

Assessment of Tile Drainage Systems in the Jewett Brook Watershed: December 2017 Monitoring Summary



PROJECT NO.

15-309

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December 2017 Monitoring Summary

The purpose of this report is to document monitoring activities performed last month, in December 2017, at 12 selected tile drain outlets in the Jewett Brook watershed in St. Albans, Vermont.

Table 1 identifies the start dates for monitoring activities at each station. The first set of weekly composite samples was collected and processed on April 11, in accordance with the project Quality Assurance Project Plan, Version 1.0, Amendment 1.

Flow monitoring and sample collection continues at all 12 tile drain monitoring stations. Samples are collected approximately weekly. Through December 2017, 37 sampling rounds had been performed. Every 30 minutes, flow and sampling data are transmitted to Stone's server. These data are checked periodically to assess whether the sampling program is working as intended. Figure 2 illustrates the pattern of observed flow data at station JBT01.

Collection of flow-paced composite samples was generally successful until the week of November 14, 2017, when all the composite sample carboys were frozen. As of November 14th, automated composite sampling was suspended due to below freezing conditions. We are currently collecting grab samples at all stations approximately once per week. The monitoring manholes were insulated to protect the flowmeters against freezing.

Stone's subcontractor, the Friends of Northern Lake Champlain, is performing the majority of sample processing. Various maintenance activities are performed on every sample collection date, including checking/changing instrument desiccant and removing vegetation or snow shading solar panels.

Samples collected at the tile drain monitoring stations are analyzed by the Vermont Agriculture and Environmental Laboratory for concentrations of total phosphorus (TP), total dissolved phosphorus (TDP), and total nitrogen (TN). Beginning in August, VTDEC (which supports the TN analysis) requested TN be collected on alternate weeks (a cost saving measure) until field conditions change due to manure application or other agricultural activities. Approved analytical data are presented in Table 2.



Completing monitoring station construction at JBT01.

A tremendous effort was devoted in the last quarter to manipulating flow data and identifying and making estimates for any gaps in the continuous (15-minute) flow and concentration time series data. This laborious effort is a necessary precursor to calculating seasonal and annual flow totals and TP and TDP concentrations and loads.

Providing sufficient power to all stations is challenging under winter conditions. Despite additional solar panels and repeated battery swaps, it has not been possible to continuously power certain stations with poor solar exposure, JBT01, JBT02, and JBT04. Extremely cold temperatures and snow accumulation on the solar panels has exacerbated the low voltage problem.

During the December sampling events, it was not possible to collect grab samples at every station because the suction lines conveying water to the autosamplers developed ice plugs. Where possible, grab samples were collected at the outlet when the autosampler intake line was frozen.

Table 1: Start dates for monitoring activities at each station

Station	Start flow monitoring	Start autosampling
JBT01	3/23/17	4/5/17
JBT02	3/23/17	4/5/17
JBT04	4/3/17	4/5/17
JBT05	4/20/17	4/20/17
JBT06	4/5/17	4/5/17
JBT07	3/30/17	4/5/17
JBT11	4/5/17	4/5/17
JBT13	4/3/17	4/11/17
JBT14	4/5/17	4/5/17
JBT16	3/30/17	4/5/17
JBT18	4/22/17	4/22/17
JBT19	4/22/17	4/22/17

Table 2: TP, TDP, and TN concentrations in samples collected through Nov. 20, 2017

LAB ID	Site	Sampling Date	Carboy	TP (µg/L)	TDP (µg/L)	TN (mg/L)	Comment
JBT01-04112017-1	JBT01	4/11/2017	1	491	258	4.81	TDP vial cloudy
JBT01-04182017-1	JBT01	4/18/2017	1	55.1	21.1	4.77	
JBT01-04252017-1	JBT01	4/25/2017	1	77.3	17.6	5.24	
JBT01-05022017-1	JBT01	5/2/2017	1	333	81.2	5.63	
JBT01-05092017-1	JBT01	5/9/2017	1	208	44.5	5.29	
JBT01-05092017-2+3	JBT01	5/9/2017	2+3	236	40.8	5.17	
JBT01-05162017-1	JBT01	5/16/2017	1	26.7	15.4	4.96	
JBT01-05232017-1	JBT01	5/23/2017	1	127	26.7	5.27	
JBT01-05302017-1	JBT01	5/30/2017	1	19.3	13.0	5.13	
JBT01-06072017-1	JBT01	6/7/2017	1	23.5	7.6	5.32	VAEL remark: TDP biased low
JBT01-06132017-1	JBT01	6/13/2017	1	23.9	13.9	5.29	
JBT01-06222017-1	JBT01	6/22/2017	1	28.6	16.1	6.48	
JBT01-06272017-1	JBT01	6/27/2017	1	108	64.4	22.19	
JBT01-06272017-2	JBT01	6/27/2017	2	111	72.2	15.57	
JBT01-06272017-3	JBT01	6/27/2017	3	63.8	44.1	8.47	
JBT01-07052017-1	JBT01	7/5/2017	1	256	77.9	8.05	
JBT01-07052017-2+3	JBT01	7/5/2017	2+3	94.6	46.7	6.27	
JBT01-07112017-1+2	JBT01	7/11/2017	1+2	223	106	6.63	
JBT01-07182017-1+2	JBT01	7/18/2017	1+2	98.0	47.5	5.31	
JBT01-07262017-1	JBT01	7/26/2017	1	31.6	21.7	4.40	Reversed TP and TDP result
JBT01-08012017-1	JBT01	8/1/2017	1	23.8	20.9	3.69	
JBT01-08082017-1	JBT01	8/8/2017	1	33.3	20.1	NS	
JBT01-08222017-1	JBT01	8/22/2017	1	55.5	26.6	3.10	
JBT01-090517-1	JBT01	9/5/2017	1	37.0	13.6	3.81	
JBT01-091217-1	JBT01	9/12/2017	1	114	34.0	NS	
JBT01-091917-1	JBT01	9/19/2017	1	116	73.0	2.40	
JBT01-092617-1	JBT01	9/26/2017	1	119	18.3	NS	
JBT01-100317-1	JBT01	10/3/2017	1	49.3	14.8	3.53	
JBT01-101017-1	JBT01	10/10/2017	1	1250	45.3	NS	TDP filtered at VAEL on 10/12/17
JBT01-101017-2	JBT01	10/10/2017	2	1204	35.0	NS	TDP filtered at VAEL on 10/12/17
JBT01-101017-3+4	JBT01	10/10/2017	3+4	914	37.9	NS	TDP filtered at VAEL on 10/12/17
JBT01-102417-1	JBT01	10/24/2017	1	44.2	13.4	NS	
JBT01-110117-3	JBT01	11/1/2017	3	360	NS	NS	TDP sample invalid (diluted w/ distilled water)
JBT01-110717-3	JBT01	11/7/2017	3	329	60.6	NS	
JBT01-111417-1	JBT01	11/14/2017	1	40.2	33.9	NS	Carboy partially frozen--only liquid sampled
JBT01-112017-1	JBT01	11/20/2017	1	33.8	17.6	NS	Carboy frozen--processed in office

