65%	53%
11/20/24 23:20	11/21/24 13:50	Rain	14:30	457	308	4.516	1.311	71%	33%
11/22/24 21:30	11/23/24 16:55	Rain, Snow	19:25	335	163	1.874	0.696	63%	51%
11/26/24 13:00	11/26/24 14:50	Event Snowmelt	1:50	35	8	0.271	0.017	94%	77%
12/12/24 14:10	12/12/24 14:30	Event Snowmelt	0:20	2	0	0.007	0.000	100%	100%
12/13/24 12:15	12/13/24 14:25	Event Snowmelt	2:10	66	26	0.615	0.046	93%	62%
12/21/24 14:15	12/23/24 3:20	Rain	37:05	522	309	6.327	1.922	70%	41%
12/24/24 15:10	12/25/24 14:20	Rain	23:10	83	6	0.513	0.017	97%	93%
12/26/24 14:10	12/26/24 16:30	Rain/Event Snowmelt	2:20	32	0	0.211	0.000	100%	100%
12/27/24 8:35	12/27/24 13:35	Rain on Snow	5:00	197	103	2.086	0.329	84%	47%
12/28/24 7:50	12/28/24 12:45	Rain on Snow	4:55	72	4	0.250	0.011	96%	95%
1/31/25 13:30	2/2/25 18:25	Rain on Snow	52:55	4,043	3,226	17.798	8.969	50%	20%
2/4/25 15:15	2/4/25 22:05	Rain on Snow	6:50	362	238	0.955	0.498	48%	34%
2/7/25 13:35	2/7/25 14:40	Event Snowmelt	1:05	12	0	0.025	0.000	100%	100%
2/16/25 13:45	2/16/25 16:55	Event Snowmelt	3:10	70	14	0.315	0.028	91%	79%
2/18/25 15:15	2/19/25 15:05	Rain on Snow	23:50	28	0	0.084	0.000	100%	100%
2/20/25 10:55	2/20/25 13:25	Event Snowmelt	2:30	61	17	0.042	0.114	-172%	72%
3/2/25 10:35	3/2/25 11:10	Event Snowmelt	0:35	5	0	0.006	0.000	100%	100%
3/3/25 11:00	3/3/25 13:25	Non-event Snowmelt	2:25	77	31	0.059	0.113	-91%	60%
3/5/25 10:45	3/5/25 17:45	Event Snowmelt	7:00	319	178	1.731	0.833	52%	44%
3/7/25 11:00	3/7/25 13:25	Non-event Snowmelt	2:25	46	10	0.071	0.021	70%	79%
3/13/25 11:15	3/13/25 16:55	Event Snowmelt	5:40	333	225	1.039	0.576	45%	32%
3/17/25 11:40	3/17/25 18:25	Event Snowmelt	6:45	166	69	0.344	0.100	71%	58%
3/30/25 10:35	3/30/25 19:55	Rain on Snow	9:20	382	263	21.901	9.157	58%	31%
3/31/25 15:20	3/31/25 18:30	Post-event Snowmelt	3:10	7	0	0.142	0.000	100%	100%
4/2/25 11:50	4/2/25 17:25	Non-event Snowmelt	5:35	305	183	8.629	3.391	61%	40%
4/16/25 16:55	4/16/25 18:10	Thunderstorm	1:15	350	304	17.743	12.158	31%	13%
4/26/25 1:35	4/27/25 15:30	Event Snowmelt	37:55	1,088	690	10.593	5.658	47%	37%
4/29/25 18:25	4/29/25 21:00	Thunderstorm	2:35	53	31	0.574	0.157	73%	42%
5/3/25 21:20	5/4/25 8:40	Rain	11:20	81	40	0.182	0.116	36%	50%
5/12/25 14:00	5/13/25 20:10	Event Snowmelt	30:10	188	107	0.473	0.369	22%	43%
5/14/25 19:00	5/14/25 19:50	Post-event Snowmelt	0:50	22	7	0.019	0.026	-34%	69%
5/17/25 15:20	5/17/25 16:15	Non-event Snowmelt	0:55	45	24	0.033	0.092	-179%	47%
6/5/25 16:15	6/5/25 18:35	Thunderstorm	2:20	278	190	0.124	0.646	-420%	32%
6/21/25 13:20	6/21/25 14:10	Thunderstorm	0:50	51	33	0.422	0.039	91%	36%
6/24/25 17:10	6/24/25 19:00	Thunderstorm	1:50	776	731	9.647	5.212	46%	6%
7/25/25 15:40	7/25/25 16:35	Thunderstorm	0:55	197	164	3.123	0.614	80%	17%
8/23/25 13:10	8/23/25 14:40	Thunderstorm	1:30	272	63	2.216	0.259	88%	77%
8/25/25 15:55	8/25/25 18:15	Thunderstorm	2:20	244	147	0.588	0.141	76%	40%
8/26/25 14:25	8/26/25 19:50	Thunderstorm	5:25	3,702	3,390	18.545	7.869	58%	8%
8/27/25 12:10	8/27/25 13:40	Thunderstorm	1:30	313	244	1.637	0.392	76%	22%
9/2/25 17:10	9/2/25 20:05	Thunderstorm	2:55	360	229	1.026	0.362	65%	36%

In accordance with the RSWMP FIG section 2.1, monitoring for trends at urban catchment outfalls is important because it provides information needed for evaluating progress toward TMDL and other regulatory goals. The objective of the trends monitoring is to detect and report the cumulative load reduction benefits of all actions implemented within the catchment over long time frames and ultimately demonstrate a local and regional reduction in pollutant loading to the lake. This statement holds true for the inflow sites at SR431. For the outflow sites at SR431, trend analysis will give insight into the effectiveness of maintenance activities in sustaining FSP removal efficiencies of the treatment vaults.

