

Mile High Flood District ALERT Network 2020 End of Year Report



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1. Introduction

This report summarizes the field maintenance activities conducted in 2020 by Water & Earth Technologies, Inc. (WET) under contract to the Mile High Flood District (District) for the Real-Time Flood Detection System.

The maintenance records are generated from the maintenance software Fast Field Forms and are provided in Appendix A.

2. Monitoring Network

Through 2020 WET maintained six stations in the UDFCD network which included Arvada Blunn Reservoir (10022), Weir Gulch (10032), Brantner Gulch (10041), Big Dry Creek at Thorncreek (10042), Upper Coal Creek at Camp Eden Road (10050), and Coal Creek at Twin Spruce (10049).

The system was inspected and activated in March and was operational from April 1 to October 23. The rain and stage stations were shut down and winterized in October with Weir Gulch (10032), Upper Coal Creek at Camp Eden Road (10050), and Coal Creek at Twin Spruce Rd (10049) transmitters being stored at the WET office.

3. Maintenance Activities

Full maintenance activities are performed during each visit. The top section of each ALERT rain gage standpipe assembly is removed to clean the screen, funnel, and tipping bucket. The tipping buckets are leveled; standpipes and other appurtenances are painted to protect against corrosion and vandalism; antenna mounts, clamps, cables, and conduits are secured; and each site is inspected to meet the terms of existing license agreements or varying field conditions. The radio and antenna system are tested. The battery is checked. Test transmissions are performed to assure that gage reports are being received by ALERT base stations. Pressure transducer (PT) orifices and protective housings are checked and maintained free of mud and debris. Pressure tests are performed on all accessible PT's. Transmitted data are recorded and compared with calibration tables. All defective equipment is repaired or replaced as needed using available spare parts. Calibration adjustments are made as needed.

A summary of maintenance work performed at each location is provided in the following sections. Detailed maintenance records are provided in the appendix.

3.1 Arvada Blunn (ID: 10022)

The radar at Arvada Blunn is left running year-round to monitor the water level at Blunn Reservoir. The station was inspected on April 24th. All equipment was checked, cleaned and tested. All equipment was in working order. The radar and staff gage values matched.

Mid-season inspections were conducted on June 30th and August 26th. All equipment was checked, cleaned and tested. All equipment was in working order.

Since there is only a radar at this station, the station is left running year-round.

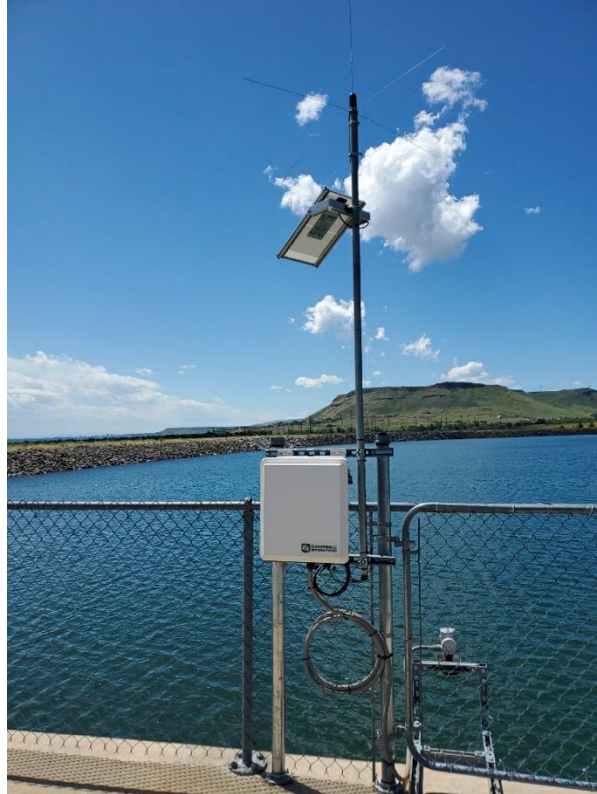


Figure 3-1: Arvada Blunn (10022) radar

Table 3-1: Arvada Blunn Maintenance Summary

Sta. No.	Station Name	Date	Battery Voltage			Solar Regulator		Radio		
			Quiet	Load	Delta	Output Voltage	Output Current	FWD	REF	SWR
			(V)	(V)	(V)	(V)	(mA)	(W)	(W)	
10022	Arvada Blunn Reservoir	4/24/2020	13.27	13.18	0.09	21.38	149	4.00	0.25	1.67
		6/30/2020	13.20	13.11	0.09	21.53	582	4.50	0.25	1.62
		8/26/2020	13.40	13.18	0.22	14.06	288	4.00	0.25	1.67

3.2 Weir Gulch (ID: 10032)

The station at Weir Gulch was activated on March 18th. All equipment was checked, cleaned, and tested. All equipment was in working order. The intake was full of sediment causing no water to get into the riser. The intake was flushed of all sediment.

Mid-season inspections were conducted on June 20th and August 26th. All equipment was checked, cleaned and tested. All equipment was in working order.

On October 23rd, winter shut-down activities were performed. All equipment was checked, cleaned and tested. The transmitter was removed, and the PT was pulled up into its winter position. All equipment was in working order.



Figure 3-2: Weir Gulch Station

Table 3-2: Weir Gulch Maintenance Summary

Sta. No.	Station Name	Date	Battery Voltage			Solar Regulator		Radio		
			Quiet	Load	Delta	Output Voltage	Output Current	FWD	REF	SWR
			(v)	(V)	(V)	(V)	(mA)	(W)	(W)	
10032	Weir Gulch	3/18/2020	12.91	12.81	0.10	14.25	37	3.25	0.00	1.00
		6/20/2020	13.43	13.37	0.06	14.32	26	3.75	0.10	1.39
		8/26/2020	13.49	13.40	0.09	13.93	280	3.90	0.00	1.00

3.3 Brantner Gulch (ID:10041)

The station at Brantner Gulch was activated on March 18th. All equipment was checked, cleaned and tested. All equipment was in working order.

Mid-season inspections were conducted on June 9th and August 26th. All equipment was checked, cleaned and tested. All equipment was in working order.

On October 23rd, winter shut-down activities were performed. The PT was pulled up into its winter position and the battery was brought back to be charged. The top section was also brought back for repairs to the base and was reinstalled.