LAB ID	Site	Sampling Date	Carboy	TP (µg/L)	TDP (µg/L)	TN (mg/L)	Comment
JBT02-04112017-1	JBT02	4/11/2017	1	976	678	7.19	TDP vial cloudy
JBT02-04182017-1	JBT02	4/18/2017	1	242	93.6	8.52	
JBT02-04252017-1	JBT02	4/25/2017	1	491	142	8.68	
JBT02-05022017-1	JBT02	5/2/2017	1	805	492	8.58	
JBT02-05092017-1	JBT02	5/9/2017	1	585	120	8.52	
JBT02-05092017-2	JBT02	5/9/2017	2	868	122	7.88	
JBT02-05092017-3	JBT02	5/9/2017	3	868	156	8.00	
JBT02-05162017-1	JBT02	5/16/2017	1	109	37.6	8.26	
JBT02-05302017-1	JBT02	5/30/2017	1	78.5	30.3	8.83	
JBT02-06072017-1	JBT02	6/7/2017	1	67.3	28.2	11.78	
JBT02-06132017-1	JBT02	6/13/2017	1	48.0	28.5	11.69	
JBT02-06222017-1	JBT02	6/22/2017	1	90.9	42.3	12.86	
JBT02-06262017-1	JBT02	6/26/2017	1	137	61.9	25.34	
JBT02-06262017-2	JBT02	6/26/2017	2	189	82.2	29.34	
JBT02-06262017-3	JBT02	6/26/2017	3	160	94.0	27.34	
JBT02-06262017-4	JBT02	6/26/2017	4	315	106	22.93	
JBT02-07052017-1+2	JBT02	7/5/2017	1+2	102	60.5	9.85	
JBT02-07112017-1	JBT02	7/11/2017	1	303	118	8.68	
JBT02-07112017-2	JBT02	7/11/2017	2	434	196	7.19	
JBT02-07182017-1	JBT02	7/18/2017	1	187	118	7.27	
JBT02-07262017-1	JBT02	7/26/2017	1	73.1	70.4	8.03	
JBT02-08012017-1	JBT02	8/1/2017	1	63.9	40.0	8.41	
JBT02-08082017-1	JBT02	8/8/2017	1	50.5	37.0	NS	
JBT02-08152017-1	JBT02	8/15/2017	1	52.0	41.3	7.29	
JBT02-08222017-1	JBT02	8/22/2017	1	308	141	5.81	
JBT02-08302017-1	JBT02	8/30/2017	1	142	63.2	NS	
JBT02-090517-1	JBT02	9/5/2017	1	137	53.4	5.09	
JBT02-091217-1	JBT02	9/12/2017	1	674	106	NS	
JBT02-091917-1	JBT02	9/19/2017	1	138	85.6	6.36	
JBT02-092617-1	JBT02	9/26/2017	1	102	65.2	NS	
JBT02-100317-1	JBT02	10/3/2017	1	81.3	43.3	4.93	
JBT02-101017-1	JBT02	10/10/2017	1	1464	69.7	NS	TDP filtered at VAEL on 10/12/17
JBT02-101017-2	JBT02	10/10/2017	2	1322	77.5	NS	TDP filtered at VAEL on 10/12/17
JBT02-101017-3+4	JBT02	10/10/2017	3+4	1202	91.7	NS	TDP filtered at VAEL on 10/12/17
JBT02-101717-1	JBT02	10/17/2017	1	252	86.7	9.22	
JBT02-102417-1	JBT02	10/24/2017	1	86.2	48.0	NS	
JBT02-110117-3	JBT02	11/1/2017	3	672	419	NS	
JBT02-110717-3	JBT02	11/7/2017	3	599	82.2	NS	
JBT02-111417-1	JBT02	11/14/2017	1	226	103	NS	Carboy partially frozen--only liquid sampled
JBT02-112017-1	JBT02	11/20/2017	1	292	113	NS	Carboy frozen--processed in office

