
***Lake Thunderbird TMDL Monitoring Plan Implementation:
Sample Year (SY) 2021- December Report***



SY2021 Monthly Report

Lake Thunderbird TMDL Monitoring Plan Implementation:

December 2021 Monitoring Report

Oklahoma Water Resources Board
Water Quality Programs Division
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SUMMARY OF DECEMBER WATER QUALITY SAMPLING

Sampling for December 2021 occurred on the sixth and was a base flow collection. Water samples were collected at eight locations and discharge measurements were collected at four locations. Samples were not collected at LT-1 because of dry conditions, or JB-1 due to construction activity. Mesonet data shows no precipitation on the sixth, in the 72 hours prior to sampling, or in the 72 hours after the sampling event. The total rainfall amount in Norman for the month of December was 0.22 inches. All water level gauges were operational for the month, except for JB-1 due to road construction. The gauge at LT-1 was removed in 2018 as a result of equipment malfunction. The equipment has not been replaced due to intermittent streamflow and dry conditions. Furthermore, this station is being reviewed for a possible location change.

RESULTS

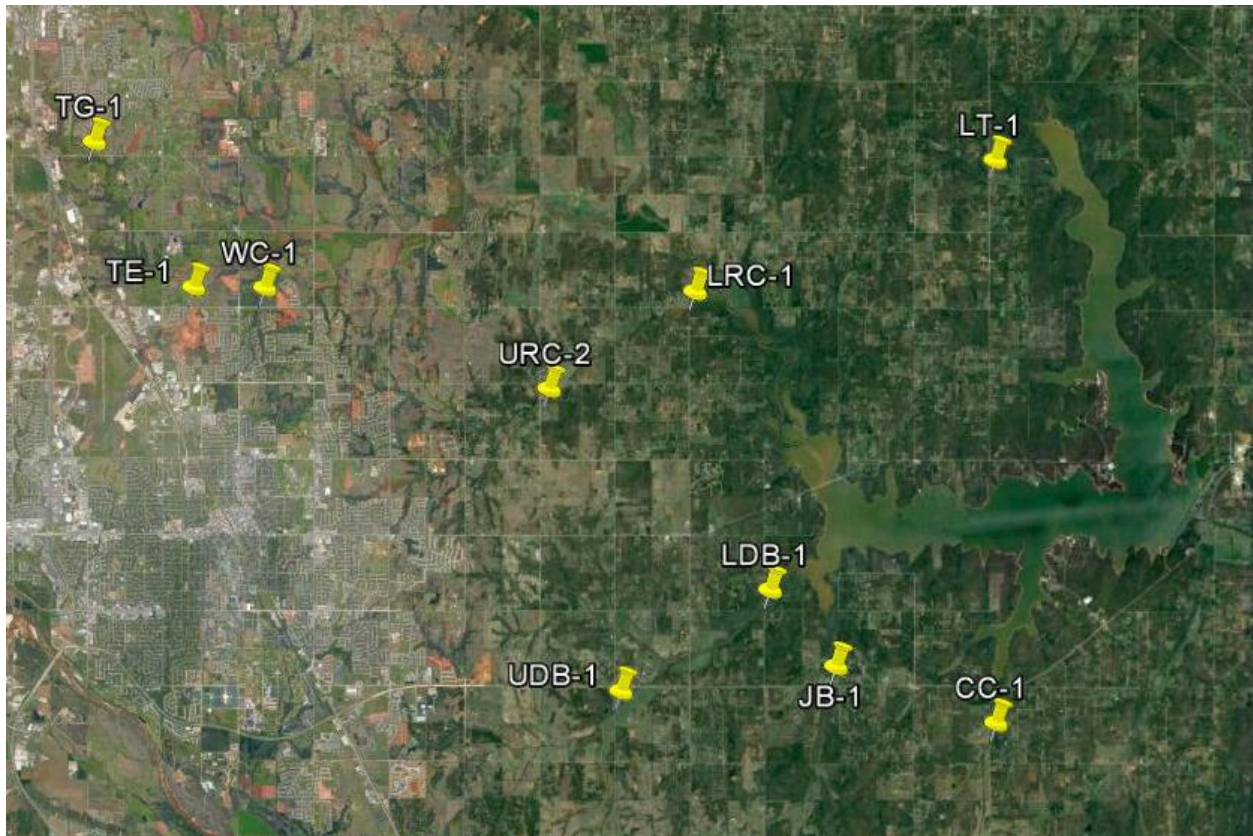


Figure 1 Monitoring Station Map

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	12/6/2021	10:10	SD	8.39	10.40	7.78	690	6	Small amount of oil sheen around rocks on LEW downstream, very similar stage to last month, low/normal conditions, used RP3
JB-1	Jim Blue Creek	12/6/2021	10:50	SD	N/A	N/A	N/A	N/A	N/A	Did not sample, active construction ongoing near channel, channel had water, new concrete culvert
LDB-1	Lower Dave Blue Creek	12/6/2021	11:10	SD	9.39	9.71	7.86	1005	4	Water very clear, minimal flow, very low water level
LRC-1	Lower Rock Creek	12/6/2021	12:10	SD	10.15	9.28	7.66	754	6	Channel more full than usual but still low flow conditions, orifice may have been slightly clogged
LT-1	Lake Laterals	12/6/2021	11:35	SD	N/A	N/A	N/A	N/A	N/A	Did not sample, upstream dry, downstream had shallow disconnected pool
TE-1	Little River Tributary	12/6/2021	15:35	SD	10.24	8.72	7.71	967	44	Very low flow, orifice may be having issues (stage bounces around ~10.65-11.3), similar stage to last month, floating debris is fallen leaves
TG-1	Little River Tributary	12/6/2021	16:20	SD	8.29	10.20	7.73	1208	3	No visible floating debris, although lots of leaves piled up in riffle section, low/normal flow
UDB-1	Upper Dave Blue Creek	12/6/2021	8:45	SD	9.38	7.27	7.67	997	3	Small amount of scum upstream of bridge, low flow, orifice clear
URC-2	Upper Rock Creek	12/6/2021	13:25	SD	8.13	9.54	7.52	881	7	Some scum upstream of bridge, very low flow
WC-1	Woodcrest Creek	12/6/2021	14:30	SD	10.17	6.08	7.42	1078	5	Scum abundant, beaver dam remnants upstream, very similar stage to last month, very low flow, orifice may be clogged