Average annual loads for FSP, TN, and TP presented in this section are normalized by both catchment size (acres) and inches of precipitation to detect load reductions resulting from improved management activities within the catchment and for comparison between water years. Percent runoff (runoff coefficient) is a function of catchment size, the amount of rainfall received, and the volume measured at the catchment outfall. It represents the fraction of runoff that was measured at the outfall compared to what would theoretically be expected if all the rainfall that fell in the catchment were measured at the outfall as runoff.

Normalized average annual load charts for the SR431 catchment show whether there is an upward, downward, or neutral trend in average annual loading of FSP, TN, and TP at each site. Also presented is a table that shows average annual percent runoff and normalized seasonal and average annual loads and trend statistics. The trend statistics (Tau, p-value, and Theil slope) indicate if there has been a statistically significant upward, downward, or neutral trend in pollutant loading in the catchment. Tau is a non-parametric measure of the relationship between data when data does not have a normal distribution, similar to the r^2 value in a regression on normally distributed data. Tau is a measure of the correspondence between two rankings, in this case are water year and pollutant load. Tau is a correlation coefficient that returns a value between -1 and 1 where 0 is no relationship, 1 is a perfect identical relationship and -1 is a perfect opposite relationship with regards to ranked pairs. The water years will always be ranked in order from 2014 through 2024. The pollutant loads are then ranked from least to most as well. The rankings of the pairs are then compared. If pollutant load steadily increases from year to year there will be a perfect identical ranking between the pairs, resulting in a Tau of 1. If pollutant load steadily decreases from year to year there will a perfect opposite ranking of the pairs, resulting in a Tau of -1. The p-value indicates the confidence level in Tau; a p-value less than 0.05 ($p<0.05$) denotes a significant relationship. The Theil slope is similar to the slope for a regression on normalized data but used for data that is not normally distributed. Lastly, charts showing annual sediment and nutrient loads and annual precipitation totals for each site are included to help visualize how precipitation and loads have varied over the period of record for each site. Trends data is updated annually with the Annual Stormwater Monitoring Report, so data shown here is through the end of WY24.

Trends data for the Contech MFS inflow is shown in Figure 5 and Table 6. Trends data for the Jellyfish inflow is shown in Figure 6 and Table 7.

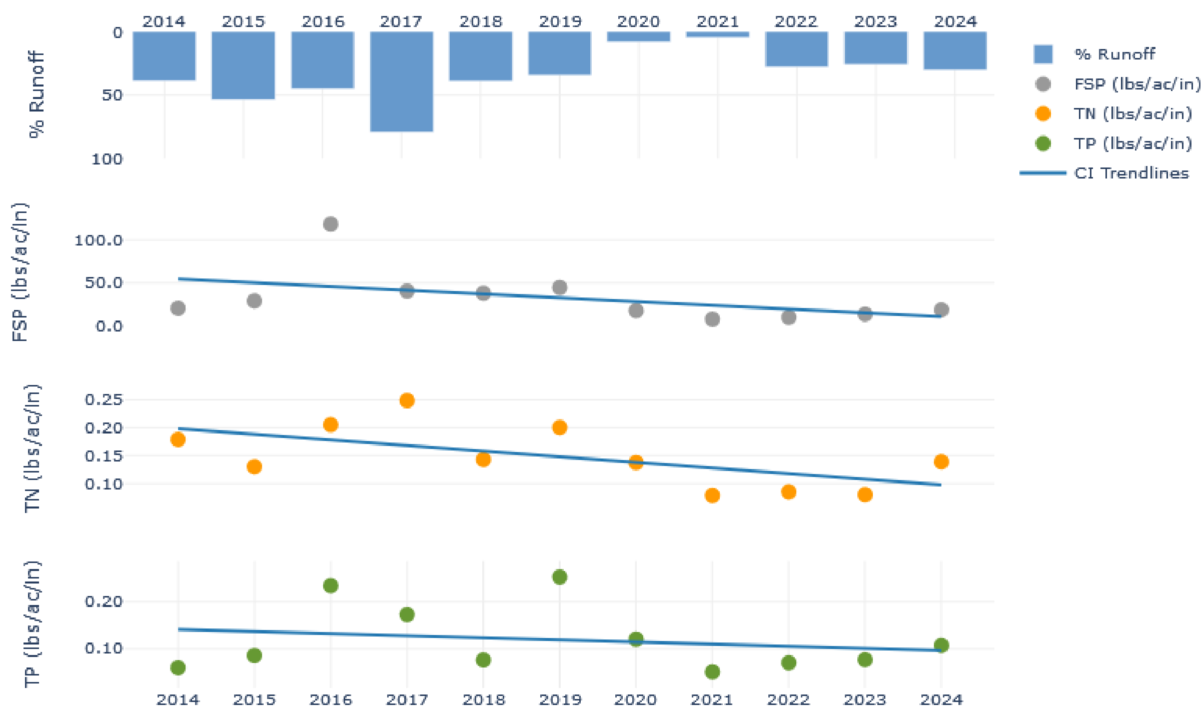

Figure 5 11-year rainfall normalized annual pollutant load trends in FSP, TN, and TP loads at the Contech MFS Inflow, WY14-24.

- Percent runoff varied between 4.4% in WY21 to 78.9% in WY17. Differences in % runoff between CI and JI are attributed to sediment accumulation in the splitter chamber that caused an unequal division of runoff to each vault.
- There is no significant trend in normalized annual FSP loads ($p>0.05$).
- There is no significant trend in normalized annual TN loads ($p>0.05$).
- There is no significant trend in normalized annual TP loads ($p>0.05$).

Table 6 11-year seasonal and annual rainfall normalized pollutant loads at the Contech MFS Inflow, WY14-24.