Figure 3-3: Brantner Gulch near Syracuse St

Table 3-3: Brantner Gulch near Syracuse St Maintenance Summary

Sta. No.	Station Name	Date	Battery Voltage			Solar Regulator		Radio		
			Quiet	Load	Delta	Output Voltage	Output Current	FWD	REF	SWR
			(v)	(V)	(V)	(V)	(mA)	(W)	(W)	
10041	Brantner Gulch	3/18/2020	12.69	12.63	0.06	21.69	267	4.50	0.10	1.35
		6/9/2020	13.59	13.47	0.12	11.94	71	4.25	0.10	1.36
		8/26/2020	13.27	13.16	0.11	14.11	157	4.50	0.00	1.00

3.4 Big Dry Creek at Thorncreek (ID: 10042)

The station at Big Dry Creek at Thorncreek was activated on March 18th. All equipment was checked, cleaned and tested. All equipment was in working order.

Mid-season inspections were conducted on June 21st and August 26th. All equipment was checked, cleaned and tested. All equipment was in working order.

On October 23rd, winter shut-down activities were performed. The PT was pulled up into its winter position, tipping bucket was covered, and the battery was brought back to be charged over winter.



Figure 3-4: Big Dry Creek at Thorncreek Golf Course

Table 3-4: Big Dry Creek at Thorncreek Golf Course Maintenance Summary

Sta. No.	Station Name	Date	Battery Voltage			Solar Regulator		Radio		
			Quiet	Load	Delta	Output Voltage	Output Current	FWD	REF	SWR
			(v)	(V)	(V)	(V)	(mA)	(W)	(W)	
10042	Big Dry Creek @ Thorncreek	3/18/2020	12.90	12.81	0.09	14.22	56	4.25	0.25	1.64
		6/21/2020	13.97	13.85	0.12	14.01	49	4.00	0.10	1.38
		8/26/2020	13.44	13.29	0.15	13.97	162	4.25	0.10	1.36

3.5 Coal Creek at Twin Spruce (ID: 10049)

The station Coal Creek at Twin Spruce was activated on March 18th. All equipment was checked, cleaned and tested. The SDI-12 PT was not reading correctly so a 6-point calibration was executed, and a -0.63 offset was programmed which keeps growing. All equipment was in working order.

A mid-season inspection was conducted on June 30th. The PT was recalibrated to an offset of -0.21. All other equipment was in working order.

The second mid-season inspection took place on August 26th. All equipment was checked, cleaned and tested. All equipment was in working order.

On October 23rd, winter shut-down activities were performed. The PT was pulled up into its winter position and the transmitter was removed to be stored at the WET office.



Figure 3-5: Coal Creek at Twin Spruce

Table 3-5: Coal Creek at Twin Spruce Maintenance Summary

Sta. No.	Station Name	Date	Battery Voltage			Solar Regulator		Radio		
			Quiet	Load	Delta	Output Voltage	Output Current	FWD	REF	SWR
			(V)	(V)	(V)	(V)	(mA)	(W)	(W)	
10049	Coal Creek @ Twin Spruce	3/18/2020	12.64	12.58	0.06	14.71	38	5.00	0.10	1.33
		6/30/2020	12.81	12.74	0.07	14.65	42	5.00	0.00	1.00
		8/26/2020	12.96	12.86	0.10	13.52	98	4.50	0.00	1.00

3.6 Upper Coal Creek at Camp Eden Rd (ID: 10050)

The station Upper Coal Creek at Camp Eden Rd was activated on March 18th. All equipment was checked, cleaned and tested. All equipment was in working order.

Mid-season inspections were conducted on June 23rd and August 26th. All equipment was checked, cleaned and tested. All equipment was in working order.

On October 23rd, winter shut-down activities were performed. The transmitter was removed to be stored at the WET office.



Figure 3-6: Upper Coal Creek at Camp Eden Road

Table 3-6: Upper Coal Creek at Camp Eden Road Maintenance Summary

Sta. No.	Station Name	Date	Battery Voltage			Solar Regulator		Radio		
			Quiet	Load	Delta	Output Voltage	Output Current	FWD	REF	SWR
			(v)	(V)	(V)	(V)	(mA)	(W)	(W)	
10050	Upper Coal Creek @ Camp Eden	3/18/2020	12.82	12.77	0.05	14.69	161	5.00	0.10	1.33
		6/23/2020	13.65	13.59	0.06	14.42	211	5.00	0.00	1.00
		8/26/2020	13.68	13.60	0.08	14.29	166	4.50	0.00	1.00

4. Conclusion

All UDFCD sites are up to date and working correctly. These stations will be visited for maintenance three times during the 2021 season: March start-up and two mid-season maintenance visits. WET will clean PT's in vinegar on each site visit to try and resolve the constant offset changes especially at Twin Spruce. The creek seems to be iron rich causing the PT casement to turn reddish. Letting the PT sit in vinegar should clean away the discoloration and clean the membrane. If the PT continues to have fluctuating offsets it may need to be replaced due to the PT going bad.

5. Spare Equipment Inventory

- (1) 300 mA solar panel
- (1) Polyphaser lightning protection
- (1) Solar panel mount
- (1) GPS antenna
- (1) MaxRad 5800 DC grounded antenna
- (1) Sunguard Solar regulator
- (1) MaxRad antenna base mount

Prior to the 2021 maintenance season, WET recommends the purchase of the following spare equipment:

- (1) Maxon SD-125E radio - \$300 ea.
- (1) Campbell Scientific AL200 - \$550 ea.
- (1) 18 Ah battery - \$90 ea
- (1) CS451 Pressure Transducer- \$875 ea.


6. Recommendations

WET recommends making periodic manual streamflow measurements at these locations in 2021 to supplement the theoretical ratings. WET also recommends the purchase of a spare CS451 SDI-12 pressure transducer in case the PT at Twin Spruce fails.