Table 1 Field Data Form

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	0.07	0.20	0.032	<5.0
JB-1	Jim Blue Creek	N/A	N/A	N/A	N/A
LDB-1	Lower Dave Blue Creek	<0.05	0.26	0.025	<5.0
LRC-1	Lower Rock Creek	<0.05	0.21	0.034	<5.0
LT-1	Lake Laterals	N/A	N/A	N/A	N/A
TE-1	Little River Tributary	<0.05	0.62	0.065	25.0
TG-1	Little River Tributary	<0.05	0.31	0.041	<5.0
UDB-1	Upper Dave Blue Creek	<0.05	0.25	0.045	<5.0
URC-2	Upper Rock Creek	<0.05	0.38	0.049	<5.0
WC-1	Woodcrest Creek	<0.05	0.30	0.086	<5.0

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	0.07	0.24	0.032	<5.0
Duplicate RPD	0%	18.18%*	0%	0%

Table 3 QA/QC Data Where the Asterisk Denotes RPD 2

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	0.33	20.49
JB-1	Jim Blue Creek	N/A	N/A
LDB-1	Lower Dave Blue Creek	1.13	15.60
LRC-1	Lower Rock Creek	0.56	4.51
LT-1	Lake Laterals	N/A	N/A
TE-1	Little River Tributary	0.01	10.82
TG-1	Little River Tributary	0.60	8.89
UDB-1	Upper Dave Blue Creek	0.32	17.24
URC-2	Upper Rock Creek	0.01	10.76
WC-1	Woodcrest Creek	0.06	7.60

Table 4 Station Discharge Summary

All rated stream discharges are provisional and subject to change.

File Information

File name: Lrc_20211206-115152.ft
 Start date and time: 12/6/2021 11:35 AM
 Start location latitude: 35.262
 Start location longitude: -97.334
 Calculations engine: FlowTracker2
 Data collection mode: Discharge

System Information

Discharge Summary

Start time: 12/6/2021 11:36 AM End time: 12/6/2021 11:50 AM
 # Stations: 14 Avg interval: 40
 Mean depth: 0.807 ft Max depth: 1.200 ft
 Mean velocity: 0.0497 ft/s Max velocity: 0.0950 ft/s
 Mean SNR: 51 dB Total width: 14.000 ft
 Mean temp: 49.550 °F Total area: 11.3000 ft²
 Wetted Perimeter: 14.386 ft Total discharge: 0.5620 ft³/s

Discharge Uncertainty

Category	ISO	IVE
Accuracy	1.0%	1.0%
Depth	0.2%	3.5%
Velocity	0.7%	8.3%
Width	0.2%	0.2%
Method	2.9%	
# Stations	3.6%	
Overall	4.8%	9.1%

Viewer Controls

Chart size + Chart size -
 Reset all

Discharge Measurement Summary

[Save PDF of summary](#)

Summary overview

No changes were made to this file
 Quality control warnings

Supplemental data summary

Gauge height time	Gauge height (ft)	Rated discharge (ft³/s)	Temperature (°F)	Salinity (PSS-78)	Gauge height comments
12/6/2021 11:36 AM	4.510				

Measurement results

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Samples	Velocity (ft/s)	Correct on	Mean Velocity (ft/s)	Area (ft²)	Flow (ft³/s)	%Q
0	11:36 AM	0.000	None	0.000	0.000	0.000	0	0.0000		-0.0005	0.0000	0.0000	0.00
1	11:36 AM	1.000	0.6	0.700	0.600	0.420	80	-0.0005	1.0000	-0.0005	0.7000	-0.0003	-0.06
2	11:37 AM	2.000	0.6	1.000	0.600	0.600	80	0.0001	1.0000	0.0001	1.0000	0.0001	0.03
3	11:38 AM	3.000	0.6	1.100	0.600	0.660	80	0.0571	1.0000	0.0571	1.1000	0.0629	11.18
4	11:40 AM	4.000	0.6	1.150	0.600	0.690	80	0.0733	1.0000	0.0733	1.1500	0.0843	15.00
5	11:41 AM	5.000	0.6	1.200	0.600	0.720	80	0.0746	1.0000	0.0746	1.2000	0.0895	15.93
6	11:42 AM	6.000	0.6	1.150	0.600	0.690	80	0.0714	1.0000	0.0714	1.1500	0.0822	14.62
7	11:43 AM	7.000	0.6	1.150	0.600	0.690	80	0.0950	1.0000	0.0950	1.1500	0.1092	19.44
8	11:44 AM	8.000	0.6	1.100	0.600	0.660	80	0.0842	1.0000	0.0842	1.1000	0.0927	16.49
9	11:45 AM	9.000	0.6	1.000	0.600	0.600	80	0.0462	1.0000	0.0462	1.0000	0.0462	8.22
10	11:47 AM	10.000	0.6	0.800	0.600	0.480	80	0.0004	1.0000	0.0004	0.8000	0.0003	0.05
11	11:48 AM	11.000	0.6	0.500	0.600	0.300	80	0.0021	1.0000	0.0021	0.5000	0.0011	0.19
12	11:49 AM	12.000	0.6	0.300	0.600	0.180	80	-0.0138	1.0000	-0.0138	0.4500	-0.0062	-1.10
13	11:50 AM	14.000	None	0.000	0.000	0.000	0	0.0000		-0.0138	0.0000	0.0000	0.00