LAB ID	Site	Sampling Date	Carboy	TP (µg/L)	TDP (µg/L)	TN (mg/L)	Comment
JBT04-04112017-1	JBT04	4/11/2017	1	798	120	4.89	TDP vial cloudy
JBT04-04182017-1	JBT04	4/18/2017	1	115	38.6	4.33	
JBT04-04252017-1	JBT04	4/25/2017	1	133	45.4	4.86	
JBT04-05022017-1	JBT04	5/2/2017	1	500	79.2	5.43	
JBT04-05092017-1	JBT04	5/9/2017	1	303	52.9	4.19	
JBT04-05092017-2+3	JBT04	5/9/2017	2+3	404	58.8	4.23	
JBT04-05162017-1	JBT04	5/16/2017	1	68.8	22.2	3.80	
JBT04-05232017-1	JBT04	5/23/2017	1	109	23.6	4.35	
JBT04-05302017-1	JBT04	5/30/2017	1	90.2	18.1	4.37	
JBT04-06072017-1	JBT04	6/7/2017	1	114	10.7	5.65	VAEL remark: TDP biased low
JBT04-06132017-1	JBT04	6/13/2017	1	42.9	19.6	5.19	
JBT04-06222017-1	JBT04	6/22/2017	1	108	49.5	5.39	
JBT04-06272017-1	JBT04	6/27/2017	1	184	52.4	29.19	
JBT04-06272017-2	JBT04	6/27/2017	2	135	49.6	27.59	
JBT04-06272017-3	JBT04	6/27/2017	3	115	65.3	16.71	
JBT04-06272017-4	JBT04	6/27/2017	4	73.6	50.1	11.85	
JBT04-07052017-1	JBT04	7/5/2017	1	271	53.0	13.07	
JBT04-07052017-2+3	JBT04	7/5/2017	2+3	132	52.6	7.29	
JBT04-07112017-1+2	JBT04	7/11/2017	1+2	262	51.5	8.25	
JBT04-07182017-1	JBT04	7/18/2017	1	126	38.4	5.79	
JBT04-07262017-1	JBT04	7/26/2017	1	50.4	39.5	4.36	Reversed TP and TDP result
JBT04-08012017-1	JBT04	8/1/2017	1	30.5	24.1	3.81	
JBT04-08082017-1	JBT04	8/8/2017	1	35.2	20.6	NS	
JBT04-08152017-1	JBT04	8/15/2017	1	29.8	22.6	2.92	
JBT04-08222017-1	JBT04	8/22/2017	1	465	228	5.89	
JBT04-08302017-1	JBT04	8/30/2017	1	71.0	23.5	NS	
JBT04-090517-1	JBT04	9/5/2017	1	152	21.5	3.19	
JBT04-091217-1+2	JBT04	9/12/2017	1+2	698	32.4	NS	0.5 L left in carboy 2
JBT04-091917-1	JBT04	9/19/2017	1	64.8	22.5	1.29	
JBT04-092617-1	JBT04	9/26/2017	1	67.6	32.0	NS	
JBT04-100317-1	JBT04	10/3/2017	1	78.3	31.0	1.05	
JBT04-101017-1	JBT04	10/10/2017	1	500	33.5	NS	TDP filtered at VAEL on 10/12/17
JBT04-101017-2	JBT04	10/10/2017	2	256	34.7	NS	TDP filtered at VAEL on 10/12/17
JBT04-101017-3+4	JBT04	10/10/2017	3+4	244	39.3	NS	TDP filtered at VAEL on 10/12/17
JBT04-101717-1	JBT04	10/17/2017	1	102	23.9	1.38	
JBT04-102417-1	JBT04	10/24/2017	1	110	17.5	NS	
JBT04-110117-3	JBT04	11/1/2017	3	372	135	NS	
JBT04-110717-3	JBT04	11/7/2017	3	384	36.6	NS	
JBT04-111417-1	JBT04	11/14/2017	1	183	51.0	NS	Carboy partially frozen--only liquid sampled
JBT04-112017-1	JBT04	11/20/2017	1	53.2	27.6	NS	Carboy frozen--processed in office

LAB ID	Site	Sampling Date	Carboy	TP (µg/L)	TDP (µg/L)	TN (mg/L)	Comment
JBT05-04252017-1	JBT05	4/25/2017	1	68.7	53.7	24.78	
JBT05-05022017-1	JBT05	5/2/2017	1	226	108	20.60	
JBT05-05092017-1	JBT05	5/9/2017	1	132	82.9	23.56	
JBT05-05162017-1	JBT05	5/16/2017	1	33.6	26.6	21.68	
JBT05-05232017-1	JBT05	5/23/2017	1	60.0	38.4	14.84	
JBT05-05302017-1	JBT05	5/30/2017	1	38.4	37.0	10.52	
JBT05-06062017-1+2	JBT05	6/6/2017	1+2	34.1	21.4	8.10	
JBT05-06132017-1+3	JBT05	6/13/2017	1+3	67.6	49.6	12.68	
JBT05-06222017-1	JBT05	6/22/2017	1	61.2	40.6	14.48	
JBT05-06272017-1+2	JBT05	6/27/2017	1+2	345	285	34.73	
JBT05-06272017-3+4	JBT05	6/27/2017	3+4	408	357	27.73	
JBT05-06302017-1	JBT05	6/30/2017	1	79.7	57.2	24.83	
JBT05-06302017-2	JBT05	6/30/2017	2	595	452	21.23	
JBT05-06302017-3	JBT05	6/30/2017	3	210	181	23.63	
JBT05-07052017-1	JBT05	7/5/2017	1	134	100	24.58	
JBT05-07112017-1+2	JBT05	7/11/2017	1+2	565	493	23.70	
JBT05-07182017-1	JBT05	7/18/2017	1	138	104	29.55	
JBT05-07262017-1	JBT05	7/26/2017	1	85.8	51.5	23.80	Reversed TP and TDP result
JBT05-08012017-1	JBT05	8/1/2017	1	42.8	37.6	21.61	
JBT05-08082017-1+2	JBT05	8/8/2017	1+2	51.1	46.6	NS	Reversed TP and TDP result
JBT05-08152017-1	JBT05	8/15/2017	1	32.2	26.1	10.63	
JBT05-08222017-1	JBT05	8/22/2017	1	125	44.4	15.31	
JBT05-08302017-1	JBT05	8/30/2017	1	91.1	28.6	NS	
JBT05-090517-1	JBT05	9/5/2017	1	204	51.3	10.41	
JBT05-091217-1	JBT05	9/12/2017	1	133	67.6	NS	
JBT05-091917-1	JBT05	9/19/2017	1	65.2	30.6	11.76	
JBT05-092617-1	JBT05	9/26/2017	1	39.0	22.3	NS	
JBT05-100317-1	JBT05	10/3/2017	1	43.7	22.4	7.82	
JBT05-101017-1	JBT05	10/10/2017	1	966	383	18.54	
JBT05-101717-1	JBT05	10/17/2017	1	167	122	12.63	
JBT05-102417-1	JBT05	10/24/2017	1	84.0	33.7	NS	
JBT05-110117-3	JBT05	11/1/2017	3	420	321	NS	
JBT05-110717-3	JBT05	11/7/2017	3	368	300	NS	
JBT05-111417-3	JBT05	11/14/2017	3	131	98.2	NS	Carboy partially frozen--only liquid sampled
JBT05-112017-1	JBT05	11/20/2017	1	75.0	51.1	NS	Carboy frozen--processed in office