7. Appendix A. Site Specific Maintenance Records

Station Maintenance Form

Station Maintenance Form

Location	Arvada Blunn
Station_ID	10022
Technician(s)	Kgs
Date	04/24/2020
Time Arrive	11:50 AM (-6 GMT)
GPS Location	
	Lat: 39.8226656283389 Long: -105.204460766956
Agency	UDFCD

Station Type

What type of station?	Stream
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Stream Station Maintenance

Stream Maintenance

Items Cleaned

Clean Checks	Funnel, Solar_panel, Tipping_bucket
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Rain Sensor

Does the station have a rain sensor?	No
--------------------------------------	----

Rain Gage Calibration

Station Maintenance Form

Error (%)	0.27
-----------	------

Power System

Regulator Output Voltage (V)	21.38
Charging Current (mA)	149.00
Battery Voltage Quiet (V)	13.27
Battery Voltage Transmitted (V)	13.18

Transmitter

Transmitter Checks	Desiccant, Program, Time
--------------------	--------------------------

Radio

Watts Forward	4.00
Watts Reflected	0.25
Standing Wave Ratio	1.6667
No calibration form necessary	Check to see if PT is working properly.

Radar Calibration

Section 1

Calibration Time	12:00 PM (-6 GMT)
Wire-Weight Reading (ft)	55.25
Radar Reading (ft)	5755.35
Adjustment amount	0.00
Comments	Radar working well!

Finishing Comments

Note for next visit	Gary Williamson no longer works with the city.
Final Comments	Station working well!
Depart Time	12:20 PM (-6 GMT)


Station Maintenance Form

Photos



Station Maintenance Form

Station Maintenance Form

Location	Arvada Blunn
Station_ID	10022
Technician(s)	ZJN,KGS
Date	06/30/2020
Time Arrive	11:21 AM (-6 GMT)
GPS Location	
	Lat: 39.822941 Long: -105.2048702
Agency	UDFCD

Station Type

What type of station?	Stream
-----------------------	--------

Stream Station Maintenance

Stream Maintenance

Rain Sensor

Does the station have a rain sensor?	No
--------------------------------------	----

Rain Gage Calibration

Error (%)	0.27
-----------	------

Power System

Station Maintenance Form

Regulator Output Voltage (V)	21.53
Charging Current (mA)	582.00
Battery Voltage Quiet (V)	13.20
Battery Voltage Transmitted (V)	13.11

Transmitter

Transmitter Checks	Desiccant, Program, Time, Bucket
--------------------	----------------------------------

Radio

Watts Forward	4.50
Watts Reflected	0.25
Standing Wave Ratio	1.6168
No calibration form necessary	Check to see if PT is working properly.

Radar Calibration

Section 1

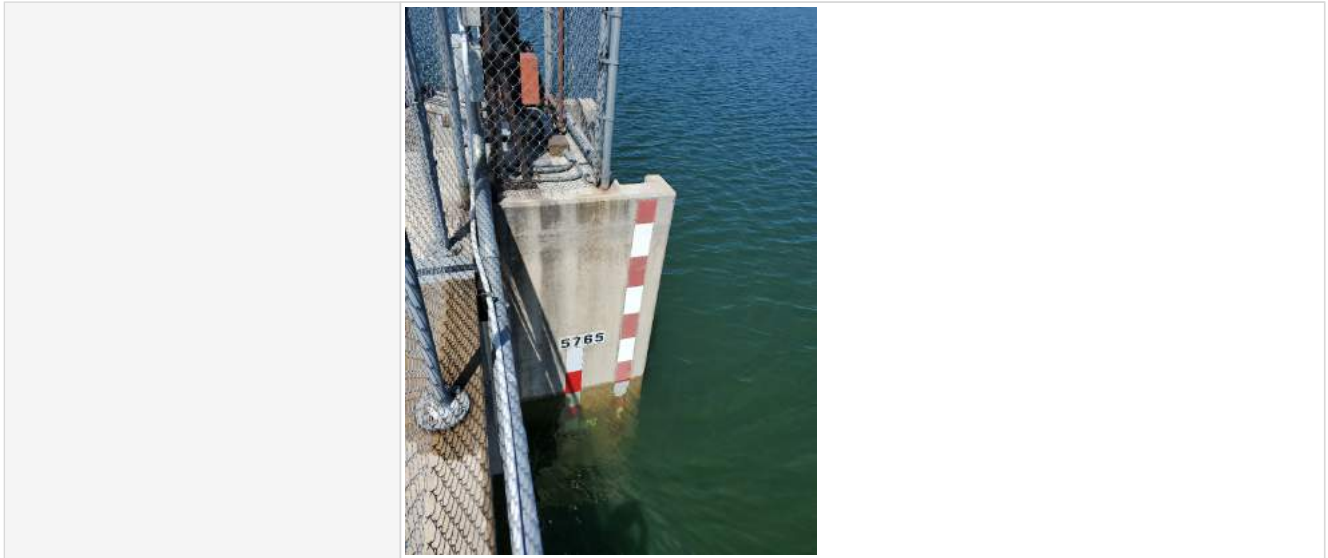
Calibration Time	11:27 AM (-6 GMT)
Wire-Weight Reading (ft)	5763.00
Radar Reading (ft)	5763.03
Comments	perfect

Finishing Comments

Final Comments	Everything working well. Received test transmissions. Radar spot on
Depart Time	11:30 AM (-6 GMT)


Photos	
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Station Maintenance Form



Station Maintenance Form

Station Maintenance Form

Location	Arvada Blunn
Station_ID	10022
Technician(s)	EJH/ZJN
Date	08/26/2020
Time Arrive	11:58 AM (-6 GMT)
GPS Location	
	Lat: 39.8229108 Long: -105.2048271
Agency	UDFCD

Station Type

What type of station?	Stream
-----------------------	--------

Stream Station Maintenance

Stream Maintenance

Items Cleaned

Clean Checks	Solar_panel
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Rain Sensor

Does the station have a rain sensor?	No
--------------------------------------	----

Rain Gage Calibration

Station Maintenance Form

Error (%)	0.27
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Power System

Regulator Output Voltage (V)	14.06
Charging Current (mA)	288.00
Battery Voltage Quiet (V)	13.40
Battery Voltage Transmitted (V)	13.18

Transmitter

Transmitter Checks	Desiccant, Program, Time
--------------------	--------------------------

Radio


Watts Forward	4.00
Watts Reflected	0.25
Standing Wave Ratio	1.6667
No calibration form necessary	Check to see if PT is working properly.