Year	% Runoff	FSP (lbs/acre/inch)				TN (lbs/acre/inch)				TP (lbs/acre/inch)			
		Fall/ Winter	Spring	Summer	Annual	Fall/ Winter	Spring	Summer	Annual	Fall/ Winter	Spring	Summer	Annual
2014	38.6%	8.358	43.467	23.094	20.612	0.065	0.230	0.386	0.179	0.021	0.122	0.079	0.060
2015	53.2%	29.875	41.461	7.517	29.122	0.127	0.164	0.086	0.130	0.097	0.110	0.015	0.086
2016	44.7%	84.812	183.564	0.000	118.153	0.179	0.260	0.000	0.205	0.149	0.399	0.000	0.234
2017	78.9%	19.239	139.993	20.235	40.646	0.178	0.611	0.048	0.248	0.064	0.688	0.035	0.173
2018	39.0%	23.391	51.881	20.808	38.173	0.136	0.116	0.554	0.143	0.083	0.068	0.113	0.076
2019	34.2%	11.578	153.825	8.569	44.624	0.083	0.565	0.227	0.200	0.066	0.866	0.070	0.253
2020	8.0%	9.896	26.907	39.794	17.783	0.040	0.148	0.723	0.138	0.068	0.175	0.288	0.120
2021	4.4%	2.493	22.475	23.756	8.003	0.010	0.130	0.671	0.079	0.016	0.132	0.185	0.051
2022	27.7%	3.203	44.055	10.439	10.133	0.050	0.191	0.184	0.085	0.030	0.267	0.076	0.070
2023	25.7%	2.939	45.010	7.690	13.743	0.025	0.150	0.209	0.080	0.022	0.230	0.054	0.077
2024	30.2%	11.206	36.101	14.661	18.790	0.106	0.148	0.507	0.139	0.072	0.188	0.086	0.107
Tau	na	-0.455	-0.236	0.055	-0.345	-0.382	-0.273	0.236	-0.382	-0.200	0.127	0.273	-0.055
P-Value	na	0.052	0.312	0.815	0.139	0.102	0.243	0.312	0.102	0.392	0.586	0.243	0.815
Theil Slope (per year)	na	-2.717	-2.760	0.095	-2.473	-0.011	-0.008	0.030	-0.009	-0.007	0.007	0.008	-0.001

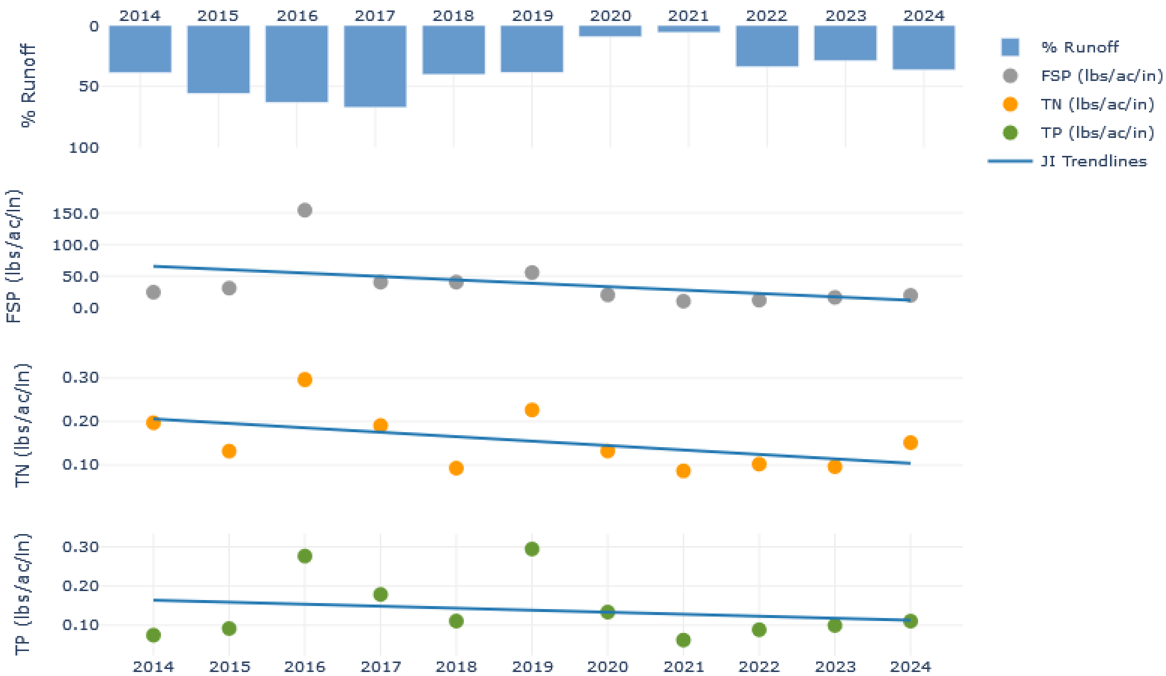

Figure 6 11-year rainfall normalized annual pollutant load trends in FSP, TN, and TP loads at the Jellyfish Inflow, WY14-24.

- Percent runoff varied between 5.7% in WY21 to 67.2% in WY17. Differences in % runoff between CI and JI are attributed to sediment accumulation in the splitter chamber that caused an unequal division of runoff to each vault.
- There is no significant trend in normalized annual FSP loads (p>0.05). However, there is a significant decreasing trend in the normalized fall/winter FSP load (p=0.016 and Tau= -0.564.)
- There is no significant trend in normalized annual TN loads (p>0.05).
- There is no significant trend in normalized annual TP loads (p>0.05).

Table 7 11-year seasonal and annual rainfall normalized pollutant loads at the Jellyfish Inflow, WY14-24.