LAB ID	Site	Sampling Date	Carboy	TP (µg/L)	TDP (µg/L)	TN (mg/L)	Comment
JBT06-04112017-1	JBT06	4/11/2017	1	195	131	33.47	
JBT06-04182017-1	JBT06	4/18/2017	1	192	76.3	20.71	
JBT06-04252017-1+2	JBT06	4/25/2017	1+2	117	70.1	24.03	
JBT06-05022017-1	JBT06	5/2/2017	1	321	164	25.20	
JBT06-05092017-1	JBT06	5/9/2017	1	150	100	28.20	
JBT06-05092017-2	JBT06	5/9/2017	2	135	98.1	13.54	
JBT06-05162017-1	JBT06	5/16/2017	1	180	96.2	26.04	
JBT06-05232017-1	JBT06	5/23/2017	1	327	65.2	21.04	
JBT06-05302017-1	JBT06	5/30/2017	1	67.7	37.8	22.52	
JBT06-06072017-1	JBT06	6/7/2017	1	138	88.9	25.87	
JBT06-06132017-1	JBT06	6/13/2017	1	47.4	36.4	25.95	
JBT06-06222017-1	JBT06	6/22/2017	1	45.9	27.3	23.12	
JBT06-06272017-1	JBT06	6/27/2017	1	412	192	42.67	
JBT06-06272017-2	JBT06	6/27/2017	2	210	157	48.27	
JBT06-06272017-3	JBT06	6/27/2017	3	416	222	46.63	
JBT06-06272017-4	JBT06	6/27/2017	4	234	183	49.83	
JBT06-06302017-	JBT06	6/30/2017	1+2+3	266	174	33.83	
JBT06-07052017-1	JBT06	7/5/2017	1	134	109	34.82	
JBT06-07112017-1+2	JBT06	7/11/2017	1+2	228	137	26.50	
JBT06-07182017-1	JBT06	7/18/2017	1	128	106	32.55	
JBT06-07262017-1	JBT06	7/26/2017	1	90.2	39.1	27.40	Reversed TP and TDP result
JBT06-101017-1	JBT06	10/10/2017	1	393	171	NS	
JBT06-110117-3	JBT06	11/1/2017	3	1884	1576	NS	
JBT06-110717-3	JBT06	11/7/2017	3	510	412	NS	
JBT06-111417-1	JBT06	11/14/2017	1	123	88.1	NS	Carboy partially frozen--only liquid sampled
JBT06-112017-1	JBT06	11/20/2017	1	234	186	NS	Carboy frozen--processed in office

LAB ID	Site	Sampling Date	Carboy	TP (µg/L)	TDP (µg/L)	TN (mg/L)	Comment
JBT07-04112017-1+2	JBT07	4/11/2017	1+2	708	159	7.52	
JBT07-04182017-1	JBT07	4/18/2017	1	45.0	14.1	4.81	
JBT07-04252017-1	JBT07	4/25/2017	1	103	27.4	5.79	
JBT07-05022017-1	JBT07	5/2/2017	1	280	58.0	6.72	
JBT07-05092017-1	JBT07	5/9/2017	1	126	41.4	6.17	
JBT07-05092017-2+3	JBT07	5/9/2017	2+3	230	54.2	6.59	
JBT07-05162017-1	JBT07	5/16/2017	1	19.7	12.9	5.21	
JBT07-05232017-1	JBT07	5/23/2017	1	24.4	11.9	5.08	
JBT07-05302017-1	JBT07	5/30/2017	1	21.1	14.2	5.29	
JBT07-06072017-1	JBT07	6/7/2017	1	17.0	7.0	5.57	
JBT07-06132017-1	JBT07	6/13/2017	1	NS	13.1	5.35	VAEL remark: TDP biased low
JBT07-06222017-1	JBT07	6/22/2017	1	39.3	17.1	8.16	
JBT07-06262017-1	JBT07	6/26/2017	1	242	177	45.18	
JBT07-06262017-2	JBT07	6/26/2017	2	555	357	45.18	
JBT07-06262017-3	JBT07	6/26/2017	3	204	182	31.59	
JBT07-06262017-4	JBT07	6/26/2017	4	389	230	23.59	
JBT07-06302017-1	JBT07	6/30/2017	1	79.7	60.8	12.67	
JBT07-06302017-2+3	JBT07	6/30/2017	2+3	700	327	18.55	
JBT07-07052017-1	JBT07	7/5/2017	1	119	88.6	11.62	
JBT07-07112017-1	JBT07	7/11/2017	1	47.3	21.0	11.05	
JBT07-07182017-1	JBT07	7/18/2017	1	69.9	54.9	15.37	
JBT07-07262017-1	JBT07	7/26/2017	1	82.5	37.3	9.14	
JBT07-08012017-1	JBT07	8/1/2017	1	29.4	25.1	6.96	
JBT07-08222017-1	JBT07	8/22/2017	1	226	136	3.37	
JBT07-08302017-1	JBT07	8/30/2017	1	52.0	32.6	NS	
JBT07-091217-1	JBT07	9/12/2017	1	169	89.5	NS	
JBT07-091217-2+3	JBT07	9/12/2017	2+3	106	77.3	NS	
JBT07-091917-1	JBT07	9/19/2017	1	51.8	19.1	3.06	
JBT07-092617-1	JBT07	9/26/2017	1	101	32.3	NS	
JBT07-101017-1	JBT07	10/10/2017	1	304	125	NS	
JBT07-101717-1	JBT07	10/17/2017	1	39.6	21.4	2.04	
JBT07-102417-1	JBT07	10/24/2017	1	44.0	20.6	NS	
JBT07-110117-3	JBT07	11/1/2017	3	471	197	NS	
JBT07-110717-3	JBT07	11/7/2017	3	450	125	NS	
JBT07-111417-1	JBT07	11/14/2017	1	116	44.3	NS	Carboy partially frozen--only liquid sampled
JBT07-112017-1	JBT07	11/20/2017	1	104	38.2	NS	Carboy frozen--processed in office