Quality control warnings

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Warnings
1	11:36 AM	1.000	0.6	0.700	0.600	0.420	SNR Threshold Variation
2	11:37 AM	2.000	0.6	1.000	0.600	0.600	SNR Threshold Variation
3	11:38 AM	3.000	0.6	1.100	0.600	0.660	Large SNR Variation, High Stn % Discharge
4	11:40 AM	4.000	0.6	1.150	0.600	0.690	High Stn % Discharge
5	11:41 AM	5.000	0.6	1.200	0.600	0.720	High Stn % Discharge
6	11:42 AM	6.000	0.6	1.150	0.600	0.690	SNR Threshold Variation, High Stn % Discharge
7	11:43 AM	7.000	0.6	1.150	0.600	0.690	SNR Threshold Variation, High Stn % Discharge
8	11:44 AM	8.000	0.6	1.100	0.600	0.660	SNR Threshold Variation, High Stn % Discharge
9	11:45 AM	9.000	0.6	1.000	0.600	0.600	Large SNR Variation, SNR Threshold Variation
10	11:47 AM	10.000	0.6	0.800	0.600	0.480	SNR Threshold Variation
11	11:48 AM	11.000	0.6	0.500	0.600	0.300	SNR Threshold Variation
12	11:49 AM	12.000	0.6	0.300	0.600	0.180	SNR Threshold Variation

Figure 2 Discharge Measurement Summary LRC-1

File Information

File name: Cc_20211206-094212.ft
 Start date and time: 12/6/2021 9:32 AM
 Start location latitude: 35.180
 Start location longitude: -97.265
 Calculations engine: FlowTracker2
 Data collection mode: Discharge

System Information

Discharge Summary

Start time: 12/6/2021 9:33 AM End time: 12/6/2021 9:41 AM
 # Stations: 7 Avg interval: 40
 Mean depth: 0.442 ft Max depth: 0.600 ft
 Mean velocity: 0.2508 ft/s Max velocity: 0.4355 ft/s
 Mean SNR: 35 dB Total width: 3.000 ft
 Mean temp: 47.415 °F Total area: 1.3250 ft²
 Wetted Perimeter: 3.382 ft Total discharge: 0.3322 ft³/s

Discharge Uncertainty

Category	ISO	IVE
Accuracy	1.0%	1.0%
Depth	0.8%	9.7%
Velocity	2.7%	46.2%
Width	0.3%	0.3%
Method	4.2%	
# Stations	7.8%	
Overall	9.3%	47.2%

Viewer Controls

Chart size + Chart size -
 Reset all

Discharge Measurement Summary

[Save PDF of summary](#)

Summary overview

No changes were made to this file
 Quality control warnings

Supplemental data summary

Gauge height time	Gauge height (ft)	Rated discharge (ft³/s)	Temperature (°F)	Salinity (PSS-78)	Gauge height comments
12/6/2021 9:33 AM	20.490				

Measurement results

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Samples	Velocity (ft/s)	Correct on	Mean Velocity (ft/s)	Area (ft²)	Flow (ft³/s)	%Q
0	9:33 AM	0.000	None	0.000	0.000	0.000	0	0.0000		-0.0002	0.0000	0.0000	0.00
1	9:34 AM	0.500	0.6	0.500	0.600	0.300	80	-0.0002	1.0000	-0.0002	0.2500	-0.0001	-0.02
2	9:36 AM	1.000	0.6	0.600	0.600	0.360	80	0.4042	1.0000	0.4042	0.3000	0.1212	36.49
3	9:37 AM	1.500	0.6	0.600	0.600	0.360	80	0.2164	1.0000	0.2164	0.3000	0.0649	19.54
4	9:39 AM	2.000	0.6	0.550	0.600	0.330	80	0.4355	1.0000	0.4355	0.2750	0.1198	36.04
5	9:40 AM	2.500	0.6	0.400	0.600	0.240	80	0.1320	1.0000	0.1320	0.2000	0.0264	7.94
6	9:41 AM	3.000	None	0.000	0.000	0.000	0	0.0000		0.1320	0.0000	0.0000	0.00

Quality control warnings

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Warnings
1	9:34 AM	0.500	0.6	0.500	0.600	0.300	SNR Threshold Variation
2	9:36 AM	1.000	0.6	0.600	0.600	0.360	Boundary Interference, High Stn % Discharge
3	9:37 AM	1.500	0.6	0.600	0.600	0.360	Large SNR Variation, High Stn % Discharge
4	9:39 AM	2.000	0.6	0.550	0.600	0.330	High Stn % Discharge
5	9:40 AM	2.500	0.6	0.400	0.600	0.240	Large SNR Variation

