Lake Thunderbird TMDL Monitoring Plan Implementation: Sample Year (SY) 2019- June Report

SY2019 Monthly Report

Lake Thunderbird TMDL Monitoring Plan Implementation:

June 2019 Monitoring Report

Oklahoma Water Resources Board
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SUMMARY OF JUNE WATER QUALITY SAMPLING

Sampling for June 2019 occurred between the eighteenth and twenty-first of May and was considered a high flow collection. Water samples were collected at all ten permanent locations, as well as the seven storm outfalls. Discharge measurements were collected at seven locations. Mesonet data shows 0.82 inches of precipitation occurring on the eighteenth, 1.09 inches of precipitation on the twentieth, and 1.90 inches of precipitation on the twenty-first. There was no precipitation in the 72 hours prior to sampling, and 0.74 inches of precipitation in the 72 hours after the sampling event. The total rainfall amount in Norman for the month of June was 5.47 inches. All water level gauges were operational for the month, with the exception of CC-1 as a result of road construction activity, and LT-1 due to equipment malfunction.

RESULTS

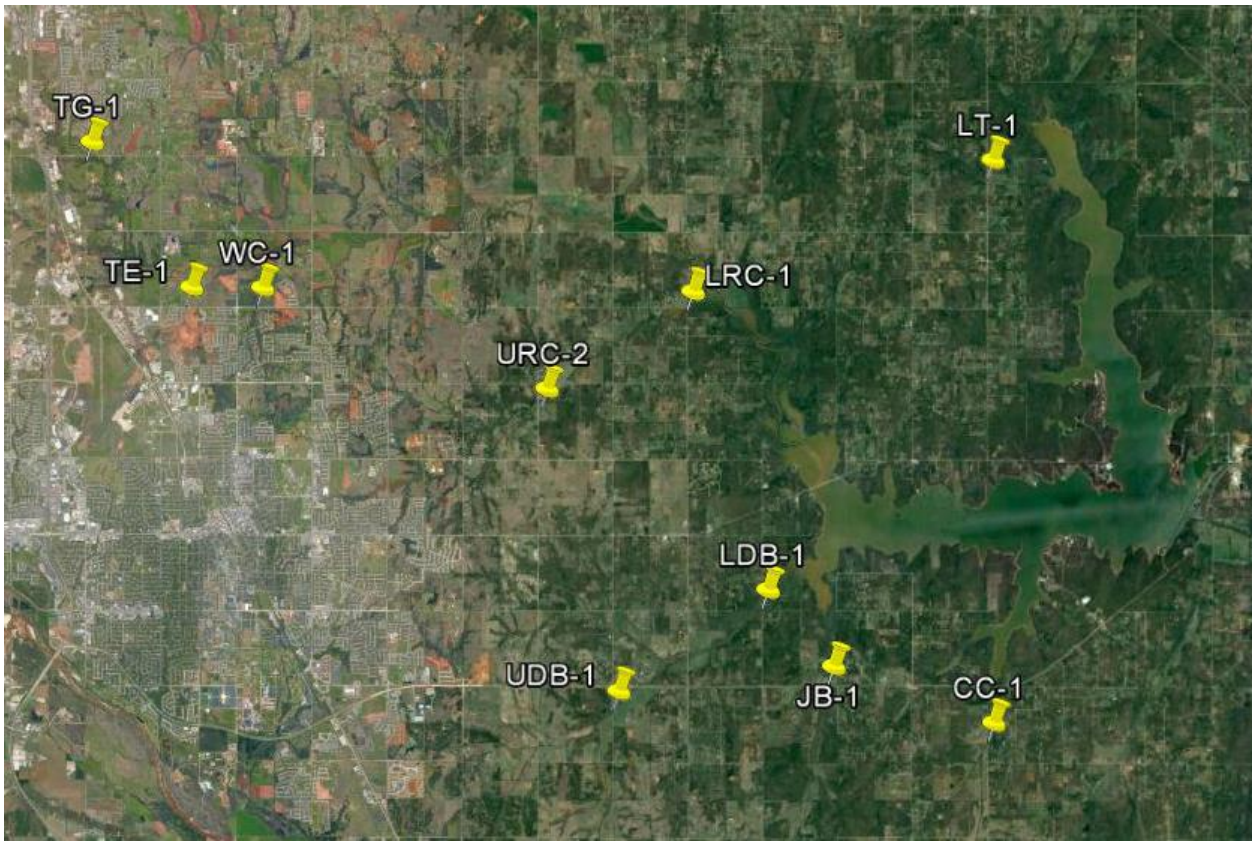

Figure 1 Monitoring Station Map

Monitoring Location ID	Monitoring Location Name	Date	Time	Field Crew	Water Temperature (°C)	Dissolved Oxygen (DO) (mg/l)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Notes
CC-1	Clear Creek	05-21-2019	11:00	JW	18.40	7.94	7.45	179	337	
JB-1	Jim Blue Creek	05-21-2019	7:30	JW	*	*	7.95	347	367	T4 @7:30 at 18.72, peak @8:30 at 19.61; flow taken @12:00 at 19.27 (86.77cfs)
LDB-1	Lower Dave Blue Creek	05-21-2019	12:15	JW	17.40	9.24	7.97	257	293	T2 @12:15 at 20.40, still slowly rising; current stage 21.43 @15:15 on 5/22
LRC-1	Lower Rock Creek	05-21-2019	4:15	JW	*	*	7.74	90	1000	T2 @4:15 at 21.13, peak @8:30 at 29.05; first flow taken @8:45 at 28.92
LT-1	Lake Laterals	05-21-2019	9:45	JW	18.30	6.43	7.26	167	111	
TE-1	Little River Tributary	05-21-2019	4:20	JW	*	*	7.71	185	659	T3 @4:15 at 17.30, collected at peak; first peak @00:45 at 15.49
TG-1	Little River Tributary	05-18-2019	10:30	SD	*	*	8.01	552	1000	T3 @10:30 at 16.94, peak @11:15 at 18.32
UDB-1	Upper Dave Blue Creek	05-18-2019	14:30	JW	*	*	8.02	649	593	T1 @14:30 at 19.03, peak @14:45 at 19.05; oil sheen on sample
URC-2	Upper Rock Creek	05-18-2019	14:35	JW	*	*	7.99	652	442	T2 @14:30 at 14.83, peak @14:45 at 14.92
WC-1	Woodcrest Creek	05-21-2019	4:30	JW	*	*	7.99	104	1000	T4 @4:30 at 16.90, peak @5:15 at 18.61
SW-08	Stormwater Outfall 08	5/20/2019	10:20	SD	*	*	7.47	23	259	
SW-09	Stormwater Outfall 09	5/20/2019	9:45	SD	*	*	7.29	293	9	
SW-10	Stormwater Outfall 10	5/20/2019	9:15	SD	*	*	7.23	220	34	
SW-11	Stormwater Outfall 11	5/20/2019	9:20	SD	*	*	7.16	239	35	
SW-12	Stormwater Outfall 12	5/20/2019	10:05	SD	*	*	7.60	157	134	
SW-13	Stormwater Outfall 13	5/21/2019	14:35	SD	*	*	7.70	190	305	
SW-14	Stormwater Outfall 14	5/21/2019	13:45	SD	19.78	7.78	7.54	295	410	not able to access sampler, collected from current conditions

Table 1 Field Data Form Where an Asterisk Denotes a Sample from the Autosampler

Monitoring Location ID	Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
CC-1	Clear Creek	0.11	2.61	0.377	348
JB-1	Jim Blue Creek	0.21	1.89	0.338	328
LDB-1	Lower Dave Blue Creek	0.13	1.43	0.297	304
LRC-1	Lower Rock Creek	0.34	8.35	2.035	3660
LT-1	Lake Laterals	0.07	1.15	0.157	76.0
TE-1	Little River Tributary	0.36	1.46	0.411	476
TG-1	Little River Tributary	0.29	2.57	0.209	1800
UDB-1	Upper Dave Blue Creek	0.28	1.57	0.377	588
URC-2	Upper Rock Creek	0.31	1.53	0.385	376
WC-1	Woodcrest Creek	0.33	3.08	0.219	1200
SW-08	Stormwater Outfall 08	0.79	4.54	0.108	424
SW-09	Stormwater Outfall 09	0.32	0.90	0.100	36.0
SW-10	Stormwater Outfall 10	0.23	1.66	0.291	74.0
SW-11	Stormwater Outfall 11	0.32	2.71	0.489	240
SW-12	Stormwater Outfall 12	0.09	1.10	0.131	104
SW-13	Stormwater Outfall 13	0.17	1.49	0.251	828
SW-14	Stormwater Outfall 14	0.12	1.13	0.255	348

Table 2 Laboratory Analysis Summary

Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
Field Blank	<0.05	<0.10	<0.010	<5.0
Duplicate	0.11	1.82	0.333	292
Duplicate RPD	0%	35.67%**	12.39%*	17.5%*

Table 3 QA/QC Data Where One Asterisk Denotes RPD 2 and Two Asterisks Denote RPD 3

Quality assurance/quality control (QA/QC) of the data includes a field blank and duplicate sample from each collection event, and is qualified by the OWRB. Relative Percent Difference (RPD) of the duplicate sample can be categorized into four levels, where Level 1 likely has no QA issues and Level 4 has major QA issues, and should be used with caution.

Monitoring Location ID	Monitoring Location Name	Discharge (cfs)	Stream Stage (ft)
CC-1	Clear Creek	43.91	N/A
JB-1	Jim Blue Creek	95.80	18.72
LDB-1	Lower Dave Blue Creek	971	20.40
LRC-1	Lower Rock Creek	77.70	21.13
LT-1	Lake Laterals	38.64	4.66
TE-1	Little River Tributary	602	17.30
TG-1	Little River Tributary	890	16.94
UDB-1	Upper Dave Blue Creek	88.00	19.03
URC-2	Upper Rock Creek	47.80	14.83
WC-1	Woodcrest Creek	1060	16.90

Table 4 Station Discharge Summary

Station Number:
Station Name: urc0521

Meas. No: 1
Date: 05/21/2019

Party:
Boat/Motor:
Gage Height: 18.62 ft

Width: 37.6 ft
Area: 134 ft²
G.H.Change: 0.000 ft

Processed by:
Mean Velocity: 2.90 ft/s
Discharge: 383 ft³/s

Area Method: Avg. Course
Nav. Method: Bottom Track
MagVar Method: None (0.0°)
Depth: Composite (BT)
Discharge Method: None
% Correction: 0.00

ADCP Depth: 0.270 ft
Shore Ens.:10
Bottom Est: Power (0.1667)
Top Est: Power (0.1667)

Index Vel.: 0.00 ft/s
Adj.Mean Vel: 0.00 ft/s
Rated Area: 0.000 ft²
Control1: Unspecified
Control2: Unspecified
Control3: Unspecified

Rating No.: 1
Qm Rating: U
Diff.: 0.000%

Screening Thresholds:
BT 3-Beam Solution: YES
WT 3-Beam Solution: YES
BT Error Vel.: 3.28 ft/s
WT Error Vel.: 32.81 ft/s
BT Up Vel.: 32.81 ft/s
WT Up Vel.: 32.81 ft/s
Use Weighted Mean Depth: YES

Max. Vel.: 9.03 ft/s
Max. Depth: 6.02 ft
Mean Depth: 3.55 ft
% Meas.: 39.12
Water Temp.: None
ADCP Temp.: 66.5 °F

ADCP:
Type/Freq.: RiverRay / 0 kHz
Serial #: 645650
Firmware: 44.21
Bin Size: 50 cm
Blank: 50 cm
BT Mode: 0
BT Pings: 1
WT Mode: 1
WT Pings: 1
WV : 170