Radar Calibration

Section 1


Calibration Time	12:01 PM (-6 GMT)
Wire-Weight Reading (ft)	5761.25
Radar Reading (ft)	5761.25

Finishing Comments

Depart Time	12:02 PM (-6 GMT)
Photos	

Station Maintenance Form

Station Maintenance Form

Location	Weir Gulch
Station_ID	10032
Technician(s)	EJH/ZJN
Date	08/26/2020
Time Arrive	12:41 PM (-6 GMT)
GPS Location	
	Lat: 39.720758 Long: -105.0314391
Agency	UDFCD

Station Type

What type of station?	Stream
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Stream Station Maintenance

Stream Maintenance

Items Cleaned

Clean Checks	Funnel, Solar_panel, Tipping_bucket
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Rain Sensor

Does the station have a rain sensor?	Yes
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Rain Gage Calibration

Station Maintenance Form

Error (%)	0.27
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Power System

Regulator Output Voltage (V)	13.93
Charging Current (mA)	280.00
Battery Voltage Quiet (V)	13.49
Battery Voltage Transmitted (V)	13.40


Transmitter

Transmitter Checks	Desiccant, Program, Time, Bucket
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Radio

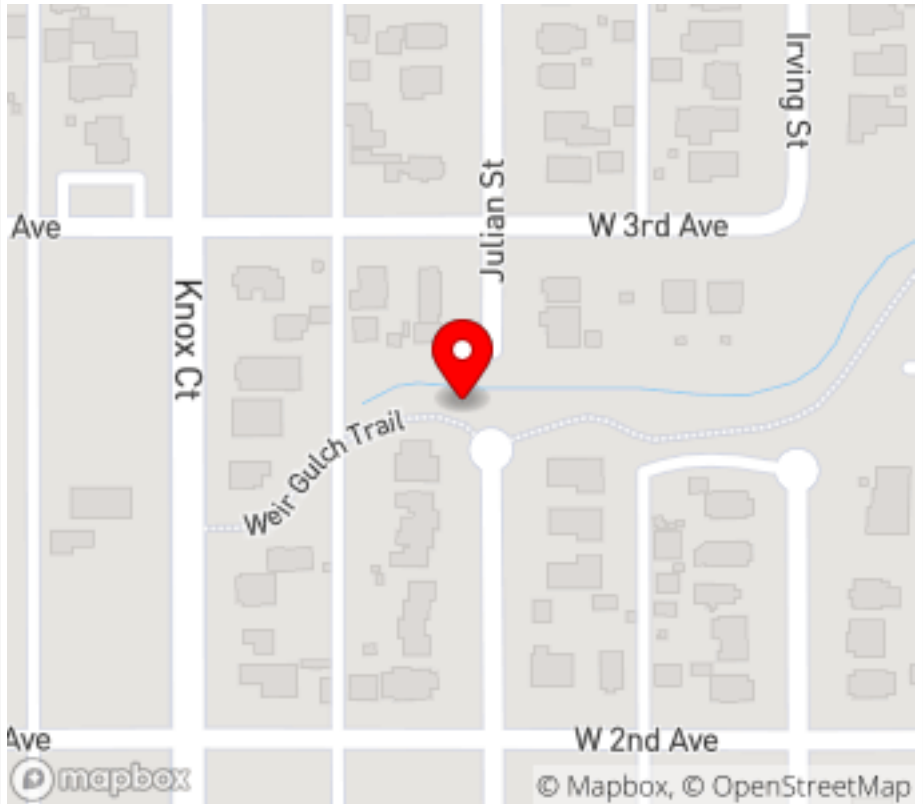
Watts Forward	3.90
Watts Reflected	0.00
Standing Wave Ratio	1.0000
Is the PT an SDI-12?	Yes
No calibration form necessary	Check to see if PT is working properly.

Finishing Comments

Depart Time	12:54 PM (-6 GMT)
Photos	

Station Maintenance Form

Station Maintenance Form

Location	Weir Gulch @ Julian St
Station_ID	10032
Technician(s)	ZJN,KGS
Date	03/18/2020
Time Arrive	05:04 PM (-6 GMT)
GPS Location	
	Lat: 39.72079046 Long: -105.03138285
Agency	UDFCD

Station Type

What type of station?	Stream
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Stream Station Maintenance

Stream Maintenance

Items Cleaned

Clean Checks	Funnel, Solar_panel, Tipping_bucket
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Rain Sensor

Does the station have a rain sensor?	Yes
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Rain Gage Calibration

Station Maintenance Form

Point ID	0
Tips During Calibration	12
Volume Added or Removed (mL)	11.00
Error (%)	-0.89
Data Logger reads tips in both directions	checked

Power System

Regulator Output Voltage (V)	14.25
Charging Current (mA)	37.00
Battery Voltage Quiet (V)	12.91
Battery Voltage Transmitted (V)	12.81


Transmitter

Transmitter Checks	Desiccant, Program, Time, Bucket
--------------------	----------------------------------

Radio


Watts Forward	3.25
Watts Reflected	0.00
Standing Wave Ratio	1.0000
Is the PT an SDI-12?	Yes
No calibration form necessary	Check to see if PT is working properly.

Finishing Comments

Final Comments	Everything working well. Received test transmissions. Intake full of sediment
Depart Time	05:52 PM (-6 GMT)
Photos	

Station Maintenance Form

Station Maintenance Form

Location	Weir gulch @ Julian street
Station_ID	10032
Technician(s)	Kgs
Date	06/23/2020
Time Arrive	08:03 AM (-6 GMT)
GPS Location	
	Lat: 39.7205083360389 Long: -105.031338149863
Agency	UDFCD

Station Type

What type of station?	Stream
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Stream Station Maintenance

Stream Maintenance

Items Cleaned

Clean Checks	Funnel, Solar_panel, Tipping_bucket
--------------	-------------------------------------

Rain Sensor

Does the station have a rain sensor?	Yes
--------------------------------------	-----

Rain Gage Calibration

Station Maintenance Form

Point ID	0
Tips During Calibration	12
Volume Added or Removed (mL)	4.00
Error (%)	-0.15
Data Logger reads tips in both directions	checked

Power System

Regulator Output Voltage (V)	14.32
Charging Current (mA)	26.00
Battery Voltage Quiet (V)	13.43
Battery Voltage Transmitted (V)	13.37

Transmitter

Transmitter Checks	Desiccant, Program, Time, Bucket
--------------------	----------------------------------

Radio


Watts Forward	3.75
Watts Reflected	0.10
Standing Wave Ratio	1.3903
Is the PT an SDI-12?	Yes
No calibration form necessary	Check to see if PT is working properly.

