



Site: Bishop Paiute Reservation

Audit Date: November 30, 2022

Instrumentation Audited: Meteorology and Particulate Matter

Key Person(s): Emma Ruppell

Auditor: David Yoho

Technical & Business Systems, Inc.  
26368 Ruether Ave  
Santa Clarita, CA 91350

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The purpose of this summary is to provide a report of significant audit findings at the Bishop Paiute Reservation in Bishop, California. Key elements of the audit are identified below. Results of the performance audit comparisons are included.

#### **GENERAL COMMENTS**

No comments were noted at the time of the audit.

#### **KEY AUDIT FINDINGS**

##### **Ozone**

The ozone analyzer was not audited. The analyzer will be audited within the coming months.

##### **Meteorology**

- The audit of the precipitation gauge had results that do not meet the recommended criteria of  $\pm 10\%$ . Replacing the cracked signal cable is recommended in addition to recalibrating the gauge.
- While the barometric pressure audit results passed the recommended criteria, the factors were adjusted to bring the sensor response closer to the correct reading.

##### **Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>)**

No performance problems were noted.

# AUDIT RECORD

## ***HORIZONTAL WIND SPEED***

*T&B Systems*

26368 Ruther Ave  
Santa Clarita, CA 91350  
(661) 309-6225

Date: **11/30/22**  
Start: **8:30 PST**  
Finish: **11:00 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**

Site Name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**

Manufacturer: **RM Young**  
Serial No.: **179042**  
K factor: **3.8**  
Range: **0 - 125**      **mph**  
Last Calibrated: **NA**

Model: **05305**  
Sensor Ht.: **10 meters**  
Starting torque: **0.1**      **gm cm**  
Starting threshold: **0.36**      **mph**  
Starting threshold criteria: **1.1**      **mph**

Audit Point	Input MPH	DAS MPH	Diff. MPH
1	0.00	0.00	0.00
2	5.73	5.73	0.00

*Audit Criteria:  $\pm 5.6$  MPH;  $ws \leq 11.2$  MPH*

Audit Point	Input MPH	DAS MPH	Diff. %
3	17.18	17.18	0.0
4	28.63	28.63	0.0
5	40.08	40.08	0.0
6	51.53	51.53	0.0
7	62.98	62.98	0.0
8	74.43	74.43	0.0

*Audit Criteria:  $\pm 5\%$ ;  $ws > 11.2$  MPH*

Comments: No problems were noted.

## AUDIT RECORD

### ***HORIZONTAL WIND DIRECTION***

*T&B Systems*

26368 Ruther Ave  
Santa Clarita, CA 91350  
(661) 309-6225

Date: **11/30/22**  
Start: **8:30 PST**  
Finish: **11:00 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**

Site Name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**

Manufacturer: **RM Young**  
Serial No.: **179042**  
K factor: **37**  
Range: **0 - 360°**  
Crossarm: **180°**  
Last Calibrated: **NA**

Model: **05305**  
Sensor Ht.: **10 meters**  
Starting torque: **6** **gm cm**  
Starting threshold: **0.90** **mph**  
Starting threshold criteria: **1.1** **mph**

<b>Audit Point</b>	<b>Degrees Reference</b>	<b>Degrees DAS</b>	<b>Diff. Degrees</b>
1	45	45	0
2	90	87	-3
3	135	132	-3
4	180	179	-1
5	225	225	0
6	270	271	1
7	315	318	3
8	0	2	2

*Audit Criteria:  $\pm 5$  degrees*

Comments: No problems were noted.

## AUDIT RECORD

### *AMBIENT TEMPERATURE*

*T&B Systems*

26368 Ruther Ave  
Santa Clarita, CA 91350  
(661) 309-6225

Date: **11/30/22**  
Start: **8:30 PST**  
Finish: **11:00 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**

Site Name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**

Manufacturer: **Climatronics**  
Serial No.: **6916**  
Lower Range: **-22**  
Upper Range: **122**  
Last Calibrated: **NA**

Model: **62**  
Sensor Ht.: **9 m**

**Deg F**  
**Deg F**

<b>Audit Point</b>	<b>Input Deg F</b>	<b>DAS Deg F</b>	<b>Diff. Deg F</b>
1	32.8	32.6	-0.2
2	71.3	71.0	-0.3
3	101.2	101.5	0.3

*Audit Criteria:  $\pm 1.8^{\circ}\text{F}$*

Comments: No problems were noted.