Performed Diag. Test: NO
Performed Moving Bed Test: NO
Performed Compass Calibration: NO Evaluation: NO
Meas. Location:

Project Name: urc0521_1edit.mmt
Software: 2.17

Tr.#		Edge Distance		#Ens.	Discharge						Width	Area	Time		Mean Vel.		% Bad	
		L	R		Top	Middle	Bottom	Left	Right	Total			Start	End	Boat	Water	Ens.	Bins
001	L	3	2	108	99.3	134	120	8.09	10.3	371	37	128	11:51	11:52	0.60	2.91	62	3
004	*R*	*3*	*2*	*113*	*95.1*	*148*	*144*	*5.47*	*16.4*	*409*	*34*	*117*	*11:55*	*11:56*	*0.63*	*3.49*	*62*	*3*
005	L	*3*	*2*	*69*	*102*	*161*	*107*	*11.1*	*12.1*	*393*	*38*	*143*	*11:57*	*11:58*	*0.66*	*2.75*	*49*	*2*
007	*L*	*3*	*2*	*100*	*84.5*	*156*	*99.9*	*6.85*	*9.61*	*357*	*41*	*147*	*11:59*	*12:01*	*0.69*	*2.43*	*41*	*2*
Mean		3	2	97	95.2	150	118	7.87	12.1	383	38	134	**Total**	00:09	0.65	2.90	54	2
SDev		0	0	20	7.66	11.7	19.3	2.38	3.03	23.0	2.5	13.8			0.04	0.45		
SD/M		0.00	0.00	0.20	0.08	0.08	0.16	0.30	0.25	0.06	0.07	0.10			0.06	0.15		

Figure 2 Discharge Summary URC-2 Measurement 1

Station Number:
Station Name: urc0521

Meas. No: 2
Date: 05/21/2019

Party:	Width: 34.3 ft	Processed by:
Boat/Motor:	Area: 117 ft²	Mean Velocity: 2.51 ft/s
Gage Height: 18.37 ft	G.H.Change: 0.000 ft	Discharge: 294 ft³/s

Area Method: Avg. Course	ADCP Depth: 0.270 ft	Index Vel.: 0.00 ft/s	Rating No.: 1
Nav. Method: Bottom Track	Shore Ens.:10	Adj.Mean Vel: 0.00 ft/s	Qm Rating: U
MagVar Method: None (0.0°)	Bottom Est: Power (0.1667)	Rated Area: 0.000 ft²	Diff.: 0.000%
Depth: Composite (BT)	Top Est: Power (0.1667)	Control1: Unspecified	
Discharge Method: None		Control2: Unspecified	
% Correction: 0.00		Control3: Unspecified	

Screening Thresholds:		ADCP:	
BT 3-Beam Solution: YES	Max. Vel.: 7.53 ft/s	Type/Freq.: RiverRay / 0 kHz	
WT 3-Beam Solution: YES	Max. Depth: 5.84 ft	Serial #: 645650	Firmware: 44.21
BT Error Vel.: 3.28 ft/s	Mean Depth: 3.45 ft	Bin Size: 50 cm	Blank: 50 cm
WT Error Vel.: 32.81 ft/s	% Meas.: 38.87	BT Mode: 0	BT Pings: 1
BT Up Vel.: 32.81 ft/s	Water Temp.: None	WT Mode: 1	WT Pings: 1
WT Up Vel.: 32.81 ft/s	ADCP Temp.: 66.6 °F	WV : 170	
Use Weighted Mean Depth: YES			

Performed Diag. Test: NO
Performed Moving Bed Test: NO
Performed Compass Calibration: NO Evaluation: NO
Meas. Location:

Project Name: urc0521_2edit.mmt
Software: 2.17

Tr.#		Edge Distance		#Ens.	Discharge						Width	Area	Time		Mean Vel.		% Bad	
		L	R		Top	Middle	Bottom	Left	Right	Total			Start	End	Boat	Water	Ens.	Bins
000	R	2	2	125	82.0	122	98.2	4.66	13.0	319	33	116	12:04	12:06	0.54	2.76	61	3
003	L	2	2	86	104	137	75.9	7.06	9.50	334	43	133	12:09	12:10	0.74	2.51	57	3
005	L	2	2	95	63.0	94.1	97.7	6.50	6.22	268	28	107	12:12	12:13	0.52	2.50	60	2
007	L	2	2	57	61.9	105	65.1	9.08	15.3	256	33	113	12:15	12:16	0.81	2.27	67	0
Mean		2	2	90	77.8	114	84.2	6.82	11.0	294	34	117	**Total**	00:11	0.65	2.51	61	2
SDev		0	0	28	20.0	18.9	16.5	1.82	3.99	38.1	6.0	11.2			0.14	0.20		
SD/M		0.00	0.00	0.31	0.26	0.16	0.20	0.27	0.36	0.13	0.17	0.10			0.22	0.08		

Figure 3 Discharge Summary URC-2 Measurement 2

Station Number:
Station Name: udb0521

Meas. No: 1
Date: 05/21/2019

Party:	Width: 48.1 ft	Processed by:
Boat/Motor:	Area: 114 ft²	Mean Velocity: 3.01 ft/s
Gage Height: 20.61 ft	G.H.Change: 0.000 ft	Discharge: 341 ft³/s

Area Method: Avg. Course	ADCP Depth: 0.270 ft	Index Vel.: 0.00 ft/s	Rating No.: 1
Nav. Method: Bottom Track	Shore Ens.:10	Adj.Mean Vel: 0.00 ft/s	Qm Rating: U
MagVar Method: None (0.0°)	Bottom Est: Power (0.1667)	Rated Area: 0.000 ft²	Diff.: 0.000%
Depth: Composite (BT)	Top Est: Power (0.1667)	Control1: Unspecified	
Discharge Method: None		Control2: Unspecified	
% Correction: 0.00		Control3: Unspecified	

Screening Thresholds:		ADCP:	
BT 3-Beam Solution: YES	Max. Vel.: 8.94 ft/s	Type/Freq.: RiverRay / 0 kHz	
WT 3-Beam Solution: YES	Max. Depth: 3.67 ft	Serial #: 645650	Firmware: 44.21
BT Error Vel.: 3.28 ft/s	Mean Depth: 2.38 ft	Bin Size: 50 cm	Blank: 50 cm
WT Error Vel.: 32.81 ft/s	% Meas.: 34.87	BT Mode: 0	BT Pings: 1
BT Up Vel.: 32.81 ft/s	Water Temp.: None	WT Mode: 1	WT Pings: 1
WT Up Vel.: 32.81 ft/s	ADCP Temp.: 65.9 °F	WV : 170	
Use Weighted Mean Depth: YES			

Performed Diag. Test: NO
Performed Moving Bed Test: NO
Performed Compass Calibration: NO Evaluation: NO
Meas. Location:

Project Name: udb0521_1.mmt
Software: 2.17

Tr.#		Edge Distance		#Ens.	Discharge						Width	Area	Time		Mean Vel.		% Bad	
		L	R		Top	Middle	Bottom	Left	Right	Total			Start	End	Boat	Water	Ens.	Bins
000	R	2	2	130	123	129	79.6	3.57	3.21	338	44	108	12:34	12:35	0.65	3.13	42	2
001	*L*	*2*	*2*	*118*	*123*	*111*	*79.1*	*4.84*	*5.09*	*323*	*40*	*100*	*12:35*	*12:36*	*0.59*	*3.23*	*58*	*2*
002	R	*2*	*2*	*147*	*129*	*118*	*86.5*	*9.64*	*5.16*	*348*	*52*	*124*	*12:37*	*12:38*	*0.67*	*2.80*	*65*	*3*
003	L	*2*	*2*	*125*	*149*	*116*	*78.3*	*3.85*	*5.47*	*353*	*56*	*123*	*12:38*	*12:39*	*0.77*	*2.88*	*67*	*2*
Mean		2	2	130	131	119	80.9	5.47	4.73	341	48	114	**Total**	00:05	0.67	3.01	58	2
SDev		0	0	12	12.7	7.49	3.76	2.83	1.03	13.4	7.3	11.8			0.08	0.20		
SD/M		0.00	0.00	0.10	0.10	0.06	0.05	0.52	0.22	0.04	0.15	0.10			0.11	0.07		

Figure 4 Discharge Summary UDB-1 Measurement 1

Station Number:
Station Name: udb0521

Meas. No: 2
Date: 05/21/2019

Party:
Boat/Motor:
Gage Height: 20.67 ft

Width: 34.7 ft
Area: 82.0 ft²
G.H.Change: 0.000 ft

Processed by:
Mean Velocity: 3.07 ft/s
Discharge: 251 ft³/s

Area Method: Avg. Course
Nav. Method: Bottom Track
MagVar Method: None (0.0°)
Depth: Composite (BT)
Discharge Method: None
% Correction: 0.00

ADCP Depth: 0.270 ft
Shore Ens.:10
Bottom Est: Power (0.1667)
Top Est: Power (0.1667)

Index Vel.: 0.00 ft/s
Adj.Mean Vel: 0.00 ft/s
Rated Area: 0.000 ft²
Control1: Unspecified
Control2: Unspecified
Control3: Unspecified

Rating No.: 1
Qm Rating: U
Diff.: 0.000%

Screening Thresholds:
BT 3-Beam Solution: YES
WT 3-Beam Solution: YES
BT Error Vel.: 3.28 ft/s
WT Error Vel.: 32.81 ft/s
BT Up Vel.: 32.81 ft/s
WT Up Vel.: 32.81 ft/s
Use Weighted Mean Depth: YES

Max. Vel.: 9.08 ft/s
Max. Depth: 3.55 ft
Mean Depth: 2.37 ft
% Meas.: 34.46
Water Temp.: None
ADCP Temp.: 66.0 °F

ADCP:
Type/Freq.: RiverRay / 0 kHz
Serial #: 645650
Firmware: 44.21
Bin Size: 50 cm
Blank: 50 cm
BT Mode: 0
BT Pings: 1
WT Mode: 1
WT Pings: 1
WV : 170

Performed Diag. Test: NO
Performed Moving Bed Test: NO
Performed Compass Calibration: NO Evaluation: NO
Meas. Location:

Project Name: udb0521_2edit.mmt
Software: 2.17

Tr.#		Edge Distance L	Edge Distance R	#Ens.	Discharge Top	Discharge Middle	Discharge Bottom	Discharge Left	Discharge Right	Discharge Total	Width	Area	Time Start	Time End	Mean Vel. Boat	Mean Vel. Water	% Bad Ens.	% Bad Bins
001	L	2	3	113	99.2	92.2	60.1	1.77	7.80	261	34	82	12:46	12:47	0.67	3.17	46	2
003	*L*	*2*	*3*	*118*	*92.5*	*84.9*	*51.4*	*2.54*	*4.34*	*236*	*32*	*77*	*12:48*	*12:49*	*0.61*	*3.06*	*46*	*3*
004	*R*	*2*	*3*	*117*	*104*	*83.1*	*62.9*	*5.79*	*9.08*	*265*	*39*	*90*	*12:49*	*12:50*	*0.62*	*2.94*	*48*	*1*
005	L	2	3	96	91.1	86.5	52.1	4.06	10.3	244	33	78	12:50	12:51	0.74	3.12	57	5
Mean		2	3	111	96.7	86.7	56.6	3.54	7.89	251	35	82	**Total**	00:05	0.66	3.07	49	3
SDev		0	0	10	6.10	3.93	5.74	1.78	2.58	13.9	3.2	5.9			0.06	0.10		
SD/M		0.00	0.00	0.09	0.06	0.05	0.10	0.50	0.33	0.06	0.09	0.07			0.09	0.03		