Finishing Comments

Depart Time	08:45 AM (-6 GMT)
Photos	

Station Maintenance Form

Station Maintenance Form

Location	Brantner Gulch @ Syracuse St
Station_ID	10041
Technician(s)	ZJN,KGS
Date	03/18/2020
Time Arrive	01:44 PM (-6 GMT)
GPS Location	
	Lat: 39.92285158 Long: -104.89739235
Agency	UDFCD

Station Type

What type of station?	Stream
-----------------------	--------

Stream Station Maintenance

Stream Maintenance

Items Cleaned

Clean Checks	Funnel, Solar_panel, Tipping_bucket
--------------	-------------------------------------

Rain Sensor

Does the station have a rain sensor?	Yes
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Rain Gage Calibration

Station Maintenance Form

Point ID	0
Tips During Calibration	12
Volume Added or Removed (mL)	9.00
Error (%)	-0.68
Data Logger reads tips in both directions	checked

Power System

Regulator Output Voltage (V)	21.69
Charging Current (mA)	267.00
Battery Voltage Quiet (V)	12.69
Battery Voltage Transmitted (V)	12.63

Transmitter

Transmitter Checks	Desiccant, Program, Time, Bucket
--------------------	----------------------------------

Radio

Watts Forward	4.50
Watts Reflected	0.10
Standing Wave Ratio	1.3504
Is the PT an SDI-12?	Yes
No calibration form necessary	Check to see if PT is working properly.


Finishing Comments

Final Comments	Everything working well. Received test transmissions
Depart Time	02:11 PM (-6 GMT)
Photos	



Station Maintenance Form

Station Maintenance Form

Location	Brantner Gulch @ Syracuse
Station_ID	10041
Technician(s)	ZJN, EJJ
Date	06/09/2020
Time Arrive	09:21 AM (-6 GMT)
GPS Location	
	Lat: 39.9229112 Long: -104.8974314
Agency	UDFCD

Station Type

What type of station?	Stream
-----------------------	--------

Stream Station Maintenance

Stream Maintenance

Items Cleaned

Clean Checks	Funnel, Solar_panel, Tipping_bucket
--------------	-------------------------------------

Rain Sensor

Does the station have a rain sensor?	Yes
--------------------------------------	-----

Rain Gage Calibration

Station Maintenance Form

Point ID	0
Tips During Calibration	12
Volume Added or Removed (mL)	12.00
Error (%)	-1.00
Data Logger reads tips in both directions	checked

Power System

Regulator Output Voltage (V)	11.94
Charging Current (mA)	71.00
Battery Voltage Quiet (V)	13.59
Battery Voltage Transmitted (V)	13.47


Transmitter

Transmitter Checks	Desiccant, Program, Time, Bucket
--------------------	----------------------------------

Radio

Watts Forward	4.25
Watts Reflected	0.10
Standing Wave Ratio	1.3624
Is the PT an SDI-12?	Yes
No calibration form necessary	Check to see if PT is working properly.

Finishing Comments

Final Comments	Spider web holding tipping bucket up and top section clogged. Everything working well. Sent test transmissions.
Depart Time	09:53 AM (-6 GMT)
Photos	

Station Maintenance Form



Station Maintenance Form

Station Maintenance Form

Location	Brantner Gulch @ Syracuse
Station_ID	10041
Technician(s)	ZJN,EJH
Date	08/26/2020
Time Arrive	01:32 PM (-7 GMT)
Agency	UDFCD

Station Type

What type of station?	Stream
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Stream Station Maintenance

Stream Maintenance

Items Cleaned

Clean Checks	Funnel, Solar_panel, Tipping_bucket
--------------	-------------------------------------

Rain Sensor

Does the station have a rain sensor?	Yes
--------------------------------------	-----

Rain Gage Calibration

Point ID	0
Tips During Calibration	12
Volume Added or Removed (mL)	7.00
Error (%)	-0.47
Data Logger reads tips in both directions	checked

Power System

Regulator Output Voltage (V)	14.11
Charging Current (mA)	157.00
Battery Voltage Quiet (V)	13.27
Battery Voltage Transmitted (V)	13.16

Transmitter

Transmitter Checks	Program, Desiccant, Time, Bucket
--------------------	----------------------------------

Radio

Watts Forward	4.50
Watts Reflected	0.00
Standing Wave Ratio	1.0000

Station Maintenance Form

Is the PT an SDI-12?	Yes
No calibration form necessary	Check to see if PT is working properly.

Finishing Comments

Final Comments	Everything working well
Depart Time	02:03 PM (-7 GMT)

Station Maintenance Form

Station Maintenance Form

Location	Big Dry Creek @ Thorncreek
Station_ID	10042
Technician(s)	ZJN,EJH
Date	08/26/2020
Time Arrive	02:15 PM (-7 GMT)
Agency	UDFCD

Station Type

What type of station?	Stream
-----------------------	--------

Stream Station Maintenance

Stream Maintenance

Items Cleaned

Clean Checks	Funnel, Solar_panel, Tipping_bucket
--------------	-------------------------------------

Rain Sensor

Does the station have a rain sensor?	Yes
--------------------------------------	-----

Rain Gage Calibration

Point ID	0
Tips During Calibration	13
Volume Added or Removed (mL)	-3.00
Error (%)	0.58
Data Logger reads tips in both directions	checked

Power System

Regulator Output Voltage (V)	13.97
Charging Current (mA)	162.00
Battery Voltage Quiet (V)	13.44
Battery Voltage Transmitted (V)	13.29

Transmitter

Transmitter Checks	Desiccant, Program, Time, Bucket
--------------------	----------------------------------

Radio

Watts Forward	4.25
Watts Reflected	0.10
Standing Wave Ratio	1.3624

Station Maintenance Form


Is the PT an SDI-12?	Yes
No calibration form necessary	Check to see if PT is working properly.