LAB ID	Site	Sampling Date	Carboy	TP (µg/L)	TDP (µg/L)	TN (mg/L)	Comment
JBT11-04112017-1	JBT11	4/11/2017	1	57.80	39.50	3.35	Reversed TP and TDP result
JBT11-04182017-1	JBT11	4/18/2017	1	16.20	11.50	2.59	Reversed TP and TDP result
JBT11-04252017-1	JBT11	4/25/2017	1	14.7	9.7	2.45	
JBT11-05022017-1	JBT11	5/2/2017	1	46.5	16.1	2.04	
JBT11-05092017-1	JBT11	5/9/2017	1	28.8	12.0	1.63	
JBT11-05092017-2	JBT11	5/9/2017	2	39.0	12.9	1.53	
JBT11-05162017-1	JBT11	5/16/2017	1	31.2	23.1	1.24	
JBT11-05232017-1	JBT11	5/23/2017	1	234	28.8	1.24	
JBT11-05302017-1	JBT11	5/30/2017	1	18.1	9.6	0.81	
JBT11-06072017-1	JBT11	6/7/2017	1	18.6	6.5	0.91	VAEL remark: TDP biased low
JBT11-06132017-1	JBT11	6/13/2017	1	49.7	17.2	1.29	
JBT11-06222017-1	JBT11	6/22/2017	1	68.8	26.4	0.77	
JBT11-06272017-1	JBT11	6/27/2017	1	61.5	29.2	1.48	
JBT11-06272017-2	JBT11	6/27/2017	2	89.8	48.0	1.59	
JBT11-06272017-3	JBT11	6/27/2017	3	77.1	51.4	1.54	
JBT11-06272017-4	JBT11	6/27/2017	4	81.4	44.0	1.51	
JBT11-06302017-1	JBT11	6/30/2017	1	30.3	17.9	1.11	
JBT11-06302017-2	JBT11	6/30/2017	2	24.8	17.9	1.01	
JBT11-06302017-3	JBT11	6/30/2017	3	24.0	16.8	1.05	
JBT11-06302017-4	JBT11	6/30/2017	4	23.3	16.0	1.06	
JBT11-07052017-1	JBT11	7/5/2017	1	21.2	16.8	1.16	
JBT11-07112017-1	JBT11	7/11/2017	1	28.1	19.5	1.30	
JBT11-07182017-1+2	JBT11	7/18/2017	1+2	64.4	33.5	1.22	Reversed TP and TDP result
JBT11-07262017-1	JBT11	7/26/2017	1	26.0	15.4	0.96	Reversed TP and TDP result
JBT11-08012017-1	JBT11	8/1/2017	1	59.1	35.2	1.23	
JBT11-090517-1	JBT11	9/5/2017	1	92.6	45.2	1.13	
JBT11-091217-1+2	JBT11	9/12/2017	1+2	420	411	NS	
JBT11-091917-1	JBT11	9/19/2017	1	77.9	38.1	1.20	
JBT11-092617-1	JBT11	9/26/2017	1	127	34.9	NS	
JBT11-100317-1	JBT11	10/3/2017	1	26.0	14.1	0.19	
JBT11-101117-1	JBT11	10/11/2017	1	256	203	NS	
JBT11-101717-1	JBT11	10/17/2017	1	92.5	77.8	0.81	
JBT11-102417-1	JBT11	10/24/2017	1	66.7	25.0	NS	
JBT11-110117-1	JBT11	11/1/2017	1	79.3	44.0	NS	
JBT11-110717-3	JBT11	11/7/2017	3	84.3	58.3	NS	
JBT11-112017-3	JBT11	11/20/2017	3	15.9	8.4	NS	Carboy frozen--processed in office; VAEL remark: TDP biased high