Figure 5 Discharge Summary UDB-1 Measurement 2

Discharge Measurement Summary

Date Generated: Mon Jun 24 2019

File Information

File Name	LT0521.WAD
Start Date and Time	2019/05/21 06:18:04

Site Details

Site Name	LT
Operator(s)	JTW

System Information

Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.1%	1.5%
Velocity	1.1%	3.2%
Width	0.1%	0.1%
Method	1.8%	-
# Stations	2.3%	-
Overall	**3.3%**	**3.7%**

Summary

Averaging Int.	40	# Stations	22
Start Edge	LEW	Total Width	23.000
Mean SNR	44.0 dB	Total Area	58.650
Mean Temp	64.38 °F	Mean Depth	2.550
Disch. Equation	Mid-Section	Mean Velocity	0.6589
		Total Discharge	**38.6422**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue May 21 06:16:46 CDT 2019	0.000	4.660		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	06:18	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	06:18	2.00	0.6	1.100	0.6	0.440	0.2697	1.00	0.2697	1.650	0.4450	1.2
2	06:19	3.00	0.6	1.300	0.6	0.520	0.5823	1.00	0.5823	1.300	0.7570	2.0
3	*06:20*	*4.00*	*0.6*	*1.200*	*0.6*	*0.480*	*0.6427*	*1.00*	*0.6427*	*1.200*	*0.7713*	*2.0*
4	*06:21*	*5.00*	*0.6*	*2.300*	*0.6*	*0.920*	*0.6749*	*1.00*	*0.6749*	*2.300*	*1.5521*	*4.0*
5	*06:23*	*6.00*	*0.6*	*2.500*	*0.6*	*1.000*	*0.7464*	*1.00*	*0.7464*	*2.500*	*1.8660*	*4.8*
6	*06:24*	*7.00*	*0.6*	*2.800*	*0.6*	*1.120*	*0.6437*	*1.00*	*0.6437*	*2.800*	*1.8023*	*4.7*
7	06:25	8.00	0.6	2.500	0.6	1.000	0.9318	1.00	0.9318	2.500	2.3294	6.0
8	06:27	9.00	0.6	3.100	0.6	1.240	0.9180	1.00	0.9180	3.100	2.8458	7.4
9	*06:28*	*10.00*	*0.6*	*3.400*	*0.6*	*1.360*	*0.7782*	*1.00*	*0.7782*	*3.400*	*2.6459*	*6.8*
10	*06:29*	*11.00*	*0.6*	*3.600*	*0.6*	*1.440*	*0.9216*	*1.00*	*0.9216*	*3.600*	*3.3178*	*8.6*
11	06:30	12.00	0.6	3.600	0.6	1.440	0.7759	1.00	0.7759	3.600	2.7934	7.2
12	*06:31*	*13.00*	*0.6*	*3.600*	*0.6*	*1.440*	*0.6040*	*1.00*	*0.6040*	*3.600*	*2.1744*	*5.6*
13	06:32	14.00	0.6	3.600	0.6	1.440	0.7083	1.00	0.7083	3.600	2.5500	6.6
14	06:33	15.00	0.6	3.600	0.6	1.440	0.6526	1.00	0.6526	3.600	2.3493	6.1
15	06:33	16.00	0.6	3.500	0.6	1.400	0.6010	1.00	0.6010	3.500	2.1037	5.4
16	06:34	17.00	0.6	3.400	0.6	1.360	0.4547	1.00	0.4547	3.400	1.5460	4.0
17	06:35	18.00	0.6	3.400	0.6	1.360	0.5420	1.00	0.5420	3.400	1.8427	4.8
18	06:36	19.00	0.6	3.200	0.6	1.280	0.7526	1.00	0.7526	3.200	2.4085	6.2
19	06:37	20.00	0.6	2.800	0.6	1.120	0.4961	1.00	0.4961	2.800	1.3889	3.6
20	*06:38*	*21.00*	*0.6*	*2.400*	*0.6*	*0.960*	*0.3202*	*1.00*	*0.3202*	*3.600*	*1.1527*	*3.0*
21	06:38	23.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 6 Discharge Summary LT-1

Station Number:
Station Name: lrc0521

Meas. No: 0
Date: 05/21/2019

Party:
Boat/Motor:
Gage Height: 28.92 ft

Width: 43.7 ft
Area: 493 ft²
G.H.Change: 0.000 ft

Processed by:
Mean Velocity: 1.05 ft/s
Discharge: 452 ft³/s

Area Method: Avg. Course
Nav. Method: Bottom Track
MagVar Method: None (0.0°)
Depth: Composite (BT)
Discharge Method: None
% Correction: 0.00

ADCP Depth: 0.270 ft
Shore Ens.:10
Bottom Est: Power (0.1667)
Top Est: Power (0.1667)

Index Vel.: 0.00 ft/s
Adj.Mean Vel: 0.00 ft/s
Rated Area: 0.000 ft²
Control1: Unspecified
Control2: Unspecified
Control3: Unspecified

Rating No.: 1
Qm Rating: U
Diff.: 0.000%

Screening Thresholds:
BT 3-Beam Solution: YES
WT 3-Beam Solution: YES
BT Error Vel.: 3.28 ft/s
WT Error Vel.: 32.81 ft/s
BT Up Vel.: 32.81 ft/s
WT Up Vel.: 32.81 ft/s
Use Weighted Mean Depth: YES

Max. Vel.: 5.46 ft/s
Max. Depth: 13.9 ft
Mean Depth: 11.2 ft
% Meas.: 65.38
Water Temp.: None
ADCP Temp.: 66.6 °F

ADCP:
Type/Freq.: RiverRay / 0 kHz
Serial #: 645650
Firmware: 44.21
Bin Size: 50 cm
Blank: 50 cm
BT Mode: 0
BT Pings: 1
WT Mode: 1
WT Pings: 1
WV : 170

Performed Diag. Test: NO
Performed Moving Bed Test: NO
Performed Compass Calibration: YES Evaluation: YES
Meas. Location:

Project Name: lrc0521_0 edit.mmt
Software: 2.17

Tr.#		Edge Distance L	Edge Distance R	#Ens.	Discharge Top	Discharge Middle	Discharge Bottom	Discharge Left	Discharge Right	Discharge Total	Width	Area	Time Start	Time End	Mean Vel. Boat	Mean Vel. Water	% Bad Ens.	% Bad Bins
000	R	2	2	107	31.7	305	76.4	23.0	8.05	444	72	833	11:11	11:13	0.77	0.53	39	0
002	R	2	2	65	37.6	287	124	22.7	-4.91	467	29	324	11:14	11:15	0.73	1.44	18	1
004	R	2	2	64	40.3	307	116	20.0	-9.22	474	38	397	11:17	11:18	0.84	1.19	25	0
005	*L*	*2*	*2*	*69*	*32.7*	*284*	*99.8*	*15.7*	*-7.98*	*424*	*36*	*417*	*11:18*	*11:19*	*0.71*	*1.01*	*17*	*0*
Mean		2	2	76	35.6	296	104	20.4	-3.51	452	44	493	**Total**	00:07	0.76	1.05	25	0
SDev		0	0	21	4.04	12.0	21.1	3.39	7.92	22.9	19.2	230.3			0.06	0.39		
SD/M		0.00	0.00	0.27	0.11	0.04	0.20	0.17	2.25	0.05	0.44	0.47			0.07	0.37		

Figure 7 Discharge Summary LRC-1 Measurement 1

Station Number:
Station Name: lrc0521

Meas. No: 2
Date: 05/21/2019

Party:
Boat/Motor:
Gage Height: 28.80 ft

Width: 37.4 ft
Area: 418 ft²
G.H.Change: 0.000 ft

Processed by:
Mean Velocity: 1.03 ft/s
Discharge: 424 ft³/s

Area Method: Avg. Course
Nav. Method: Bottom Track
MagVar Method: None (0.0°)
Depth: Composite (BT)
Discharge Method: None
% Correction: 0.00

ADCP Depth: 0.270 ft
Shore Ens.:10
Bottom Est: Power (0.1667)
Top Est: Power (0.1667)

Index Vel.: 0.00 ft/s
Adj.Mean Vel: 0.00 ft/s
Rated Area: 0.000 ft²
Control1: Unspecified
Control2: Unspecified
Control3: Unspecified

Rating No.: 1
Qm Rating: U
Diff.: 0.000%

Screening Thresholds:
BT 3-Beam Solution: YES
WT 3-Beam Solution: YES
BT Error Vel.: 3.28 ft/s
WT Error Vel.: 32.81 ft/s
BT Up Vel.: 32.81 ft/s
WT Up Vel.: 32.81 ft/s
Use Weighted Mean Depth: YES

Max. Vel.: 7.29 ft/s
Max. Depth: 14.0 ft
Mean Depth: 11.2 ft
% Meas.: 67.97
Water Temp.: None
ADCP Temp.: 66.6 °F

ADCP:
Type/Freq.: RiverRay / 0 kHz
Serial #: 645650
Bin Size: 50 cm
BT Mode: 0
WT Mode: 1
WV : 170

Firmware: 44.21
Blank: 50 cm
BT Pings: 1
WT Pings: 1

Performed Diag. Test: NO
Performed Moving Bed Test: NO
Performed Compass Calibration: NO Evaluation: NO
Meas. Location:

Project Name: lrc0521_2 edit.mmt
Software: 2.17

Tr.#		Edge Distance L	Edge Distance R	#Ens.	Discharge Top	Discharge Middle	Discharge Bottom	Discharge Left	Discharge Right	Discharge Total	Width	Area	Time Start	Time End	Mean Vel. Boat	Mean Vel. Water	% Bad Ens.	% Bad Bins
001	L	2	3	61	34.6	305	101	10.2	-8.69	441	34	390	11:25	11:25	0.75	1.13	18	1
002	R	2	3	106	33.8	264	114	6.85	7.10	426	32	351	11:27	11:28	0.46	1.21	28	1
003	*L*	*2*	*3*	*75*	*31.5*	*266*	*98.5*	*9.25*	*-8.86*	*396*	*39*	*427*	*11:28*	*11:29*	*0.75*	*0.93*	*23*	*0*
004	R	*2*	*3*	*84*	*33.7*	*319*	*76.5*	*10.6*	*-6.22*	*433*	*45*	*503*	*11:29*	*11:31*	*0.78*	*0.86*	*38*	*0*
Mean		2	3	81	33.4	288	97.5	9.22	-4.17	424	37	418	**Total**	00:06	0.68	1.03	27	1
SDev		0	0	19	1.36	27.4	15.6	1.67	7.61	19.6	5.8	64.9			0.15	0.17		
SD/M		0.00	0.00	0.23	0.04	0.10	0.16	0.18	1.83	0.05	0.16	0.16			0.22	0.16		

Figure 8 Discharge Summary LRC-1 Measurement 2

Station Number:
Station Name: lrc0521

Meas. No: 3
Date: 05/21/2019

Party:
Boat/Motor:
Gage Height: 27.79 ft

Width: 30.2 ft
Area: 312 ft²
G.H.Change: 0.000 ft

Processed by:
Mean Velocity: 0.801 ft/s
Discharge: 249 ft³/s

Area Method: Avg. Course
Nav. Method: Bottom Track
MagVar Method: None (0.0°)
Depth: Composite (BT)
Discharge Method: None
% Correction: 0.00

