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Docketed Date:	10/31/2019

MALBURG GENERATING STATION
4963 Soto Street
Vernon, CA 90058
Telephone: (323) 476-3610
Fax: (323) 476-3640

QUARTERLY COMPLIANCE REPORT
(Third Quarter 2019)

MALBURG GENERATING STATION
4963 SOTO STREET, VERNON, CA 90058

SUBMITTED TO:

CALIFORNIA ENERGY COMMISSION

1516 9TH STREET, SACRAMENTO, CA 95814

MALBURG GENERATING STATION
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Contents

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LIST OF TABLES

LIST OF APPENDICES

SECTION 1
INTRODUCTION

This Quarterly Compliance Report (QCR) has been prepared to meet the California Energy Commission (CEC) requirements for the Malburg Generating Station (MGS). This QCR fulfills various Conditions of Certifications as described in the California Energy Commission's Petition to Amend License, June 20, 2019.

1.1 PROJECT LOCATION AND DESCRIPTION

The Malburg Generating Station is located at 4963 Soto Street on approximately 3.4 acres, in an industrial land use area. MGS is located near the geographic center of metropolitan Los Angeles County. MGS consists of two Alstom GTX-100 frame type natural gas combustion turbine generators (CTGs); two heat recovery steam generators (HRSG); a steam turbine-generator (STG); a cooling tower, a diesel fuel fired emergency firewater pump and support equipment.

The commissioning of MGS was completed in October 2005 and the power plant began Commercial Operation on October 17, 2005.

1.2 ORGANIZATION OF THE QUARTERLY COMPLIANCE REPORT

A summary of each condition of certification and required means of verification are provided in Section 2. Each sub-section also contains a description of the method used by MGS to demonstrate compliance with the verification requirements and references to Appendices, Figures and Tables as appropriate.

SECTION 2
COMPLIANCE DETAILS

The compliance details for various conditions of certification are provided below.

2.1 CONDITION OF CERTIFICATION AQ-C6

As per the Condition of Certification Number AQ-C6, MGS shall determine the Total Dissolved Solids (TDS) levels in the blowdown water by independent laboratory testing prior to initial operation and periodically thereafter.

For verification of the above condition of certification, the CEC requires MGS to submit weekly TDS reports for the blowdown water as part of the quarterly emission report to the Compliance Project Manager (CPM) for approval.

As demonstration of compliance, the weekly TDS results are provided in Table 2-1, and the weekly sample reports during operation are provided in Appendix A.

2.2 CONDITION OF CERTIFICATION AQ-C7

As per the Condition of Certification Number AQ-C7, particulate matter of diameter less than 10 microns (PM_{10}) emissions from the cooling tower shall not exceed 6.2 lb/day.

Compliance with the PM_{10} daily emission limit shall be demonstrated as follows:

PM_{10} lb/day = A*B*C*D

Where:

A	=	circulating water recirculation rate
B	=	total dissolved solids concentration in the blowdown water to be updated on a weekly basis
C	=	design drift rate
D	=	correction factor

For verification of the above condition of certification, the CEC requires the project owner to calculate the daily PM_{10} emissions from the cooling tower and submit all calculations and results on a quarterly basis in the quarterly emissions reports to the CPM for approval.

As demonstration of compliance, the daily PM_{10} emissions from the cooling tower are provided in Tables 2-2 through 2-4.

2.3 CONDITION OF CERTIFICATION AQ-C8

As per the Condition of certification Number AQ-C8, the project owner shall refrain from testing the firewater pump during the same hour as either gas fired combustion turbines is in start up or shut down as defined by Condition of Certification AQ-C9.

For verification of the above condition of certification, the CEC requires MGS to submit to the CPM for approval all testing times and results of the diesel fired emergency firewater pump in the quarterly emissions report.

As demonstration of compliance, the testing times for the diesel fired emergency firewater pump are provided in Table 2-5. MGS refrained from testing the diesel fired

emergency firewater pump on the same hour the combustion turbines were either started or shutdown.

2.4 CONDITION OF CERTIFICATION AQ-C9

As per the Condition of certification Number AQ-C9, MGS shall use the provided definitions to determine compliance with startup, shutdown and any related emission or operational limitations.

For verification of the above condition of certification, the CEC requires MGS to submit to the CPM for approval, a record of all startups and shutdowns including duration and date of occurrence on a quarterly basis as part of the quarterly emission report.

As demonstration of compliance, the startup and shutdown details as defined by the decision modifications issued in March, 2014 are provided in Table 2-14.

2.5 CONDITION OF CERTIFICATION AQ-C10

The condition of certification number AQ-C10 has been deleted.

2.6 CONDITION OF CERTIFICATION AQ-C11

As per the Condition of Certification Number AQ-C11, MGS shall submit a quarterly emissions report on a quarterly basis to the CPM for approval. The quarterly emissions report shall generally report all ammonia, NO_X, SO_X, CO, PM_{10} and VOC emissions from the MGS as necessary to demonstrate compliance with all emission limits. The fourth quarter emission report shall include an annual summary of all emissions of ammonia, NO_X, SO_X, CO, PM_{10} and VOC as necessary to demonstrate compliance with all annual emission limits.

For verification of the above condition of certification, the CEC requires MGS to submit the quarterly emissions report no less than 30 days after the end of each calendar quarter.

2.7 CONDITION OF CERTIFICATION AQ-2

As per the Condition of Certification Number AQ-2, MGS shall not use diesel oil containing sulfur compounds in excess of 15 ppm by weight as supplied by the supplier.

For verification of the above condition of certification, the CEC requires MGS to submit fuel purchase records for approval to the CPM on a quarterly basis in the quarterly emissions report.

Low sulfur diesel fuel was purchased May 20, 2019.

2.8 CONDITION OF CERTIFICATION AQ-3

As per the Condition of Certification Number AQ-3, MGS shall keep records, in a manner approved by the District, for the following parameter(s) or item(s): Purchase records of fuel oil and sulfur content of the fuel.

For verification of the above condition of certification, the CEC requires MGS to submit fuel purchase records for approval to the CPM on a quarterly basis in the quarterly emissions report.

Low sulfur diesel fuel was purchased May 20, 2019.

2.9 CONDITION OF CERTIFICATION AQ-5

As per the condition of certification number AQ-5, MGS shall limit the emissions from both gas-fired combustion turbine-heat recovery steam generator train exhaust stacks as follows:

Contaminant Emissions Limit

- CO 7,633 lbs in any one month
- PM_{10} 4,876 lbs in any one month
- $PM_{2.5}$ 4,876 lbs in any one month
- VOC 3,236 lbs in any one month
- SO_x 227 lbs in any one month

For verification of the above condition of certification, the CEC requires the MGS to submit all emission calculations, fuel use and a summary demonstrating compliance of all emission limits stated in this condition for approval to the CPM on a quarterly basis in the quarterly emissions report.

As demonstration of compliance, the monthly emissions of CO, PM_{10}, VOC, and SOx are presented in Tables 2-11 through 2-13. In addition, the fuel usage for the two turbine-duct burner pairs is provided in Table 2-15. MGS calculates the emission limit(s) for CO based on readings from the certified CEMS. In the event the CO CEMS is not operating or the emissions exceed the valid upper range of the analyzer, the emissions are calculated in accordance with the approved CEMS Plan. MGS calculates the emission limit(s) by using the monthly fuel use data and the following emission factors:- $PM_{10,}$ $PM_{2.5}$: 6.014 lb/mmscf, VOC: 1.54 lb/mmscf & SOx: 0.28lb/mmscf.

2.10 CONDITION OF CERTIFICATION AQ-6

As per the condition of certification numbers AQ-6; following commissioning, start-ups shall not exceed 120 minutes during a cold start-up without a trip, and 150 minutes during a cold start-up with a trip. Cold start-ups with or without a trip shall not exceed the following limits: NOx 122.8 lbs, CO 204.8 lbs and VOC 1.75 lbs.

Start-ups shall not exceed 90 minutes during a non-cold start-up without a trip or 120 minutes during a non-cold start-up with a trip. Non-cold start-ups shall not exceed the following limits: NOx 51.3 lbs, CO 59.9 lbs, and VOC 1.55 lbs.

Shut-downs shall not exceed 30 minutes. Shut-downs shall not exceed the following limits: NOx 4.5 lbs, CO 10.8 lbs, and VOC 0.71 lbs.

The number of startups shall not exceed two per day per turbine.

For verification of the above condition of certification, the CEC requires the MGS to submit a record of all startups and shutdowns including duration and date of occurrence on a quarterly basis as part of the quarterly emission report.

As demonstration of compliance, the startup and shutdown details are provided in Table 2-14. Additionally, quarterly excess emission reports from the DAHS are provided in Appendix B.

2.11 CONDITION OF CERTIFICATION AQ-8

The Condition of Certification Number AQ-8 has been deleted.

2.12 CONDITION OF CERTIFICATION AQ-9

As per the Condition of Certification Number AQ-9, the 2.0 PPM oxides of nitrogen (NO_X) emissions limit(s) are averaged over 1 hour at 15 percent oxygen, dry basis, during the normal operation of the MGS combustion turbine generators.

For verification of the above condition of certification, the CEC requires MGS to submit to the CPM for approval all emissions and emission calculations on a quarterly basis as part of the quarterly emissions report.

NO_X emission for MGS Units 1 and 2 are measured using the CEMS. A review of CEMS NOx emission data indicated that the maximum corrected NOx emissions concentration for both MGS combustion turbines during normal operations was 1.9 ppm, which is lower than the emission concentration limit of 2.0 ppm. All CEMS data for MGS combustion turbines are stored electronically at MGS. As demonstration of compliance, quarterly excess emission reports from the DAHS are provided in Appendix B.

2.13 CONDITION OF CERTIFICATION AQ-10

As per the Condition of Certification Number AQ-10 the 2.0 PPM carbon monoxide (CO) emissions limit(s) are averaged over 1 hour at 15 percent oxygen, dry basis, during the normal operation of the MGS combustion turbine generators.

For verification of the above condition of certification, the CEC requires MGS to submit to the CPM for approval all emissions and emission calculations on a quarterly basis as part of the quarterly emissions report.

CO emission for MGS Units 1 and 2 are measured using the CEMS. A review of CEMS CO emission data indicated that maximum CO emission concentration for both MGS combustion turbines was 1.5 ppm, which is lower than the emission concentration limit of 2.0 ppm. All CEMS data for MGS combustion turbines are stored electronically at MGS. As demonstration of compliance, quarterly excess emission reports from the DAHS are provided in Appendix B.

2.14 CONDITION OF CERTIFICATION AQ-11

As per the Condition of Certification Number AQ-11, the 2.0 ppm VOC emission limit(s) are averaged over 1 hour at 15 percent oxygen, dry basis.

For verification of the above condition of certification, the CEC requires MGS to submit to the CPM for approval all emissions and emission calculations on a quarterly basis as part of the quarterly emissions report.

2.15 CONDITION OF CERTIFICATION AQ-12

As per the Condition of Certification Number AQ-12, the 5 ppm ammonia (NH_3) emission limit(s) are averaged over 1 hour at 15 percent oxygen, dry basis. MGS shall calculate and continuously record the ammonia slip concentration using the following:

NH_3 (ppmv) = [a-(b*c/1,000,000)]*(1,000,000*d/b) where

a = ammonia injection rate (lbs/hr)/17 (lbs/lb-mole)

b = dry exhaust gas flow rate (lbs/hr)/29 (lbs/lb-mole)

c = change in measured NO_X across the SCR (ppmv dry basis)

d = correction derived by comparing the measured and calculated NH3 slip concentrations during annual compliance testing.

For verification of the above condition of certification, the CEC requires MGS to submit to the CPM for approval all emissions and emission calculations on a quarterly basis as part of the quarterly emissions report.

NH_3 emissions are calculated via the CEMS on an hourly basis but compliance with 5 ppm limit is demonstrated from source tests. The last NH3 compliance source test, performed in August 2019, indicated compliance with the emission limits for both CT1 and for CT2.

2.16 CONDITION OF CERTIFICATION AQ-13

As per the Condition of Certification Number AQ-13, for the purpose of determining compliance with District Rule 475, combustion contaminant emissions may exceed the concentration limit or the mass emission limit listed, but not both emission limits at the same time.

For verification of the above condition of certification, the CEC requires MGS to submit to the CPM for approval all emissions and emission calculations on a quarterly basis as part of the quarterly emissions report.

Rule 475 limits emission of combustion contaminants from electric generating equipment to no more than 5 kilograms (11 pounds) per hour or 23 milligrams per cubic meter (0.01 gr/SCF) calculated at three percent oxygen on a dry basis averaged over 15 consecutive minutes or any other averaging time specified by the Executive Officer.

The results of the last compliance source tests performed in August 2019 indicated compliance with the particulate matter emission limits for both CT1 and CT2.

2.17 CONDITION OF CERTIFICATION AQ-14

As per the Condition of Certification Number AQ-14, MGS shall only use diesel fuel containing the following specified compounds:

Sulfur less than or equal to 15 ppm by weight.

For verification of the above condition of certification, the CEC requires MGS to submit fuel purchase records to the CPM on a quarterly basis as part of the quarterly emissions report.

MGS uses CARB Ultra Low Sulfur Diesel for the diesel fire pump (D48). This is an ash less oil. As demonstration of compliance, detailed specifications of CARB Ultra Low Sulfur Diesel are provided in Appendix C.

2.18 CONDITION OF CERTIFICATION AQ-15

As per the condition of certification number AQ-15, MGS will limit the operating time to no more than 200 hours each in any one year.

Operations for maintenance and testing as defined in Rule 1470 shall not exceed 50 hours in any one calendar year. The total annual operating time includes all operations including maintenance and testing.

For verification of the above condition of certification, the CEC requires MGS to submit to the CPM for approval all testing times and results of the diesel fired emergency firewater pump in the quarterly emissions report.

As demonstration of compliance, the testing times for the diesel fired emergency firewater pump are provided in Table 2-5.

2.19 CONDITION OF CERTIFICATION NUMBER AQ-27

As per the Condition of Certification Number AQ-27, MGS shall limit the fuel usage of each turbine-duct burner pair to no more than 405 MM cubic feet per month.

For verification of the above condition of certification, the CEC requires MGS to submit to the CPM for approval all emissions and emission calculations on a quarterly basis as part of the quarterly emissions report.

As demonstration of compliance, the fuel usage for the two turbine-duct burner pairs is provided in Table 2-15.

Appendix A

Cooling Tower Blowdown Reports

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

July 10, 2019

Tom Barnhart
Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Report No.: 1907031
Project Name: Malburg Generating Station Weekly

Dear Tom Barnhart,

This report contains the analytical results for the sample(s) received under chain of custody(s) by Positive Lab Service on July 03, 2019.

The test results in this report are performed in compliance with ELAP accreditation requirements for the certified parameters. The laboratory report may not be produced, except in full, without the written approval of the laboratory.

The issuance of the final Certificate of Analysis takes precedence over any previous Preliminary Report. Preliminary data should not be used for regulatory purposes. Authorized signature(s) is provided on final report only.

If you have any questions in reference to this report, please contact your Positive Lab Service coordinator.

Project Manager

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

Certificate of Analysis

Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

File #:74548
Report Date: 07/10/19
Submitted: 07/03/19
PLS Report No.: 1907031

Attn: Tom Barnhart Phone: (323) 476-3626 FAX:(323) 476-3640

Project: Malburg Generating Station Weekly

Sample ID: Cooling Tower Blowdown Water (1907031-01) Sampled: 07/02/19 08:10 Received: 07/03/19 08:10

Analyte	Results	Flag	D.F.	Units	PQL	Prep/Test Method	Prepared	Analyzed	By	Batch
Total Dissolved Solids	**4120**		1	mg/L	5.0	- SM 2540C	07/08/19	07/09/19	dd	BG91019

Quality Control Data

Analyte	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch BG91019 - -										
Blank	**Prepared: 07/08/19 Analyzed: 07/09/19**									
Total Dissolved Solids	ND	5.0	mg/L							
LCS	**Prepared: 07/08/19 Analyzed: 07/09/19**									
Total Dissolved Solids	333	5.0	mg/L	356.0		93.5	80-120			
Duplicate Source: 1907031-01	**Prepared: 07/08/19 Analyzed: 07/09/19**									
Total Dissolved Solids	4260	5.0	mg/L		4120			3.22	5	

Notes and Definitions

NA	Not Applicable
ND	Analyte NOT DETECTED at or above the detection limit
NR	Not Reported
MDL	Method Detection Limit
PQL	Practical Quantitation Limit

Environmental Laboratory Accreditation Program Certificate No. 1131, Mobile Lab No. 2534, LACSD No. 10138

Authorized Signature(s)

108988

POSITIVE LAB SERVICE

CHAIN OF CUSTODY AND ANALYSIS REQUEST

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

DATE: 7.27 PAGE 1 OF 1

LOG BOOK NO. _____ FILE NO. _____ LAB NO. 1907031

CLIENT NAME: CEM Project Name/No. Moorpark Generating Station P.O. NO.