LAB ID	Site	Sampling Date	Carboy	TP (µg/L)	TDP (µg/L)	TN (mg/L)	Comment
JBT13-04182017-1	JBT13	4/18/2017	1	63.8	23.2	6.12	
JBT13-04252017-1	JBT13	4/25/2017	1	113	26.1	6.44	
JBT13-05022017-1	JBT13	5/2/2017	1	560	41.1	5.25	
JBT13-05092017-1+2	JBT13	5/9/2017	1+2	120	35.7	6.10	
JBT13-05162017-1	JBT13	5/16/2017	1	35295	NS	217.21	TDP vial lost in transit; samples dark brown
JBT13-05232017-1	JBT13	5/23/2017	1	3720	2525	17.20	
JBT13-05302017-1	JBT13	5/30/2017	1	2975	2070	14.08	Sample is cloudy; lots of sediment
JBT13-06072017-1	JBT13	6/7/2017	1	3585	2240	19.08	Sample is cloudy; lots of sediment
JBT13-06132017-1	JBT13	6/13/2017	1	815	490	7.97	
JBT13-06222017-1	JBT13	6/22/2017	1	912	585	8.94	
JBT13-06272017-1	JBT13	6/27/2017	1	525	218	21.83	
JBT13-06272017-2	JBT13	6/27/2017	2	385	137	12.71	
JBT13-07052017-1	JBT13	7/5/2017	1	312	143	28.87	
JBT13-07052017-2	JBT13	7/5/2017	2	87.1	70.5	14.03	
JBT13-07112017-1	JBT13	7/11/2017	1	350	191	12.15	
JBT13-07182017-1	JBT13	7/18/2017	1	95.3	94.8	16.97	
JBT13-07262017-1	JBT13	7/26/2017	1	127	118	10.20	
JBT13-08082017-1	JBT13	8/8/2017	1	248	148	NS	
JBT13-08152017-1	JBT13	8/15/2017	1	336	196	5.29	
JBT13-08222017-1	JBT13	8/22/2017	1	275	139	7.74	
JBT13-08302017-1	JBT13	8/30/2017	1	272	94.1	NS	
JBT13-090517-1	JBT13	9/5/2017	1	139	70.8	2.87	
JBT13-091217-1+2	JBT13	9/12/2017	1+2	202	149	NS	
JBT13-091917-1	JBT13	9/19/2017	1	105	57.7	5.94	
JBT13-092617-1	JBT13	9/26/2017	1	86.8	46.4	NS	
JBT13-100317-1	JBT13	10/3/2017	1	99.1	61.5	1.86	
JBT13-101117-1	JBT13	10/11/2017	1	612	172	NS	TDP filtered at VAEL on 10/12/17
JBT13-101717-1	JBT13	10/17/2017	1	178	115	NS	
JBT13-102417-1	JBT13	10/24/2017	1	63.2	36.5	NS	
JBT13-110117-1+2	JBT13	11/1/2017	1+2	172	77.6	NS	
JBT13-110717-3	JBT13	11/7/2017	3	141	85.6	NS	
JBT13-111417-1	JBT13	11/14/2017	1	66.4	49.8	NS	Carboy partially frozen--only liquid sampled
JBT13-112017-1	JBT13	11/20/2017	1	64.1	42.8	NS	Carboy frozen--processed in office

LAB ID	Site	Sampling Date	Carboy	TP (µg/L)	TDP (µg/L)	TN (mg/L)	Comment
JBT14-04112017-1	JBT14	4/11/2017	1	248	66.5	7.43	
JBT14-04182017-1	JBT14	4/18/2017	1	70.5	33.2	8.25	
JBT14-04252017-1	JBT14	4/25/2017	1	145	51.5	7.62	
JBT14-04252017-2	JBT14	4/25/2017	2	46.3	35.2	8.22	
JBT14-05022017-1	JBT14	5/2/2017	1	342	59.3	7.20	
JBT14-05092017-1+2	JBT14	5/9/2017	1+2	177	51.1	7.12	
JBT14-05162017-1	JBT14	5/16/2017	1	4335	1640	51.21	Samples dark brown; TDP filtered at VAEL
JBT14-05232017-1	JBT14	5/23/2017	1	690	183	9.66	
JBT14-05302017-1	JBT14	5/30/2017	1	78.2	75.7	7.72	
JBT14-06072017-1	JBT14	6/7/2017	1	138	143	19.95	
JBT14-06132017-1+2	JBT14	6/13/2017	1+2	73.6	60.1	9.89	
JBT14-06222017-1	JBT14	6/22/2017	1	189	132	11.88	
JBT14-06272017-1	JBT14	6/27/2017	1	482	208	31.95	
JBT14-06272017-2	JBT14	6/27/2017	2	618	345	22.75	
JBT14-06272017-3	JBT14	6/27/2017	3	246	216	19.91	
JBT14-06302017-1	JBT14	6/30/2017	1	436	210	56.87	
JBT14-06302017-2	JBT14	6/30/2017	2	220	162	34.23	
JBT14-07052017-1	JBT14	7/5/2017	1	95.9	86.4	16.81	
JBT14-07052017-2	JBT14	7/5/2017	2	90.4	74.1	14.07	
JBT14-07112017-1	JBT14	7/11/2017	1	103	87.4	13.35	
JBT14-07182017-1+2	JBT14	7/18/2017	1+2	102	88.3	14.87	Reversed TP and TDP result
JBT14-07262017-1	JBT14	7/26/2017	1	79.3	69.4	12.90	Reversed TP and TDP result
JBT14-08012017-1	JBT14	8/1/2017	1	73.6	59.7	11.80	Reversed TP and TDP result
JBT14-08302017-1	JBT14	8/30/2017	1	350	239	NS	
JBT14-090517-1	JBT14	9/5/2017	1	309	251	4.97	
JBT14-091217-1+2	JBT14	9/12/2017	1+2	162	107	NS	
JBT14-091917-1	JBT14	9/19/2017	1	52.9	26.1	7.84	
JBT14-092617-1	JBT14	9/26/2017	1	37.5	29.0	NS	
JBT14-100317-1	JBT14	10/3/2017	1	82.0	67.7	4.95	
JBT14-101117-1	JBT14	10/11/2017	1	776	150	NS	
JBT14-101117-3	JBT14	10/11/2017	3	341	184	NS	
JBT14-101117-4	JBT14	10/11/2017	4	134	91.0	NS	
JBT14-101717-1	JBT14	10/17/2017	1	67.3	49.5	NS	
JBT14-102417-1	JBT14	10/24/2017	1	54.4	39.0	NS	
JBT14-110117-3	JBT14	11/1/2017	3	152	71.7	NS	
JBT14-110717-3+4	JBT14	11/7/2017	3+4	161	98.4	NS	
JBT14-111417-1	JBT14	11/14/2017	1	107	42.7	NS	Carboy partially frozen--only liquid sampled
JBT14-112017-1	JBT14	11/20/2017	1	55.1	43.1	NS	Carboy frozen--processed in office