ADCP Depth: 0.270 ft
Shore Ens.:10
Bottom Est: Power (0.1667)
Top Est: Power (0.1667)

Index Vel.: 0.00 ft/s
Adj.Mean Vel: 0.00 ft/s
Rated Area: 0.000 ft²
Control1: Unspecified
Control2: Unspecified
Control3: Unspecified

Rating No.: 1
Qm Rating: U
Diff.: 0.000%

Screening Thresholds:
BT 3-Beam Solution: YES
WT 3-Beam Solution: YES
BT Error Vel.: 3.28 ft/s
WT Error Vel.: 32.81 ft/s
BT Up Vel.: 32.81 ft/s
WT Up Vel.: 32.81 ft/s
Use Weighted Mean Depth: YES

Max. Vel.: 3.85 ft/s
Max. Depth: 13.1 ft
Mean Depth: 10.3 ft
% Meas.: 64.64
Water Temp.: None
ADCP Temp.: 66.7 °F

ADCP:
Type/Freq.: RiverRay / 0 kHz
Serial #: 645650
Bin Size: 50 cm
BT Mode: 0
WT Mode: 1
WV : 170

Firmware: 44.21
Blank: 50 cm
BT Pings: 1
WT Pings: 1

Performed Diag. Test: NO
Performed Moving Bed Test: NO
Performed Compass Calibration: NO Evaluation: NO
Meas. Location:

Project Name: lrc0521_3 edit.mmt
Software: 2.17

Tr.#		Edge Distance L	Edge Distance R	#Ens.	Discharge Top	Discharge Middle	Discharge Bottom	Discharge Left	Discharge Right	Discharge Total	Width	Area	Time Start	Time End	Mean Vel. Boat	Mean Vel. Water	% Bad Ens.	% Bad Bins
001	L	2	3	68	21.1	164	60.5	6.57	-2.22	250	30	310	14:16	14:17	0.62	0.81	13	2
003	L	2	3	89	22.3	163	69.9	9.61	-2.79	262	28	292	14:19	14:20	0.46	0.90	16	1
004	*R*	*2*	*3*	*85*	*20.4*	*146*	*53.5*	*6.89*	*-0.071*	*227*	*31*	*318*	*14:20*	*14:22*	*0.44*	*0.71*	*16*	*2*
005	L	*2*	*3*	*76*	*22.1*	*172*	*62.4*	*6.71*	*-4.10*	*259*	*31*	*328*	*14:22*	*14:23*	*0.64*	*0.79*	*12*	*2*
Mean		2	3	79	21.5	161	61.6	7.44	-2.30	249	30	312	**Total**	00:06	0.54	0.80	14	2
SDev		0	0	9	0.880	10.8	6.77	1.45	1.68	15.8	1.5	15.1			0.11	0.08		
SD/M		0.00	0.00	0.12	0.04	0.07	0.11	0.19	0.73	0.06	0.05	0.05			0.20	0.09		

Figure 9 Discharge Summary LRC-1 Measurement 3

Station Number:
Station Name: lrc0521

Meas. No: 4
Date: 05/21/2019

Party:
Boat/Motor:
Gage Height: 27.24 ft

Width: 32.8 ft
Area: 324 ft²
G.H.Change: 0.000 ft

Processed by:
Mean Velocity: 0.714 ft/s
Discharge: 222 ft³/s

Area Method: Avg. Course
Nav. Method: Bottom Track
MagVar Method: None (0.0°)
Depth: Composite (BT)
Discharge Method: None
% Correction: 0.00

ADCP Depth: 0.270 ft
Shore Ens.:10
Bottom Est: Power (0.1667)
Top Est: Power (0.1667)

Index Vel.: 0.00 ft/s
Adj.Mean Vel: 0.00 ft/s
Rated Area: 0.000 ft²
Control1: Unspecified
Control2: Unspecified
Control3: Unspecified

Rating No.: 1
Qm Rating: U
Diff.: 0.000%

Screening Thresholds:
BT 3-Beam Solution: YES
WT 3-Beam Solution: YES
BT Error Vel.: 3.28 ft/s
WT Error Vel.: 32.81 ft/s
BT Up Vel.: 32.81 ft/s
WT Up Vel.: 32.81 ft/s
Use Weighted Mean Depth: YES

Max. Vel.: 9.06 ft/s
Max. Depth: 14.0 ft
Mean Depth: 9.92 ft
% Meas.: 63.48
Water Temp.: None
ADCP Temp.: 67.4 °F

ADCP:
Type/Freq.: RiverRay / 0 kHz
Serial #: 645650
Bin Size: 50 cm
BT Mode: 0
WT Mode: 1
WV : 170

Firmware: 44.21
Blank: 50 cm
BT Pings: 1
WT Pings: 1

Performed Diag. Test: NO
Performed Moving Bed Test: NO
Performed Compass Calibration: NO Evaluation: NO
Meas. Location:

Project Name: lrc0521_4 edit.mmt
Software: 2.17

Tr.#		Edge Distance L	Edge Distance R	#Ens.	Discharge Top	Discharge Middle	Discharge Bottom	Discharge Left	Discharge Right	Discharge Total	Width	Area	Time Start	Time End	Mean Vel. Boat	Mean Vel. Water	% Bad Ens.	% Bad Bins
000	R	3	2	128	20.2	143	55.9	7.70	3.11	229	47	452	15:05	15:07	0.48	0.51	33	3
002	*R*	*3*	*2*	*60*	*20.0*	*145*	*51.5*	*18.4*	*2.26*	*237*	*28*	*283*	*15:09*	*15:10*	*0.51*	*0.84*	*23*	*2*
004	R	*3*	*2*	*78*	*20.1*	*143*	*49.3*	*7.52*	*-0.600*	*219*	*28*	*270*	*15:11*	*15:12*	*0.39*	*0.81*	*14*	*1*
005	*L*	*3*	*2*	*108*	*17.1*	*133*	*43.3*	*9.89*	*-1.55*	*202*	*29*	*290*	*15:13*	*15:14*	*0.42*	*0.70*	*14*	*2*
Mean		3	2	93	19.3	141	50.0	10.9	0.803	222	33	324	**Total**	00:09	0.45	0.71	21	2
SDev		0	0	30	1.52	5.37	5.28	5.13	2.23	15.4	9.4	86.0			0.05	0.15		
SD/M		0.00	0.00	0.33	0.08	0.04	0.11	0.47	2.78	0.07	0.29	0.27			0.12	0.21		

Figure 10 Discharge Summary LRC-1 Measurement 4

Discharge Measurement Summary

Date Generated: Mon Jun 24 2019

File Information

File Name	JB0521.WAD
Start Date and Time	2019/05/21 09:13:32

Site Details

Site Name	JB
Operator(s)	JTW

System Information

Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.1%	0.8%
Velocity	0.4%	1.3%
Width	0.1%	0.1%
Method	1.9%	-
# Stations	2.3%	-
Overall	**3.1%**	**1.8%**

Summary

Averaging Int.	40	# Stations	22
Start Edge	LEW	Total Width	30.000
Mean SNR	51.3 dB	Total Area	73.849
Mean Temp	65.41 °F	Mean Depth	2.462
Disch. Equation	Mid-Section	Mean Velocity	1.1750
		Total Discharge	**86.7714**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue May 21 09:09:54 CDT 2019	0.000	19.270		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	09:13	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	09:13	3.00	0.6	1.000	0.6	0.400	0.1152	1.00	0.1152	4.000	0.4606	0.5
2	*09:15*	*8.00*	*0.6*	*2.800*	*0.6*	*1.120*	*0.0440*	*1.00*	*0.0440*	*8.400*	*0.3693*	*0.4*
3	09:16	9.00	0.6	2.800	0.6	1.120	0.1640	1.00	0.1640	2.800	0.4593	0.5
4	09:17	10.00	0.6	3.300	0.6	1.320	0.5630	1.00	0.5630	3.300	1.8578	2.1
5	09:18	11.00	0.6	3.300	0.6	1.320	0.8143	1.00	0.8143	3.300	2.6871	3.1
6	09:19	12.00	0.6	3.500	0.6	1.400	0.9573	1.00	0.9573	3.500	3.3507	3.9
7	09:20	13.00	0.6	3.600	0.6	1.440	1.3514	1.00	1.3514	3.600	4.8650	5.6
8	09:21	14.00	0.6	3.700	0.6	1.480	1.6027	1.00	1.6027	3.700	5.9302	6.8
9	09:23	15.00	0.6	3.600	0.6	1.440	1.7480	1.00	1.7480	3.600	6.2930	7.3
10	09:24	16.00	0.6	3.500	0.6	1.400	1.7963	1.00	1.7963	3.500	6.2869	7.2
11	09:25	17.00	0.6	3.400	0.6	1.360	1.8638	1.00	1.8638	3.400	6.3370	7.3
12	09:26	18.00	0.6	3.300	0.6	1.320	1.8940	1.00	1.8940	3.300	6.2500	7.2
13	09:27	19.00	0.6	3.200	0.6	1.280	1.8635	1.00	1.8635	3.200	5.9635	6.9
14	09:28	20.00	0.6	3.200	0.6	1.280	1.8474	1.00	1.8474	3.200	5.9121	6.8
15	09:29	21.00	0.6	3.000	0.6	1.200	1.8599	1.00	1.8599	3.000	5.5797	6.4
16	09:30	22.00	0.6	3.000	0.6	1.200	1.7890	1.00	1.7890	3.000	5.3671	6.2
17	09:31	23.00	0.6	3.000	0.6	1.200	1.7303	1.00	1.7303	3.000	5.1909	6.0
18	09:32	24.00	0.6	3.000	0.6	1.200	1.6726	1.00	1.6726	3.000	5.0177	5.8
19	09:33	25.00	0.6	2.800	0.6	1.120	1.2280	1.00	1.2280	2.800	3.4383	4.0
20	09:34	26.00	0.6	2.500	0.6	1.000	0.8248	1.00	0.8248	6.250	5.1550	5.9
21	09:34	30.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 11 Discharge Summary JB-1

Discharge Measurement Summary

Date Generated: Mon Jun 24 2019

File Information

File Name	CC0521.WAD
Start Date and Time	2019/05/21 07:43:04

Site Details

Site Name	CC
Operator(s)	JTW

System Information

Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.2%	1.5%
Velocity	0.5%	1.4%
Width	0.1%	0.1%
Method	1.9%	-
# Stations	1.9%	-
Overall	**2.9%**	**2.2%**

Summary

Averaging Int.	40	# Stations	27
Start Edge	LEW	Total Width	27.000
Mean SNR	56.9 dB	Total Area	17.400
Mean Temp	64.59 °F	Mean Depth	0.644
Disch. Equation	Mid-Section	Mean Velocity	2.5238
		Total Discharge	**43.9139**