Year	% Runoff	FSP (lbs/acre/inch) Fall/ Winter	FSP Spring	FSP Summer	FSP Annual	TN (lbs/acre/inch) Fall/ Winter	TN Spring	TN Summer	TN Annual	TP (lbs/acre/inch) Fall/ Winter	TP Spring	TP Summer	TP Annual
2014	38.6%	13.733	51.563	18.989	24.558	0.060	0.313	0.384	0.197	0.033	0.160	0.075	0.075
2015	55.5%	30.438	46.614	8.065	31.038	0.116	0.174	0.109	0.132	0.095	0.133	0.017	0.092
2016	62.9%	117.285	228.200	0.000	154.437	0.214	0.457	0.000	0.296	0.223	0.385	0.000	0.276
2017	67.2%	19.818	137.664	15.455	40.456	0.096	0.643	0.061	0.191	0.065	0.714	0.033	0.179
2018	40.2%	20.067	59.455	18.262	40.577	0.072	0.076	0.526	0.093	0.070	0.146	0.105	0.111
2019	38.3%	12.118	199.427	9.225	55.670	0.090	0.649	0.263	0.227	0.059	1.068	0.071	0.294
2020	9.1%	7.699	43.672	29.192	20.335	0.034	0.172	0.630	0.132	0.057	0.263	0.221	0.134
2021	5.7%	2.562	32.779	26.575	10.351	0.011	0.166	0.672	0.087	0.016	0.183	0.197	0.062
2022	33.7%	3.405	54.860	11.002	11.978	0.060	0.253	0.189	0.102	0.039	0.331	0.094	0.089
2023	28.8%	3.350	54.324	8.714	16.387	0.033	0.181	0.235	0.096	0.028	0.300	0.069	0.100
2024	36.4%	9.545	41.953	16.927	19.565	0.094	0.203	0.581	0.152	0.060	0.223	0.097	0.111
Tau	na	-0.564	-0.309	0.091	-0.345	-0.382	-0.091	0.309	-0.309	-0.382	0.127	0.309	-0.055
P-Value	na	0.016	0.186	0.697	0.139	0.102	0.697	0.186	0.186	0.102	0.586	0.186	0.815
Theil Slope (per year)	na	-2.904	-2.306	0.290	-2.141	-0.007	-0.006	0.035	-0.011	-0.006	0.008	0.008	0.000

3. Provide mass loading v. volume calculations for select events

Seasonal Progress Report #3 provides this analysis for events that occurred in the fall/winter and spring of water year 2016. Seasonal Progress Report #1 included a similar study based on four events that occurred in the late spring and early summer of water year 2015. Analyses have consistently shown that in general, turbidities (and thus FSP) mirror the flow and therefore no first flush phenomenon exists at SR431 with respect to FSP. This may indicate that the primary road serves as a constant source of sediment. Due to consistent results this analysis has not been repeated since Seasonal Progress Report #3. This analysis can be repeated upon request.

Appendix A

Hydrographs, continuous turbidity, and sample distribution for all sampled events.

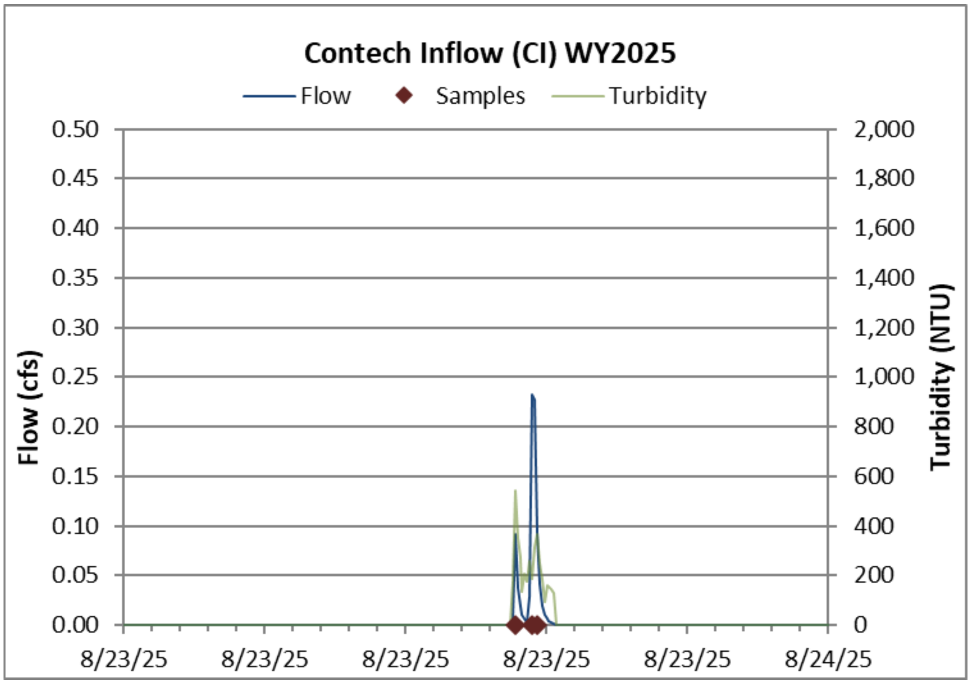

Figure 7 Hydrograph, continuous turbidity, and sample distribution at the Contech Inflow for the 8/23/2025 thunderstorm event.

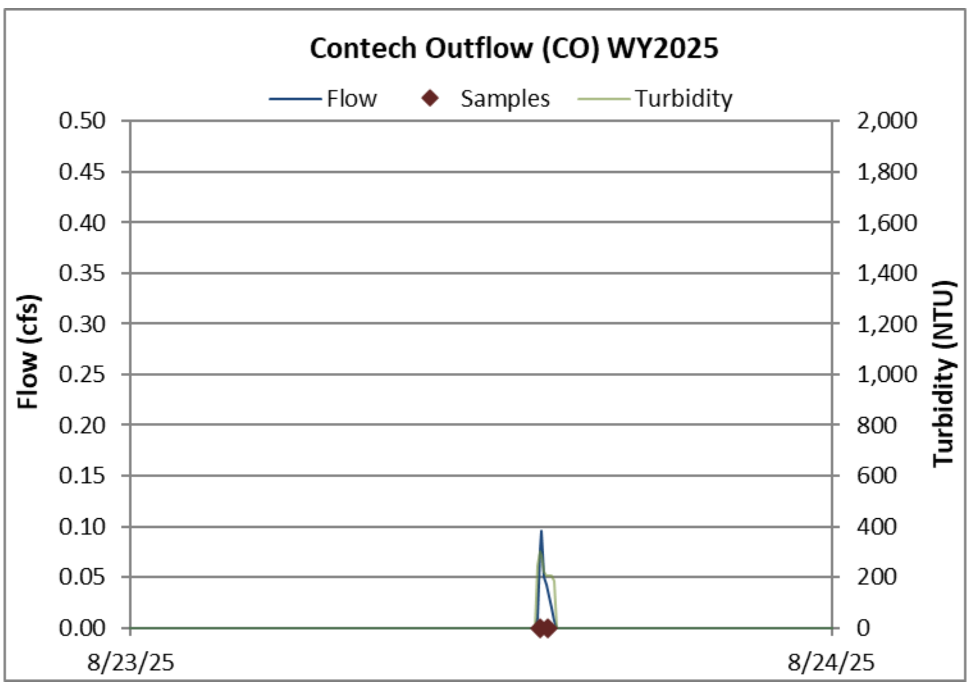

Figure 8 Hydrograph, continuous turbidity, and sample distribution at the Contech Outflow for the 8/23/2025 thunderstorm event.