AIRBILL NO: _____

ADDRESS: ANALYSES REQUESTED:

COOLER TEMP: 1.4°C

PROJECT MANAGER: Tom Bamhart PHONE NO: FAX NO:

PRESERVATIVE:

SAMPLER NAME: John Bake (Printed) _____ (Signature)

REMARKS:

TAT (Analytical Turn Around Time): 0 = Same Day; 1 = 1 Day; 2 = 2 Days; 3 = 3 Days; N = Normal (5-7 Working Days)

CONTAINER TYPES: B = Brass, E = Encore, G = Glass, P = Plastic, V = VOA Vial, O = Other:

UST Project: Y N - Global ID# _____

	SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	SAMPLE DESCRIPTION	MATRIX: WATER	SOIL	SLUDGE	OTHER	TAT	CONTAINER: #	TYPE		SAMPLE CONDITION/ CONTAINER /COMMENTS:
1		7.27.9	0830	Cooling Tower Blowdown	X				2	1	P	X	
2													
3													
4													
5													
6													
7													
8													
9													
10													

Relinquished By: (Signature and Printed Name) _____ Received By: (Signature and Printed Name) Guadalupe Tavarez Date: 7.27.9 Time: 0930

Relinquished By: (Signature and Printed Name) _____ Received By: (Signature and Printed Name) _____ Date: _____ Time: _____

Relinquished By: (Signature and Printed Name) _____ Received By: (Signature and Printed Name) _____ Date: _____ Time: _____

SPECIAL INSTRUCTIONS:

SAMPLE DISPOSITION:

1. Samples returned to client? YES NO
2. Samples will not be stored over 30 days, unless additional storage time is requested.
3. Storage time requested: _____ days

By _____ Date _____

PRESERVATIVE: 1-HNO_3, 2-H_2SO_4, 3-HCL, 4-Zinc Acetate, 5-NaOH, 6-NH_4 Buffer, 7-Other

LAB COPY

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

July 16, 2019

Tom Barnhart
Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Report No.: 1907062
Project Name: Malburg Generating Station Weekly

Dear Tom Barnhart,

This report contains the analytical results for the sample(s) received under chain of custody(s) by Positive Lab Service on July 09, 2019.

The test results in this report are performed in compliance with ELAP accreditation requirements for the certified parameters. The laboratory report may not be produced, except in full, without the written approval of the laboratory.

The issuance of the final Certificate of Analysis takes precedence over any previous Preliminary Report. Preliminary data should not be used for regulatory purposes. Authorized signature(s) is provided on final report only.

If you have any questions in reference to this report, please contact your Positive Lab Service coordinator.

Project Manager

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

Certificate of Analysis

Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Attn: Tom Barnhart Phone: (323) 476-3626 FAX:(323) 476-3640

File #:74548
Report Date: 07/16/19
Submitted: 07/09/19
PLS Report No.: 1907062

Project: Malburg Generating Station Weekly

Sample ID: Cooling Tower Blowdown Water (1907062-01) Sampled: 07/09/19 08:30 Received: 07/09/19 08:30

Analyte	Results	Flag	D.F.	Units	PQL	Prep/Test Method	Prepared	Analyzed	By	Batch
Total Dissolved Solids	**4020**		1	mg/L	5.0	- SM 2540C	07/15/19	07/16/19	dd	BG91623

Quality Control Data

Analyte	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch BG91623 -										
Blank	**Prepared: 07/15/19 Analyzed: 07/16/19**									
Total Dissolved Solids	ND	5.0	mg/L							
LCS	**Prepared: 07/15/19 Analyzed: 07/16/19**									
Total Dissolved Solids	346	5.0	mg/L	356.0		97.2	80-120			
Duplicate **Source: 1907089-01**	**Prepared: 07/15/19 Analyzed: 07/16/19**									
Total Dissolved Solids	1560	5.0	mg/L		1520			2.57	5	

Notes and Definitions

NA	Not Applicable
ND	Analyte NOT DETECTED at or above the detection limit
NR	Not Reported
MDL	Method Detection Limit
PQL	Practical Quantitation Limit

Environmental Laboratory Accreditation Program Certificate No. 1131, Mobile Lab No. 2534, LACSD No. 10138

Authorized Signature(s)

109143

POSITIVE LAB SERVICE

CHAIN OF CUSTODY AND ANALYSIS REQUEST

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

DATE: 7-9-19 PAGE 1 OF 1

LOG BOOK NO. _____ FILE NO. _____ LAB NO. 1907062

CLIENT NAME: CEM Project Name/No. Malburg Generating Station P.O. NO.

AIRBILL NO: _____

ADDRESS:

ANALYSES REQUESTED:

COOLER TEMP: 10°C

PROJECT MANAGER: Tom Barnhart PHONE NO: FAX NO:

PRESERVATIVE:

SAMPLER NAME: Tom Barnhart (Printed) _____ (Signature)

REMARKS:

TAT (Analytical Turn Around Time): 0 = Same Day; 1 = 1 Day; 2 = 2 Days; 3 = 3 Days; N = Normal (5-7 Working Days)

CONTAINER TYPES: B = Brass, E = Encore, G = Glass, P = Plastic, V = VOA Vial, O = Other:

UST Project: Y N - Global ID# ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

	SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	SAMPLE DESCRIPTION	MATRIX: WATER	SOIL	SLUDGE	OTHER	TAT	CONTAINER: #	TYPE	SAMPLE CONDITION/ CONTAINER /COMMENTS:
1		7-9-19	0830	Cooling Tower Blowdown	X				R	1	P	
2												
3												
4												
5												
6												
7												
8												
9												
10												

Relinquished By: (Signature and Printed Name) _____ Received By: (Signature and Printed Name) Christopher Tamura Date: 7-9-19 Time: 1035

Relinquished By: (Signature and Printed Name) _____ Received By: (Signature and Printed Name) _____ Date: _____ Time: _____

Relinquished By: (Signature and Printed Name) _____ Received By: (Signature and Printed Name) _____ Date: _____ Time: _____

SPECIAL INSTRUCTIONS:

SAMPLE DISPOSITION:

1. Samples returned to client? YES NO
2. Samples will not be stored over 30 days, unless additional storage time is requested.
3. Storage time requested: _____ days

By _____ Date _____

PRESERVATIVE: 1-HNO_3, 2-H_2SO_4, 3-HCL, 4-Zinc Acetate, 5-NaOH, 6-NH_4 Buffer, 7-Other

LAB COPY

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

July 24, 2019

Tom Barnhart
Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Report No.: 1907171
Project Name: Malburg Generating Station Weekly

Dear Tom Barnhart,

This report contains the analytical results for the sample(s) received under chain of custody(s) by Positive Lab Service on July 17, 2019.

The test results in this report are performed in compliance with ELAP accreditation requirements for the certified parameters. The laboratory report may not be produced, except in full, without the written approval of the laboratory.

The issuance of the final Certificate of Analysis takes precedence over any previous Preliminary Report. Preliminary data should not be used for regulatory purposes. Authorized signature(s) is provided on final report only.

If you have any questions in reference to this report, please contact your Positive Lab Service coordinator.

Project Manager

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

Certificate of Analysis

Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Attn: Tom Barnhart Phone: (323) 476-3626 FAX:(323) 476-3640

File #:74548
Report Date: 07/24/19
Submitted: 07/17/19
PLS Report No.: 1907171

Project: Malburg Generating Station Weekly

Sample ID: Cooling Tower Blowdown Water (1907171-01) Sampled: 07/17/19 09:10 Received: 07/17/19 09:10

Analyte	Results	Flag	D.F.	Units	PQL	Prep/Test Method	Prepared	Analyzed	By	Batch
Total Dissolved Solids	**3940**		1	mg/L	5.0	- SM 2540C	07/23/19	07/24/19	vc	BG92426

Quality Control Data

Analyte	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch BG92426 - -										
Blank	**Prepared: 07/23/19 Analyzed: 07/24/19**									
Total Dissolved Solids	ND	5.0	mg/L							
LCS	**Prepared: 07/23/19 Analyzed: 07/24/19**									
Total Dissolved Solids	353	5.0	mg/L	356.0		99.2	80-120			
Duplicate Source: 1907171-01	**Prepared: 07/23/19 Analyzed: 07/24/19**									
Total Dissolved Solids	4150	5.0	mg/L		3940			5.14	5	
Duplicate Source: 1907194-06	**Prepared & Analyzed: 07/24/19**									
Total Dissolved Solids	933	5.0	mg/L		905			3.08	5	

Notes and Definitions

NA	Not Applicable
ND	Analyte NOT DETECTED at or above the detection limit
NR	Not Reported
MDL	Method Detection Limit
PQL	Practical Quantitation Limit

Environmental Laboratory Accreditation Program Certificate No. 1131, Mobile Lab No. 2534, LACSD No. 10138

Authorized Signature(s)

109788

POSITIVE LAB SERVICE

CHAIN OF CUSTODY AND ANALYSIS REQUEST

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

DATE: 7-17-19 PAGE 1 OF 1

LOG BOOK NO. _____ FILE NO. _____ LAB NO. 190771

CLIENT NAME: CEM Project Name/No. Malburg Generating Station Weekly P.O. NO.

ADDRESS:

PROJECT MANAGER: Tom Barnhart PHONE NO: FAX NO:

SAMPLER NAME: John Barie (Printed) (Signature)

TAT (Analytical Turn Around Time): 0 = Same Day; 1 = 1 Day; 2 = 2 Days; 3 = 3 Days; N = Normal (5-7 Working Days)

CONTAINER TYPES: B = Brass, E = Encore, G = Glass, P = Plastic, V = VOA Vial, O = Other:

UST Project: Y N - Global ID# ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

ANALYSES REQUESTED:

AIRBILL NO: _____

COOLER TEMP: 1.4°C

PRESERVATIVE:

REMARKS:

	SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	SAMPLE DESCRIPTION	MATRIX: WATER	SOIL	SLUDGE	OTHER	TAT	CONTAINER: #	TYPE	SAMPLE CONDITION/ CONTAINER /COMMENTS:
1		7-17-19	0915	Cooling Tower Blowdown	X				N	1	P	
2												
3												
4												
5												
6												
7												
8												
9												
10												

Relinquished By: (Signature and Printed Name) Received By: (Signature and Printed Name) Date: Time:

Relinquished By: (Signature and Printed Name) Guadalupe Tanaka Received By: (Signature and Printed Name) 7-17-19 1130 Date: Time:

Relinquished By: (Signature and Printed Name) Received By: (Signature and Printed Name) Date: Time:

SPECIAL INSTRUCTIONS:

SAMPLE DISPOSITION:

1. Samples returned to client? YES NO
2. Samples will not be stored over 30 days, unless additional storage time is requested.
3. Storage time requested: _____ days

By _____ Date _____

PRESERVATIVE: 1-HNO_3, 2-H_2SO_4, 3-HCL, 4-Zinc Acetate, 5-NaOH, 6-NH_4 Buffer, 7-Other

LAB COPY

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

July 26, 2019

Tom Barnhart
Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Report No.: 1907196
Project Name: Malburg Generating Station Weekly

Dear Tom Barnhart,

This report contains the analytical results for the sample(s) received under chain of custody(s) by Positive Lab Service on July 22, 2019.

The test results in this report are performed in compliance with ELAP accreditation requirements for the certified parameters. The laboratory report may not be produced, except in full, without the written approval of the laboratory.

The issuance of the final Certificate of Analysis takes precedence over any previous Preliminary Report. Preliminary data should not be used for regulatory purposes. Authorized signature(s) is provided on final report only.

If you have any questions in reference to this report, please contact your Positive Lab Service coordinator.

Project Manager

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

Certificate of Analysis

Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Attn: Tom Barnhart Phone: (323) 476-3626 FAX:(323) 476-3640

File #:74548
Report Date: 07/26/19
Submitted: 07/22/19
PLS Report No.: 1907196

Project: Malburg Generating Station Weekly

Sample ID: Cooling Tower Blowdown Water (1907196-01) Sampled: 07/22/19 08:05 Received: 07/22/19 08:05

Analyte	Results	Flag	D.F.	Units	PQL	Prep/Test Method	Prepared	Analyzed	By	Batch
Total Dissolved Solids	**4060**		1	mg/L	5.0	- SM 2540C	07/23/19	07/24/19	vc	BG92426

Quality Control Data

Analyte	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch BG92426										
Blank	**Prepared: 07/23/19 Analyzed: 07/24/19**									
Total Dissolved Solids	ND	5.0	mg/L							
LCS	**Prepared: 07/23/19 Analyzed: 07/24/19**									
Total Dissolved Solids	353	5.0	mg/L	356.0		99.2	80-120			
Duplicate **Source: 1907194-06**	**Prepared & Analyzed: 07/24/19**									
Total Dissolved Solids	933	5.0	mg/L		905			3.08	5	

Notes and Definitions

NA	Not Applicable
ND	Analyte NOT DETECTED at or above the detection limit
NR	Not Reported
MDL	Method Detection Limit
PQL	Practical Quantitation Limit

Environmental Laboratory Accreditation Program Certificate No. 1131, Mobile Lab No. 2534, LACSD No. 10138

Authorized Signature(s)

109261

POSITIVE LAB SERVICE

CHAIN OF CUSTODY AND ANALYSIS REQUEST

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

DATE: 7-22-14 PAGE 1 OF 1

LOG BOOK NO. _____ FILE NO. _____ LAB NO. 1407196

CLIENT NAME: CEM Project Name/No. Moorpark Generating Station Weekly P.O. NO.

AIRBILL NO: _____

ADDRESS:

ANALYSES REQUESTED:

COOLER TEMP: 0.9°C

PROJECT MANAGER: Tom Barnhart PHONE NO: FAX NO:

PRESERVATIVE:

SAMPLER NAME: Tom Barnhart (Printed) (Signature)

REMARKS:

TAT (Analytical Turn Around Time): 0 = Same Day; 1 = 1 Day; 2 = 2 Days; 3 = 3 Days; N = Normal (5-7 Working Days)

CONTAINER TYPES: B = Brass, E = Encore, G = Glass, P = Plastic, V = VOA Vial, O = Other:

UST Project: Y N - Global ID# ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

	SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	SAMPLE DESCRIPTION	MATRIX: WATER	SOIL	SLUDGE	OTHER	TAT	CONTAINER: #	TYPE		SAMPLE CONDITION/ CONTAINER /COMMENTS:
1		7-22-14	0805	Cooling Tower Blowdown	X				N	1	P	X	
2													
3													
4													
5													
6													
7													
8													
9													
10													

Relinquished By: (Signature and Printed Name) Received By: (Signature and Printed Name) Guadalupe Tanaka Date: 7-22-14 Time: 0925

Relinquished By: (Signature and Printed Name) Received By: (Signature and Printed Name) Date: Time:

Relinquished By: (Signature and Printed Name) Received By: (Signature and Printed Name) Date: Time:

SPECIAL INSTRUCTIONS:

SAMPLE DISPOSITION:

1. Samples returned to client? YES (NO)
2. Samples will not be stored over 30 days, unless additional storage time is requested.
3. Storage time requested: _____ days

By _____ Date _____

PRESERVATIVE: 1-HNO_3, 2-H_2SO_4, 3-HCL, 4-Zinc Acetate, 5-NaOH, 6-NH_4 Buffer, 7-Other

LAB COPY

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

August 05, 2019

Tom Barnhart
Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Report No.: 1907235
Project Name: Malburg Generating Station Weekly

Dear Tom Barnhart,

This report contains the analytical results for the sample(s) received under chain of custody(s) by Positive Lab Service on July 29, 2019.

The test results in this report are performed in compliance with ELAP accreditation requirements for the certified parameters. The laboratory report may not be produced, except in full, without the written approval of the laboratory.

The issuance of the final Certificate of Analysis takes precedence over any previous Preliminary Report. Preliminary data should not be used for regulatory purposes. Authorized signature(s) is provided on final report only.

If you have any questions in reference to this report, please contact your Positive Lab Service coordinator.