LAB ID	Site	Sampling Date	Carboy	TP (µg/L)	TDP (µg/L)	TN (mg/L)	Comment
JBT16-04112017-1+2	JBT16	4/11/2017	1+2	105	72.7	5.77	
JBT16-04182017-1	JBT16	4/18/2017	1	28.2	22.4	5.12	
JBT16-04252017-1	JBT16	4/25/2017	1	28.5	21.5	4.48	
JBT16-05022017-1	JBT16	5/2/2017	1	256	25.5	3.89	
JBT16-05092017-1+2	JBT16	5/9/2017	1+2	31.3	13.7	2.79	
JBT16-05162017-1	JBT16	5/16/2017	1	19.4	13.3	2.89	
JBT16-05232017-1	JBT16	5/23/2017	1	26.2	17.0	2.96	
JBT16-05302017-1	JBT16	5/30/2017	1	26.7	17.7	2.62	
JBT16-06072017-1	JBT16	6/7/2017	1	25.9	9.6	3.68	VAEL remark: TDP biased low
JBT16-06132017-1	JBT16	6/13/2017	1	29.4	17.4	3.44	
JBT16-06222017-1	JBT16	6/22/2017	1	85.9	32.9	5.81	
JBT16-06262017-1+2	JBT16	6/26/2017	1+2	89.2	44.1	21.99	
JBT16-07052017-1	JBT16	7/5/2017	1	41.0	28.9	14.85	
JBT16-07052017-2+3	JBT16	7/5/2017	2+3	34.3	27.6	12.43	
JBT16-07112017-1	JBT16	7/11/2017	1	32.8	29.8	9.75	
JBT16-07182017-1	JBT16	7/18/2017	1	35.4	22.3	8.40	
JBT16-07262017-1	JBT16	7/26/2017	1	51.7	45.9	8.87	
JBT16-08012017-1	JBT16	8/1/2017	1	54.7	39.1	8.52	
JBT16-08152017-1	JBT16	8/15/2017	1	159	32.6	6.41	
JBT16-08222017-1	JBT16	8/22/2017	1	81.9	59.9	6.67	
JBT16-08302017-1	JBT16	8/30/2017	1	59.6	36.8	NS	
JBT16-091217-1+2	JBT16	9/12/2017	1+2	84.1	48.5	NS	
JBT16-091917-1	JBT16	9/19/2017	1	63.5	35.3	5.66	
JBT16-101017-1	JBT16	10/10/2017	1	1025	630	NS	TDP filtered at VAEL on 10/12/17
JBT16-101717-1	JBT16	10/17/2017	1	169	133	7.09	
JBT16-110117-1	JBT16	11/1/2017	1	161	115	NS	
JBT16-110717-3	JBT16	11/7/2017	3	120	106	NS	
JBT16-111417-1	JBT16	11/14/2017	1	44.5	31.5	NS	Carboy partially frozen--only liquid sampled
JBT16-112017-1	JBT16	11/20/2017	1	18.0	10.5	NS	Carboy frozen--processed in office

LAB ID	Site	Sampling Date	Carboy	TP (µg/L)	TDP (µg/L)	TN (mg/L)	Comment
JBT18-04252017-1	JBT18	4/25/2017	1	87.4	46.1	1.16	
JBT18-05022017-1	JBT18	5/2/2017	1	170	42.3	1.26	
JBT18-05092017-1	JBT18	5/9/2017	1	140	40.1	1.13	
JBT18-05092017-2	JBT18	5/9/2017	2	77.5	37.5	0.99	
JBT18-05092017-3	JBT18	5/9/2017	3	159	32.5	1.06	
JBT18-05092017-4	JBT18	5/9/2017	4	199	38.6	1.10	
JBT18-05162017-1	JBT18	5/16/2017	1	80.8	35.9	0.71	
JBT18-05232017-1	JBT18	5/23/2017	1	49.7	16.0	0.78	
JBT18-05302017-1	JBT18	5/30/2017	1	89.1	23.0	0.95	
JBT18-06062017-1	JBT18	6/6/2017	1	46.5	8.6	0.79	VAEL remark: TDP biased low
JBT18-06132017-1	JBT18	6/13/2017	1	160	31.1	1.25	
JBT18-06222017-1	JBT18	6/22/2017	1	71.2	NS	1.33	Lab broke TDP sample vial
JBT18-06302017-1	JBT18	6/30/2017	1	261	57.2	2.04	
JBT18-06302017-2	JBT18	6/30/2017	2	234	71.5	1.90	
JBT18-06302017-3	JBT18	6/30/2017	3	206	58.9	1.61	
JBT18-06302017-4	JBT18	6/30/2017	4	142	57.9	1.38	
JBT18-07052017-	JBT18	7/5/2017	1+2+3	143	74.4	0.98	
JBT18-07112017-1	JBT18	7/11/2017	1	135	59.5	1.06	
JBT18-07182017-1	JBT18	7/18/2017	1	183	166	1.15	Reversed TP and TDP result
JBT18-07262017-1	JBT18	7/26/2017	1	66.5	40.0	1.10	
JBT18-08012017-1	JBT18	8/1/2017	1	43.3	28.2	0.83	
JBT18-08082017-1	JBT18	8/8/2017	1	34.5	16.1	NS	
JBT18-08222017-1	JBT18	8/22/2017	1	75.9	33.1	2.18	
JBT18-08302017-1	JBT18	8/30/2017	1	46.2	26.6	NS	
JBT18-090517-1	JBT18	9/5/2017	1	75.9	28.3	3.15	
JBT18-091217-1	JBT18	9/12/2017	1	186	114	NS	
JBT18-091217-2	JBT18	9/12/2017	2	117	71.2	NS	
JBT18-091917-1	JBT18	9/19/2017	1	64.6	26.9	0.84	
JBT18-092617-1	JBT18	9/26/2017	1	180	28.6	NS	
JBT18-101017-1	JBT18	10/10/2017	1	223	80.9	NS	
JBT18-101717-1	JBT18	10/17/2017	1	195	47.9	1.58	
JBT18-102417-1	JBT18	10/24/2017	1	97.0	68.5	NS	
JBT18-110117-1	JBT18	11/1/2017	1	432	194	NS	
JBT18-110717-3	JBT18	11/7/2017	3	130	73.2	NS	
JBT18-111417-1	JBT18	11/14/2017	1	46.0	33.5	NS	Carboy partially frozen--only liquid sampled
JBT18-112017-1	JBT18	11/20/2017	1	61.5	43.4	NS	Carboy frozen--processed in office