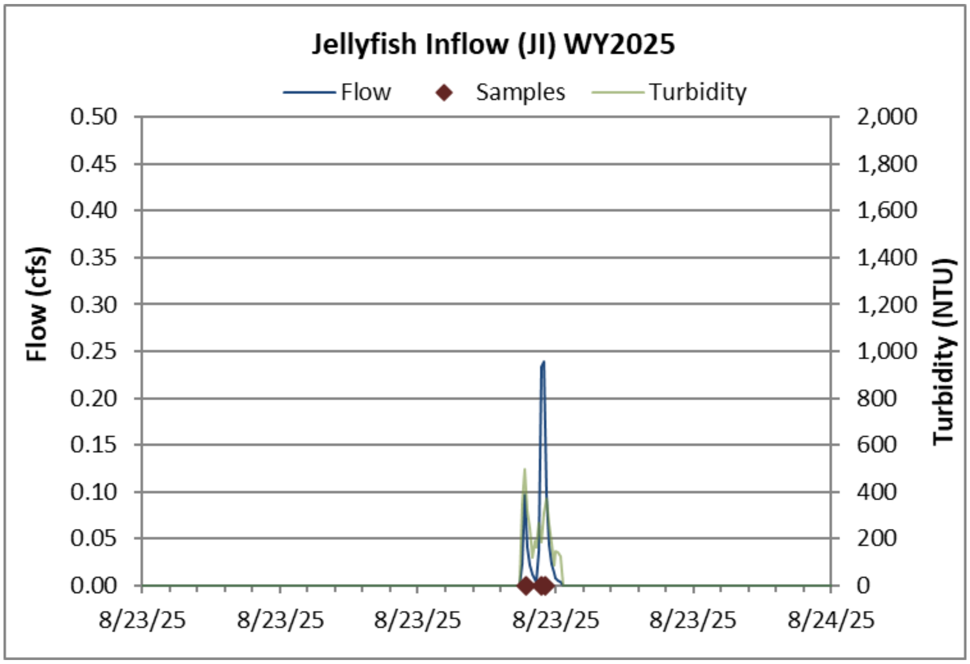

Figure 9 Hydrograph, continuous turbidity, and sample distribution at the Jellyfish Inflow for the 8/23/2025 thunderstorm event.

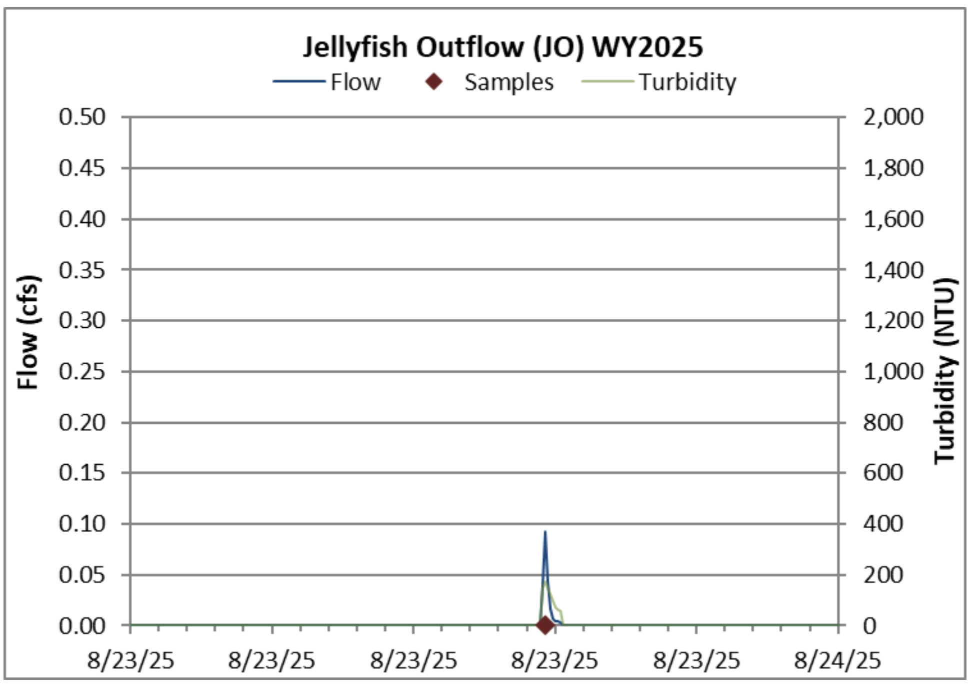

Figure 10 Hydrograph, continuous turbidity, and sample distribution at the Jellyfish Outflow for the 8/23/2025 thunderstorm event.