D Sanchez
Project Manager

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

Certificate of Analysis

Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

File #:74548
Report Date: 08/05/19
Submitted: 07/29/19
PLS Report No.: 1907235

Attn: Tom Barnhart Phone: (323) 476-3626 FAX:(323) 476-3640

Project: Malburg Generating Station Weekly

Sample ID: Cooling Tower Blowdown Water (1907235-01) Sampled: 07/29/19 07:45 Received: 07/29/19 07:45

Analyte	Results	Flag	D.F.	Units	PQL	Prep/Test Method	Prepared	Analyzed	By	Batch
Total Dissolved Solids	**3920**		1	mg/L	5.0	- SM 2540C	08/01/19	08/02/19	vc	BH90215

Quality Control Data

Analyte	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch BH90215										
Blank	**Prepared: 08/01/19 Analyzed: 08/02/19**									
Total Dissolved Solids	ND	5.0	mg/L							
LCS	**Prepared: 08/01/19 Analyzed: 08/02/19**									
Total Dissolved Solids	362	5.0	mg/L	356.0		102	80-120			
Duplicate **Source: 1907235-01**	**Prepared: 08/01/19 Analyzed: 08/02/19**									
Total Dissolved Solids	4070	5.0	mg/L		3920			3.55	5	

Notes and Definitions

NA	Not Applicable
ND	Analyte NOT DETECTED at or above the detection limit
NR	Not Reported
MDL	Method Detection Limit
PQL	Practical Quantitation Limit

Environmental Laboratory Accreditation Program Certificate No. 1131, Mobile Lab No. 2534, LACSD No. 10138

Authorized Signature(s)

POSITIVE LAB SERVICE

CHAIN OF CUSTODY AND ANALYSIS REQUEST

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

DATE: 7-29-09 PAGE 1 OF 1

LOG BOOK NO. ______ FILE NO. ______ LAB NO. 1907235

CLIENT NAME: CAM   Project Name/No. Malburg Generating Station Weekly   P.O. NO.

AIRBILL NO: ______

ADDRESS:

ANALYSES REQUESTED:

COOLER TEMP: 1.0°C

PROJECT MANAGER: Tom Barnhart   PHONE NO: FAX NO:

PRESERVATIVE:

SAMPLER NAME: John Barre (Printed) (Signature)

REMARKS:

TAT (Analytical Turn Around Time): 0 = Same Day; 1 = 1 Day; 2 = 2 Days; 3 = 3 Days; N = Normal (5-7 Working Days)

CONTAINER TYPES: B = Brass, E = Encore, G = Glass, P = Plastic, V = VOA Vial, O = Other:

UST Project: Y N - Global ID# ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

	SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	SAMPLE DESCRIPTION	MATRIX WATER	MATRIX SOIL	MATRIX SLUDGE	MATRIX OTHER	TAT	CONTAINER #	CONTAINER TYPE	TDS								SAMPLE CONDITION/ CONTAINER /COMMENTS:
1		7-29-09	0745	Cooling Tower Blowdown	w				N	1	P	✓								
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Relinquished By: (Signature and Printed Name)	Received By: (Signature and Printed Name)	Date:	Time:
[signature]	[signature] Guadalupe Fonseca	7-29-09	0825

SPECIAL INSTRUCTIONS:

SAMPLE DISPOSITION:
1. Samples returned to client? YES NO
2. Samples will not be stored over 30 days, unless additional storage time is requested.
3. Storage time requested: ____________ days

By ____________ Date ________

PRESERVATIVE: 1-HNO_3, 2-H_2SO_4, 3-HCL, 4-Zinc Acetate, 5-NaOH, 6-NH_4 Buffer, 7-Other

LAB COPY

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

August 13, 2019

Tom Barnhart
Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Report No.: 1908035
Project Name: Malburg Generating Station Weekly

Dear Tom Barnhart,

This report contains the analytical results for the sample(s) received under chain of custody(s) by Positive Lab Service on August 06, 2019.

The test results in this report are performed in compliance with ELAP accreditation requirements for the certified parameters. The laboratory report may not be produced, except in full, without the written approval of the laboratory.

The issuance of the final Certificate of Analysis takes precedence over any previous Preliminary Report. Preliminary data should not be used for regulatory purposes. Authorized signature(s) is provided on final report only.

If you have any questions in reference to this report, please contact your Positive Lab Service coordinator.

Project Manager

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

Certificate of Analysis

Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Attn: Tom Barnhart Phone: (323) 476-3626 FAX:(323) 476-3640

File #:74548
Report Date: 08/13/19
Submitted: 08/06/19
PLS Report No.: 1908035

Project: Malburg Generating Station Weekly

Sample ID: Cooling Tower Blowdown Water (1908035-01) Sampled: 08/06/19 09:55 Received: 08/06/19 09:55

Analyte	Results	Flag	D.F.	Units	PQL	Prep/Test Method	Prepared	Analyzed	By	Batch
Total Dissolved Solids	**3900**		1	mg/L	5.0	- SM 2540C	08/12/19	08/13/19	dd	BH91341

Quality Control Data

Analyte	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch BH91341										
Blank	**Prepared: 08/12/19 Analyzed: 08/13/19**									
Total Dissolved Solids	ND	5.0	mg/L							
LCS	**Prepared: 08/12/19 Analyzed: 08/13/19**									
Total Dissolved Solids	335	5.0	mg/L	356.0		94.1	80-120			
Duplicate **Source: 1908035-01**	**Prepared: 08/12/19 Analyzed: 08/13/19**									
Total Dissolved Solids	3900	5.0	mg/L		3900			0.128	5	

Notes and Definitions

NA	Not Applicable
ND	Analyte NOT DETECTED at or above the detection limit
NR	Not Reported
MDL	Method Detection Limit
PQL	Practical Quantitation Limit

Environmental Laboratory Accreditation Program Certificate No. 1131, Mobile Lab No. 2534, LACSD No. 10138

Authorized Signature(s)

109819

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

CHAIN OF CUSTODY AND ANALYSIS REQUEST

DATE 8-6-19 PAGE 1 OF 1

LOG BOOK NO. ______ FILE NO. ______ LAB NO. 1908035

CLIENT NAME: CEM Project Name/No. Malburg Generating Station P.O. NO.

AIRBILL NO: ______

ADDRESS:

ANALYSES REQUESTED:

COOLER TEMP: 1.3°C

PROJECT MANAGER: Tom Barnhart PHONE NO: FAX NO:

PRESERVATIVE:

SAMPLER NAME: Jon Bode (Printed) (Signature)

REMARKS:

TAT (Analytical Turn Around Time): 0 = Same Day; 1 = 1 Day; 2 = 2 Days; 3 = 3 Days; N = Normal (5-7 Working Days)

CONTAINER TYPES: B = Brass, E = Encore, G = Glass, P = Plastic, V = VOA Vial, 0 = Other:

UST Project: Y N - Global ID# ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

	SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	SAMPLE DESCRIPTION	MATRIX: WATER	MATRIX: SOIL	MATRIX: SLUDGE	MATRIX: OTHER	TAT	CONTAINER #	CONTAINER TYPE	P5								SAMPLE CONDITION/ CONTAINER /COMMENTS:
1		8-6-19	0955	Cooling Tower Blowdown	✓				N	1	P	X								
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Relinquished By: (Signature and Printed Name)	Received By: (Signature and Printed Name)	Date:	Time:
[signature]	[signature]	8-6-19	1110

SAMPLE DISPOSITION:
1. Samples returned to client? YES NO
2. Samples will not be stored over 30 days, unless additional storage time is requested.
3. Storage time requested: __________ days

By __________ Date ______

SPECIAL INSTRUCTIONS:

PRESERVATIVE: 1-HNO_3, 2-H_2SO_4, 3-HCL, 4-Zinc Acetate, 5-NaOH, 6-NH_4 Buffer, 7-Other

LAB COPY

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

August 19, 2019

Tom Barnhart
Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Report No.: 1908100
Project Name: Malburg Generating Station Weekly

Dear Tom Barnhart,

This report contains the analytical results for the sample(s) received under chain of custody(s) by Positive Lab Service on August 12, 2019.

The test results in this report are performed in compliance with ELAP accreditation requirements for the certified parameters. The laboratory report may not be produced, except in full, without the written approval of the laboratory.

The issuance of the final Certificate of Analysis takes precedence over any previous Preliminary Report. Preliminary data should not be used for regulatory purposes. Authorized signature(s) is provided on final report only.

If you have any questions in reference to this report, please contact your Positive Lab Service coordinator.

Project Manager

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

Certificate of Analysis

Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Attn: Tom Barnhart Phone: (323) 476-3626 FAX:(323) 476-3640

File #:74548
Report Date: 08/19/19
Submitted: 08/12/19
PLS Report No.: 1908100

Project: Malburg Generating Station Weekly

Sample ID: Cooling Tower Blowdown Water (1908100-01) Sampled: 08/12/19 08:30 Received: 08/12/19 08:30

Analyte	Results	Flag	D.F.	Units	PQL	Prep/Test Method	Prepared	Analyzed	By	Batch
Total Dissolved Solids	**4480**		1	mg/L	5.0	- SM 2540C	08/15/19	08/16/19	dd	BH91933

Quality Control Data

Analyte	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch BH91933										
Blank	**Prepared: 08/15/19 Analyzed: 08/16/19**									
Total Dissolved Solids	ND	5.0	mg/L							
LCS	**Prepared: 08/15/19 Analyzed: 08/16/19**									
Total Dissolved Solids	337	5.0	mg/L	356.0		94.7	80-120			
Duplicate **Source: 1908100-01**	**Prepared: 08/15/19 Analyzed: 08/16/19**									
Total Dissolved Solids	4500	5.0	mg/L		4480			0.445	5	

Notes and Definitions

NA	Not Applicable
ND	Analyte NOT DETECTED at or above the detection limit
NR	Not Reported
MDL	Method Detection Limit
PQL	Practical Quantitation Limit

Environmental Laboratory Accreditation Program Certificate No. 1131, Mobile Lab No. 2534, LACSD No. 10138

Authorized Signature(s)

109826

POSITIVE LAB SERVICE

CHAIN OF CUSTODY AND ANALYSIS REQUEST

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

DATE: 8-12-19 PAGE 1 OF 1

LOG BOOK NO. _____ FILE NO. _____ LAB NO. 190800

CLIENT NAME: CEM Project Name/No. Malburg Generating Station Weekly P.O. NO.

ADDRESS:

PROJECT MANAGER: Tom Bainbait PHONE NO: FAX NO:

SAMPLER NAME: Tom Bailie (Printed) (Signature)

TAT (Analytical Turn Around Time): 0 = Same Day; 1 = 1 Day; 2 = 2 Days; 3 = 3 Days; N = Normal (5-7 Working Days)

CONTAINER TYPES: B = Brass, E = Encore, G = Glass, P = Plastic, V = VOA Vial, O = Other:

UST Project: Y N - Global ID# ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

ANALYSES REQUESTED:

AIRBILL NO: _____

COOLER TEMP: 0.7°C

PRESERVATIVE:

REMARKS:

	SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	SAMPLE DESCRIPTION	MATRIX: WATER	SOIL	SLUDGE	OTHER	TAT	CONTAINER: #	TYPE	TPHs								SAMPLE CONDITION/ CONTAINER /COMMENTS:
1		8-12-19	0830	Cooling Tower Blowdown	X				N	1	P	X								
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Relinquished By: (Signature and Printed Name) Received By: (Signature and Printed Name) Guadalupe Tamaka Date: 8-12-19 Time: 1040

Relinquished By: (Signature and Printed Name) Received By: (Signature and Printed Name) Date: Time:

Relinquished By: (Signature and Printed Name) Received By: (Signature and Printed Name) Date: Time:

SPECIAL INSTRUCTIONS:

SAMPLE DISPOSITION:

1. Samples returned to client? YES NO
2. Samples will not be stored over 30 days, unless additional storage time is requested.
3. Storage time requested: _____ days

By _____ Date _____

PRESERVATIVE: 1-HNO_3, 2-H_2SO_4, 3-HCL, 4-Zinc Acetate, 5-NaOH, 6-NH_4 Buffer, 7-Other

LAB COPY

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

August 26, 2019

Tom Barnhart
Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Report No.: 1908169
Project Name: Malburg Generating Station Weekly

Dear Tom Barnhart,

This report contains the analytical results for the sample(s) received under chain of custody(s) by Positive Lab Service on August 20, 2019.

The test results in this report are performed in compliance with ELAP accreditation requirements for the certified parameters. The laboratory report may not be produced, except in full, without the written approval of the laboratory.

The issuance of the final Certificate of Analysis takes precedence over any previous Preliminary Report. Preliminary data should not be used for regulatory purposes. Authorized signature(s) is provided on final report only.

If you have any questions in reference to this report, please contact your Positive Lab Service coordinator.

Project Manager

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

Certificate of Analysis

Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Attn: Tom Barnhart Phone: (323) 476-3626 FAX:(323) 476-3640

File #:74548
Report Date: 08/26/19
Submitted: 08/20/19
PLS Report No.: 1908169

Project: Malburg Generating Station Weekly

Sample ID: Cooling Tower Blowdown Water (1908169-01) Sampled: 08/20/19 09:30 Received: 08/20/19 09:30

Analyte	Results	Flag	D.F.	Units	PQL	Prep/Test Method	Prepared	Analyzed	By	Batch
Total Dissolved Solids	**4240**		1	mg/L	5.0	- SM 2540C	08/21/19	08/22/19	dd	BH92310

Quality Control Data

Analyte	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch BH92310 - -										
Blank	**Prepared: 08/21/19 Analyzed: 08/22/19**									
Total Dissolved Solids	ND	5.0	mg/L							
LCS	**Prepared: 08/21/19 Analyzed: 08/22/19**									
Total Dissolved Solids	364	5.0	mg/L	356.0		102	80-120			
Duplicate Source: 1908160-01	**Prepared: 08/21/19 Analyzed: 08/22/19**									
Total Dissolved Solids	4060	5.0	mg/L		3900			3.89	5	
Duplicate Source: 1908164-01	**Prepared: 08/21/19 Analyzed: 08/22/19**									
Total Dissolved Solids	10400	5.0	mg/L		9940			4.92	5	

Notes and Definitions

NA	Not Applicable
ND	Analyte NOT DETECTED at or above the detection limit
NR	Not Reported
MDL	Method Detection Limit
PQL	Practical Quantitation Limit

Environmental Laboratory Accreditation Program Certificate No. 1131, Mobile Lab No. 2534, LACSD No. 10138

Authorized Signature(s)

109654

POSITIVE LAB SERVICE

CHAIN OF CUSTODY AND ANALYSIS REQUEST

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

DATE: 8/20/19 PAGE 1 OF 1

LOG BOOK NO. _____ FILE NO. _____ LAB NO. 19081609

CLIENT NAME: CEM Project Name/No. Mohave Generating Station Weekly P.O. NO.

ADDRESS:

PROJECT MANAGER: Tom Belknot PHONE NO: FAX NO:

SAMPLER NAME: Jon Bake (Printed) (Signature)

TAT (Analytical Turn Around Time): 0 = Same Day; 1 = 1 Day; 2 = 2 Days; 3 = 3 Days; N = Normal (5-7 Working Days)

CONTAINER TYPES: B = Brass, E = Encore, G = Glass, P = Plastic, V = VOA Vial, O = Other:

UST Project: Y N - Global ID# ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

AIRBILL NO: _____

COOLER TEMP: 1.8°C

ANALYSES REQUESTED: TDS

PRESERVATIVE:

REMARKS:

	SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	SAMPLE DESCRIPTION	MATRIX: WATER	SOIL	SLUDGE	OTHER	TAT	CONTAINER: #	TYPE	TDS	SAMPLE CONDITION/ CONTAINER /COMMENTS:
1		8/20/19	0930	Cooling Tower Blowdown	X				N	1	P	X	
2													
3													
4													
5													
6													
7													
8													
9													
10													

Relinquished By: (Signature and Printed Name) Received By: (Signature and Printed Name) Date: Time:

Relinquished By: (Signature and Printed Name) Received By: (Signature and Printed Name) Guadalupe Tapia 8/20/19 1130 Date: Time:

Relinquished By: (Signature and Printed Name) Received By: (Signature and Printed Name) Date: Time:

SPECIAL INSTRUCTIONS:

SAMPLE DISPOSITION:

1. Samples returned to client? YES NO
2. Samples will not be stored over 30 days, unless additional storage time is requested.
3. Storage time requested: _____ days

By _____ Date _____

PRESERVATIVE: 1-HNO_3, 2-H_2SO_4, 3-HCL, 4-Zinc Acetate, 5-NaOH, 6-NH_4 Buffer, 7-Other

LAB COPY

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

September 03, 2019

Tom Barnhart
Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Report No.: 1908218
Project Name: Malburg Generating Station Weekly

Dear Tom Barnhart,

This report contains the analytical results for the sample(s) received under chain of custody(s) by Positive Lab Service on August 26, 2019.