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	07:43	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*07:43*	*1.00*	*0.6*	*0.300*	*0.6*	*0.120*	*-0.0007*	*1.00*	*-0.0007*	*0.300*	*-0.0002*	*0.0*
2	*07:44*	*2.00*	*0.6*	*0.500*	*0.6*	*0.200*	*0.2533*	*1.00*	*0.2533*	*0.500*	*0.1266*	*0.3*
3	*07:45*	*3.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.5459*	*1.00*	*0.5459*	*0.400*	*0.2183*	*0.5*
4	07:46	4.00	0.6	0.400	0.6	0.160	0.8031	1.00	0.8031	0.400	0.3212	0.7
5	07:47	5.00	0.6	0.400	0.6	0.160	0.7123	1.00	0.7123	0.400	0.2849	0.6
6	07:47	6.00	0.6	0.400	0.6	0.160	0.7408	1.00	0.7408	0.400	0.2963	0.7
7	07:48	7.00	0.6	0.300	0.6	0.120	0.6578	1.00	0.6578	0.300	0.1973	0.4
8	07:49	8.00	0.6	0.300	0.6	0.120	0.5820	1.00	0.5820	0.300	0.1745	0.4
9	*07:50*	*9.00*	*0.6*	*0.300*	*0.6*	*0.120*	*1.4872*	*1.00*	*1.4872*	*0.300*	*0.4460*	*1.0*
10	07:51	10.00	0.6	0.400	0.6	0.160	2.5689	1.00	2.5689	0.400	1.0274	2.3
11	07:52	11.00	0.6	0.500	0.6	0.200	2.9196	1.00	2.9196	0.500	1.4598	3.3
12	07:53	12.00	0.6	0.500	0.6	0.200	3.0935	1.00	3.0935	0.500	1.5468	3.5
13	07:55	13.00	0.6	0.600	0.6	0.240	3.3970	1.00	3.3970	0.600	2.0384	4.6
14	07:55	14.00	0.6	0.600	0.6	0.240	3.3967	1.00	3.3967	0.600	2.0382	4.6
15	07:56	15.00	0.6	0.700	0.6	0.280	3.6273	1.00	3.6273	0.700	2.5396	5.8
16	07:57	16.00	0.6	0.800	0.6	0.320	3.4593	1.00	3.4593	0.800	2.7670	6.3
17	07:58	17.00	0.6	0.900	0.6	0.360	3.3730	1.00	3.3730	0.900	3.0355	6.9
18	07:59	18.00	0.6	1.000	0.6	0.400	3.2910	1.00	3.2910	1.000	3.2910	7.5
19	08:00	19.00	0.6	1.000	0.6	0.400	3.3353	1.00	3.3353	1.000	3.3353	7.6
20	08:01	20.00	0.6	1.100	0.6	0.440	3.3038	1.00	3.3038	1.100	3.6344	8.3
21	08:02	21.00	0.6	1.200	0.6	0.480	3.2631	1.00	3.2631	1.200	3.9162	8.9
22	08:03	22.00	0.6	1.000	0.6	0.400	2.7057	1.00	2.7057	1.000	2.7057	6.2
23	08:04	23.00	0.6	1.000	0.6	0.400	2.8442	1.00	2.8442	1.000	2.8442	6.5
24	08:05	24.00	0.6	1.000	0.6	0.400	2.4590	1.00	2.4590	1.000	2.4590	5.6
25	08:06	25.00	0.6	1.200	0.6	0.480	1.7835	1.00	1.7835	1.800	3.2106	7.3
26	08:06	27.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 12 Discharge Summary CC-1

Station Number:
Station Name: ldb0521

Meas. No: 1
Date: 05/21/2019

Party:	Width: 53.2 ft	Processed by:
Boat/Motor:	Area: 287 ft²	Mean Velocity: 1.59 ft/s
Gage Height: 20.53 ft	G.H.Change: 0.000 ft	Discharge: 455 ft³/s

Area Method: Avg. Course	ADCP Depth: 0.270 ft	Index Vel.: 0.00 ft/s	Rating No.: 1
Nav. Method: Bottom Track	Shore Ens.:10	Adj.Mean Vel: 0.00 ft/s	Qm Rating: U
MagVar Method: None (0.0°)	Bottom Est: Power (0.1667)	Rated Area: 0.000 ft²	Diff.: 0.000%
Depth: Composite (BT)	Top Est: Power (0.1667)	Control1: Unspecified	
Discharge Method: None		Control2: Unspecified	
% Correction: 0.00		Control3: Unspecified	

Screening Thresholds:		ADCP:	
BT 3-Beam Solution: YES	Max. Vel.: 4.01 ft/s	Type/Freq.: RiverRay / 0 kHz	
WT 3-Beam Solution: YES	Max. Depth: 7.79 ft	Serial #: 645650	Firmware: 44.21
BT Error Vel.: 3.28 ft/s	Mean Depth: 5.42 ft	Bin Size: 50 cm	Blank: 50 cm
WT Error Vel.: 32.81 ft/s	% Meas.: 55.63	BT Mode: 0	BT Pings: 1
BT Up Vel.: 32.81 ft/s	Water Temp.: None	WT Mode: 1	WT Pings: 1
WT Up Vel.: 32.81 ft/s	ADCP Temp.: 65.7 °F	WV : 170	
Use Weighted Mean Depth: YES			

Performed Diag. Test: NO
Performed Moving Bed Test: NO
Performed Compass Calibration: NO Evaluation: NO
Meas. Location:

Project Name: ldb0521_1 edit.mmt
Software: 2.17

Tr.#		Edge Distance		#Ens.	Discharge						Width	Area	Time		Mean Vel.		% Bad	
		L	R		Top	Middle	Bottom	Left	Right	Total			Start	End	Boat	Water	Ens.	Bins
001	L	3	3	122	79.0	255	120	1.80	5.54	461	57	297	13:12	13:14	0.66	1.55	34	0
002	R	3	3	152	74.6	261	123	4.87	2.47	466	50	294	13:14	13:15	0.47	1.59	29	0
003	L	3	3	168	76.7	244	113	3.07	2.75	440	53	271	13:16	13:17	0.48	1.62	33	0
Mean		3	3	147	76.8	253	118	3.25	3.59	455	53	287	**Total**	00:05	0.53	1.59	32	0
SDev		0	0	23	2.21	8.42	5.21	1.54	1.70	13.9	3.3	14.1			0.11	0.04		
SD/M		0.00	0.00	0.16	0.03	0.03	0.04	0.48	0.47	0.03	0.06	0.05			0.20	0.02		

Figure 13 Discharge Summary LDB-1 Measurement 1

Station Number:
Station Name: ldb0521

Meas. No: 2
Date: 05/21/2019

Party:
Boat/Motor:
Gage Height: 20.54 ft

Width: 52.1 ft
Area: 292 ft²
G.H.Change: 0.000 ft

Processed by:
Mean Velocity: 1.42 ft/s
Discharge: 415 ft³/s

Area Method: Avg. Course
Nav. Method: Bottom Track
MagVar Method: None (0.0°)
Depth: Composite (BT)
Discharge Method: None
% Correction: 0.00

ADCP Depth: 0.270 ft
Shore Ens.:10
Bottom Est: Power (0.1667)
Top Est: Power (0.1667)

Index Vel.: 0.00 ft/s
Adj.Mean Vel: 0.00 ft/s
Rated Area: 0.000 ft²
Control1: Unspecified
Control2: Unspecified
Control3: Unspecified

Rating No.: 1
Qm Rating: U
Diff.: 0.000%

Screening Thresholds:
BT 3-Beam Solution: YES
WT 3-Beam Solution: YES
BT Error Vel.: 3.28 ft/s
WT Error Vel.: 32.81 ft/s
BT Up Vel.: 32.81 ft/s
WT Up Vel.: 32.81 ft/s
Use Weighted Mean Depth: YES

Max. Vel.: 4.40 ft/s
Max. Depth: 7.78 ft
Mean Depth: 5.60 ft
% Meas.: 55.73
Water Temp.: None
ADCP Temp.: 65.8 °F

ADCP:
Type/Freq.: RiverRay / 0 kHz
Serial #: 645650
Bin Size: 50 cm
BT Mode: 0
WT Mode: 1
WV : 170

Firmware: 44.21
Blank: 50 cm
BT Pings: 1
WT Pings: 1

Performed Diag. Test: NO
Performed Moving Bed Test: NO
Performed Compass Calibration: NO Evaluation: NO
Meas. Location:

Project Name: ldb0521_2 edit.mmt
Software: 2.17

Tr.#		Edge Distance		#Ens.	Discharge						Width	Area	Time		Mean Vel.		% Bad	
		L	R		Top	Middle	Bottom	Left	Right	Total			Start	End	Boat	Water	Ens.	Bins
001	L	3	3	107	72.1	239	111	1.77	2.90	427	52	284	13:24	13:26	0.67	1.51	24	0
002	R	3	3	122	69.3	227	114	3.85	2.30	417	53	293	13:26	13:27	0.58	1.42	12	0
005	L	3	3	116	63.5	227	102	4.06	4.70	401	52	299	13:31	13:32	0.63	1.34	49	0
Mean		3	3	115	68.3	231	109	3.23	3.30	415	52	292	**Total**	00:07	0.62	1.42	29	0
SDev		0	0	8	4.39	7.07	6.48	1.27	1.25	13.4	0.6	7.4			0.04	0.08		
SD/M		0.00	0.00	0.07	0.06	0.03	0.06	0.39	0.38	0.03	0.01	0.03			0.07	0.06		