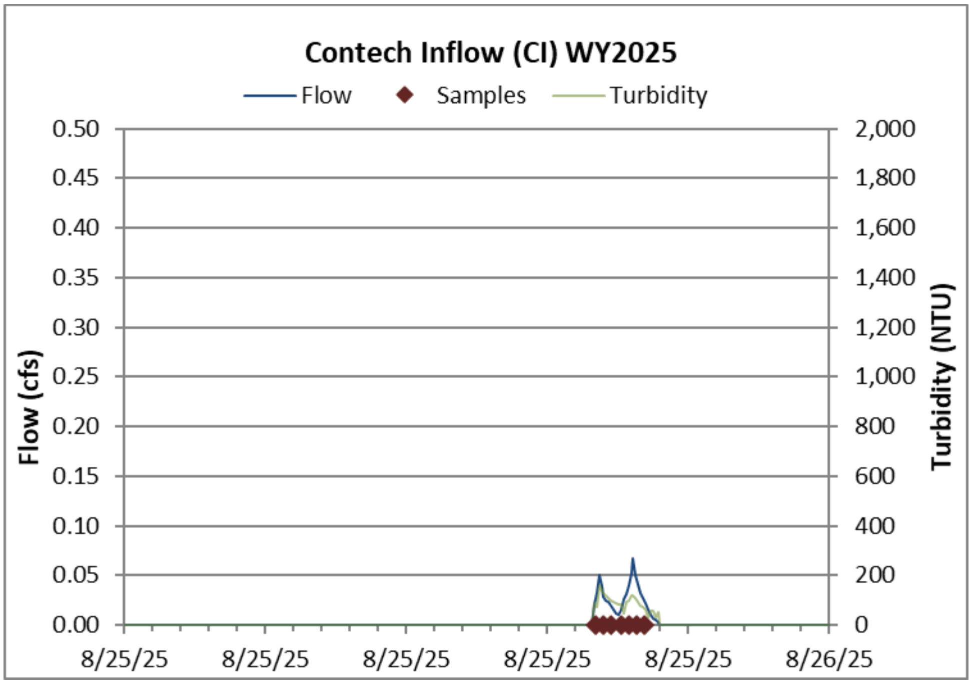

Figure 11 Hydrograph, continuous turbidity, and sample distribution at the Contech Inflow for the 8/25/2025 thunderstorm event.

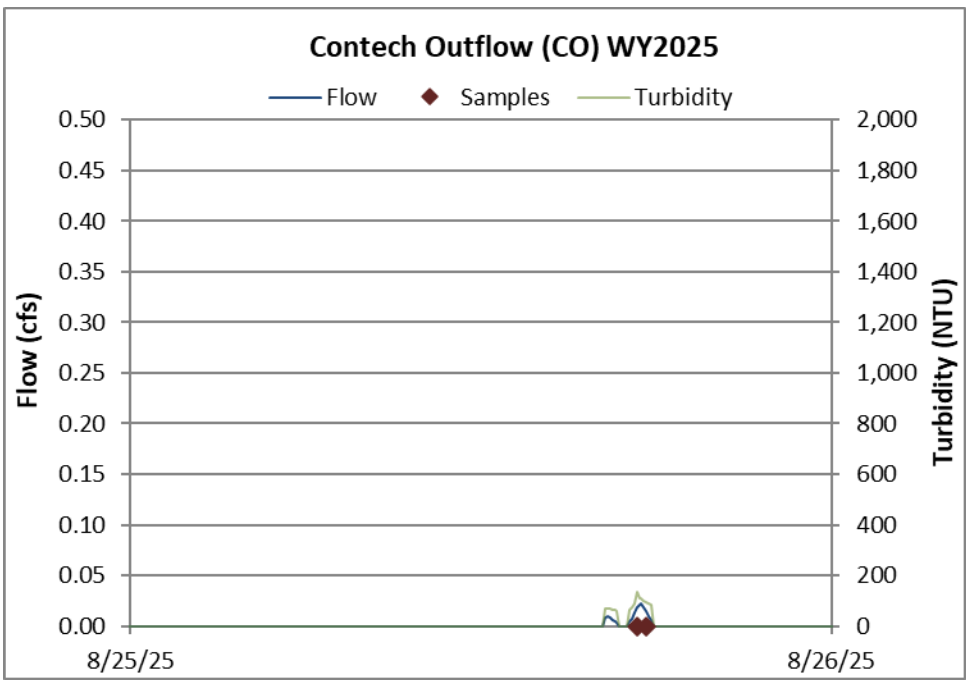

Figure 12 Hydrograph, continuous turbidity, and sample distribution at the Contech Outflow for the 8/25/2025 thunderstorm event.

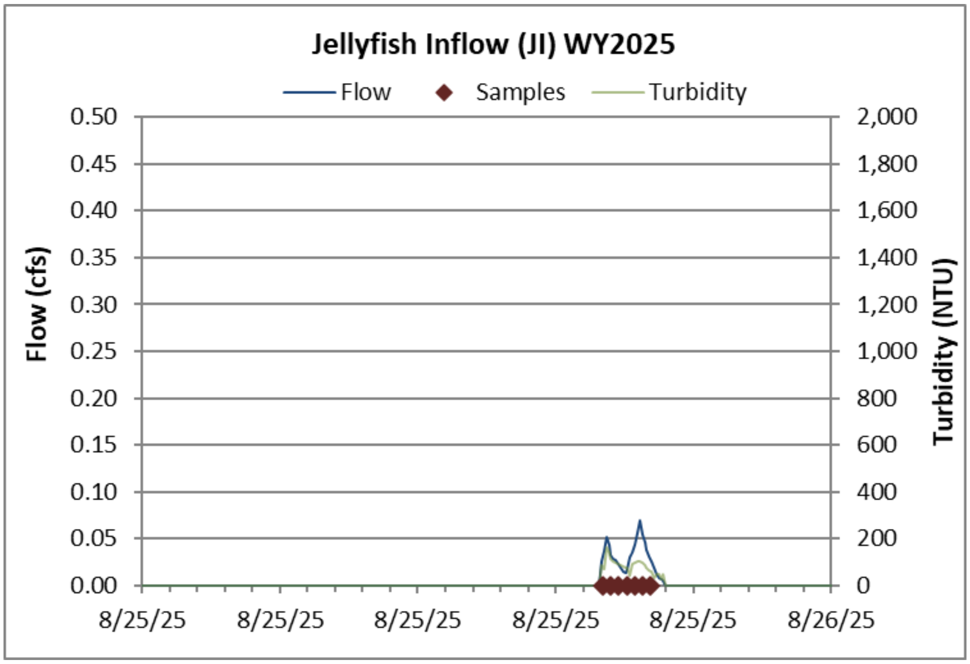

Figure 13 Hydrograph, continuous turbidity, and sample distribution at the Jellyfish Inflow for the 8/25/2025 thunderstorm event.