The test results in this report are performed in compliance with ELAP accreditation requirements for the certified parameters. The laboratory report may not be produced, except in full, without the written approval of the laboratory.

The issuance of the final Certificate of Analysis takes precedence over any previous Preliminary Report. Preliminary data should not be used for regulatory purposes. Authorized signature(s) is provided on final report only.

If you have any questions in reference to this report, please contact your Positive Lab Service coordinator.

D Sanchez
Project Manager

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

Certificate of Analysis

Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Attn: Tom Barnhart Phone: (323) 476-3626 FAX:(323) 476-3640

File #:74548
Report Date: 09/03/19
Submitted: 08/26/19
PLS Report No.: 1908218

Project: Malburg Generating Station Weekly

Sample ID: Cooling Tower Blowdown Water (1908218-01) Sampled: 08/26/19 08:35 Received: 08/26/19 08:35

Analyte	Results	Flag	D.F.	Units	PQL	Prep/Test Method	Prepared	Analyzed	By	Batch
Total Dissolved Solids	**4340**		1	mg/L	5.0	- SM 2540C	08/29/19	08/30/19	dd	BH93011

Quality Control Data

Analyte	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch BH93011 - -										
Blank	**Prepared: 08/29/19 Analyzed: 08/30/19**									
Total Dissolved Solids	ND	5.0	mg/L							
LCS	**Prepared: 08/29/19 Analyzed: 08/30/19**									
Total Dissolved Solids	380	5.0	mg/L	356.0		107	80-120			
Duplicate **Source: 1908218-01**	**Prepared: 08/29/19 Analyzed: 08/30/19**									
Total Dissolved Solids	4510	5.0	mg/L		4340			4.03	5	

Notes and Definitions

NA	Not Applicable
ND	Analyte NOT DETECTED at or above the detection limit
NR	Not Reported
MDL	Method Detection Limit
PQL	Practical Quantitation Limit

Environmental Laboratory Accreditation Program Certificate No. 1131, Mobile Lab No. 2534, LACSD No. 10138

Authorized Signature(s)

109668

POSITIVE LAB SERVICE

CHAIN OF CUSTODY AND ANALYSIS REQUEST

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

DATE: 82619 PAGE 1 OF 1

LOG BOOK NO. _____ FILE NO. _____ LAB NO. 1908248

CLIENT NAME: CEM Project Name/No. Malburg Generating Station P.O. NO.

AIRBILL NO: _____

ADDRESS:

ANALYSES REQUESTED:

COOLER TEMP: 1.0°c

PROJECT MANAGER: Tom Barnhart PHONE NO: FAX NO:

PRESERVATIVE:

SAMPLER NAME: Tom Barnhart (Printed) _____ (Signature)

REMARKS:

TAT (Analytical Turn Around Time): 0 = Same Day; 1 = 1 Day; 2 = 2 Days; 3 = 3 Days; N = Normal (5-7 Working Days)

CONTAINER TYPES: B = Brass, E = Encore, G = Glass, P = Plastic, V = VOA Vial, O = Other:

UST Project: Y N - Global ID# ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

	SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	SAMPLE DESCRIPTION	MATRIX: WATER	SOIL	SLUDGE	OTHER	TAT	CONTAINER: #	TYPE	SAR								SAMPLE CONDITION/ CONTAINER /COMMENTS:
1		82619	0835	Cooling Tower Blowdown	X				N	1	P	X								
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Relinquished By: (Signature and Printed Name) _____ Received By: (Signature and Printed Name) _____ Date: 8/26/19 Time: 1055

Relinquished By: (Signature and Printed Name) _____ Received By: (Signature and Printed Name) _____ Date: _____ Time: _____

Relinquished By: (Signature and Printed Name) _____ Received By: (Signature and Printed Name) _____ Date: _____ Time: _____

SPECIAL INSTRUCTIONS:

SAMPLE DISPOSITION:
1. Samples returned to client? YES NO
2. Samples will not be stored over 30 days, unless additional storage time is requested.
3. Storage time requested: _____ days

By _____ Date _____

PRESERVATIVE: 1-HNO_3, 2-H_2SO_4, 3-HCL, 4-Zinc Acetate, 5-NaOH, 6-NH_4 Buffer, 7-Other

LAB COPY

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

September 11, 2019

Tom Barnhart
Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Report No.: 1909031
Project Name: Malburg Generating Station Weekly

Dear Tom Barnhart,

This report contains the analytical results for the sample(s) received under chain of custody(s) by Positive Lab Service on September 05, 2019.

The test results in this report are performed in compliance with ELAP accreditation requirements for the certified parameters. The laboratory report may not be produced, except in full, without the written approval of the laboratory.

The issuance of the final Certificate of Analysis takes precedence over any previous Preliminary Report. Preliminary data should not be used for regulatory purposes. Authorized signature(s) is provided on final report only.

If you have any questions in reference to this report, please contact your Positive Lab Service coordinator.

Project Manager

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

Certificate of Analysis

Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Attn: Tom Barnhart Phone: (323) 476-3626 FAX:(323) 476-3640

File #:74548
Report Date: 09/11/19
Submitted: 09/05/19
PLS Report No.: 1909031

Project: Malburg Generating Station Weekly

Sample ID: Cooling Tower Blowdown Water (1909031-01) Sampled: 09/05/19 09:05 Received: 09/05/19 09:05

Analyte	Results	Flag	D.F.	Units	PQL	Prep/Test Method	Prepared	Analyzed	By	Batch
Total Dissolved Solids	**4240**		1	mg/L	5.0	- SM 2540C	09/05/19	09/06/19	dd	BI90913

Quality Control Data

Analyte	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch BI90913 - -										
Blank	**Prepared: 09/05/19 Analyzed: 09/06/19**									
Total Dissolved Solids	ND	5.0	mg/L							
LCS	**Prepared: 09/05/19 Analyzed: 09/06/19**									
Total Dissolved Solids	373	5.0	mg/L	356.0		105	80-120			
Duplicate Source: 1909008-06	**Prepared: 09/05/19 Analyzed: 09/06/19**									
Total Dissolved Solids	5030	5.0	mg/L		5070			0.732	5	
Duplicate Source: 1909026-07	**Prepared: 09/05/19 Analyzed: 09/06/19**									
Total Dissolved Solids	7060	5.0	mg/L		6740			4.71	5	

Notes and Definitions

NA	Not Applicable
ND	Analyte NOT DETECTED at or above the detection limit
NR	Not Reported
MDL	Method Detection Limit
PQL	Practical Quantitation Limit

Environmental Laboratory Accreditation Program Certificate No. 1131, Mobile Lab No. 2534, LACSD No. 10138

Authorized Signature(s)

109722

POSITIVE LAB SERVICE

CHAIN OF CUSTODY AND ANALYSIS REQUEST

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

DATE: 9-5-19 PAGE 1 OF 1

LOG BOOK NO. _____ FILE NO. _____ LAB NO. 1909031

CLIENT NAME: Calm Project Name/No. Malburg Generating Station Weekly P.O. NO.

AIRBILL NO: _____

ADDRESS:

ANALYSES REQUESTED:

COOLER TEMP: 1-4c

PROJECT MANAGER: Tom Bernhart PHONE NO: FAX NO:

PRESERVATIVE:

SAMPLER NAME: Tom Bernhart (Printed) _____ (Signature)

REMARKS:

TAT (Analytical Turn Around Time): 0 = Same Day; 1 = 1 Day; 2 = 2 Days; 3 = 3 Days; N = Normal (5-7 Working Days)

CONTAINER TYPES: B = Brass, E = Encore, G = Glass, P = Plastic, V = VOA Vial, O = Other:

UST Project: Y N - Global ID# ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

	SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	SAMPLE DESCRIPTION	MATRIX: WATER	SOIL	SLUDGE	OTHER	TAT	CONTAINER: #	TYPE	TPH								SAMPLE CONDITION/ CONTAINER /COMMENTS:
1		9-5-19	0905	Loading Tower Blowdown	X				N	1	P	X								
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Relinquished By: (Signature and Printed Name) _____ Received By: (Signature and Printed Name) _____ Date: 9-5-19 Time: 1120

Relinquished By: (Signature and Printed Name) _____ Received By: (Signature and Printed Name) _____ Date: _____ Time: _____

Relinquished By: (Signature and Printed Name) _____ Received By: (Signature and Printed Name) _____ Date: _____ Time: _____

SPECIAL INSTRUCTIONS:

SAMPLE DISPOSITION:

1. Samples returned to client? YES NO
2. Samples will not be stored over 30 days, unless additional storage time is requested.
3. Storage time requested: _____ days

By _____ Date _____

PRESERVATIVE: 1-HNO_3, 2-H_2SO_4, 3-HCL, 4-Zinc Acetate, 5-NaOH, 6-NH_4 Buffer, 7-Other

LAB COPY

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

September 13, 2019

Tom Barnhart
Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Report No.: 1909066
Project Name: Malburg Generating Station Weekly

Dear Tom Barnhart,

This report contains the analytical results for the sample(s) received under chain of custody(s) by Positive Lab Service on September 09, 2019.

The test results in this report are performed in compliance with ELAP accreditation requirements for the certified parameters. The laboratory report may not be produced, except in full, without the written approval of the laboratory.

The issuance of the final Certificate of Analysis takes precedence over any previous Preliminary Report. Preliminary data should not be used for regulatory purposes. Authorized signature(s) is provided on final report only.

If you have any questions in reference to this report, please contact your Positive Lab Service coordinator.

Project Manager

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

Certificate of Analysis

Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Attn: Tom Barnhart Phone: (323) 476-3626 FAX:(323) 476-3640

File #:74548
Report Date: 09/13/19
Submitted: 09/09/19
PLS Report No.: 1909066

Project: Malburg Generating Station Weekly

Sample ID: Cooling Tower Blowdown Water (1909066-01) Sampled: 09/09/19 09:45 Received: 09/09/19 09:45

Analyte	Results	Flag	D.F.	Units	PQL	Prep/Test Method	Prepared	Analyzed	By	Batch
Total Dissolved Solids	**4300**		1	mg/L	5.0	- SM 2540C	09/10/19	09/11/19	dd	BI91135

Quality Control Data

Analyte	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch BI91135 - -										
Blank	**Prepared: 09/10/19 Analyzed: 09/11/19**									
Total Dissolved Solids	ND	5.0	mg/L							
LCS	**Prepared: 09/10/19 Analyzed: 09/11/19**									
Total Dissolved Solids	331	5.0	mg/L	356.0		93.0	80-120			
Duplicate **Source: 1909066-01**	**Prepared: 09/10/19 Analyzed: 09/11/19**									
Total Dissolved Solids	4380	5.0	mg/L		4300			1.84	5	

Notes and Definitions

NA	Not Applicable
ND	Analyte NOT DETECTED at or above the detection limit
NR	Not Reported
MDL	Method Detection Limit
PQL	Practical Quantitation Limit

Environmental Laboratory Accreditation Program Certificate No. 1131, Mobile Lab No. 2534, LACSD No. 10138

Authorized Signature(s)

109729

POSITIVE LAB SERVICE

CHAIN OF CUSTODY AND ANALYSIS REQUEST

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

DATE: 9.9.19 PAGE 1 OF 1

LOG BOOK NO. _____ FILE NO. _____ LAB NO. 1909066

CLIENT NAME: CEM Project Name/No. Moiburg Generating Station Weekly P.O. NO.

AIRBILL NO: _____

ADDRESS:

ANALYSES REQUESTED:

COOLER TEMP: 10°C

PROJECT MANAGER: Tom Brannat PHONE NO: FAX NO:

PRESERVATIVE:

SAMPLER NAME: Tom Bane (Printed) (Signature)

REMARKS:

TAT (Analytical Turn Around Time): 0 = Same Day; 1 = 1 Day; 2 = 2 Days; 3 = 3 Days; N = Normal (5-7 Working Days)

CONTAINER TYPES: B = Brass, E = Encore, G = Glass, P = Plastic, V = VOA Vial, O = Other:

UST Project: Y N - Global ID# _ _ _ _ _ _ _ _ _ _

	SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	SAMPLE DESCRIPTION	MATRIX: WATER	SOIL	SLUDGE	OTHER	TAT	CONTAINER: #	TYPE		SAMPLE CONDITION/ CONTAINER /COMMENTS:
1		9.9.19	0945	Cooling Tower Blowdown	X				N	1	G	X	
2													
3													
4													
5													
6													
7													
8													
9													
10													

Relinquished By: (Signature and Printed Name) Received By: (Signature and Printed Name) Date: Time:

Relinquished By: (Signature and Printed Name) Received By: (Signature and Printed Name) 9/9/19 1035

Relinquished By: (Signature and Printed Name) Received By: (Signature and Printed Name) Date: Time:

SPECIAL INSTRUCTIONS:

SAMPLE DISPOSITION:

1. Samples returned to client? YES NO
2. Samples will not be stored over 30 days, unless additional storage time is requested.
3. Storage time requested: _____ days

By _____ Date _____

PRESERVATIVE: 1-HNO_3, 2-H_2SO_4, 3-HCL, 4-Zinc Acetate, 5-NaOH, 6-NH_4 Buffer, 7-Other

LAB COPY

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

September 23, 2019

Tom Barnhart
Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Report No.: 1909164
Project Name: Malburg Generating Station Weekly

Dear Tom Barnhart,

This report contains the analytical results for the sample(s) received under chain of custody(s) by Positive Lab Service on September 17, 2019.

The test results in this report are performed in compliance with ELAP accreditation requirements for the certified parameters. The laboratory report may not be produced, except in full, without the written approval of the laboratory.

The issuance of the final Certificate of Analysis takes precedence over any previous Preliminary Report. Preliminary data should not be used for regulatory purposes. Authorized signature(s) is provided on final report only.

If you have any questions in reference to this report, please contact your Positive Lab Service coordinator.

Project Manager

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

Certificate of Analysis

Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

File #:74548
Report Date: 09/23/19
Submitted: 09/17/19
PLS Report No.: 1909164

Attn: Tom Barnhart Phone: (323) 476-3626 FAX:(323) 476-3640

Project: Malburg Generating Station Weekly

Sample ID: Cooling Tower Blowdown Water (1909164-01) Sampled: 09/17/19 09:45 Received: 09/17/19 09:45

Analyte	Results	Flag	D.F.	Units	PQL	Prep/Test Method	Prepared	Analyzed	By	Batch
Total Dissolved Solids	**4070**		1	mg/L	5.0	SM 2540C	09/19/19	09/20/19	dd	BI92324

Quality Control Data

Analyte	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch BI92324 - -										
Blank	**Prepared: 09/19/19 Analyzed: 09/20/19**									
Total Dissolved Solids	ND	5.0	mg/L							
LCS	**Prepared: 09/19/19 Analyzed: 09/20/19**									
Total Dissolved Solids	324	5.0	mg/L	356.0		91.0	80-120			
Duplicate **Source: 1909164-01**	**Prepared: 09/19/19 Analyzed: 09/20/19**									
Total Dissolved Solids	4250	5.0	mg/L		4070			4.40	5	

Notes and Definitions

NA	Not Applicable
ND	Analyte NOT DETECTED at or above the detection limit
NR	Not Reported
MDL	Method Detection Limit
PQL	Practical Quantitation Limit

Environmental Laboratory Accreditation Program Certificate No. 1131, Mobile Lab No. 2534, LACSD No. 10138

Authorized Signature(s)

109745

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

CHAIN OF CUSTODY AND ANALYSIS REQUEST

DATE: 9.17.19 PAGE 1 OF 1

LOG BOOK NO. _____ FILE NO. _____ LAB NO. 19091164

CLIENT NAME: CEM Project Name/No. Moorburg Generating Station Weekly P.O. NO.