# AUDIT RECORD

## *PRECIPITATION*

*T&B Systems*

26368 Ruther Ave  
Santa Clarita, CA 91350  
(661) 309-6225

Date: **11/30/22**  
Start: **8:30 PST**  
Finish: **11:00 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**

Site name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**

Manufacturer: **Climatronics**  
Serial No.: **956**  
Units: **inches**  
Last Calibrated: **NA**

Model: **100508-G1**  
Sensor Ht.: **1.5 m above roof**  
Funnel Diam: **15.4 cm**

Audit Point	Input Inches	DAS Inches	Diff. %
1	1.06	0.73	-30.9

*Audit Criteria:  $\pm 10\%$  of input*

Comments: The audit results for the tipping bucket did not meet the criteria. It is recommended to replace the signal cable and recalibrate the tipping bucket.

**AUDIT RECORD**

***SOLAR RADIATION***

**T&B Systems**

26368 Ruther Ave  
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(661) 309-6225

Date: **11/30/22**  
Start: **8:30 PST**  
Finish: **11:00 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**

Site name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**

Sensor Mfg: **K&Z**  
Serial No.: **113299**  
Range: **0 - 2.145 Langleys/min**  
Last Calibrated: **NA**

Model: **SP-Lite**  
Sensor Ht.: **8 meters**

Audit Point	Input L/min	DAS L/min	% Diff
1	0.636	0.583	-8.3
2	0.699	0.638	-8.7
3	0.735	0.677	-7.9
4	0.800	0.746	-6.8

*Criteria:  $\pm 10\%$*

Comments: No problems were noted.

## AUDIT RECORD

### **BAROMETRIC PRESSURE**

*T&B Systems*

26368 Ruther Ave  
Santa Clarita, CA 91350  
(661) 309-6225

Date: **11/30/22**  
Start: **8:30 PST**  
Finish: **11:00 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**

Site name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**

Manufacturer: **Climatronics**  
Serial No.: **87**  
Units: **mb**  
Last Calibrated: **NA**

Model: **1022761**  
Sensor Ht.: **2 m**

<b>Audit Point</b>	<b>Input mb</b>	<b>DAS mb</b>	<b>Diff. mb</b>
As found	870.8	873.4	2.6
As left	870.8	870.4	-0.4

*Audit Criteria:  $\pm 3.0$  mb*

Comments: While the pressure passed the audit, the factors were adjusted to bring the response closer to the true reading.

## AUDIT RECORD

### ***RELATIVE HUMIDITY***

*T&B Systems*

26368 Ruther Ave  
Santa Clarita, CA 91350  
(661) 309-6225

Date: **11/30/22**

Start: **8:30 PST**

Finish: **11:00 PST**

Auditor: **David Yoho**

Witness: **Emma Ruppell**

Site name: **Bishop Paiute**

Operator: **Emma Ruppell**

Project: **QA**

Sensor Mfg: **Climatronics**

Serial No.: **NA**

Range: **0-100 %**

Last Calibrated: **NA**

Model: **NA**

Sensor Ht.: **9 meters**

<b>Audit Point</b>	<b>Input RH (%)</b>	<b>DAS RH (%)</b>	<b>Diff. %</b>
1	45.5	44.6	-0.9
2	44.0	41.6	-2.4
3	40.9	40.4	-0.5
4	38.1	40.9	2.8
5	36.1	39.5	3.4

*Criteria:  $\pm 10\%$*

Comments: No problems were noted.



**AUDIT RECORD****PM<sub>10</sub>****T&B Systems**26368 Ruther Ave  
Santa Clarita, CA 91350  
(661) 309-6225Date: **11/30/22**  
Start: **11:00 PST**  
Finish: **12:00 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**Site name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**Sampler: **TEOM (PM10)**  
Serial No.: **1405A231661508**  
Last Calibrated.: **11/21/22**Make: **Thermo**  
Model: **1405**Amb. Press: **25.68 in. Hg**  
Amb. Temp.: **7.8 °C**Flowmeters  
Model: **Alicat FP25**  
Certification Date: **5/26/2022**T Case (°C): **50.00**  
T Air (°C): **50.00**T Cap (°C): **50.00**  
F Main (lpm): **3.00**  
F Aux (lpm): **13.65**