Figure 14 Discharge Summary LDB-1 Measurement 2

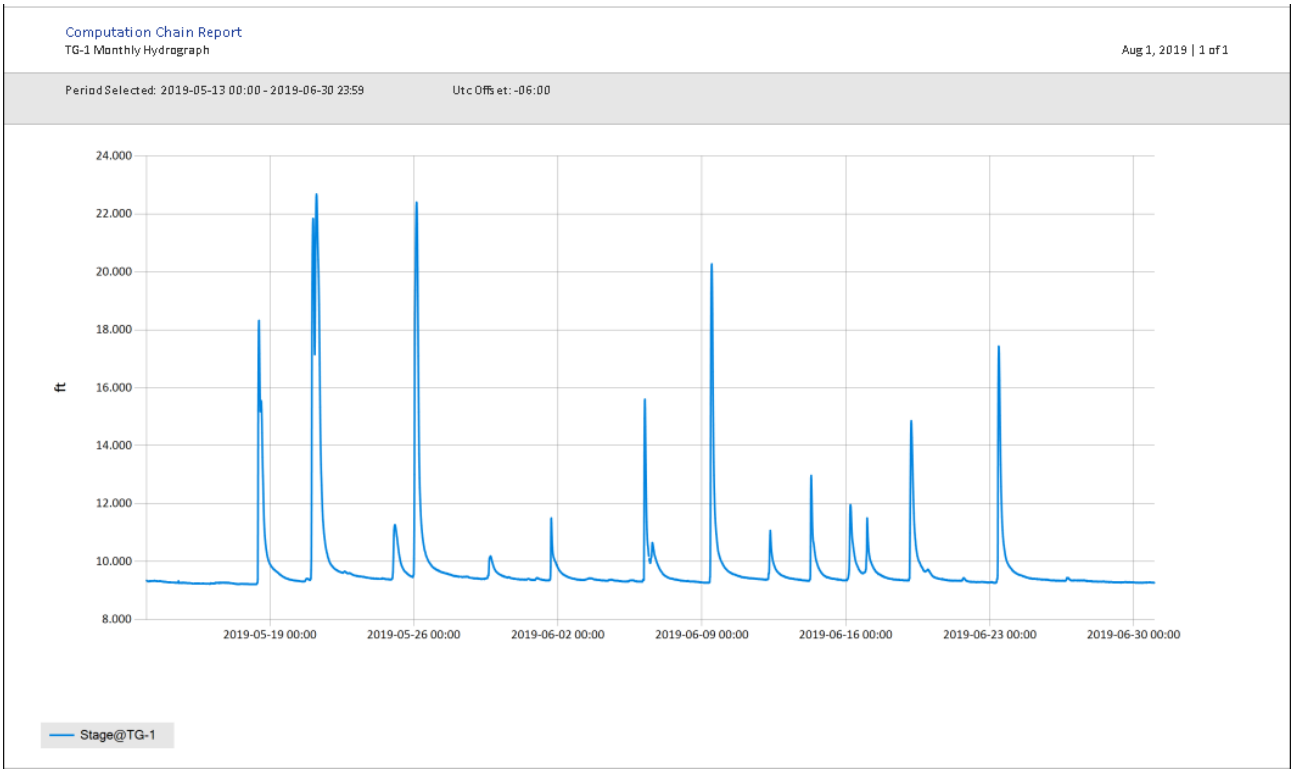

Figure 15 Monthly Hydrograph TG-1

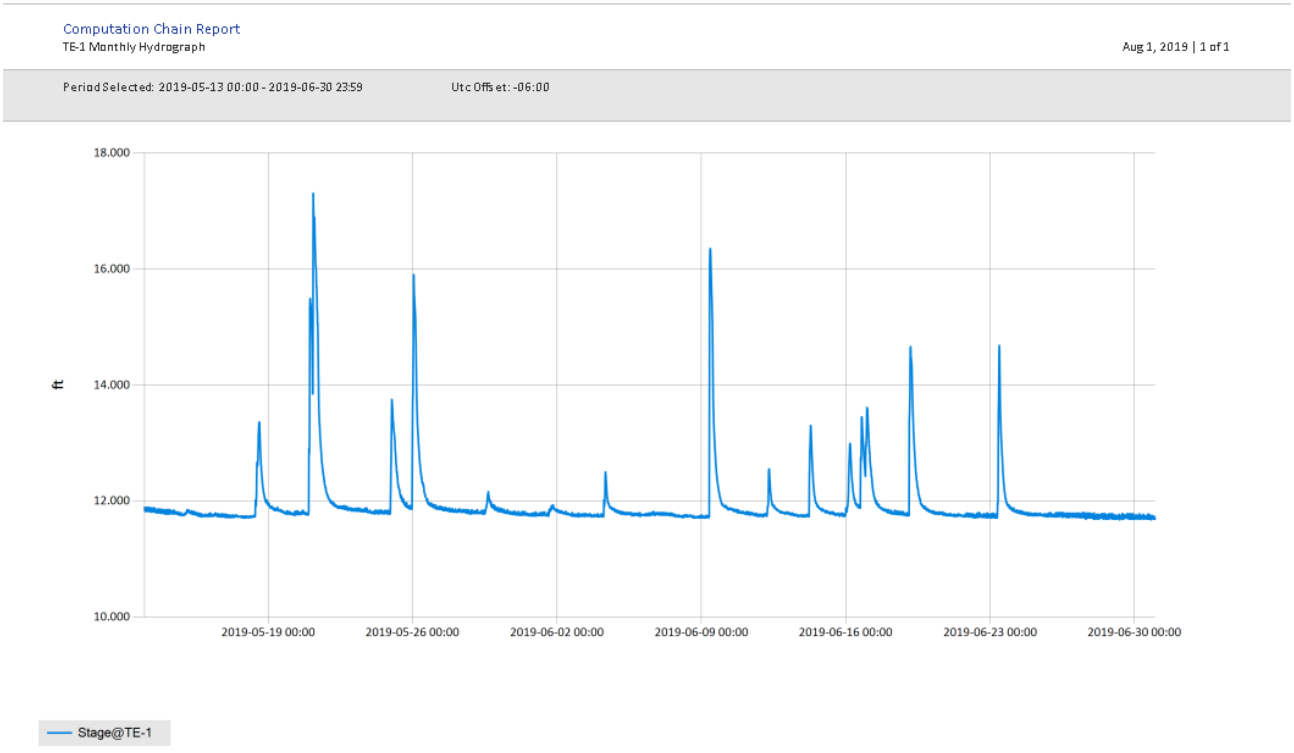

Figure 16 Monthly Hydrograph TE-1

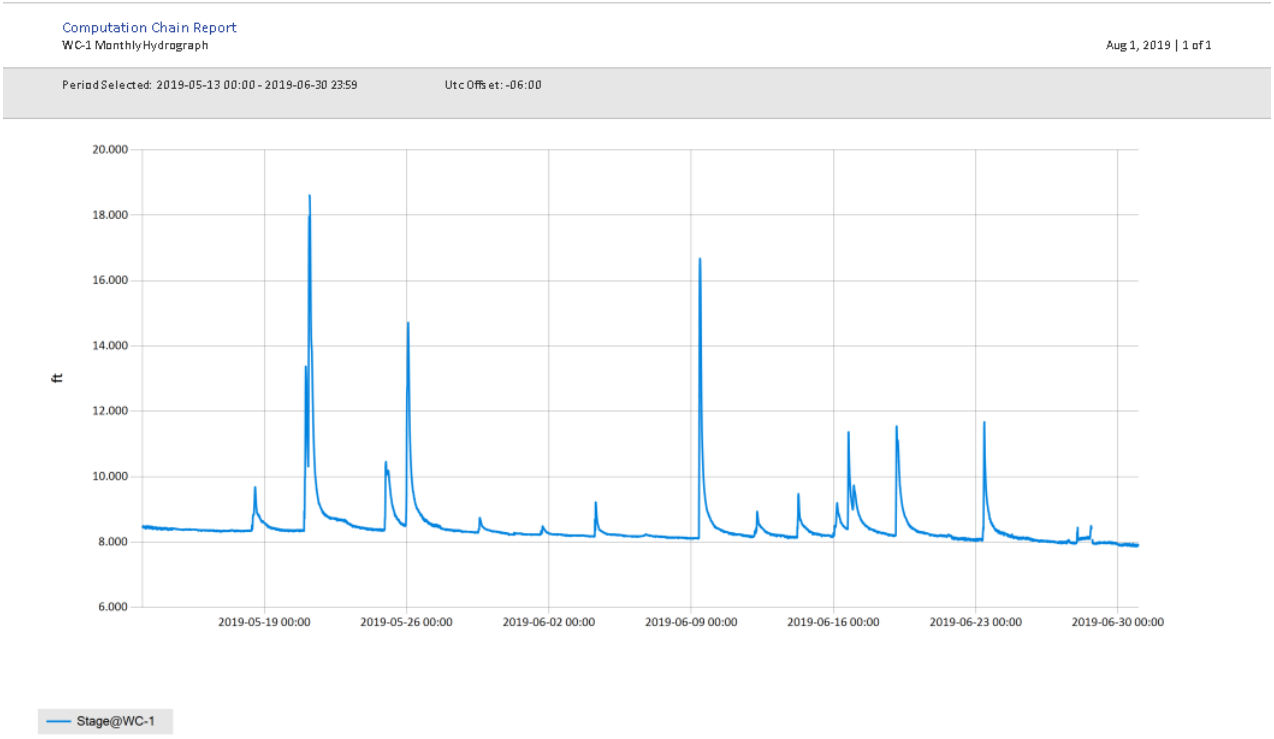

Figure 17 Monthly Hydrograph WC-1

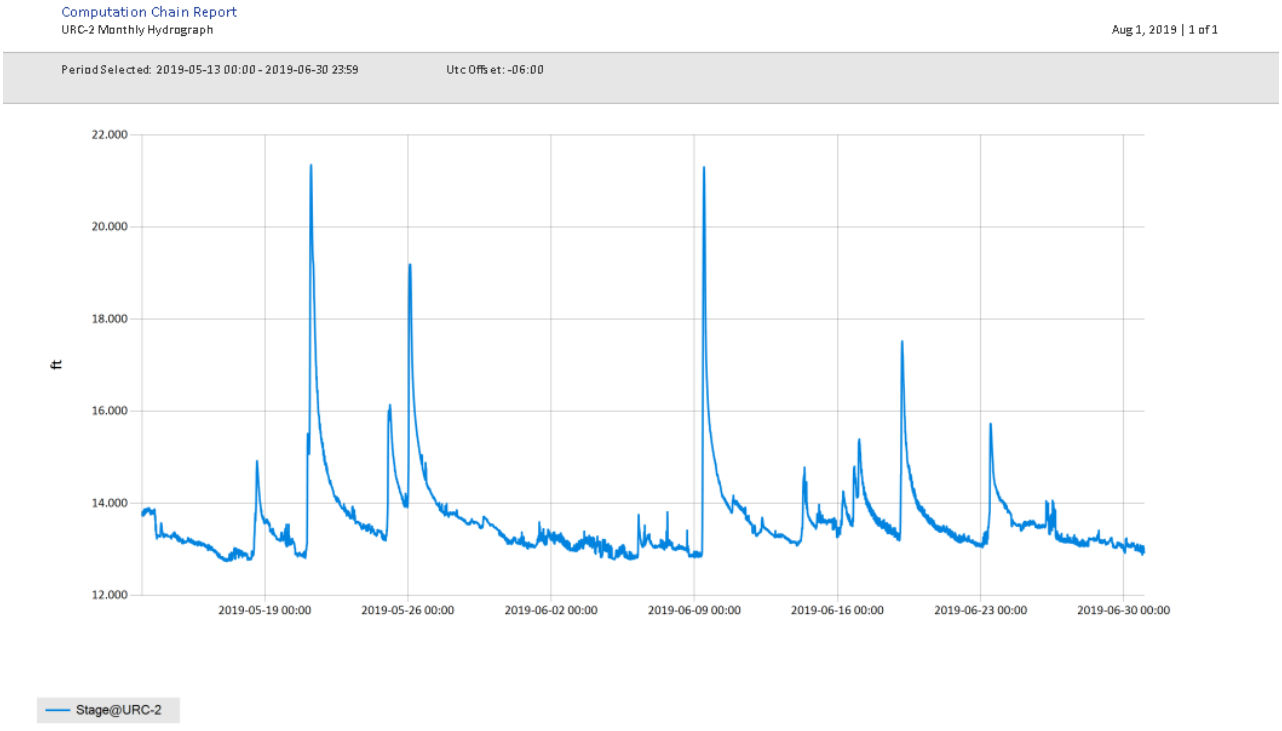

Figure 18 Monthly Hydrograph URC-2