Figure 3 Discharge Measurement Summary CC-1

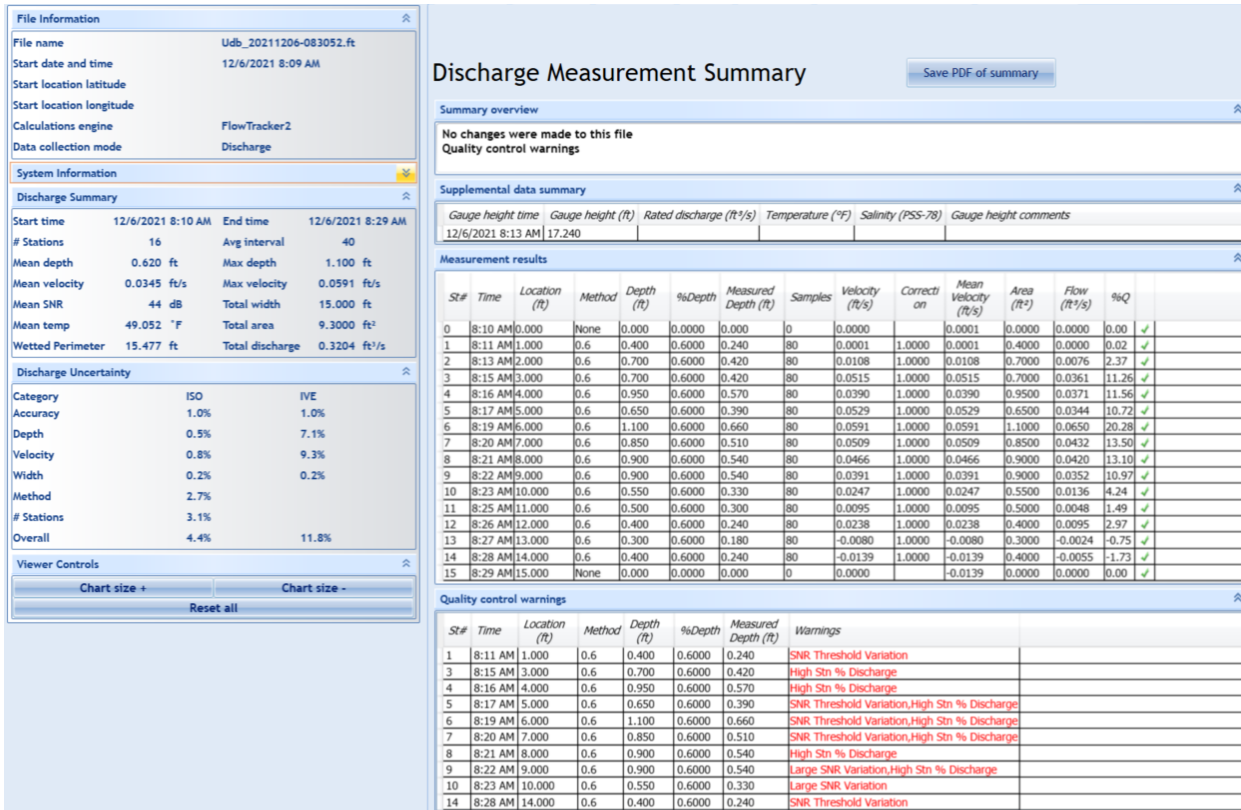


Figure 4 Discharge Measurement Summary UDB-1

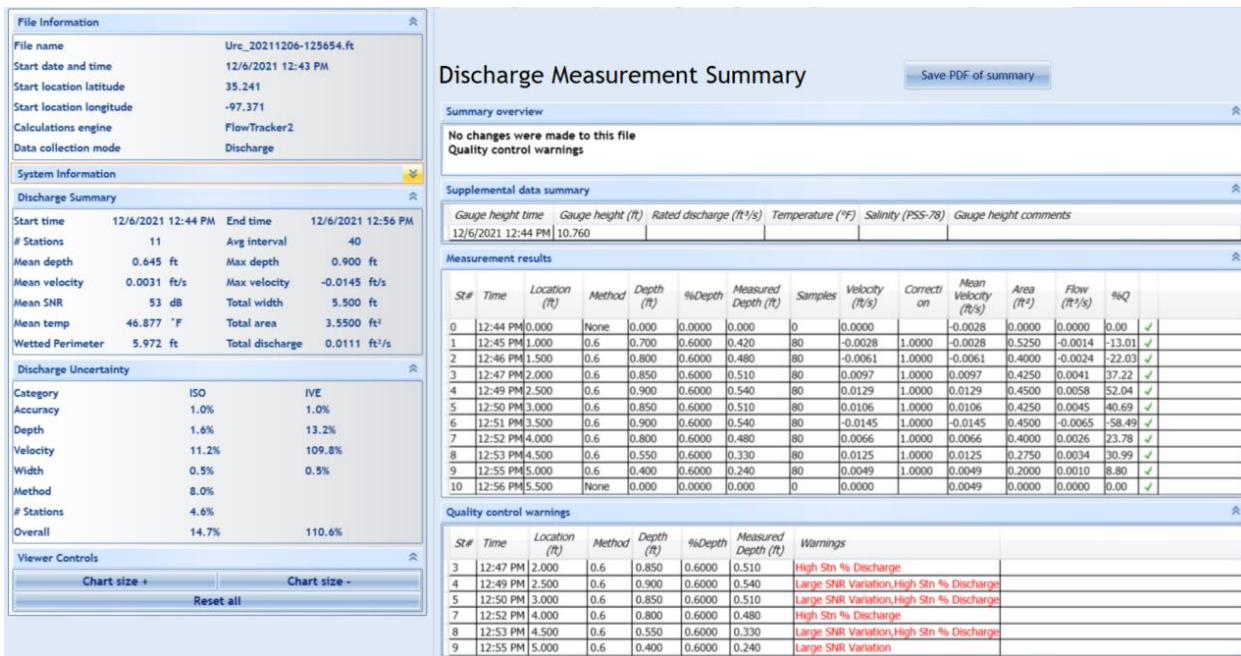
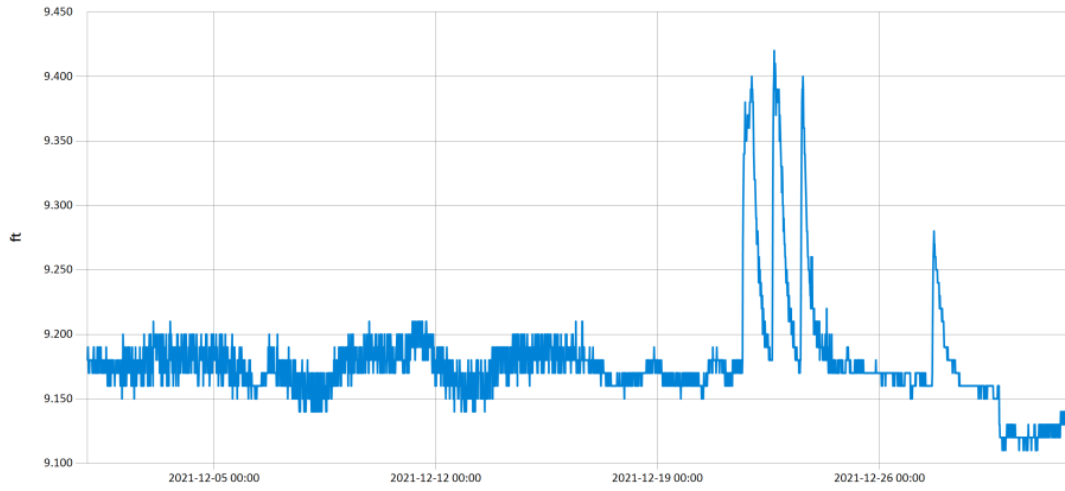