	Audit	Site	Diff.
Main	3.04 lpm	3.00 lpm	-1.3%
Bypass	13.92 lpm	13.65 lpm	-1.9%
Total	16.96 lpm	16.65 lpm	-1.8%
Amb T	7.8 °C	7.9 °C	0.1
Amb P	0.858 atm	0.858 atm	0.000

*Audit Criteria:* Flow -  $\pm 10\%$ ; Total 15.00 - 18.34 lpm  
Amb T -  $\pm 2^\circ \text{C}$   
Amb P -  $\pm 0.013 \text{ atm}$ **Leak Check**Main: 0.00 lpm      Audit Criteria: <0.15 lpm  
Bypass: -0.18 lpm      <0.60 lpm**Mass Transducer Calibration Verification**

Cal Filter Weight (g)	Frequency (w/o filter) (Hz)	Frequency (with filter) (Hz)	Audit K <sub>0</sub>	Actual K <sub>0</sub>	Error (%)
NA	NA	NA	NA	NA	NA

*Audit Criteria:*  $\pm 2.5\%$ 

Comments: No problems were noted. A mass transducer calibration verification was not performed.

# AUDIT RECORD

*T&B Systems*

26368 Ruther Ave  
Santa Clarita, CA 91350  
(661) 309-6225

***PM*<sub>2.5</sub>**

Date: **11/30/22**  
Start: **11:00 PST**  
Finish: **12:00 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**

Site name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**

Sampler: **Teledyne API**  
Serial No.: **070600000**  
Last Calibrated.: **11/10/22**

Model: **T640**

Amb. Press: **25.68 in. Hg**  
Amb. Temp.: **8.6 °C**  
Leak Check: **0.000 ug/m3**

Flowmeters  
Model: **Alicat FP25**  
Certification Date: **5/26/2022**

	Audit	Site	Diff.
Flowrate:	4.95 lpm	4.99 lpm	0.8%
Amb T (°C)	8.6 °C	8.6 °C	0.0
Amb P (mm Hg)	652.5 mm Hg	650.8 mm Hg	-1.7

*Audit Criteria:*      *Flow - ±4%*  
                                 *Amb T - ±2 °C*  
                                 *Amb P - ±10 mm Hg*

Comments: No problems were noted.



Site: Bishop Paiute Reservation

Audit Date: February 1, 2023

Instrumentation Audited: Ozone Analyzer

Key Person(s): Emma Ruppell

Auditor: David Yoho

Technical & Business Systems, Inc.  
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Santa Clarita, CA 91350

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The purpose of this summary is to provide a report of significant audit findings at the Bishop Paiute Reservation in Bishop, California. Key elements of the audit are identified below. Results of the performance audit comparisons are included.

#### **GENERAL COMMENTS**

No comments were noted at the time of the audit.

#### **KEY AUDIT FINDINGS**

##### **Ozone**

There were no issues noted at the time of the ozone analyzer audit.

**AUDIT RECORD**26368 Ruther Ave  
Santa Clarita, CA 91350  
(661) 309-6225**OZONE**Date: **02/01/23**  
Start: **15:40 PST**  
Finish: **16:40 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**Site Name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**Analyzer make: **Thermo Electron**  
Serial No.: **630719320**  
Sample flow: **0.593/0.603 lpm**  
Slope Set Point: **1.012**  
Zero Set Point: **0.40**  
Range: **0.5 ppm**Model: **49i**  
Filter: **01/18/23**  
Ozone Measure: **90509**  
Ozone Ref: **120750**  
Last Calibrated: **01/25/23**

O <sub>3</sub> Audit Point	PPM Input (X)	PPM DAS (Y)	PPM Dif (%)
1	0.000	-0.001	
2	0.015	0.016	6.7
3	0.034	0.034	0.0
4	0.083	0.082	-1.2
5	0.183	0.180	-1.6

Linear Regression: (Y=PPM Corrected, X=PPM Input)

Audit Statistics	
Slope:	0.983
Intercept:	0.000
Correlation:	0.9999

Comments: No problems were noted.

Audit Equipment	Make	Model	ID	Certification Date
Dilution System:	API	M700EU	83	1/31/23
Ozone Standard:	API	M700EU	83	11/07/22
Zero Air System:	API	701	2427	NA

Ozone Transfer Standard	
Sample Freq: NA	Cell Temperature: NA deg C
Control Freq: NA	Ambient Pressure: NA "Hg
Span Setting: NA	Certification Slope: 0.9923
	Certification Intercept: 0.0000 ppm