Finishing Comments

Final Comments	Everything working well. Beehive in bottom of top section. Bring spray and cover hole
Depart Time	02:51 PM (-7 GMT)

Station Maintenance Form

Station Maintenance Form

Location	Big dry creek at thorn creek golf
Station_ID	10042
Technician(s)	Kgs
Date	06/21/2020
Time Arrive	10:29 AM (-6 GMT)
GPS Location	
	Lat: 39.9396925498262 Long: -104.990016393342
Agency	UDFCD

Station Type

What type of station?	Stream
-----------------------	--------

Stream Station Maintenance

Stream Maintenance

Items Cleaned

Clean Checks	Funnel, Solar_panel, Tipping_bucket
--------------	-------------------------------------

Rain Sensor

Does the station have a rain sensor?	Yes
--------------------------------------	-----

Rain Gage Calibration

Station Maintenance Form

Point ID	0
Tips During Calibration	13
Volume Added or Removed (mL)	-8.00
Error (%)	1.11
Data Logger reads tips in both directions	checked

Power System

Regulator Output Voltage (V)	14.01
Charging Current (mA)	49.00
Battery Voltage Quiet (V)	13.97
Battery Voltage Transmitted (V)	13.85


Transmitter

Transmitter Checks	Desiccant, Program, Time, Bucket
--------------------	----------------------------------

Radio

Watts Forward	4.00
Watts Reflected	0.10
Standing Wave Ratio	1.3756
Is the PT an SDI-12?	Yes
No calibration form necessary	Check to see if PT is working properly.

Finishing Comments

Depart Time	11:03 AM (-6 GMT)
Photos	

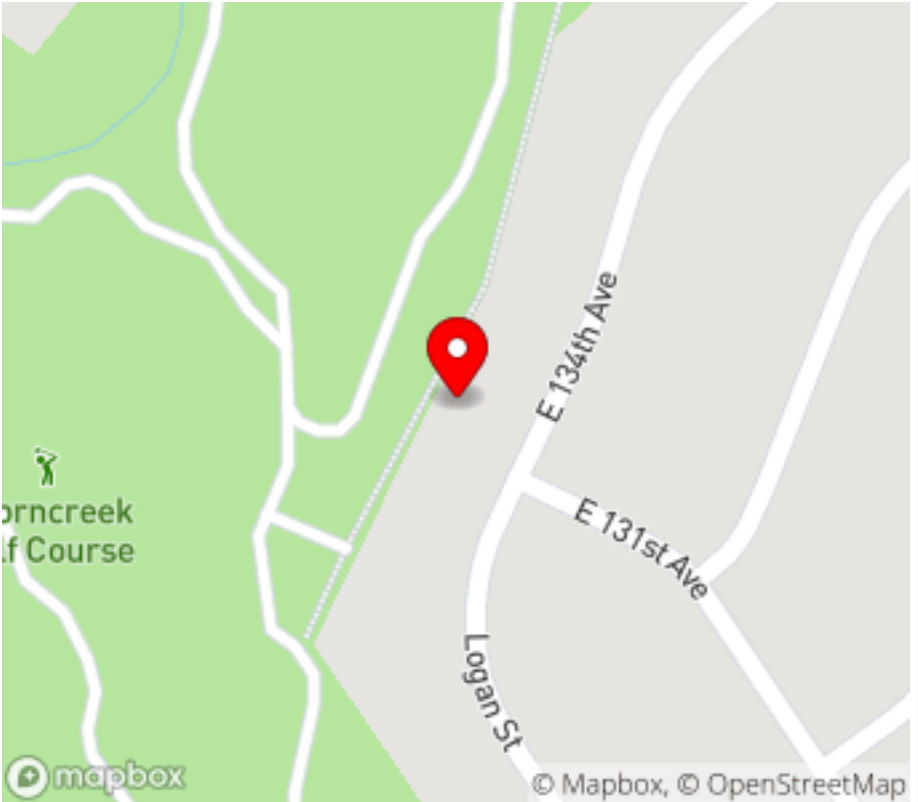
Station Maintenance Form





Station Maintenance Form

Station Maintenance Form

Location	Big Dry Creek at Thorncreek
Station_ID	10042
Technician(s)	ZJN,KGS
Date	03/18/2020
Time Arrive	12:53 PM (-6 GMT)
GPS Location	
	Lat: 39.9367579 Long: -104.9839787
Agency	UDFCD

Station Type

What type of station?	Stream
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Stream Station Maintenance

Stream Maintenance

Items Cleaned

Clean Checks	Funnel, Solar_panel, Tipping_bucket
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Rain Sensor

Does the station have a rain sensor?	Yes
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Rain Gage Calibration

Station Maintenance Form

Point ID	0
Tips During Calibration	13
Volume Added or Removed (mL)	-5.00
Error (%)	0.80
Data Logger reads tips in both directions	checked

Power System

Regulator Output Voltage (V)	14.22
Charging Current (mA)	56.00
Battery Voltage Quiet (V)	12.90
Battery Voltage Transmitted (V)	12.81


Transmitter

Transmitter Checks	Desiccant, Program, Time, Bucket
--------------------	----------------------------------

Radio


Watts Forward	4.25
Watts Reflected	0.25
Standing Wave Ratio	1.6404
Is the PT an SDI-12?	Yes
No calibration form necessary	Check to see if PT is working properly.

Finishing Comments

Final Comments	Everything working well. Received test transmissions. Bring wasp spray and something to cover hole on bottom of tipping bucket stand
Depart Time	01:27 PM (-6 GMT)
Photos	

Station Maintenance Form

Station Maintenance Form

Location	Coal Creek @ Twin Spruce
Station_ID	10049
Technician(s)	ZJN,KGS
Date	03/18/2020
Time Arrive	03:55 PM (-6 GMT)
GPS Location	
	Lat: 39.90019495 Long: -105.34282536
Agency	UDFCD

Station Type

What type of station?	Stream
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Stream Station Maintenance

Stream Maintenance

Items Cleaned

Clean Checks	Tipping_bucket, Solar_panel, Funnel
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Rain Sensor

Does the station have a rain sensor?	Yes
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Rain Gage Calibration

Station Maintenance Form

Point ID	0
Tips During Calibration	12
Volume Added or Removed (mL)	12.00
Error (%)	-1.00
Data Logger reads tips in both directions	checked

Power System

Regulator Output Voltage (V)	14.71
Charging Current (mA)	38.00
Battery Voltage Quiet (V)	12.64
Battery Voltage Transmitted (V)	12.58


Transmitter

Transmitter Checks	Bucket, Time, Program, Desiccant
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Radio


Watts Forward	5.00
Watts Reflected	0.10
Standing Wave Ratio	1.3294
Is the PT an SDI-12?	Yes
No calibration form necessary	Check to see if PT is working properly.