Figure 5 Discharge Measurement Summary URC-2

Period Selected: 2021-12-01 00:00 - 2021-12-31 23:59

UTC Offs et: -06:00

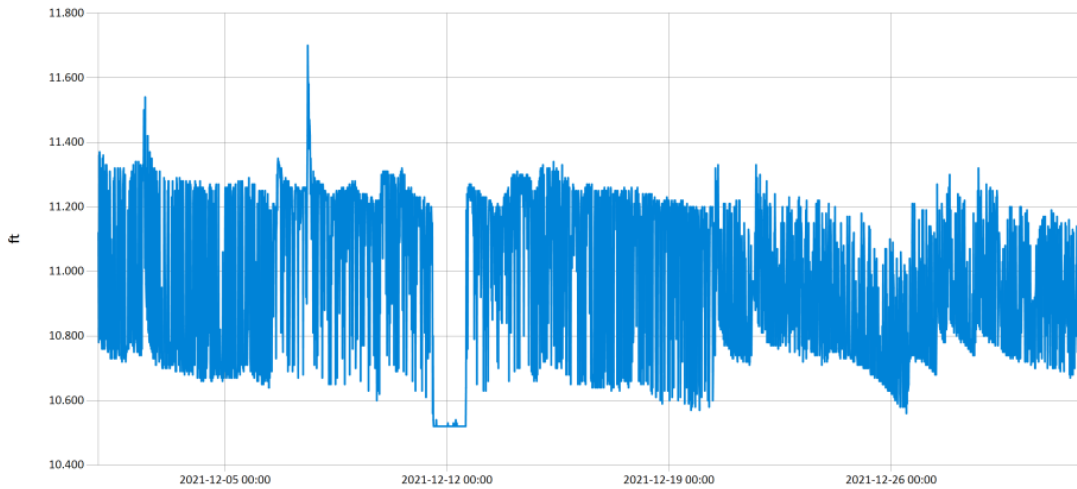


— Stage@TG

Figure 6 Monthly Hydrograph TG-1

Period Selected: 2021-12-01 00:00 - 2021-12-31 23:59

UTC Offs et: -06:00

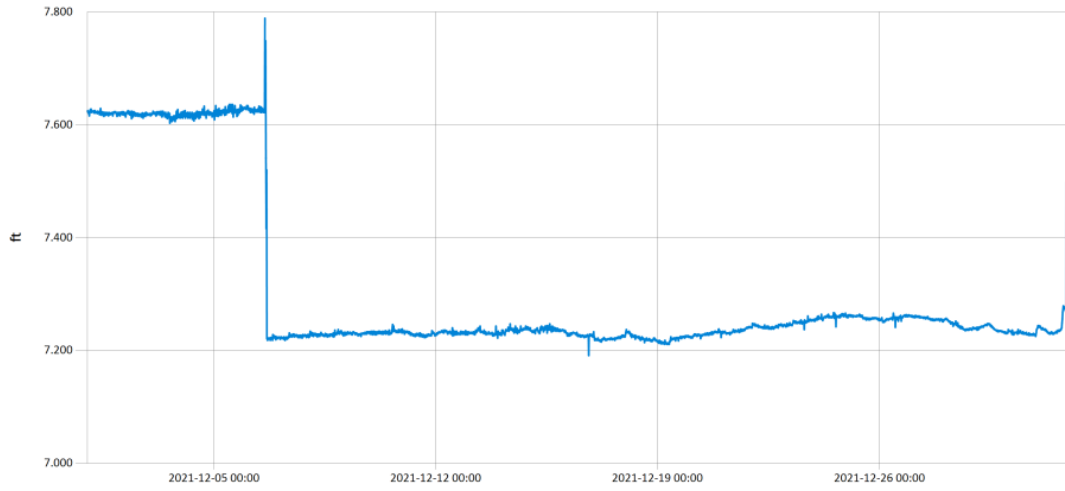


— Stage@TE

Figure 7 Monthly Hydrograph TE-1

Period Selected: 2021-12-01 00:00 - 2021-12-31 23:59

UTC Offs et: -06:00

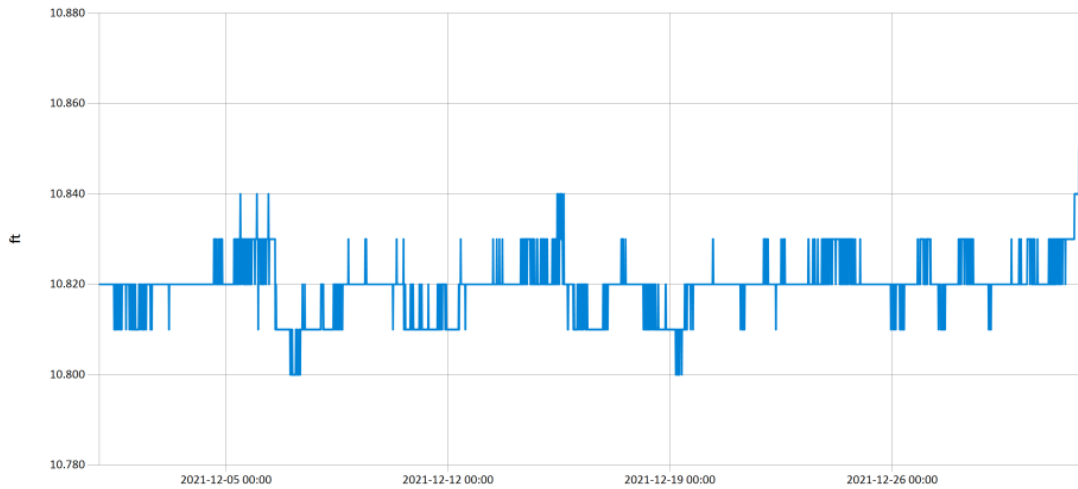


— Stage@WC

Figure 8 Monthly Hydrograph WC-1

Period Selected: 2021-12-01 00:00 - 2021-12-31 23:59

UTC Offs et: -06:00

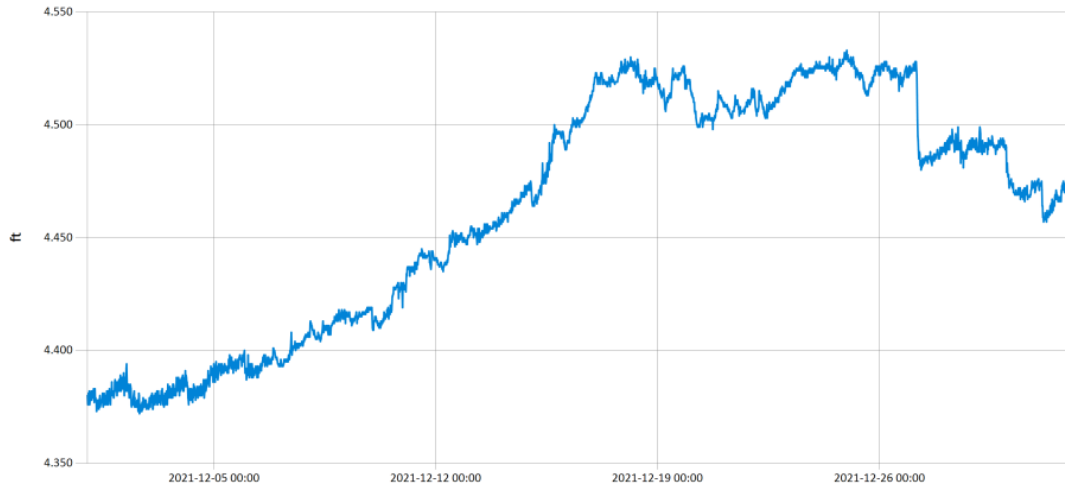


— Stage@URC

Figure 9 Monthly Hydrograph URC-2

Period Selected: 2021-12-01 00:00 - 2021-12-31 23:59

UTC Offs et: -06:00

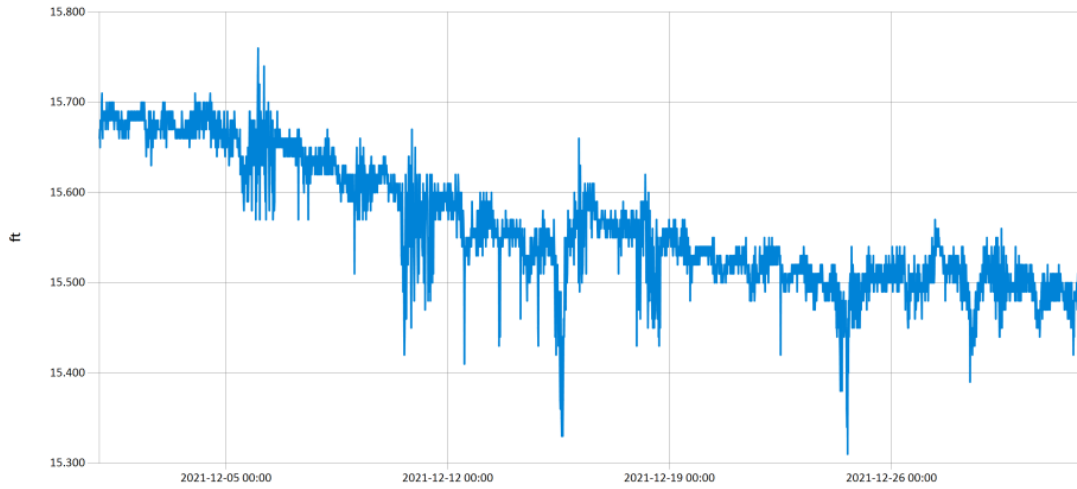


— Stage@LRC

Figure 10 Monthly Hydrograph LRC-1

Period Selected: 2021-12-01 00:00 - 2021-12-31 23:59

UTC Offs et: -06:00

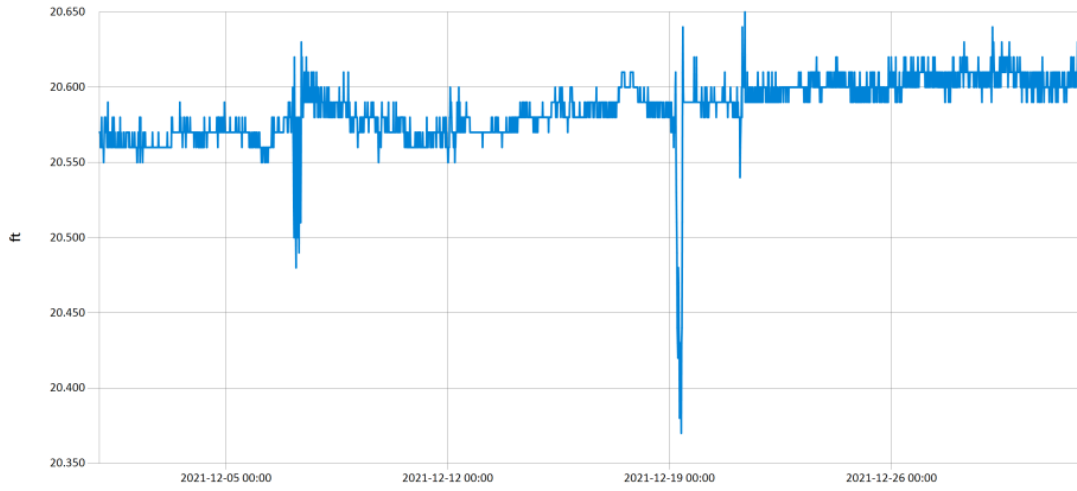


— Stage@LDB

Figure 11 Monthly Hydrograph LDB-1

Period Selected: 2021-12-01 00:00 - 2021-12-31 23:59

UTC Offs et: -06:00

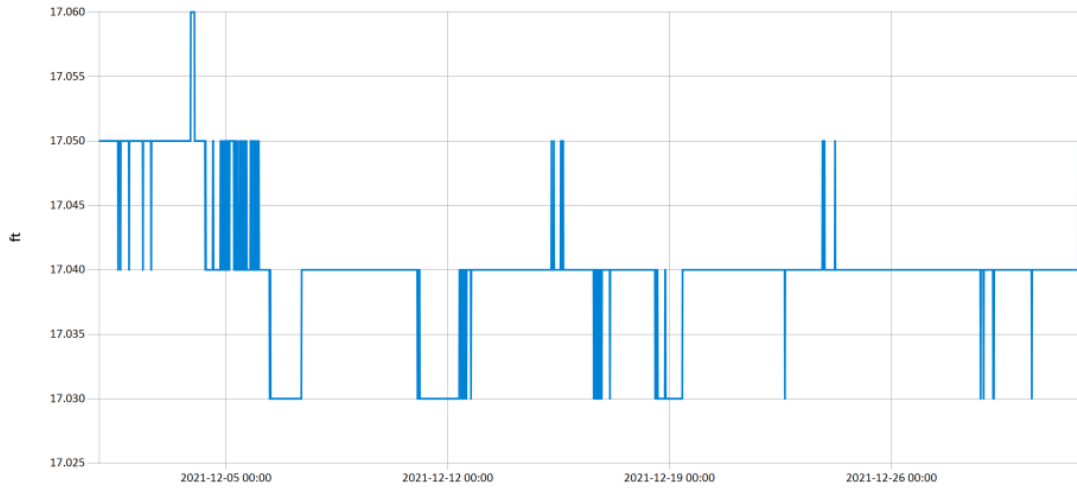


— Stage@CC

Figure 12 Monthly Hydrograph CC-1

Period Selected: 2021-12-01 00:00 - 2021-12-31 23:59