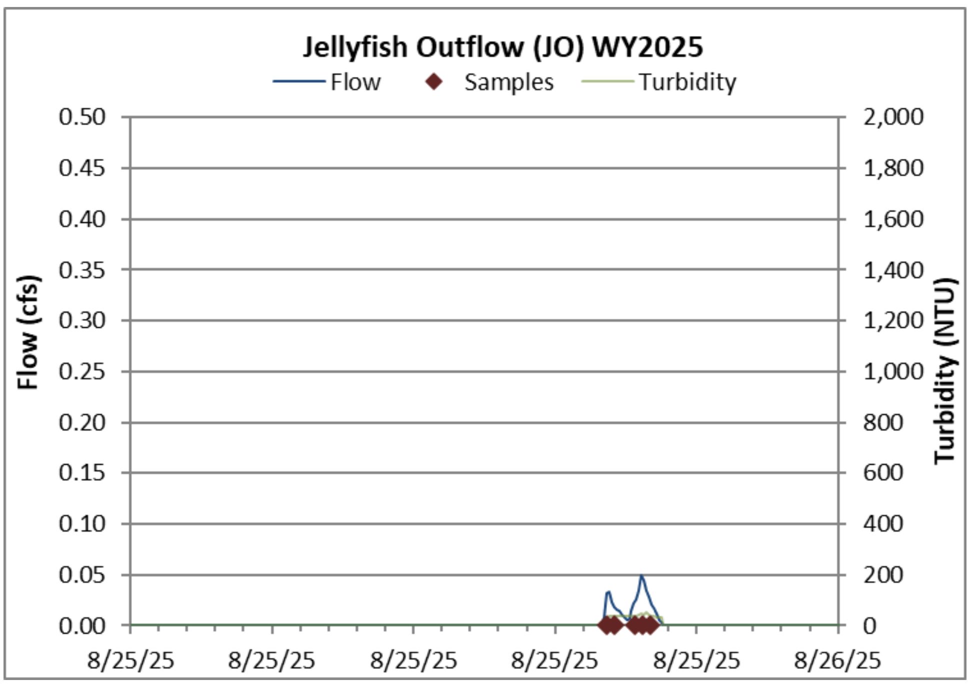

Figure 14 Hydrograph, continuous turbidity, and sample distribution at the Jellyfish Outflow for the 8/25/2025 thunderstorm event.

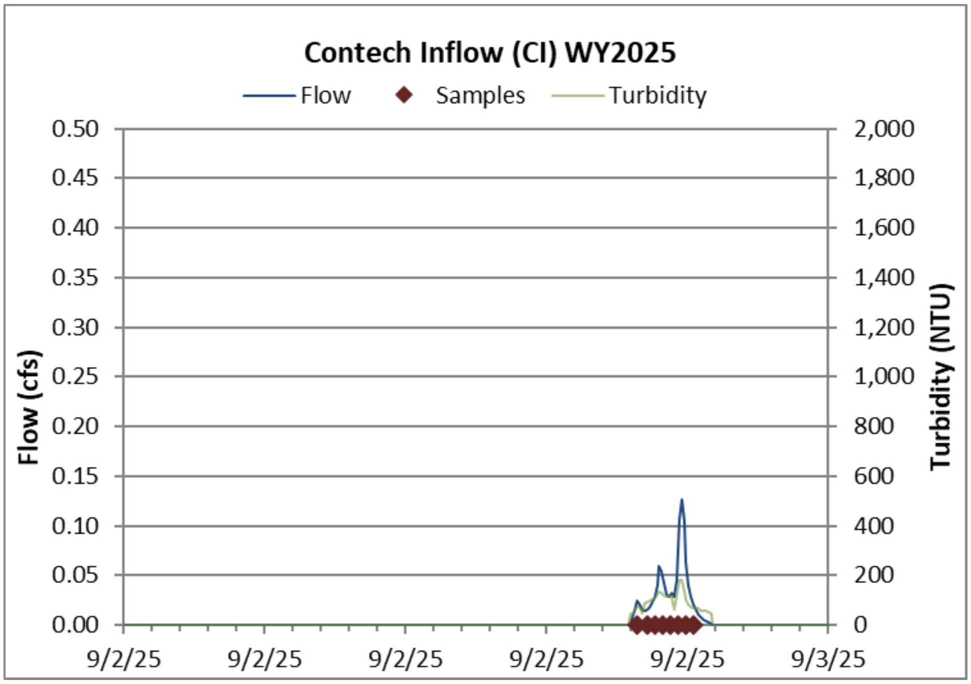

Figure 15 Hydrograph, continuous turbidity, and sample distribution at the Contech Inflow for the 9/2/2025 thunderstorm event.