AIRBILL NO: _____

ADDRESS:

ANALYSES REQUESTED:

COOLER TEMP: 1.6°C

PROJECT MANAGER: Tom Barnhart PHONE NO: FAX NO:

PRESERVATIVE:

SAMPLER NAME: Jon Baire (Printed) (Signature)

REMARKS:

TAT (Analytical Turn Around Time): 0 = Same Day; 1 = 1 Day; 2 = 2 Days; 3 = 3 Days; N = Normal (5-7 Working Days)

CONTAINER TYPES: B = Brass, E = Encore, G = Glass, P = Plastic, V = VOA Vial, O = Other:

UST Project: Y N - Global ID# ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

	SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	SAMPLE DESCRIPTION	MATRIX: WATER	SOIL	SLUDGE	OTHER	TAT	CONTAINER: #	TYPE	TPH								SAMPLE CONDITION/ CONTAINER /COMMENTS:
1		9.17.19	0945	Cooling Tower Blowdown	X				N	1	P	X								
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Relinquished By: (Signature and Printed Name) Received By: (Signature and Printed Name) Date: 9.17.19 Time: 1125

Relinquished By: (Signature and Printed Name) Received By: (Signature and Printed Name) Date: Time:

Relinquished By: (Signature and Printed Name) Received By: (Signature and Printed Name) Date: Time:

SPECIAL INSTRUCTIONS:

SAMPLE DISPOSITION:

1. Samples returned to client? YES NO
2. Samples will not be stored over 30 days, unless additional storage time is requested.
3. Storage time requested: _____ days

By _____ Date _____

PRESERVATIVE: 1-HNO_3, 2-H_2SO_4, 3-HCL, 4-Zinc Acetate, 5-NaOH, 6-NH_4 Buffer, 7-Other

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POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

September 30, 2019

Tom Barnhart
Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Report No.: 1909231
Project Name: Malburg Generating Station Weekly

Dear Tom Barnhart,

This report contains the analytical results for the sample(s) received under chain of custody(s) by Positive Lab Service on September 23, 2019.

The test results in this report are performed in compliance with ELAP accreditation requirements for the certified parameters. The laboratory report may not be produced, except in full, without the written approval of the laboratory.

The issuance of the final Certificate of Analysis takes precedence over any previous Preliminary Report. Preliminary data should not be used for regulatory purposes. Authorized signature(s) is provided on final report only.

If you have any questions in reference to this report, please contact your Positive Lab Service coordinator.

Project Manager

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

Certificate of Analysis

Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

File #:74548
Report Date: 09/30/19
Submitted: 09/23/19
PLS Report No.: 1909231

Attn: Tom Barnhart Phone: (323) 476-3626 FAX:(323) 476-3640

Project: Malburg Generating Station Weekly

Sample ID: Cooling Tower Blowdown Water (1909231-01) Sampled: 09/23/19 08:50 Received: 09/23/19 08:50

Analyte	Results	Flag	D.F.	Units	PQL	Prep/Test Method	Prepared	Analyzed	By	Batch
Total Dissolved Solids	**4280**		1	mg/L	5.0	- SM 2540C	09/26/19	09/27/19	dd	BI93031

Quality Control Data

Analyte	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch BI93031 - -										
Blank	**Prepared: 09/26/19 Analyzed: 09/27/19**									
Total Dissolved Solids	ND	5.0	mg/L							
LCS	**Prepared: 09/26/19 Analyzed: 09/27/19**									
Total Dissolved Solids	332	5.0	mg/L	356.0		93.3	80-120			
Duplicate **Source: 1909231-01**	**Prepared: 09/26/19 Analyzed: 09/27/19**									
Total Dissolved Solids	4280	5.0	mg/L		4280			0.117	5	

Notes and Definitions

NA	Not Applicable
ND	Analyte NOT DETECTED at or above the detection limit
NR	Not Reported
MDL	Method Detection Limit
PQL	Practical Quantitation Limit

Environmental Laboratory Accreditation Program Certificate No. 1131, Mobile Lab No. 2534, LACSD No. 10138

Authorized Signature(s)

110061

POSITIVE LAB SERVICE

CHAIN OF CUSTODY AND ANALYSIS REQUEST

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

DATE: 9/23/9 PAGE 1 OF 1

LOG BOOK NO. _____ FILE NO. _____ LAB NO. 190231

CLIENT NAME: CEM Project Name/No. Malburg Generating Station P.O. NO.

AIRBILL NO: _____

ADDRESS:

ANALYSES REQUESTED:

COOLER TEMP: 1.1°C

PROJECT MANAGER: Tom Barnhart PHONE NO: FAX NO:

PRESERVATIVE:

SAMPLER NAME: Tom Barnhart (Printed) (Signature)

REMARKS:

TAT (Analytical Turn Around Time): 0 = Same Day; 1 = 1 Day; 2 = 2 Days; 3 = 3 Days; N = Normal (5-7 Working Days)

CONTAINER TYPES: B = Brass, E = Encore, G = Glass, P = Plastic, V = VOA Vial, O = Other:

UST Project: Y N - Global ID# _____

	SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	SAMPLE DESCRIPTION	MATRIX: WATER	SOIL	SLUDGE	OTHER	TAT	CONTAINER: #	TYPE	TDS	SAMPLE CONDITION/ CONTAINER /COMMENTS:
1		9/23/9	0850	Cooling Tower Blowdown	X				N	1	P	X	
2													
3													
4													
5													
6													
7													
8													
9													
10													

Relinquished By: (Signature and Printed Name) _____ Received By: (Signature and Printed Name) Guadalupe Tamayo Date: 9/23/9 Time: 1125

Relinquished By: (Signature and Printed Name) _____ Received By: (Signature and Printed Name) _____ Date: _____ Time: _____

Relinquished By: (Signature and Printed Name) _____ Received By: (Signature and Printed Name) _____ Date: _____ Time: _____

SPECIAL INSTRUCTIONS:

SAMPLE DISPOSITION:

1. Samples returned to client? YES NO
2. Samples will not be stored over 30 days, unless additional storage time is requested.
3. Storage time requested: _____ days

By _____ Date _____

PRESERVATIVE: 1-HNO_3, 2-H_2SO_4, 3-HCL, 4-Zinc Acetate, 5-NaOH, 6-NH_4 Buffer, 7-Other

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Table 2-1

Malburg Generating Station
Cooling Tower TDS Sampling Results
Quarter 3, 2019

Starting	Ending	TDS (ppm)
6/30/2019	7/6/2019	4120
7/7/2019	7/13/2019	4020
7/14/2019	7/20/2019	3940
7/21/2019	7/27/2019	4060
7/28/2019	8/3/2019	3920
8/4/2019	8/10/2019	3900
8/11/2019	8/17/2019	4480
8/18/2019	8/24/2019	4240
8/25/2019	8/31/2019	4340
9/1/2019	9/7/2019	4240
9/8/2019	9/14/2019	4300
9/15/2019	9/21/2019	4070
9/22/2019	9/28/2019	4280

Table 2-2

Malburg Generating Station
Cooling Tower Daily PM10 Emissions During Jul. 2019

PM_{10} = A x B x C x D **A = Circulation Rate** **B = TDS**
PM_{10} Limit is 6.2 lbs/day **C = Drift Factor** **D = Correction Factor**

Date	Circulation Rate (gal/day)	TDS (ppm)	PM_{10} (lbs/day)
1	38,811,456	4120	**1.33**
2	38,811,456	4120	**1.33**
3	38,811,456	4120	**1.33**
4	38,811,456	4120	**1.33**
5	38,811,456	4120	**1.33**
6	38,811,456	4120	**1.33**
7	38,811,456	4020	**1.30**
8	38,811,456	4020	**1.30**
9	38,811,456	4020	**1.30**
10	38,811,456	4020	**1.30**
11	38,811,456	4020	**1.30**
12	38,811,456	4020	**1.30**
13	38,811,456	4020	**1.30**
14	38,811,456	3940	**1.27**
15	38,811,456	3940	**1.27**
16	38,811,456	3940	**1.27**
17	38,811,456	3940	**1.27**
18	38,811,456	3940	**1.27**
19	38,811,456	3940	**1.27**
20	38,811,456	3940	**1.27**
21	38,811,456	4060	**1.31**
22	38,811,456	4060	**1.31**
23	38,811,456	4060	**1.31**
24	38,811,456	4060	**1.31**
25	38,811,456	4060	**1.31**
26	38,811,456	4060	**1.31**
27	38,811,456	4060	**1.31**
28	38,811,456	3920	**1.27**
29	38,811,456	3920	**1.27**
30	38,811,456	3920	**1.27**
31	38,811,456	3920	**1.27**

Table 2-3

Malburg Generating Station
Cooling Tower Daily PM10 Emissions During Aug. 2019

PM_{10} = A x B x C x D **A = Circulation Rate** **B = TDS**
PM_{10} Limit is 6.2 lbs/day **C = Drift Factor** **D = Correction Factor**

Date	Circulation Rate (gal/day)	TDS (ppm)	PM_{10} (lbs/day)
1	38,811,456	3920	**1.27**
2	38,811,456	3920	**1.27**
3	38,811,456	3920	**1.27**
4	38,811,456	3900	**1.26**
5	38,811,456	3900	**1.26**
6	38,811,456	3900	**1.26**
7	38,811,456	3900	**1.26**
8	38,811,456	3900	**1.26**
9	38,811,456	3900	**1.26**
10	38,811,456	3900	**1.26**
11	38,811,456	4480	**1.45**
12	38,811,456	4480	**1.45**
13	38,811,456	4480	**1.45**
14	38,811,456	4480	**1.45**
15	38,811,456	4480	**1.45**
16	38,811,456	4480	**1.45**

Date	Circulation Rate (gal/day)	TDS (ppm)	PM_{10} (lbs/day)
17	38,811,456	4480	**1.45**
18	38,811,456	4240	**1.37**
19	38,811,456	4240	**1.37**
20	38,811,456	4240	**1.37**
21	38,811,456	4240	**1.37**
22	38,811,456	4240	**1.37**
23	38,811,456	4240	**1.37**
24	38,811,456	4240	**1.37**
25	38,811,456	4340	**1.40**
26	38,811,456	4340	**1.40**
27	38,811,456	4340	**1.40**
28	38,811,456	4340	**1.40**
29	38,811,456	4340	**1.40**
30	38,811,456	4340	**1.40**
31	38,811,456	4340	**1.40**

Table 2-4

Malburg Generating Station
Cooling Tower Daily PM10 Emissions During Sep. 2019

PM_{10} = A x B x C x D **A = Circulation Rate** **B = TDS**
PM_{10} Limit is 6.2 lbs/day **C = Drift Factor** **D = Correction Factor**

Date	Circulation Rate (gal/day)	TDS (ppm)	PM_{10} (lbs/day)
1	38,811,456	4240	**1.37**
2	38,811,456	4240	**1.37**
3	38,811,456	4240	**1.37**
4	38,811,456	4240	**1.37**
5	38,811,456	4240	**1.37**
6	38,811,456	4240	**1.37**
7	38,811,456	4240	**1.37**
8	38,811,456	4300	**1.39**
9	38,811,456	4300	**1.39**
10	38,811,456	4300	**1.39**
11	38,811,456	4300	**1.39**
12	38,811,456	4300	**1.39**
13	38,811,456	4300	**1.39**
14	38,811,456	4300	**1.39**
15	38,811,456	4070	**1.32**
16	38,811,456	4070	**1.32**

Date	Circulation Rate (gal/day)	TDS (ppm)	PM_{10} (lbs/day)
17	38,811,456	4070	**1.32**
18	38,811,456	4070	**1.32**
19	38,811,456	4070	**1.32**
20	38,811,456	4070	**1.32**
21	38,811,456	4070	**1.32**
22	38,811,456	4280	**1.38**
23	38,811,456	4280	**1.38**
24	38,811,456	4280	**1.38**
25	38,811,456	4280	**1.38**
26	38,811,456	4280	**1.38**
27	38,811,456	4280	**1.38**
28	38,811,456	4280	**1.38**
29	38,811,456	4280	**1.38**
30	38,811,456	4280	**1.38**

Table 2-5

Heorot Power Management
Malburg Generating Station
Diesel Fuel Fired Emergency Firewater Pump Testing Times
During Quarter 3, 2019

Date	Time	Main / Test Emerg.	Hours of Operation	Fuel Used (gals)	Initials
Jul. 31, 2019	14:00	Testing	0.4	3.6	RS
Aug. 05, 2019	00:14	Testing	0.5	4.5	VFFO
Aug. 11, 2019	22:30	Testing	0.5	4.5	SCTFO
Aug. 18, 2019	23:59	Testing	0.5	4.5	STFO
Aug. 25, 2019	23:20	Testing	0.6	5.4	JPFO
Sep. 02, 2019	23:31	Testing	0.5	4.5	JAFO
Sep. 08, 2019	22:29	Testing	0.5	4.5	VFFO
Sep. 15, 2019	22:00	Testing	0.5	4.5	SCTFO
Sep. 22, 2019	20:29	Testing	0.5	4.5	STFO

Note: Event 'DNR' - Did Not Run

Table 2-11

Malburg Generating Station
Total Monthly Emissions
Jul-2019

Contaminant	Gas Turbines (2)
CO lbs	972
PM10 lbs	2,735
PM2.5 lbs	2,735
VOC lbs	700
SOx lbs	128

Table 2-12

Malburg Generating Station
Total Monthly Emissions
Aug-2019

Contaminant	Gas Turbines (2)
CO lbs	1,087
PM10 lbs	2,758
PM2.5 lbs	2,758
VOC lbs	706
SOx lbs	129

Table 2-13

Malburg Generating Station
Total Monthly Emissions
Sep-2019

Contaminant	Gas Turbines (2)
CO lbs	1,053
PM10 lbs	2,722
PM2.5 lbs	2,722
VOC lbs	696
SOx lbs	128

Table 2-14

Malburg Generating Station
Combustion Turbines Startup and Shutdown Events
During Quarter 3, 2019

CT1

Date	Event Type	Event Start	Event End	Duration (hrs:min)
08/03/2019	Shutdown	00:01	00:08	0:07
08/03/2019	Startup	14:25	15:39	1:14
09/10/2019	Shutdown	19:49	19:49	0:00
09/10/2019	Startup	23:12	00:59	1:47

CT2

07/14/2019	Shutdown/Trip	05:08	05:08	00:00
07/14/2019	Startup	08:24	09:13	00:49
08/03/2019	Shutdown/Trip	14:00	14:00	00:00
08/05/2019	Startup	12:30	13:56	01:26
08/10/2019	Shutdown	23:59	00:06	00:07
08/10/2019	Startup	16:13	17:14	01:01
08/15/2019	Shutdown/Trip	10:10	10:10	00:00
08/15/2019	Startup	13:39	14:33	00:54
08/23/2019	Shutdown/Trip	09:00	09:00	00:00
08/23/2019	Startup	17:58	18:37	00:39
08/23/2019	Shutdown/Trip	18:37	18:37	00:00
08/23/2019	Startup	19:22	20:01	00:39
09/01/2019	Shutdown/Trip	18:21	18:21	00:00
09/01/2019	Startup w/trip	21:13	23:05	01:52
09/09/2019	Shutdown	05:11	05:13	00:02
09/09/2019	Startup	17:14	18:17	01:03
09/18/2019	Shutdown/Trip	09:15	09:15	00:00
09/18/2019	Startup	11:58	12:51	00:53
09/23/2019	Shutdown/Trip	06:49	06:49	00:00
09/24/2019	Startup	15:31	16:36	01:05

Table 2-15

Malburg Generating Station
Combustion Turbines and Duct Burner Gas Usage
During Quarter 3,2019

Month	CT-1 / DB-1 Gas Usage (mmscf)	CT-2 / DB-2 Gas Usage (mmscf)
Jul-19	226.94	227.81
Aug-19	241.94	216.56
Sep-19	235.65	216.96

Appendix B

Excess Emission Reports

Startup/Shutdown Excess Emissions Report

U1 CO Startup/Shutdown

From: 07/01/2019 00:00 **To:** 09/30/2019 23:59 **Facility Name:** Malburg Generating Station
Generated: 10/14/2019 12:35 **Location:** Vernon, California
Tag Name: U1_CO_LbPerHr_1M SI = SampleInvalid, * = Excess Emission
Total Operating Time: 2,189.95 Hours

Unit Operation

Event Period				Reason	Action
Begin/End	Duration in Minute(s)	Lb/Event	Limit	Code - Description	Code - Description

No excess emissions were found in the reporting period.

Excess Emission Report

Unit 1 - CO ppmvdc 3-hour Rolling during Normal Operation

From: 07/01/2019 00:00 **To:** 09/30/2019 23:59 **Facility Name:** Malburg Generating Station
Generated: 10/14/2019 12:28 **Location:** Vernon, California

Tag Name: U1_CO_3HrRoll_Ppmvdc_1H
Total Operating Time: 2,192.00 Hour(s) **No Exclusions Allowed**
Non-Operating Time: 16.00 Hour(s) Report Time: 2,208.00 Hour(s)

No incidents have been reported for this reporting period. Data is 100% in compliance.