UTC Offs et: -06:00



— Stage@UDB

Figure 13 Monthly Hydrograph UDB-1

MESONET CLIMATOLOGICAL DATA SUMMARY				December 2021				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)				DEG DAYS		HUMIDITY (%)			RAIN		PRESSURE (in)		WIND SPEED (mph)		SOLAR (MJ/m ²)	4" SOIL TEMPERATURES				
	MAX	MIN	AVG	DEWPT	HDD	CDD	MAX	MIN	AVG	(in)	STN	MSL	DIR	AVG	MAX		SOD	BARE	MAX	MIN	
1	71	39	53.7	38.4	10	0	90	27	61	0.00	28.81	30.06	NNW	3.6	13.1	11.45	52.2	54.4	60	49	
2	78*	40*	58.4*	38.7*	6*	0*	84*	24*	52*	0.00*	28.80*	30.05*	S *	4.7*	17.0*	NA	51.8*	54.0*	61*	48*	
3	76	51	61.2	50.1	2	0	93	37	70	0.00	28.70	29.95	S	5.9	14.1	10.02	54.0	56.8	62	53	
4	59	47	53.7	45.6	12	0	89	66	74	0.00	28.80	30.05	NNE	6.3	16.6	3.15	54.0	55.5	57	53	
5	75	43	59.2	47.9	6	0	93	37	69	0.00	28.58	29.82	SSW	10.9	40.7	10.87	54.8	56.5	61	52	
6	51	30	39.8	16.2	25	0	62	28	39	0.00	28.99	30.25	N	14.1	41.8	12.02	51.9	52.8	58	48	
7	49	27	38.4	20.7	27	0	69	31	50	0.00	28.79	30.04	SSE	6.0	21.7	9.38	48.7	47.3	51	43	
8	60	26	43.8	35.0	22	0	90	45	73	0.00	28.69	29.94	S	7.0	28.1	10.56	48.3	47.7	53	42	
9	71	49	58.1	37.1	5	0	81	23	50	0.00	28.48	29.72	S	7.9	21.2	10.56	51.1	52.5	58	48	
10	80	41	61.7	40.0	4	0	75	24	47	0.01	28.40	29.63	S	14.2	46.9	5.04	52.6	54.7	59	52	