Finishing Comments

Final Comments	PT working but offset keeps getting larger. Offset changed to 0.63 after 7 point test. Everything else working well. Received test transmissions.	
Depart Time	04:20 PM (-6 GMT)	
Photos		

Station Maintenance Form

Station Maintenance Form

Location	Coal Creek @ Twin Spruce
Station_ID	10049
Technician(s)	ZJN,KGS
Date	06/30/2020
Time Arrive	10:04 AM (-6 GMT)
GPS Location	
	Lat: 39.8999131 Long: -105.3429639
Agency	UDFCD

Station Type

What type of station?	Stream
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Stream Station Maintenance

Stream Maintenance

Items Cleaned

Clean Checks	Funnel, Tipping_bucket, Solar_panel
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Rain Sensor

Does the station have a rain sensor?	Yes
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Rain Gage Calibration

Station Maintenance Form

Point ID	0
Tips During Calibration	12
Volume Added or Removed (mL)	11.00
Error (%)	-0.89
Data Logger reads tips in both directions	checked

Power System

Regulator Output Voltage (V)	14.65
Charging Current (mA)	42.00
Battery Voltage Quiet (V)	12.81
Battery Voltage Transmitted (V)	12.74

Transmitter

Transmitter Checks	Desiccant, Program, Time, Bucket
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Radio

Watts Forward	5.00
Watts Reflected	0.00
Standing Wave Ratio	1.0000
Is the PT an SDI-12?	Yes
No calibration form necessary	Check to see if PT is working properly.

Finishing Comments

Final Comments	<p>PT reading way too low. Did a 6 point calibration and got an offset of -0.21. Changed from -0.63</p> <p>New power lines right above and electrical boxes around the standpipe. Most likely what is effecting the transmissions. Decoded data, radio is working great.</p>
Depart Time	10:50 AM (-6 GMT)
Photos	

Station Maintenance Form

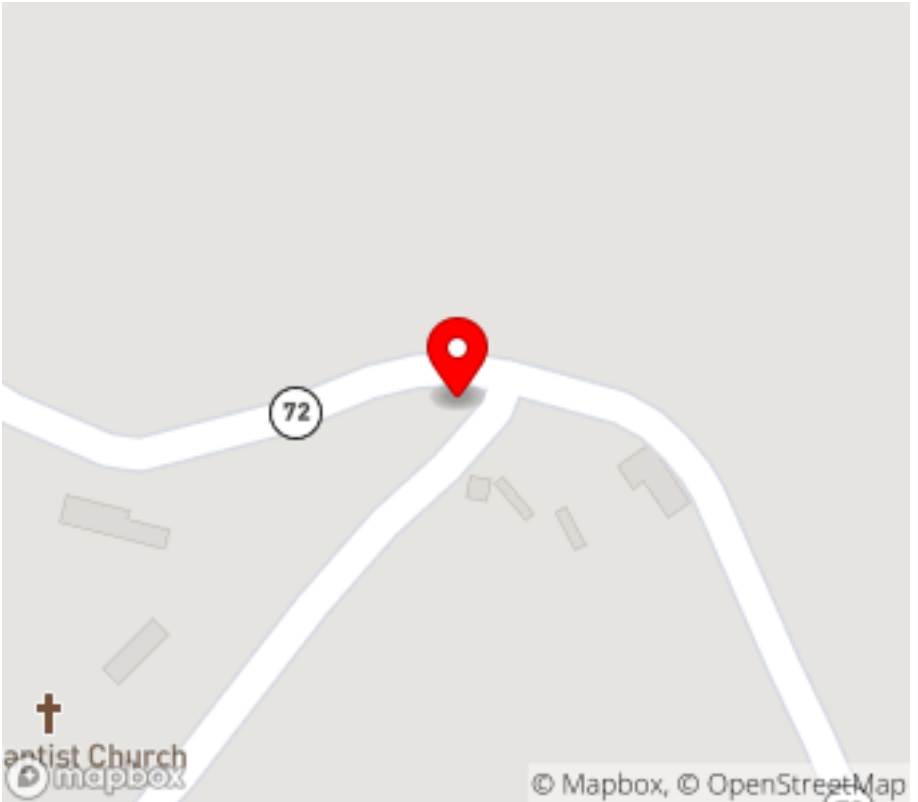


Station Maintenance Form



Station Maintenance Form

Station Maintenance Form

Location	Coal Creek@ Twin Spruce
Station_ID	10049
Technician(s)	EJH/ZJN
Date	08/26/2020
Time Arrive	10:35 AM (-6 GMT)
GPS Location	
	Lat: 39.9001106 Long: -105.3428018
Agency	UDFCD

Station Type

What type of station?	Stream
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Stream Station Maintenance

Stream Maintenance

Items Cleaned

Clean Checks	Funnel, Solar_panel, Tipping_bucket
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Rain Sensor

Does the station have a rain sensor?	Yes
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Rain Gage Calibration

Station Maintenance Form

Point ID	10049
Tips During Calibration	13
Volume Added or Removed (mL)	0.00
Error (%)	0.27
Data Logger reads tips in both directions	checked

Power System

Regulator Output Voltage (V)	13.52
Charging Current (mA)	98.00
Battery Voltage Quiet (V)	12.96
Battery Voltage Transmitted (V)	12.86


Transmitter

Transmitter Checks	Desiccant, Program, Time, Bucket
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Radio


Watts Forward	4.50
Watts Reflected	0.00
Standing Wave Ratio	1.0000
Is the PT an SDI-12?	Yes
No calibration form necessary	Check to see if PT is working properly.