Total Operating Time:	**2,192.00 Hour(s)**
Total Duration (Online only):	**0.00 Hour(s)**
Time in exceedance as a percentage of operating time:	**0.00 %**
Time in compliance as a percentage of operating time:	**100.00 %**

Excess Emission Report

Unit 1 - NOx ppmvdc 1-hour during Normal Operation

From: 07/01/2019 00:00 **To:** 09/30/2019 23:59 **Facility Name:** Malburg Generating Station
Generated: 10/14/2019 12:02 **Location:** Vernon, California

Tag Name: U1_NOxNormal_Ppmvdc_1H
Total Operating Time: 2,192.00 Hour(s) **No Exclusions Allowed**
Non-Operating Time: 16.00 Hour(s) Report Time: 2,208.00 Hour(s)

No incidents have been reported for this reporting period. Data is 100% in compliance.

Total Operating Time:	**2,192.00 Hour(s)**
Total Duration (Online only):	**0.00 Hour(s)**
Time in exceedance as a percentage of operating time:	**0.00 %**
Time in compliance as a percentage of operating time:	**100.00 %**

Excess Emission Report

Unit 1 - VOC ppmvdc 1-hour during Normal Operation

From: 07/01/2019 00:00 **To:** 09/30/2019 23:59 **Facility Name:** Malburg Generating Station
Generated: 10/14/2019 12:25 **Location:** Vernon, California

Tag Name: U1_VOCNormal_Ppmvdc_1H
Total Operating Time: 2,192.00 Hour(s) **No Exclusions Allowed**
Non-Operating Time: 16.00 Hour(s) Report Time: 2,208.00 Hour(s)

No incidents have been reported for this reporting period. Data is 100% in compliance.

Total Operating Time:	**2,192.00 Hour(s)**
Total Duration (Online only):	**0.00 Hour(s)**
Time in exceedance as a percentage of operating time:	**0.00 %**
Time in compliance as a percentage of operating time:	**100.00 %**

Excess Emission Report

Unit 1 - CO ppmvdc 1-hour during Normal Operation

From: 07/01/2019 00:00 **To:** 09/30/2019 23:59 **Facility Name:** Malburg Generating Station
Generated: 10/14/2019 12:29 **Location:** Vernon, California

Tag Name: U1_CONormal_Ppmvdc_1H
Total Operating Time: 2,192.00 Hour(s) **No Exclusions Allowed**
Non-Operating Time: 16.00 Hour(s) Report Time: 2,208.00 Hour(s)

No incidents have been reported for this reporting period. Data is 100% in compliance.

Total Operating Time:	**2,192.00 Hour(s)**
Total Duration (Online only):	**0.00 Hour(s)**
Time in exceedance as a percentage of operating time:	**0.00 %**
Time in compliance as a percentage of operating time:	**100.00 %**

Quad K Excess Emissions Report

U1 NOX 4-Hour Events

From: 07/01/2019 00:00 **To:** 09/30/2019 23:59 **Facility Name:** Malburg Generating Station
Generated: 10/14/2019 12:31 **Location:** Vernon, California

Tag Name: U1_NOx4H_Ppmvdc_1H
Total Operating Time: 2,192.00 Hour(s) **No Exclusions Allowed**
Non-Operating Time: 16.00 Hour(s) Report Time: 2,208.00 Hour(s)

No incidents have been reported for this reporting period. Data is 100% in compliance.

Total Operating Time:	**2,192.00 Hour(s)**
Total Duration (Online only):	**Hour(s)**
Time in exceedance as a percentage of operating time:	**0.00 %**
Time in compliance as a percentage of operating time:	**100.00 %**

Startup/Shutdown Excess Emissions Report

U1 NOx Startup/Shutdown

From: 07/01/2019 00:00 **To:** 09/30/2019 23:59 **Facility Name:** Malburg Generating Station
Generated: 10/14/2019 12:37 **Location:** Vernon, California
Tag Name: U1_NOx_LbPerHr_1M SI = SampleInvalid, * = Excess Emission
Total Operating Time: 2,189.95 Hours

Unit Operation

Event Period				Reason	Action
Begin/End	Duration in Minute(s)	Lb/Event	Limit	Code - Description	Code - Description

No excess emissions were found in the reporting period.

Startup/Shutdown Excess Emissions Report

U1 VOC Startup/Shutdown

From: 07/01/2019 00:00 **To:** 09/30/2019 23:59 **Facility Name:** Malburg Generating Station
Generated: 10/14/2019 12:39 **Location:** Vernon, California
Tag Name: U1_VOC_LbPerHr_1M SI = SampleInvalid, * = Excess Emission
Total Operating Time: 2,189.95 Hours

Unit Operation

Event Period				Reason	Action
Begin/End	Duration in Minute(s)	Lb/Event	Limit	Code - Description	Code - Description

No excess emissions were found in the reporting period.

Startup/Shutdown Event Report

U2 CO Startup/Shutdown Events

From: 07/01/2019 00:00 **To:** 09/30/2019 23:59 **Facility Name:** Malburg Generating Station
Generated: 10/14/2019 12:36 **Location:** Vernon, California
Tag Name: U2_CO_LbPerHr_1M SI = SampleInvalid, * = Excess Emission
Total Operating Time: 2,078.30 Hours

Unit Operation

Event Period				Reason	Action
Begin/End	Duration in Minute(s)	Lb/Event	Limit	Code - Description	Code - Description

No excess emissions were found in the reporting period.

Excess Emission Report

Unit 2 - CO ppmvdc 3-hour Rolling during Normal Operation

From: 07/01/2019 00:00 **To:** 09/30/2019 23:59 **Facility Name:** Malburg Generating Station
Generated: 10/14/2019 12:00 **Location:** Vernon, California

Tag Name: U2_CO_3HrRoll_Ppmvdc_1H
Total Operating Time: 2,091.00 Hour(s) **No Exclusions Allowed**
Non-Operating Time: 117.00 Hour(s) Report Time: 2,208.00 Hour(s)

No incidents have been reported for this reporting period. Data is 100% in compliance.

Total Operating Time:	**2,091.00 Hour(s)**
Total Duration (Online only):	**0.00 Hour(s)**
Time in exceedance as a percentage of operating time:	**0.00 %**
Time in compliance as a percentage of operating time:	**100.00 %**

Excess Emission Report

Unit 2 - NOx ppmvdc 1-hour during Normal Operation

From: 07/01/2019 00:00 **To:** 09/30/2019 23:59 **Facility Name:** Malburg Generating Station
Generated: 10/14/2019 12:27 **Location:** Vernon, California

Tag Name: U2_NOxNormal_Ppmvdc_1H
Total Operating Time: 2,091.00 Hour(s) **No Exclusions Allowed**
Non-Operating Time: 117.00 Hour(s) Report Time: 2,208.00 Hour(s)

No incidents have been reported for this reporting period. Data is 100% in compliance.

Total Operating Time:	**2,091.00 Hour(s)**
Total Duration (Online only):	**0.00 Hour(s)**
Time in exceedance as a percentage of operating time:	**0.00 %**
Time in compliance as a percentage of operating time:	**100.00 %**

Excess Emission Report

Unit 2 - VOC ppmvdc 1-hour during Normal Operation

From: 07/01/2019 00:00 **To:** 09/30/2019 23:59 **Facility Name:** Malburg Generating Station
Generated: 10/14/2019 12:26 **Location:** Vernon, California

Tag Name: U2_VOCNormal_Ppmvdc_1H
Total Operating Time: 2,091.00 Hour(s) **No Exclusions Allowed**
Non-Operating Time: 117.00 Hour(s) Report Time: 2,208.00 Hour(s)

No incidents have been reported for this reporting period. Data is 100% in compliance.

Total Operating Time:	**2,091.00 Hour(s)**
Total Duration (Online only):	**0.00 Hour(s)**
Time in exceedance as a percentage of operating time:	**0.00 %**
Time in compliance as a percentage of operating time:	**100.00 %**

Excess Emission Report

Unit 2 - CO ppmvdc 1-hour during Normal Operation

From: 09/11/2019 00:00 **To:** 09/11/2019 23:43 **Facility Name:** Malburg Generating Station
Generated: 10/14/2019 12:28 **Location:** Vernon, California

Tag Name: U2_CONormal_Ppmvdc_1H
Total Operating Time: 24.00 Hour(s) **No Exclusions Allowed**
Non-Operating Time: 0.00 Hour(s) Report Time: 24.00 Hour(s)

No incidents have been reported for this reporting period. Data is 100% in compliance.

Total Operating Time:	**24.00 Hour(s)**
Total Duration (Online only):	**0.00 Hour(s)**
Time in exceedance as a percentage of operating time:	**0.00 %**
Time in compliance as a percentage of operating time:	**100.00 %**

Quad K Excess Emissions Report

U2 NOX 4-Hour Events

From: 07/01/2019 00:00 **To:** 09/30/2019 23:59 **Facility Name:** Malburg Generating Station
Generated: 10/14/2019 12:32 **Location:** Vernon, California

Tag Name: U2_NOx4H_Ppmvdc_1H
Total Operating Time: 2,091.00 Hour(s) **No Exclusions Allowed**
Non-Operating Time: 117.00 Hour(s) Report Time: 2,208.00 Hour(s)

No incidents have been reported for this reporting period. Data is 100% in compliance.

Total Operating Time:	**2,091.00 Hour(s)**
Total Duration (Online only):	**Hour(s)**
Time in exceedance as a percentage of operating time:	**0.00 %**
Time in compliance as a percentage of operating time:	**100.00 %**

Startup/Shutdown Excess Emissions Report

U2 NOx Startup/Shutdown

From: 07/01/2019 00:00 **To:** 09/30/2019 23:59 **Facility Name:** Malburg Generating Station
Generated: 10/14/2019 12:38 **Location:** Vernon, California
Tag Name: U2_NOx_LbPerHr_1M SI = SampleInvalid, * = Excess Emission
Total Operating Time: 2,078.30 Hours

Unit Operation

Event Period				Reason	Action
Begin/End	Duration in Minute(s)	Lb/Event	Limit	Code - Description	Code - Description

No excess emissions were found in the reporting period.

Startup/Shutdown Event Report

U2 VOC Startup/Shutdown Events

From: 07/01/2019 00:00 **To:** 09/30/2019 23:59 **Facility Name:** Malburg Generating Station
Generated: 10/14/2019 12:40 **Location:** Vernon, California
Tag Name: U2_VOC_LbPerHr_1M
SI = SampleInvalid, * = Excess Emission
Total Operating Time: 2,078.30 Hours

Unit Operation

Event Period				Reason	Action
Begin/End	Duration in Minute(s)	Lb/Event	Limit	Code - Description	Code - Description

No excess emissions were found in the reporting period.

Appendix C

Diesel Fuel Oil Specifications

CHEVRON GST® OILS

ISO 32, 46, 68, 100

CUSTOMER BENEFITS

Chevron GST Oils deliver value through:

- **Superior oxidation stability** for long service life at elevated temperatures.
- **Rust and corrosion protection**
- **High viscosity index** assures minimum viscosity change when variations in temperature occur.
- **Minimum foam** prevents sump overflow or erratic governor operation.
- **Fast air release** minimizes possibility of pump cavitation in systems with high circulation rates and small reservoirs.
- **Superior thermal stability** minimizes deposit formation.
- **Rapid water separation** keeps water in oil to a minimum.
- **Hydraulic fluid service** — Chevron GST Oils ISO 32, 46, and 68 are excellent hydraulic fluids in low pressure systems up to 1000 psi.
- **Air compressor** lubricant when OEM recommends R&O type oil.
- **Environmental benefits** — All grades are ashless. This facilitates reclaiming and recycling of the used oils. Chevron GST Oils are not expected to be harmful to aquatic organisms.

FEATURES

Chevron GST Oils are designed to meet the critical demands of:

- gas, steam, and hydroelectric turbine bearing lubrication
- reduction gear lubrication in marine operations

They are an excellent recommendation for many other industrial applications including air compression.

Chevron GST Oils are formulated with ISOSYN® base stocks.

Higher temperatures in advanced gas and steam turbines require a circulating system oil with exceptional high temperature stability. Chevron GST Oils have outstanding **thermal and oxidation stability**.

Nonvolatile **oxidation inhibition** minimizes the evaporative loss of the inhibitors, a common problem with turbine oils where bearing temperatures are high and system capacities are limited. With retained oxidation resistance for long periods under high temperature conditions, Chevron GST Oils have proven they will provide longer oil service life and reduced turbine down time.

Corrosion inhibition protects costly turbine shafts and gears from corrosion and rusting.

Chevron GST Oils have excellent demulsibility characteristics which allow these oils to maintain a high film strength coating on critical wear points of bearings and gear reducers and assure fast removal of water contamination.

Foam inhibition prevents sump overflow and erratic governor operation.

APPLICATIONS

Chevron GST Oils are recommended for use in turbines of all types including gas, steam, and hydroelectric turbines, and marine gear turbine sets.

The following viscosity grades are formulated to meet the specified OEM requirements:

Chevron GST Oil ISO 32

- meets and exceeds
  - — **General Electric** GEK-32568f, GEK 28143A, GEK-46506D, GEK-27070
  - — **Ingersoll Rand** specification for Centac Centrifugal Compressors
  - — **Solar** ES 9 224 requirements for gas turbine oils
  - — **ASTM D4304**, **British Standard 489**, and **DIN 51515** standard organization requirements for new lubricants used in gas and steam turbines and auxiliary equipment
- is approved by
  - — **Cincinnati Machine** P-38
  - — **Alstom Power** HTGD 90117
  - — **Siemens Westinghouse** M spec 55125Z3
  - — **Siemens** TLV 901304

Chevron GST Oil ISO 46

- meets
  - — **General Electric** and **Westinghouse** requirements for marine gas turbine system oils. Recommended by Siemens Westinghouse for reactor coolant pump motor bearings.
  - — **Siemens** TLV 901304
  - — **Solar** ES 9 224 requirements for gas turbine oils
  - — **ASTM D4304**, **British Standard 489**, and **DIN 51515** standard organization requirements for new lubricants used in gas and steam turbines and auxiliary equipment
- is approved by
  - — **Cincinnati Machine** P 55
  - — **Alstom Power** HTGD 90117

Chevron GST Oil ISO 68

- meets
  - — meets **General Electric**, **Alstom**, **Westinghouse**, and other OEM requirements for hydroelectric turbines, land and marine steam turbines, and associated reduction gears
  - — **ASTM D4304**, **British Standard 489**, and **DIN 51515** standard organization requirements for new lubricants used in gas and steam turbines and auxiliary equipment
- is approved by
  - — **Cincinnati Machine** P-54

Chevron GST Oil ISO 100

- meets
  - — meets **General Electric**, **Alstom**, **Westinghouse**, and other OEM requirements for hydroelectric turbines, land and marine steam turbines, and associated reduction gears
  - — **ASTM D4304**, **British Standard 489**, and **DIN 51515** standard organization requirements for new lubricants used in gas and steam turbines and auxiliary equipment

Chevron GST Oils ISO 32, 46, 68, and 100 are registered with NSF and are acceptable as lubricants where there is no possibility of food contact (H2) in and around food processing areas. The NSF Nonfood Compounds Registration Program is a continuation of the USDA product approval and listing program, which is based on meeting regulatory requirements of appropriate use, ingredient review and labeling verification.

Do not use in high pressure systems in the vicinity of flames, sparks and hot surfaces. Use only in well ventilated areas. Keep container closed.

Do not use in breathing air apparatus or medical equipment.

TYPICAL TEST DATA

ISO Grade	32	46	68	100
CPS Number	*253026*	*253027*	*253028*	*253029*
MSDS Number	*6710*	*6710*	*6710*	*6710*
AGMA Grade	—	1	2	3
API Gravity	32.7	32.0	31.7	31.4
Viscosity, Kinematic cSt at 40°C cSt at 100°C	 30.4 5.2	 43.7 6.6	 64.6 8.5	 95.0 11.0
Viscosity, Saybolt SUS at 100°F SUS at 210°F	 157 43.8	 225 48.2	 334 54.8	 495 63.9
Viscosity Index	102	101	102	100
Flash Point,°C(°F)	222(432)	224(435)	245(473)	262(504)
Pour Point, °C(°F)	-36(-33)	-36(-33)	-33(-27)	-30(-22)
Oxidation Stability ASTM D 943[1] ASTM D 2272[2]	 17,000 1700	 12,000 1400	 11,000 1400	 11,000 1400
FZG, Pass stage, DIN 51354	—	—	—	—

Typical test data are average values only. Minor variations which do not affect product performance are to be expected in normal manufacturing.