11	49	33	39.5	19.8	24	0	62	26	46	0.00	28.93	30.18	NNW	10.8	33.5	12.19	49.5	50.1	54	46	
12	58	30	43.4	20.0	21	0	63	20	42	0.00	28.88	30.14	S	11.3	29.8	11.95	47.2	46.5	52	42	
13	67	39	51.7	29.8	12	0	69	24	46	0.00	28.86	30.12	S	10.4	24.3	11.51	48.6	49.1	55	44	
14	74	51	62.3	52.6	3	0	95	39	73	0.00	28.81	30.06	S	13.2	27.9	10.07	52.1	54.4	59	50	
15	77	63	69.7	60.1	0	5	91	55	73	0.00	28.62	29.86	S	14.6	45.0	5.26	56.3	59.5	63	57	
16	69	41	51.0	28.0	10	0	72	24	42	0.00	28.79	30.04	NE	9.9	26.8	11.30	54.7	56.9	61	54	
17	64	46	54.0	39.6	10	0	84	45	59	0.00	28.67	29.92	N	5.0	23.1	3.26	53.6	55.1	57	54	
18	46	26	37.5	22.8	29	0	70	40	56	0.00	28.99	30.25	N	15.2	31.3	10.75	50.8	51.0	55	46	
19	44	15	30.8	16.8	36	0	88	30	59	0.00	29.05	30.31	S	4.4	11.2	11.20	46.2	44.0	49	39	
20	52	32	39.6	25.8	23	0	87	34	59	0.00	28.92	30.17	S	5.9	17.4	6.97	46.4	44.9	49	42	
21	62	28	42.8	31.6	20	0	95	33	69	0.00	28.80	30.04	SSW	4.5	18.5	11.37	45.6	44.9	52	39	
22	62	27	45.7	37.1	21	0	96	48	74	0.00	28.77	30.02	SSE	5.6	19.4	11.33	46.0	46.2	52	40	
23	65	41	54.3	42.5	12	0	99	28	70	0.00	28.61	29.85	S	8.6	20.8	8.05	48.7	49.7	54	46	
24	81	59	69.7	45.1	0	5	66	27	43	0.00	28.40	29.63	SSW	13.7	34.8	8.72	52.2	55.2	60	51	