Finishing Comments

Depart Time	10:54 AM (-6 GMT)
Photos	

Station Maintenance Form

Station Maintenance Form

Location	Coal Creek @ Camp Eden
Station_ID	10050
Technician(s)	EJH/ZJN
Date	08/26/2020
Time Arrive	10:06 AM (-6 GMT)
GPS Location	
	Lat: 39.9077214 Long: -105.3923191
Agency	UDFCD

Station Type

What type of station?	Precipitation
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Precipitation Station Maintenance

Precipitation Maintenance

Items Cleaned

Clean Checks	Solar_panel, Funnel, Tipping_bucket
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Rain Gage Calibration

Point ID	10050
Tips During Calibration	13

Station Maintenance Form

Volume Added or Removed (mL)	-14.00
Error (%)	1.74
Data Logger reads tips in both directions	checked

Power System

Regulator Output Voltage (V)	14.29
Charging Current (mA)	166.00
Battery Voltage Quiet (V)	13.68
Battery Voltage Transmitted (V)	13.60

Transmitter

Transmitter Checks	Desiccant, Program, Time, Bucket
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Radio

Watts Forward	4.50
Watts Reflected	0.00
Standing Wave Ratio	1.0000

Stream Station Maintenance


No calibration form necessary	Check to see if PT is working properly.
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Finishing Comments

Depart Time	10:22 AM (-6 GMT)
Photos	

Station Maintenance Form

Station Maintenance Form

Location	Upper Coal Creek @ Camp Eden
Station_ID	10050
Technician(s)	ZJN,KGS
Date	03/18/2020
Time Arrive	03:29 PM (-6 GMT)
GPS Location	
	Lat: 39.90777626 Long: -105.39236732
Agency	UDFCD

Station Type

What type of station?	Precipitation
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Precipitation Station Maintenance

Precipitation Maintenance

Items Cleaned

Clean Checks	Funnel, Solar_panel, Tipping_bucket
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Rain Gage Calibration

Point ID	0
Tips During Calibration	13

Station Maintenance Form

Volume Added or Removed (mL)	-6.00
Error (%)	0.90
Data Logger reads tips in both directions	checked

Power System

Regulator Output Voltage (V)	14.69
Charging Current (mA)	161.00
Battery Voltage Quiet (V)	12.82
Battery Voltage Transmitted (V)	12.77

Transmitter

Transmitter Checks	Desiccant, Program, Time, Bucket
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Radio

Watts Forward	5.00
Watts Reflected	0.10
Standing Wave Ratio	1.3294

Stream Station Maintenance

No calibration form necessary	Check to see if PT is working properly.
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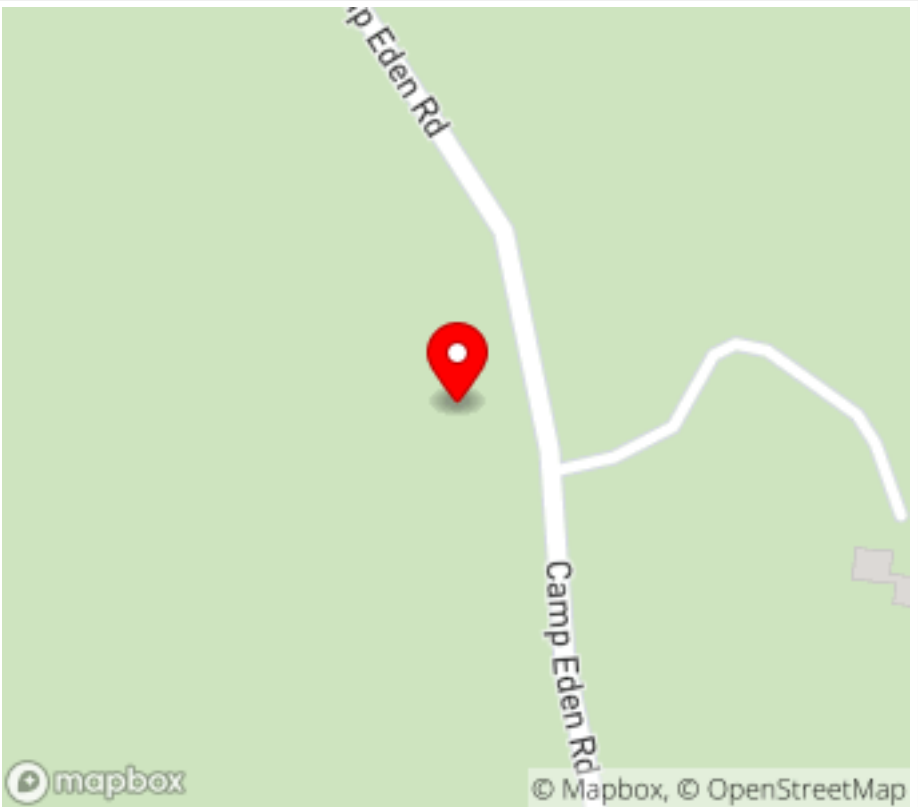
Finishing Comments

Final Comments	Everything working well. Received test transmissions.
Depart Time	03:50 PM (-6 GMT)
Photos	



Station Maintenance Form

Station Maintenance Form

Location	Upper coal creek @ camp Eden Road
Station_ID	10050
Technician(s)	Kgs
Date	06/23/2020
Time Arrive	09:42 AM (-6 GMT)
GPS Location	
	Lat: 39.9077453613281 Long: -105.392500078404
Agency	UDFCD

Station Type

What type of station?	Precipitation
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Precipitation Station Maintenance

Precipitation Maintenance

Items Cleaned

Clean Checks	Funnel, Solar_panel, Tipping_bucket
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Rain Gage Calibration

Point ID	0
Tips During Calibration	12

Station Maintenance Form

Volume Added or Removed (mL)	8.00
Error (%)	-0.58
Data Logger reads tips in both directions	checked

Power System

Regulator Output Voltage (V)	14.42
Charging Current (mA)	211.00
Battery Voltage Quiet (V)	13.65
Battery Voltage Transmitted (V)	13.59

Transmitter

Transmitter Checks	Desiccant, Program, Time, Bucket
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Radio

Watts Forward	5.00
Watts Reflected	0.00
Standing Wave Ratio	1.0000

Stream Station Maintenance

No calibration form necessary	Check to see if PT is working properly.
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Finishing Comments

Depart Time	09:46 AM (-6 GMT)
Photos	