1 Hours to 2.0 mg KOH/g acid number modified D943
2 Minutes to 25 psi pressure drop

Invoice

Southern Counties Oil Co, a Ca LP
1800 West Katella Ave, Suite 400, P.O. Box 4159, Orange, CA 92863-4159
PLEASE REMIT ALL PAYMENTS TO:
P.O. BOX 14237
ORANGE, CA 92863-1237
Ph:(800) 659-5823 Fax:(714) 992-7377 Credit Inquiries:(888) 364-0121

SHIP TO: 1L CUST NO: 01-0001084
COLORADO ENERGY MANAGEMENT LLC
4963 SOTO STREET
VERNON, CA 90058

INVOICE 1427153-IN	DUE DATE 6/19/2019
INVOICE DATE 5/20/2019	SHIP DATE 5/20/2019
ORDER DATE 5/15/2019	SHIP VIA 924
CUSTOMER PO MGS16324	ORDER NUMBER 1427153
TERMS N30	SALESMAN Todd Cripps

ACCT NO (Bill-to): 01-0001084
COLORADO ENERGY MANAGEMENT LLC
ATTN: ACCOUNTS PAYABLE
4963 S. SOTO STREET
VERNON, CA 90058
(323) 476-3622

Please direct any questions regarding this invoice to:
CSS@scfuels.com

UNIT	ITEM CODE	ITEM DESCRIPTION	QUANTITY DELIVERED	PACKAGE DESCRIPTION	EXTENDED QTY	UNIT PRICE	EXT PRICE
D055	422D055	CARB ULTRA L.S. DYED DIESEL	2.00	55 GAL DRM	110.00	4.30000	473.00
		Whse: 101					
	UN1202, DIESEL FUEL, 3, PG III - NONTAXABLE USE ONLY, PENALITY FOR TAXABLE USE						
Federal Lust						0.00100	0.11
CA - AB 32 - DSL						0.00704	0.77
						4.30804	473.88
D400	CH277210983D400	MEROPA 150 NRD#LT	1.00	400 LB DRM	400.00	2.78000	1,112.00
		Whse: 101					
C001	DRUMDEPOSITC001	DRUM DEPOSIT FEE	2.00	MISC CHRG	2.00	25.00000	50.00
		Whse: 101					
	/FUELCH	FUEL SURCHARGE					9.92
	/RCF	REGULATORY COMPLIANCE FEE					12.95

Net Invoice:	1,658.75
Less Discount:	0.00
Freight:	0.00
Sales Tax:	152.82
Invoice Total:	1,811.57

Save time, pay online! View invoices, make payments and more.
Sign up for the Customer Portal today. **https://customerportal.scfuels.com**

SC Fuels
P.O. Box 14237
Orange, CA 92863-1237
Tel: 800-659-5823
Fax: 714-992-7377
Credit Inquiries: 888-364-0121

DELIVERY TICKET

Order#: 1427153
Order Date: 5/15/2019
Delv Req Date: 5/20/2019
Sales Person: 0177 - Todd Cripps

SOLD TO: 01-0001084
COLORADO ENERGY MANAGEMENT LLC
ATTN: ACCOUNTS PAYABLE
4963 S. SOTO STREET
VERNON, CA 90058
(323) 476-3622

SHIP TO: 1L
COLORADO ENERGY MANAGEMENT LLC
4963 SOTO STREET
VERNON, CA 90058
(323) 476-3632

Confirm To: ASHLEY HURD
Customer PO: MGS16324 Ship Via: Whse: 101 Terms: N30

HM	Product Code / Desc / Svc Type	Qty Ordered / Package Desc	Ext Qty Ordered	Qty Delivered	Unit Price	Extended Amount
X	UN1202, DIESEL FUEL, 3, PG III - NONTAXABLE USE ONLY, PENALITY FOR TAXABLE USE					
	422D055 30 CARB ULTRA L.S. DYED DIESEL	2.00 55 GAL DRM	110.00 GALS	2		
	CH277210983D400 30 MEROPA 150 NRD#LT	1.00 400 LB DRM	400.00 LBS	1		
	DRUMDEPOSITC001 30 DRUM DEPOSIT FEE	2.00 MISC CHRG	2.00 EACH	2		
	/FUELCH 30 FUEL SURCHARGE		0.00			
	/RCF 30 REGULATORY COMPLIANCE FEE		0.00			

Received in INFOR
5 / 20 / 19
M. Gordon

Rec'd by _____ Date 5/20/19
Print Name _____
Driver's Signature _____

ARRIVED LOAD POINT		AM PM	DATE	COMPLETED LOADING		AM PM	DATE	TRUCK # 924	B/L #	FOR COMPANY USE ONLY RT☐ TF☐ OP☐	
ARRIVED DESTINATION		AM PM	DATE	COMPLETED UNLOADING		AM PM	DATE	D.O.T. HAZARDOUS MATERIALS PLACARD PROVIDED BY SHIPPER ■ CARRIER ■			
END TANK	GAS	DIESEL	OTHER	WATER DETECTED ? ☐ YES ☐ NO			GRAVITY	THIS IS TO CERTIFY THAT THE ABOVE NAMED MATERIALS ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELED AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO APPLICABLE REGULATIONS OF THE DEPARTMENT OF TRANSPORTATION.			
BEGINNING TANK	GAS	DIESEL	OTHER	DRUM DEPOSIT 3			DRUM CREDIT 3	IN THE EVENT OF A HAZARDOUS MATERIALS INCIDENT - CALL 1-800-424-9300			

FOR CHEMICAL EMERGENCY
Spill, Leak, Fire Exposure or Accident
CALL CHEMTREC - DAY OR NIGHT
800-424-9300

SC Fuels
P.O. Box 14237
Orange, CA 92863-1237
Tel: 800-659-5823
Fax: 714-992-7377
Credit Inquiries: 888-364-0121

SALES QUOTE

Order#: 1427153
Order Date: 5/15/2019
Delv Req Date: 12/31/5999
Sales Person: 0177 - Todd Cripps

SOLD TO: 01-0001084
COLORADO ENERGY MANAGEMENT LLC
ATTN: ACCOUNTS PAYABLE
4963 S. SOTO STREET
VERNON, CA 90058
(323) 476-3622

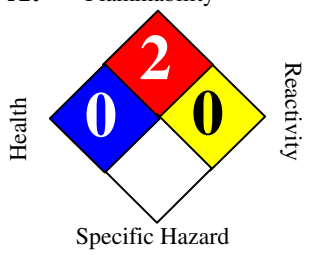
SHIP TO: 1L
COLORADO ENERGY MANAGEMENT LLC
4963 SOTO STREET
VERNON, CA 90058
(323) 476-3632

Confirm To: ASHLEY HURD
Customer PO: Ship Via: Whse: 101 Terms: N30

HM	Product Code / Desc / Svc Type		Qty Ordered / Package Desc	Ext Qty Ordered	Qty Delivered	Unit Price	Extended Amount
X	UN1202, DIESEL FUEL, 3, PG III - NONTAXABLE USE ONLY, PENALITY FOR TAXABLE USE						
	422D055	30	2.00 55 GAL DRM	110.00 GALS		4.30000	473.00
	CARB ULTRA L.S. DYED DIESEL						
			N10630				
	Federal Lust					0.00100	0.11
	CA - AB 32 - DSL					0.00704	0.77
						4.30804	473.88
	CH277210983D400	30	1.00 400 LB DRM	400.00 LBS		2.78000	1,112.00
	MEROPA 150 NRD#LT						
			MGS-06081				
	Royal Purple Synfilm GT 100 $49.18/gal						
	DRUMDEPOSITC001	30	2.00 MISC CHRG	2.00 EACH		25.00000	50.00
	DRUM DEPOSIT FEE						
	/FUELCH	30		0.00			9.92
	FUEL SURCHARGE						
	/RCF	30		0.00			12.95
	REGULATORY COMPLIANCE FEE						

Material Safety Data Sheet
Diesel Low Sulfur (LSD) and Ultra Low Sulfur Diesel (ULSD)

NFPA:



TESORO

HMIS III:

HEALTH	1
FLAMMABILITY	2
PHYSICAL	0

0 = Insignificant, 1 = Slight, 2 = Moderate, 3 = High, 4 = Extreme

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Diesel Low Sulfur (LSD) and Ultra Low Sulfur Diesel (ULSD)		
Synonyms	:	CARB Diesel, 888100004478		
MSDS Number	:	888100004478	**Version**	: 2.10
Product Use Description	:	Fuel		
Company	:	For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259		
Tesoro Call Center	:	(877) 783-7676	**Chemtrec (Emergency Contact)**	: (800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Regulatory status : This material is considered hazardous by the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (29 CFR 1910.1200).

Signal Word : WARNING

Hazard Summary : Toxic. Combustible Liquid

Potential Health Effects

Eyes : Eye irritation may result from contact with liquid, mists, and/or vapors.

Inhalation : Vapors or mists from this material can irritate the nose, throat, and lungs, and can cause signs and symptoms of central nervous system depression, depending on the concentration and duration of exposure.

Skin : Skin irritation leading to dermatitis may occur upon prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed. Long-term, repeated skin contact may cause skin cancer

Ingestion : Harmful or fatal if swallowed. Do NOT induce vomiting. This material can irritate the mouth, throat, stomach, and cause nausea, vomiting, diarrhea and restlessness Aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death.

Target Organs : Central nervous system, Eyes, Skin, Kidney, Liver

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Fuels, diesel, No 2; Gasoil - unspecified	68476-34-6	100%
Nonane	111-84-2	0 - 5%
Naphthalene	91-20-3	0 - 1%
1,2,4-Trimethylbenzene	95-63-6	0 - 2%
Xylene	1330-20-7	0 - 2%
Sulfur	7704-34-9	15 ppm maximum

SECTION 4. FIRST AID MEASURES

Inhalation : Move to fresh air. Give oxygen. If breathing is irregular or stopped, administer artificial respiration. Seek medical attention immediately.

Skin contact : Take off all contaminated clothing immediately. Wash off immediately with soap and plenty of water. Wash contaminated clothing before re-use. If skin irritation persists, seek medical attention immediately.

Eye contact : Remove contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes. If symptoms persist, seek medical attention.

Ingestion : Do not induce vomiting without medical advice. If a person vomits when lying on his back, place him in the recovery position. Seek medical attention immediately.

Notes to physician : Symptoms: Dizziness, Discomfort, Headache, Nausea, Disorder, Vomiting, Lung edema, Aspiration may cause pulmonary edema and pneumonitis, Liver disorders, Kidney disorders.

SECTION 5. FIRE-FIGHTING MEASURES

Form : Liquid

Flash point : 38℃ Minimum for #1 Diesel, 52℃ Minimum for #2 Diesel

Auto Ignition temperature : 257 ℃ (495 ℉)

Lower explosive limit : 0.6 %(V)

Upper explosive limit : 4.7 %(V)

Suitable extinguishing media : Carbon dioxide (CO2), Water spray, Dry chemical, Foam, Keep containers and surroundings cool with water spray.

Specific hazards during fire fighting : Fire Hazard Do not use a solid water stream as it may scatter and spread fire. Cool closed containers exposed to fire with water spray.

Special protective equipment : Wear self-contained breathing apparatus and protective suit. Use personal

for fire-fighters		protective equipment.
Further information	:	Exposure to decomposition products may be a hazard to health. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to contain spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact. Ensure adequate ventilation. Use personal protective equipment.
Environmental precautions	:	Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection. Discharge into the environment must be avoided. If the product contaminates rivers and lakes or drains inform respective authorities.
Methods for cleaning up	:	Take up with sand or oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

CERCLA Hazardous substances and corresponding RQs :

Xylene	1330-20-7	100 lbs
Naphthalene	91-20-3	100 lbs
Nonane	111-84-2	100 lbs

SECTION 7. HANDLING AND STORAGE

Handling	:	Keep away from fire, sparks and heated surfaces. No smoking near areas where material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.
Advice on protection against fire and explosion	:	Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initated fire or explosion during transfer, storage or handling, include but are not limited to these examples: (1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators. (2) Special slow load procedures for "switch loading" must be followed to

avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such gasoline or naphtha).

(3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

Dust explosion class : Not applicable

Requirements for storage areas and containers : Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Other data : Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure.

Advice on common storage Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA Z1	Xylene	1330-20-7	PEL	100 ppm 435 mg/m3
	Naphthalene	91-20-3	PEL	10 ppm 50 mg/m3
ACGIH	Diesel Fuel	68476-30-2	TWA	100 mg/m3
	Xylene	1330-20-7	TWA	100 ppm
		1330-20-7	STEL	150 ppm
	Naphthalene	91-20-3	TWA	10 ppm
		91-20-3	STEL	15 ppm
	Nonane	111-84-2	TWA	200 ppm

Engineering measures : Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use only intrinsically safe electrical equipment approved for use in classified areas.

Eye protection : Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Hand protection : Gloves constructed of nitrile, neoprene, or PVC are recommended. Consult manufacturer specifications for further information.

Skin and body protection	:	If needed to prevent skin contact, chemical protective clothing such as of DuPont TyChem®, Saranex or equivalent recommended based on degree of exposure. The resistance of specific material may vary from product to product as well as with degree of exposure.
Respiratory protection	:	A NIOSH/ MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection. Use a NIOSH/ MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.
Work / Hygiene practices	:	Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Form	:	Liquid
Appearance	:	Clear, straw colored
Odor	:	Characteristic petroleum (kerosene) odor
Flash point - typical	:	38°C Minimum for #1 Diesel, 52°C Minimum for #2 Diesel
Auto Ignition temperature	:	257 °C (495 °F)
Thermal decomposition	:	No decomposition if stored and applied as directed.
Lower explosive limit	:	0.6 %(V)
Upper explosive limit	:	4.7 %(V)
pH	:	Not applicable
Freezing point	:	No data available
Boiling point	:	148 - 372 °C(298 - 702 °F)
Vapor Pressure	:	< 2 mm Hg at 20 °C
Density	:	**0.86** g/cm3
Water solubility	:	Negligible
Viscosity, dynamic	:	1.7 - 40 mPa.s at 37.8 °C (100.0 °F)

Percent Volatiles	:	100 %
Conductivity (conductivity can be reduced by environmental factors such as a decrease in temperature		Diesel Fuel Oils at terminal load rack: At least 25 pS/m Ultra Low Sulfur Diesel (ULSD) without conductivity additive: 0 pS/m to 5 pS/m ULSD at terminal load rack with conductivity additive: At least 50 pS/m but conductivity may decrease from environmental factors such as temperature drop. JP-8 at terminal load rack: 150 pS/m to 600 pS/m

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Keep away from strong oxidizers. Viton ® ; Fluorel ®
Materials to avoid	:	Strong oxidizing agents. Peroxides
Hazardous decomposition products	:	Carbon monoxide, carbon dioxide and noncombusted hydrocarbons (smoke). Diesel exhaust particulates may be a lung hazard - see Section 11.
Thermal decomposition	:	No decomposition if stored and applied as directed.
Hazardous reactions	:	Keep away from oxidizing agents, and acidic or alkaline products.

SECTION 11. TOXICOLOGICAL INFORMATION

Carcinogenicity

NTP	:	Naphthalene (CAS-No.: 91-20-3)
IARC	:	Naphthalene (CAS-No.: 91-20-3)
OSHA	:	No component of this product which is present at levels greater than or equal to 0.1 % is identified as a carcinogen or potential carcinogen by OSHA.
CA Prop 65	:	WARNING! This product contains a chemical known to the State of California to cause cancer. naphthalene (CAS-No.: 91-20-3)
Skin irritation	:	Irritating to skin.
Eye irritation	:	Irritating to eyes.
Further information	:	Studies have shown that similar products produce skin cancer or skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation. Positive mutagenicity results have been reported. Repeated over-exposure may cause liver and kidney injury IARC classifies whole diesel fuel exhaust particulates as probably carcinogenic to humans (Group 2A). NIOSH regards whole diesel fuel exhaust particulates as a potential cause of occupational lung cancer based on animal studies and limited evidence in humans.

Component:

Fuels, diesel, No 2; Gasoil - unspecified	68476-34-6	Acute oral toxicity: LD50 rat Dose: 5,001 mg/kg Acute dermal toxicity: LD50 rabbit

		Dose: 2,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: 7.64 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Severe skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
Nonane	111-84-2	Acute oral toxicity: LD50 mouse Dose: 218 mg/kg Acute inhalation toxicity: LC50 rat Exposure time: 4 h
Naphthalene	91-20-3	Acute oral toxicity: LD50 rat Dose: 2,001 mg/kg Acute dermal toxicity: LD50 rat Dose: 2,501 mg/kg Acute inhalation toxicity: LC50 rat Dose: 101 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation Carcinogenicity: N11.00422130
1,2,4-Trimethylbenzene	95-63-6	Acute inhalation toxicity: LC50 rat Dose: 18 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Skin irritation Eye irritation: Classification: Irritating to eyes. Result: Eye irritation
Xylene	1330-20-7	Acute oral toxicity: LD50 rat Dose: 2,840 mg/kg Acute dermal toxicity: LD50 rabbit Dose: ca. 4,500 mg/kg Acute inhalation toxicity: LC50 rat Dose: 6,350 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological : Keep out of sewers, drainage areas, and waterways. Report spills and releases, as

information applicable, under Federal and State regulations.