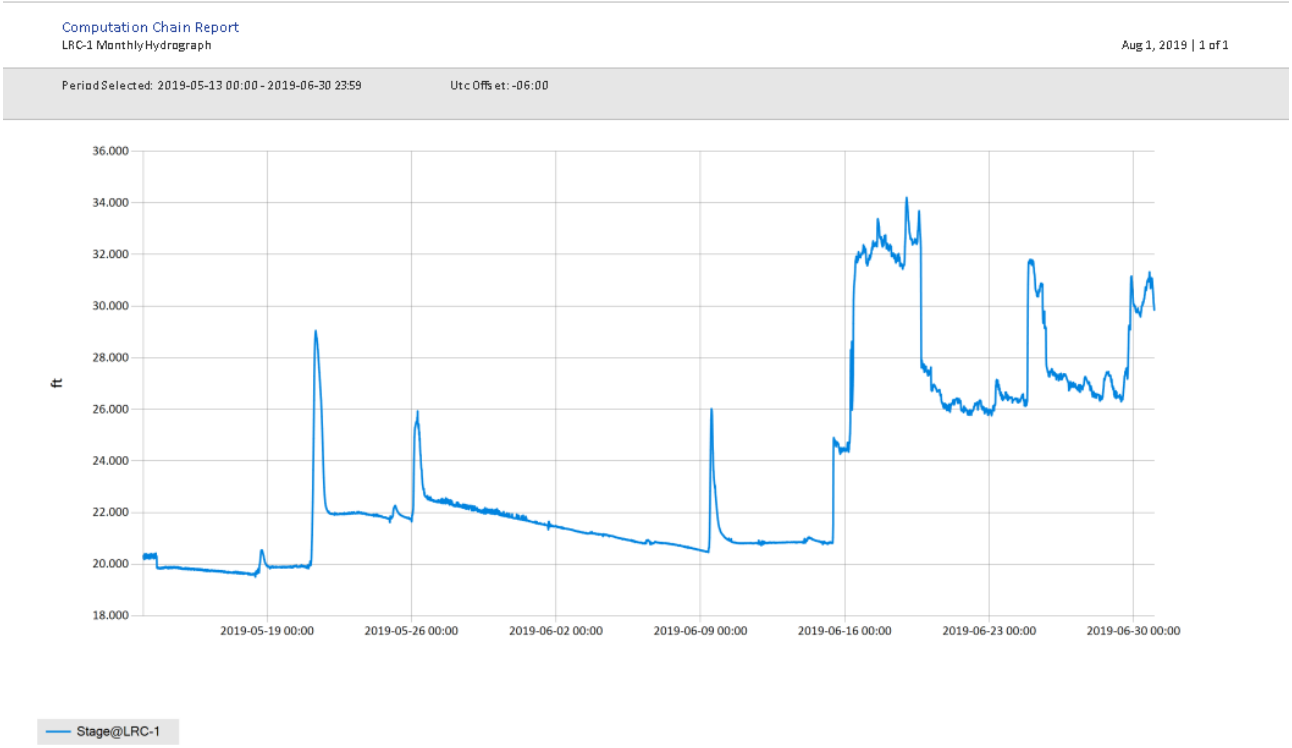

Figure 19 Monthly Hydrograph LRC-1

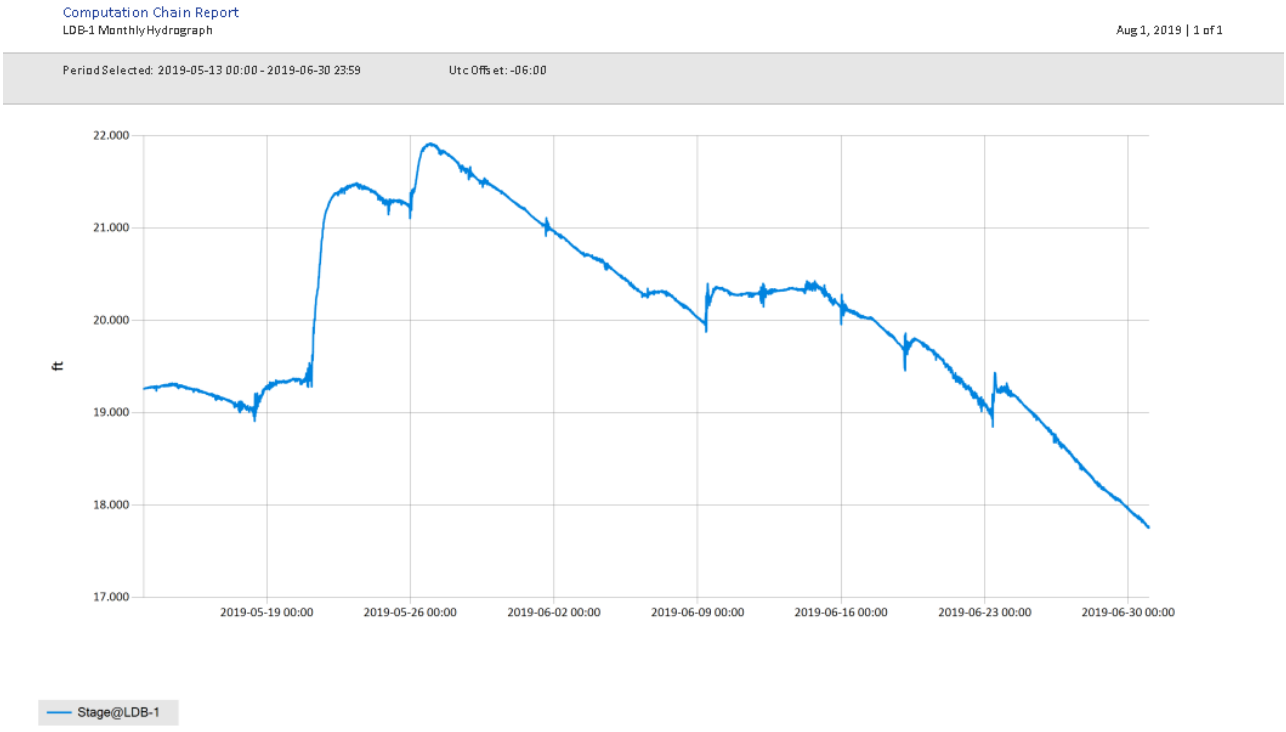

Figure 20 Monthly Hydrograph LDB-1

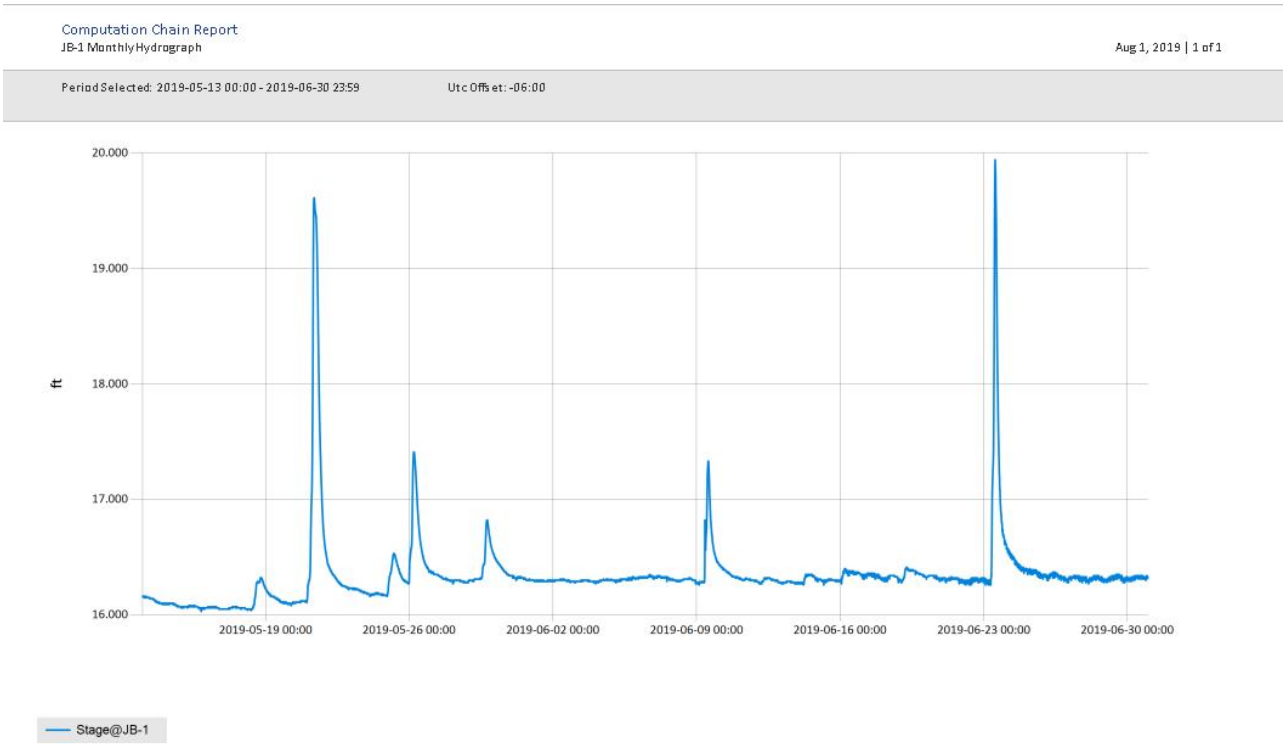

Figure 21 Monthly Hydrograph JB-1

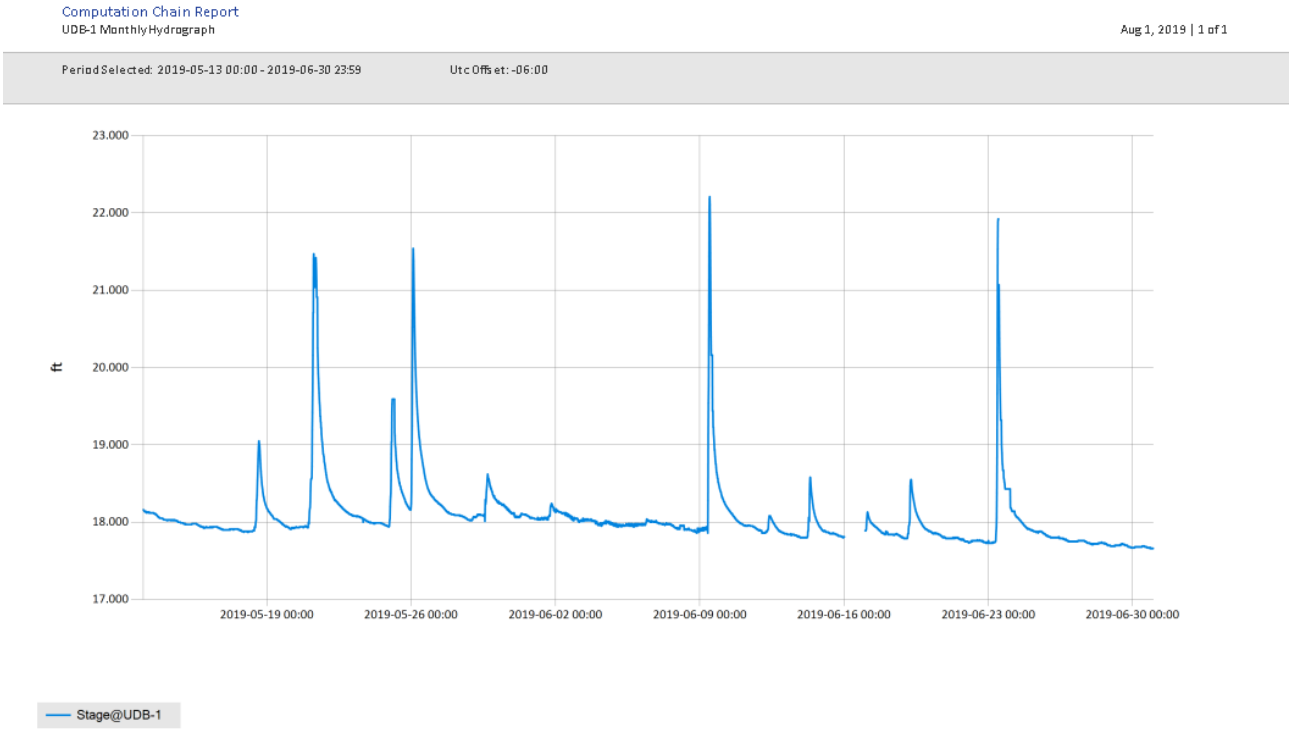

Figure 22 Monthly Hydrograph UDB-1

MESONET CLIMATOLOGICAL DATA SUMMARY — May 2019 — Time Zone: Midnight-Midnight CST