LAB ID	Site	Sampling Date	Carboy	TP (µg/L)	TDP (µg/L)	TN (mg/L)	Comment
JBT19-04252017-1	JBT19	4/25/2017	1	31.7	27.2	1.00	Reversed TP and TDP result
JBT19-05022017-1	JBT19	5/2/2017	1	56.0	21.1	1.10	
JBT19-05092017-1	JBT19	5/9/2017	1	40.1	29.1	0.76	
JBT19-05092017-2	JBT19	5/9/2017	2	20.9	12.2	0.61	
JBT19-05092017-3+4	JBT19	5/9/2017	3+4	55.2	20.4	0.82	
JBT19-05162017-1	JBT19	5/16/2017	1	17.6	12.6	0.45	
JBT19-05232017-1	JBT19	5/23/2017	1	54.6	22.1	1.00	
JBT19-05302017-1	JBT19	5/30/2017	1	21.8	10.4	0.49	
JBT19-06132017-1	JBT19	6/13/2017	1	81.1	23.1	0.91	
JBT19-06222017-1	JBT19	6/22/2017	1	151	NS	1.24	Lab broke TDP sample vial
JBT19-06302017-1	JBT19	6/30/2017	1	163	73.7	2.04	
JBT19-06302017-2	JBT19	6/30/2017	2	52.2	39.4	0.88	
JBT19-06302017-3+4	JBT19	6/30/2017	3+4	51.8	40.9	0.94	
JBT19-07052017-	JBT19	7/5/2017	1+2+3	41.4	31.3	0.71	
JBT19-07112017-1	JBT19	7/11/2017	1	45.3	21.8	0.57	
JBT19-07182017-1+2	JBT19	7/18/2017	1+2	79.3	74.2	1.05	
JBT19-07262017-1	JBT19	7/26/2017	1	29.3	27.5	0.73	
JBT19-08012017-1	JBT19	8/1/2017	1	32.8	18.7	0.58	
JBT19-08082017-1	JBT19	8/8/2017	1	111	22.6	NS	
JBT19-08302017-1	JBT19	8/30/2017	1	29.1	13.8	NS	
JBT19-090517-1	JBT19	9/5/2017	1	55.5	17.4	1.92	
JBT19-091217-1+2	JBT19	9/12/2017	1+2	62.4	28.9	NS	
JBT19-091917-1	JBT19	9/19/2017	1	62.1	12.5	0.75	
JBT19-101717-1	JBT19	10/17/2017	1	209	16.4	1.46	
JBT19-102417-1	JBT19	10/24/2017	1	318	15.0	NS	
JBT19-110117-1	JBT19	11/1/2017	1	95.9	14.8	NS	
JBT19-110717-3	JBT19	11/7/2017	3	63.8	16.0	NS	
JBT19-111417-1	JBT19	11/14/2017	1	35.7	18.5	NS	Carboy partially frozen--only liquid sampled
JBT19-112017-1	JBT19	11/20/2017	1	27.5	11.4	NS	Carboy frozen--processed in office

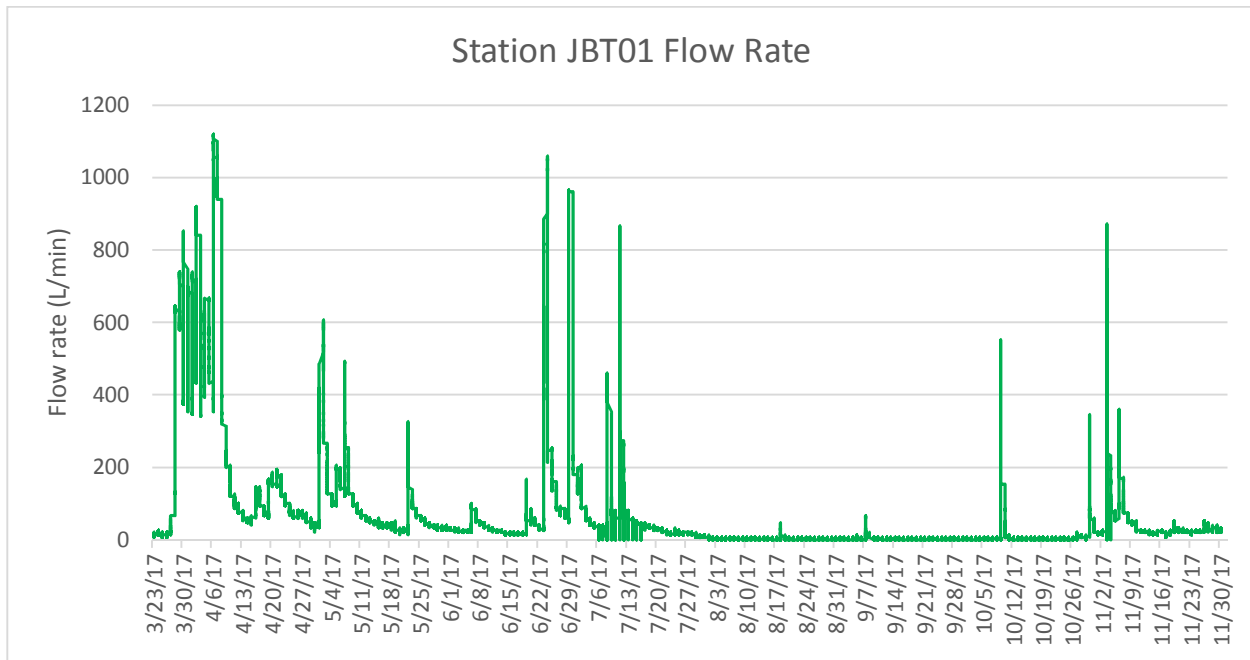


Figure 1. Flow rate at the JBT01 tile drain monitoring station