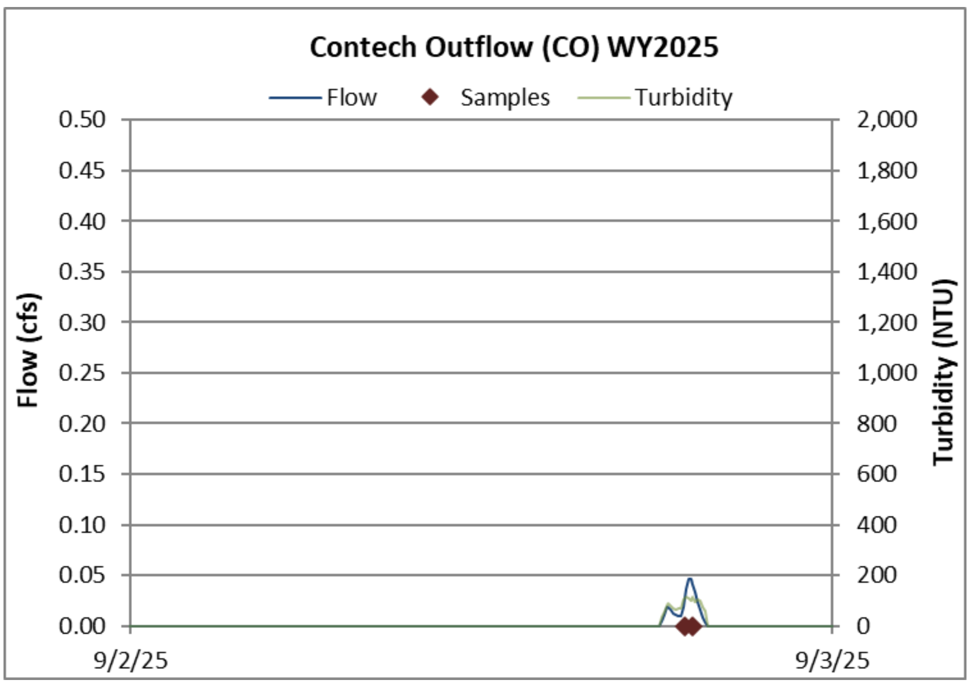

Figure 16 Hydrograph, continuous turbidity, and sample distribution at the Contech Outflow for the 9/2/2025 thunderstorm event.

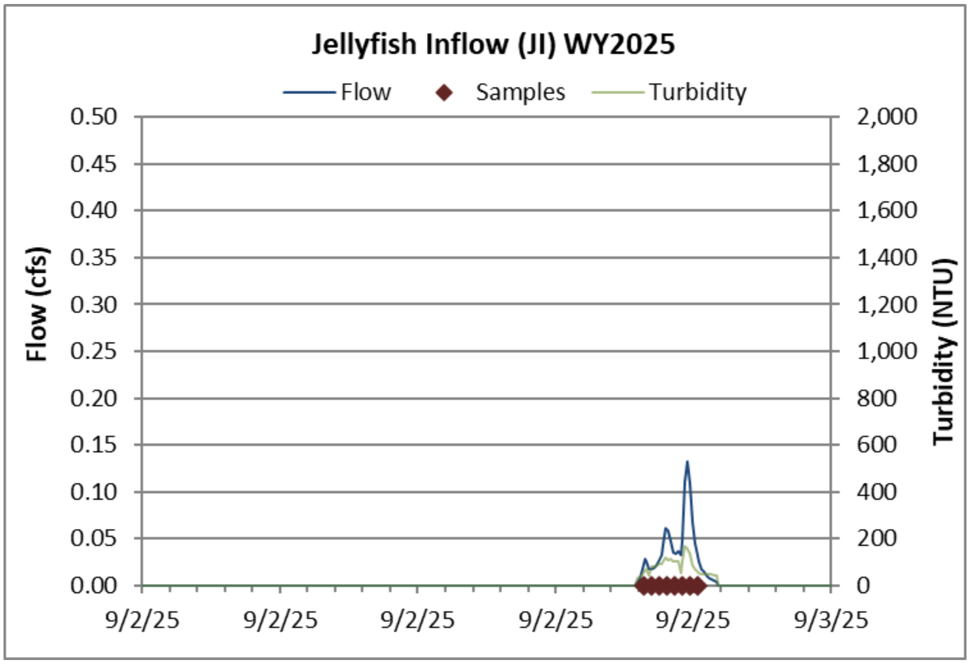

Figure 17 Hydrograph, continuous turbidity, and sample distribution at the Jellyfish Inflow for the 9/2/2025 thunderstorm event.

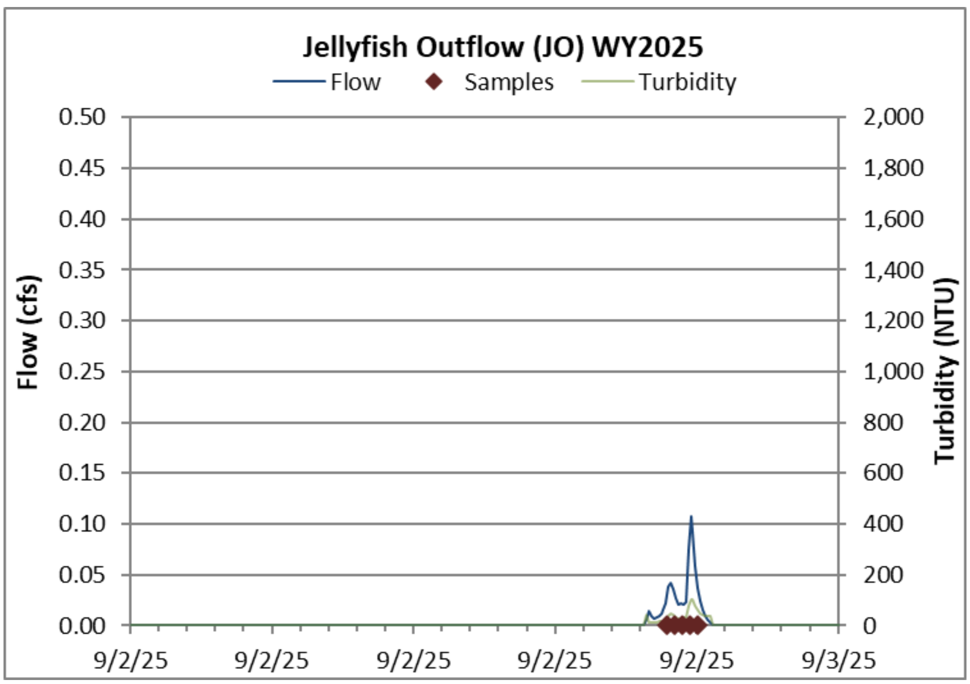

Figure 18 Hydrograph, continuous turbidity, and sample distribution at the Jellyfish Outflow for the 9/2/2025 thunderstorm event.

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