(NRMN) Norman — Nearest City: 2.1 NW Norman — County: Cleveland

Latitude: 35-14-09 — Longitude: 97-27-53 — Elevation: 1171 feet

DAY	TEMPERATURE (°F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND DIR	SPEED AVG	(mph) MAX	SOLAR (MJ/m²)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	73	57	64.0	60.0	0	0	100	65	87	0.90	28.64	29.88	SE	7.7	37.7	7.98	64.7	64.1	67	62
2	67*	56*	62.0*	57.0*	3*	0*	98*	71*	84*	0.00*	28.76*	30.01*	NNE*	7.7*	20.0*	NA	64.6*	64.9*	68*	62*
3	67*	56*	58.6*	57.0*	4*	0*	98*	80*	95*	1.22*	28.72*	29.97*	ENE*	6.1*	19.1*	NA	63.5*	63.5*	65*	62*
4	71	55	61.2	55.4	2	0	100	55	83	0.00	28.71	29.95	N	5.7	14.1	18.46	63.7	64.0	70	61
5	78	54	67.0	59.7	0	1	98	62	79	0.40	28.63	29.88	SSE	6.9	23.8	26.83	66.4	67.2	74	61
6	83	61	71.3	62.6	0	7	95	54	75	0.09	28.66	29.90	S	8.9	28.4	23.16	69.4	69.9	75	66
7	81	61	71.8	64.6	0	6	96	61	79	0.09	28.67	29.91	SSE	9.8	32.3	21.66	70.1	70.6	75	66
8	71	58	63.9	59.7	1	0	99	71	87	2.02	28.49	29.73	SSE	9.2	34.5	14.63	68.7	68.9	72	66
9	61	47	53.0	45.8	11	0	93	65	77	0.01	28.75	30.00	N	13.9	29.0	14.02	64.8	65.0	68	61
10	63	42	52.3	43.8	13	0	96	53	74	0.43	28.86	30.11	NNE	8.7	23.7	19.99	60.9	60.4	65	56
11	60	50	53.8	50.5	10	0	98	71	89	0.12	28.70	29.94	N	5.4	16.7	7.68	60.9	60.4	62	59
12	74	45	61.1	47.0	5	0	100	31	65	0.00	28.65	29.89	NNW	6.0	21.2	27.10	62.2	62.6	69	56
13	81	50	68.1	54.7	0	1	92	42	65	0.00	28.67	29.91	SSW	7.4	23.2	28.69	65.4	66.4	73	60
14	82	60	72.4	56.5	0	6	80	40	59	0.00	28.71	29.96	SSW	8.5	24.1	26.91	68.6	68.1	73	63
15	85	62	74.5	61.2	0	8	87	45	65	0.00	28.72	29.96	SSW	9.0	23.0	28.97	70.5	69.0	75	63
16	85	64	75.1	63.3	0	10	88	47	68	0.00	28.68	29.92	S	9.2	24.5	27.78	72.2	70.8	76	65
17	82	68	74.8	65.1	0	10	87	58	72	0.00	28.53	29.76	S	12.2	31.4	20.88	72.4	72.6	78	67
18	75	62	68.1	64.4	0	3	97	79	88	0.82	28.41	29.64	SSE	10.3	36.6	7.39	70.5	70.6	74	68
19	77	52	65.9	54.6	1	0	99	47	69	0.00	28.65	29.89	E	6.6	22.2	30.19	69.8	70.2	77	64
20	80	60	68.5	63.9	0	5	98	74	86	1.09	28.50	29.74	SSE	10.9	28.1	5.98	69.2	68.2	71	66
21	75	62	67.9	53.6	0	4	99	30	66	1.90	28.30	29.53	S	14.0	51.8	23.71	68.7	68.7	72	66
22	85	56	73.0	63.3	0	5	83	55	72	0.00	28.49	29.73	S	7.8	23.3	15.44	68.4	67.9	73	63
23	84	73	77.6	69.9	0	13	94	61	78	0.00	28.69	29.93	SSE	10.9	32.1	16.92	71.9	72.7	76	70
24	84	64	76.4	69.4	0	9	98	65	80	0.74	28.71	29.95	SSE	10.6	36.2	15.80	73.1	73.7	77	71
25	84	64	73.7	67.1	0	9	98	65	81	1.05	28.74	29.99	S	9.3	41.6	22.21	73.4	73.4	78	69
26	82	64	73.5	66.5	0	8	98	61	80	0.08	28.75	30.00	SSE	9.7	25.4	22.01	73.9	74.3	78	70
27	81	71	76.2	68.0	0	11	87	67	76	0.00	28.58	29.82	S	10.6	30.6	19.72	74.8	75.0	78	72
28	83	66	74.2	67.5	0	10	89	68	80	0.02	28.45	29.68	S	11.2	31.6	16.56	74.5	74.6	78	71
29	75	58	66.6	63.8	0	2	99	79	91	0.24	28.55	29.79	S	7.1	21.6	6.03	71.9	71.0	73	69
30	80	55	67.9	55.3	0	2	100	33	69	0.00	28.73	29.98	WNW	4.6	19.8	30.32	71.1	71.2	78	65
31	84	57	72.6	59.1	0	6	96	39	65	0.00	28.75	30.00	SW	4.5	14.1	26.23	72.6	72.4	78	67
	77*	58*	68.0*	59.7*	<- Monthly Averages ->						28.64*	29.88*	S *	8.7*	51.8*	19.77*	68.8*	68.8*	73*	65*

Temperature - Highest: 85*
Lowest: 42*

Degree Days - Total HDD: 50*
Total CDD: 136*

Number of Days With:
Tmax ≥ 90: 0* — Rainfall ≥ 0.01 inch: 17*
Tmax ≤ 32: 0* — Rainfall ≥ 0.10 inch: 12*
Tmin ≤ 32: 0* — Avg Wind Speed ≥ 10 mph: 9*
Tmin ≤ 0: 0* — Max Wind Speed ≥ 30 mph: 11*

Rainfall: Monthly Total: 11.22* in.
Greatest 24 Hr: 2.02* in.

Humidity - Highest: 100*
Lowest: 30*

* Denotes incomplete record

Figure 23 May Mesonet Data

MESONET CLIMATOLOGICAL DATA SUMMARY — June 2019 — Time Zone: Midnight-Midnight CST

(NRMN) Norman — Nearest City: 2.1 NW Norman — County: Cleveland

Latitude: 35-14-09 — Longitude: 97-27-53 — Elevation: 1171 feet

DAY	TEMPERATURE (°F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND DIR	SPEED AVG	(mph) MAX	SOLAR (MJ/m²)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	85	63	72.2	63.8	0	9	93	55	76	0.16	28.71	29.96	S	6.2	45.5	19.48	73.7	72.5	77	68
2	86	65	75.4	64.8	0	11	97	47	72	0.00	28.71	29.95	S	4.5	14.0	26.37	74.9	73.8	79	69
3	87	66	75.8	68.5	0	12	96	54	79	0.00	28.70	29.95	SSE	5.7	21.7	20.36	75.8	74.5	79	71
4	83*	66*	74.6*	67.4*	0*	10*	96*	59*	79*	0.30*	28.69*	29.93*	S *	8.1*	29.8*	NA	75.8*	74.1*	77*	71*
5	88	69	75.2	69.3	0	13	98	51	83	0.01	28.62	29.87	S	5.9	22.4	22.11	76.4	75.0	80	71
6	76	66	69.7	66.6	0	6	97	68	90	0.10	28.55	29.79	NNW	7.1	25.3	10.58	75.2	73.1	75	71
7	87	66	75.8	65.7	0	11	97	47	73	0.00	28.57	29.81	N	8.3	21.2	27.04	75.6	74.0	80	69
8	88	63	77.1	65.6	0	11	95	46	70	0.00	28.62	29.86	SE	4.6	15.4	29.78	77.8	78.7	87	71
9	83	64	72.8	63.7	0	9	100	50	74	1.47	28.79	30.04	N	11.5	50.8	19.39	77.0	77.0	81	73
10	76	58	67.6	50.4	0	2	86	36	57	0.00	29.06	30.32	N	9.9	26.0	30.00	74.1	73.0	77	68
11	79	56	69.3	54.5	0	3	93	41	62	0.00	28.87	30.12	SSE	6.7	22.9	28.01	74.0	71.3	75	67
12	NA	NA	NA	NA	NA	NA	97*	34*	66*	0.36*	NA	NA	N *	NA	44.6*	NA	74.5*	71.9*	77*	67*
13	81	55	69.8	53.0	0	3	91	36	58	0.00	28.85	30.11	SE	5.8	17.9	30.30	74.2	71.2	77	65
14	86	62	74.7	63.8	0	9	93	57	70	0.39	28.64	29.88	SSE	12.1	31.1	22.75	74.6	71.7	77	67
15	87	66	79.3	69.5	0	11	90	61	73	0.16	28.56	29.80	S	10.6	50.4	19.05	76.7	74.8	78	71
16	80	62	69.2	64.9	0	6	99	59	87	0.90	28.63	29.87	S	5.4	20.8	16.20	75.7	74.2	78	70
17	83	64	73.5	65.6	0	9	99	51	78	0.01	28.67	29.91	NNW	4.3	16.4	25.28	75.9	76.1	82	71
18	88	66	78.2	67.0	0	12	99	48	71	0.00	28.64	29.88	S	5.6	18.7	25.81	77.9	78.4	84	73
19	85	63	74.1	65.3	0	9	98	50	76	0.68	28.54	29.78	W	6.2	41.1	27.06	77.9	78.3	84	73
20	92	68	81.4	72.7	0	15	95	60	76	0.00	28.50	29.74	SSE	8.1	20.8	27.52	79.6	80.1	86	74
21	92	79	85.4	74.9	0	20	91	55	72	0.00	28.49	29.73	S	13.8	35.3	28.76	81.7	82.1	86	79
22	91	77	82.1	72.8	0	19	87	50	74	0.00	28.58	29.82	S	11.8	29.3	22.89	81.4	80.2	83	78
23	79	67	73.5	70.6	0	8	98	75	91	0.92	28.55	29.79	S	6.3	25.6	7.26	78.7	77.2	79	75
24	84	64	74.4	62.3	0	9	100	43	69	0.01	28.66	29.91	ESE	5.7	16.2	30.76	77.7	77.6	84	72
25	88	69	78.7	70.0	0	14	98	55	76	0.00	28.71	29.96	SSE	6.7	18.8	28.39	79.9	80.3	87	75
26	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00*	NA	NA	S *	NA	23.2*	NA	NA	NA	NA	NA
27	89	72	80.6	71.1	0	15	93	54	74	0.00	28.87	30.12	S	8.8	21.4	27.89	79.9	79.7	84	75
28	92	73	82.5	71.6	0	18	92	53	71	0.00	28.84	30.09	S	8.2	21.0	28.77	80.5	81.8	89	76
29	93	73	82.9	70.4	0	18	88	46	68	0.00	28.81	30.06	ESE	6.1	17.6	25.71	81.3	85.0	92	78
30	87	72	79.0	69.5	0	15	98	54	74	0.00	28.80	30.04	SE	7.3	20.5	27.69	81.3	85.9	92	80
	86*	66*	75.9*	66.3*	<- Monthly Averages ->						28.69*	29.93*	S *	7.5*	50.8*	24.27*	77.2*	76.7*	82*	72*

Temperature - Highest: 93*
Lowest: 55*

Degree Days - Total HDD: 0*
Total CDD: 304*

Number of Days With:
Tmax ≥ 90: 5*
Tmax ≤ 32: 0*
Tmin ≤ 32: 0*
Tmin ≤ 0: 0*
Rainfall ≥ 0.01 inch: 13*
Rainfall ≥ 0.10 inch: 10*
Avg Wind Speed ≥ 10 mph: 5*
Max Wind Speed ≥ 30 mph: 7*

Rainfall: Monthly Total: 5.47* in.
Greatest 24 Hr: 1.47* in.

Humidity - Highest: 100*
Lowest: 34*

* Denotes incomplete record

Figure 24 June Mesonet Data