25	73	47	62.1	39.0	5	0	72	29	44	0.00	28.56	29.81	SW	6.0	25.8	9.61	54.0	57.7	61	54	
26	75	41	61.9	51.3	7	0	85	51	69	0.00	28.51	29.75	S	8.7	25.4	7.46	53.4	55.8	60	51	
27	67	42	54.5	27.1	11	0	96	16	40	0.00	28.57	29.81	NE	8.1	25.0	9.35	53.5	55.7	59	51	
28	71	43	57.8	30.9	8	0	77	15	40	0.00	28.38	29.61	WSW	9.8	33.8	10.97	53.2	56.0	61	54	
29	63	35	47.2	33.0	16	0	85	33	59	0.03	28.51	29.75	NE	4.7	19.2	9.80	51.2	52.3	57	50	
30	68	28	48.0	28.0	17	0	87	20	52	0.00	28.57	29.82	S	6.6	29.9	9.39	49.1	49.3	54	44	
31	63	49	55.8	41.5	9	0	93	42	61	0.18	28.45	29.69	S	7.5	27.3	3.00	50.7	51.6	54	50	
	65*	39*	51.8*	35.2*	<- Monthly Averages ->							28.70*	29.95*	S *	8.5*	46.9*	9.22*	51.0*	52.2*	57*	48*
Temperature - Highest: 81*				Degree Days - Total HDD: 411*				Number of Days With:													
Lowest: 15*				Total CDD: 10*				Tmax ≥ 90: 0*				Rainfall ≥ 0.01 inch: 3*									
Rainfall: Monthly Total: 0.22* in.				Humidity - Highest: 99*				Tmax ≤ 32: 0*				Rainfall ≥ 0.10 inch: 1*									
Greatest 24 Hr: 0.18* in.				Lowest: 15*				Tmin ≤ 32: 10*				Avg Wind Speed ≥ 10 mph: 10*									
								Tmin ≤ 0: 0*				Max Wind Speed ≥ 30 mph: 8*									

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* Denotes incomplete record

Figure 14 December Mesonet Data