Component:

Naphthalene	91-20-3	Toxicity to algae: EC50 Species: Dose: 33 mg/l Exposure time: 24 h
1,2,4-Trimethylbenzene	95-63-6	Toxicity to fish: LC50 Species: Pimephales promelas (fathead minnow) Dose: 7.72 mg/l Exposure time: 96 h Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia Dose: 3.6 mg/l Exposure time: 48 h

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : In accordance with local and national regulations.

SECTION 14. TRANSPORT INFORMATION

CFR

Proper shipping name	: DIESEL FUEL
UN-No.	: UN1202 (NA 1993)
Class	: 3
Packing group	: III

TDG

Proper shipping name	: DIESEL FUEL
UN-No.	: UN1202 (NA 1993)
Class	: 3
Packing group	: III

IATA Cargo Transport

UN UN-No.	: UN1202 (NA 1993)
Description of the goods	: DIESEL FUEL
Class	: 3
Packaging group	: III
ICAO-Labels	: 3
Packing instruction (cargo aircraft)	: 310
Packing instruction (cargo aircraft)	: Y309

IATA Passenger Transport

UN UN-No.	: UN1202 (NA 1993)
Description of the goods	: DIESEL FUEL
Class	: 3
Packaging group	: III

	ICAO-Labels	: 3
	Packing instruction (passenger aircraft)	: 309
	Packing instruction (passenger aircraft)	: Y309
IMDG-Code		
	UN-No.	: UN 1202 (NA 1993)
	Description of the goods	: DIESEL FUEL
	Class	: 3
	Packaging group	: III
	IMDG-Labels	: 3
	EmS Number	: F-E S-E
	Marine pollutant	: No

SECTION 15. REGULATORY INFORMATION

OSHA Hazards : Combustible Liquid
Moderate skin irritant
Moderate eye irritant
Toxic by ingestion
POSSIBLE CANCER HAZARD

TSCA Status : On TSCA Inventory

DSL Status : All components of this product are on the Canadian DSL list.

SARA 311/312 Hazards : Fire Hazard
Acute Health Hazard
Chronic Health Hazard

SARA III — US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required

Components	CAS-No.
Xylene	1330-20-7
1,2,4-Trimethylbenzene	95-63-6
Naphthalene	91-20-3

PENN RTK — US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Components	CAS-No.
Nonane	111-84-2
Naphthalene	91-20-3
1,2,4-Trimethylbenzene	95-63-6
xylene	1330-20-7
Fuels, diesel, No 2; Gasoil - unspecified	68476-34-6

MASS RTK — US. Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Components	CAS-No.

Xylene	1330-20-7
1,2,4-Trimethylbenzene	95-63-6
Naphthalene	91-20-3
Nonane	111-84-2

NJ RTK — US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Components	CAS-No.
Nonane	111-84-2
Naphthalene	91-20-3
1,2,4-Trimethylbenzene	95-63-6
Xylene	1330-20-7
Fuels, diesel, No 2; Gasoil - unspecified	68476-34-6

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to cause cancer.

Naphthalene 91-20-3

SECTION 16. OTHER INFORMATION

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Prepared by : GWU mbH
Birlenbacher Str. 18
D-57078 Siegen

Germany

Telephone: +49-(0)271-88072-0

10/15/2009

65, 66, 295

Appendix D

Cooling Tower PM10 Guidance

SPX Cooling Technologies

Balcke | Hamon Dry Cooling | Marley

COOLING TOWER DRIFT MASS DISTRIBUTION
Excel Drift Eliminators

The following table represents the predicted mass distribution of drift particle size for cooling tower drift dispersed from Marley TU10 and TU12 Excel Drift Eliminators properly installed in a cooling tower.

Mass in Particles (%)		Droplet Size (Microns)
0.2	Larger Than	525
1.0	Larger Than	375
5.0	Larger Than	230
10.0	Larger Than	170
20.0	Larger Than	115
40.0	Larger Than	65
60.0	Larger Than	35
80.0	Larger Than	15
88.0	Larger Than	10

How to read table: Example – 0.2% of the drift will have particle sizes larger than 525 microns.

Marley guarantees the data above for properly installed, undamaged drift eliminators in 'like-new' condition.

SPX COOLING TECHNOLOGIES

PREFERRED COOLING TOWER WATER CONDITION LIMITS

NOTE: Biological treatment and control of Legionella and other potentially health-threatening bacteria is essential. Consult a competent water treatment expert or service company.

pH	6.5 to 9.0 (special materials may be required beyond these limits)
Temperature	125° F (51.7° C) typical maximum; higher temperatures possible with special materials
Langelier Saturation Index	0.0 to 1.0 recommended; higher allowed if scale is controllable.
M-Alkalinity	100 to 500 ppm as $CaCO_3$
Silica	150 ppm as SiO_2 maximum (scale formation)
Iron	3 ppm maximum (staining and scale contributor)
Manganese	0.1 ppm maximum (staining and scale contributor)
Sulfides	Greater than 1 ppm can be corrosive to copper alloys, iron, steel, and galvanized steel. See table below for limits with film fill.
Ammonia	50 ppm maximum if copper alloys present; lower limits apply for film fill - see table.
Chlorine / bromine	1 ppm free residual intermittently (shock), or 0.4 ppm continuously maximum. Excess can attack sealants, accelerate corrosion, increase drift, and embrittle PVC.
Organic solvents	These can attack plastics and promote bio-growth. Trace amounts may be acceptable, depending on the solvent.
TDS	Over 5000 ppm may require thermal performance derate.

Individual Ions:		MAXIMUM:
Cations:	**Calcium**	800 ppm as $CaCO_3$ preferred, (300 ppm with MX fills in arid climate).
	Magnesium	Depends on pH and silica level (for magnesium silicate scale).
	Sodium	No limit.
Anions:	**Chlorides**	450 ppm as Cl^- (300 for galvanized towers). upgrades are required for higher chloride levels.
	Sulfates	800 ppm as $CaCO_3$ preferred if calcium is also high ($CaSO_4$ scale).
	Nitrates	300 ppm as NO_3 (bacteria nutrient).
	Carbonates/Bicarbonates	300 ppm as $CaCO_3$ preferred for wood or galvanized steel tower.

Fouling Contaminant Limits - based on fouling load of 2.5 pounds per cubic foot

Bacteria counts listed below relate to maintaining fill thermal efficiency only.
Biocidal treatment is required for all cooling tower installations. (see NOTE above).

Fill Type	Aerobic Bacteria Heterotrophic Plate Count	Total Suspended Solids (TSS)	Oil and Grease	Sulfides	Ammonia
MC75, MC120	10,000 CFU/ml	50 ppm	1 ppm	0.5 ppm	10 ppm
FB20, MX75 and MX625 (crossflow)	100,000 CFU/ml with TSS up to 50 ppm, or 10,000 CFU/ml with TSS up to 150 ppm		1 ppm	1.0 ppm	15 ppm
DF254, MCR16	100,000 CFU/ml	150 ppm	5 ppm	1.5 ppm	25 ppm
DF381 with 1' MC75 overlay	1,000,000 CFU/ml with TSS up to 50 ppm, or 100,000 CFU/ml with TSS up to 150 ppm		5 ppm	1.5 ppm	25 ppm
DF381, MVC20, AAFNCS ('Cleanflow') MCR12, Tricklebloc	1,000,000 CFU/ml	250 ppm	10 ppm	2.0 ppm	25 ppm
Splash bar or grid fill	1,000,000 CFU/ml target	No specific limit	10 ppm	N/A	N/A

Note: Any amount of oil or grease is likely to adversely affect thermal performance. Sulfides and ammonia promote bacterial growth which can cause fill fouling; conformance to the limits above will assist in controlling bacteria to the recommended levels.

Drift Effects:

Certain contaminants or treatment chemicals such as surfactants, glycols, biodispersants and antifoams may increase drift rate. When minimizing drift is vital, the circulating water shall have a surface tension of at least 65 dynes/cm and a total organic carbon (TOC) level below 25 ppm. *Reclaim or re-use waters in particular may contain contaminants which increase drift rate either directly or by necessitating the use of treatment chemicals which increase drift rate.*

Miscellaneous Solids and Nutrients

Avoid high efficiency fill (MC75) with water containing bacteria nutrients such as alcohols, nitrates, ammonia, fats, glycols, phosphates, black liquor, or TOC greater than 50 ppm. Clog-resistant fills may be considered for contaminated water, case by case.
For all film fills, avoid fibrous, oily, greasy, fatty, or tarry contaminants, which can plug fill.
In general, do not use film fill in Steel Plants, Pulp & Paper Mills, Food Processing Operations, or similar applications unless leaks and contamination by airborne or waterborne particulates, oil, or fibers are extremely unlikely. If film fill is used, biological-growth control must be stringent and diligent.

Calculating Realistic PM_{10} Emissions from Cooling Towers

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ABSTRACT

Particulate matter less than 10 micrometers in diameter (PM_{10}) emissions from wet cooling towers may be calculated using the methodology presented in EPA's AP-42[1] , which assumes that all total dissolved solids (TDS) emitted in "drift" particles (liquid water entrained in the air stream and carried out of the tower through the induced draft fan stack.) are PM_{10}. However, for wet cooling towers with medium to high TDS levels, this method is overly conservative, and predicts significantly higher PM_{10} emissions than would actually occur, even for towers equipped with very high efficiency drift eliminators (e.g., 0.0006% drift rate). Such over-prediction may result in unrealistically high PM_{10} modeled concentrations and/or the need to purchase expensive Emission Reduction Credits (ERCs) in PM_{10} non-attainment areas. Since these towers have fairly low emission points (10 to 15 m above ground), over-predicting PM_{10} emission rates can easily result in exceeding federal Prevention of Significant Deterioration (PSD) significance levels at a project's fenceline. This paper presents a method for computing realistic PM_{10} emissions from cooling towers with medium to high TDS levels.

INTRODUCTION

Cooling towers are heat exchangers that are used to dissipate large heat loads to the atmosphere. Wet, or evaporative, cooling towers rely on the latent heat of water evaporation to exchange heat between the process and the air passing through the cooling tower. The cooling water may be an integral part of the process or may provide cooling via heat exchangers, for example, steam condensers. Wet cooling towers provide direct contact between the cooling water and air passing through the tower, and as part of normal operation, a very small amount of the circulating water may be entrained in the air stream and be carried out of the tower as "drift" droplets. Because the drift droplets contain the same chemical impurities as the water circulating through the tower, the particulate matter constituent of the drift droplets may be classified as an emission. The magnitude of the drift loss is influenced by the number and size of droplets produced within the tower, which are determined by the tower fill design, tower design, the air and water patterns, and design of the drift eliminators.

AP-42 METHOD OF CALCULATING DRIFT PARTICULATE

EPA's AP-42[1] provides available particulate emission factors for wet cooling towers, however, these values only have an emission factor rating of "E" (the lowest level of confidence acceptable). They are also rather high, compared to typical present-day manufacturers' guaranteed drift rates, which are on the order of 0.0006%. (Drift emissions are typically

expressed as a percentage of the cooling tower water circulation rate). AP-42 states that "a *conservatively high* PM_{10} emission factor can be obtained by (a) multiplying the total liquid drift factor by the TDS fraction in the circulating water, and (b) assuming that once the water evaporates, all remaining solid particles are within the PM_{10} range." (Italics per EPA).

If TDS data for the cooling tower are not available, a source-specific TDS content can be estimated by obtaining the TDS for the make-up water and multiplying it by the cooling tower cycles of concentration. [The cycles of concentration is the ratio of a measured parameter for the cooling tower water (such as conductivity, calcium, chlorides, or phosphate) to that parameter for the make-up water.]

Using AP-42 guidance, the total particulate emissions (PM) (after the pure water has evaporated) can be expressed as:

$$PM = \text{Water Circulation Rate} \times \text{Drift Rate} \times TDS \qquad [1]$$

For example, for a typical power plant wet cooling tower with a water circulation rate of 146,000 gallons per minute (gpm), drift rate of 0.0006%, and TDS of 7,700 parts per million by weight (ppmw):

$$PM = 146{,}000 \text{ gpm} \times 8.34 \text{ lb water/gal} \times 0.0006/100 \times 7{,}700 \text{ lb solids}/10^6 \text{ lb water} \times 60 \text{ min/hr} = \underline{3.38 \text{ lb/hr}}$$

On an annual basis, this is equivalent to almost 15 tons per year (tpy). Even for a state-of-the-art drift eliminator system, this is not a small number, especially if assumed to all be equal to PM_{10}, a regulated criteria pollutant. However, as the following analysis demonstrates, only a very small fraction is actually PM_{10}.

COMPUTING THE PM_{10} FRACTION

Based on a representative drift droplet size distribution and TDS in the water, the amount of solid mass in each drop size can be calculated. That is, for a given initial droplet size, assuming that the mass of dissolved solids condenses to a spherical particle after all the water evaporates, and assuming the density of the TDS is equivalent to a representative salt (e.g., sodium chloride), the diameter of the final solid particle can be calculated. Thus, using the drift droplet size distribution, the percentage of drift mass containing particles small enough to produce PM_{10} can be calculated. This method is conservative as the final particle is assumed to be perfectly spherical; hence as small a particle as can exist.

The droplet size distribution of the drift emitted from the tower is critical to performing the analysis. Brentwood Industries, a drift eliminator manufacturer, was contacted and agreed to provide drift eliminator test data from a test conducted by Environmental Systems Corporation (ESC) at the Electric Power Research Institute (EPRI) test facility in Houston, Texas in 1988 (Aull[2], 1999). The data consist of water droplet size distributions for a drift eliminator that achieved a tested drift rate of 0.0003 percent. As we are using a 0.0006 percent drift rate, it is reasonable to expect that the 0.0003 percent drift rate would produce smaller droplets, therefore,

this size distribution data can be assumed to be conservative for predicting the fraction of PM_{10} in the total cooling tower PM emissions.

In calculating PM_{10} emissions the following assumptions were made:

- Each water droplet was assumed to evaporate shortly after being emitted into ambient air, into a single, solid, spherical particle.
- Drift water droplets have a density (ρ_w) of water; $1.0\ g/cm^3$ or $1.0 * 10^{-6}\ \mu g/\mu m^3$.
- The solid particles were assumed to have the same density (ρ_{TDS}) as sodium chloride, (i.e., 2.2 g/cm^3).

Using the formula for the volume of a sphere, $V = 4\pi r^3/3$, and the density of pure water, $\rho_w = 1.0\ g/cm^3$, the following equations can be used to derive the solid particulate diameter, D_p, as a function of the TDS, the density of the solids, and the initial drift droplet diameter, D_d :

Volume of drift droplet = $(4/3)\pi(D_d/2)^3$ [2]

Mass of solids in drift droplet = (TDS)(ρ_w)(Volume of drift droplet) [3]

substituting,

Mass of solids in drift = (TDS)(ρ_w) $(4/3)\pi(D_d/2)^3$ [4]

Assuming the solids remain and coalesce after the water evaporates, the mass of solids can also be expressed as:

Mass of solids = (ρ_{TDS}) (solid particle volume) = (ρ_{TDS})$(4/3)\pi(D_p/2)^3$ [5]

Equations [4] and [5] are equivalent:

$(\rho_{TDS})(4/3)\pi(D_p/2)^3 = (TDS)(\rho_w)(4/3)\pi(D_d/2)^3$ [6]

Solving for D_p:

$D_p = D_d\ [(TDS)(\rho_w/\rho_{TDS})]^{1/3}$ [7]

Where,

TDS is in units of ppmw
D_p = diameter of solid particle, micrometers (μm)
D_d = diameter of drift droplet, μm

Using formulas [2] – [7] and the particle size distribution test data, Table 1 can be constructed for drift from a wet cooling tower having the same characteristics as our example; 7,700 ppmw TDS and a 0.0006% drift rate. The first and last columns of this table are the particle size distribution derived from test results provided by Brentwood Industries. Using straight-line interpolation for a solid particle size 10 μm in diameter, we conclude that approximately 14.9 percent of the mass emissions are equal to or smaller than PM_{10}. The balance of the solid

particulate are particulate greater than 10 μm. Hence, PM_{10} emissions from this tower would be equal to PM emissions x 0.149, or 3.38 lb/hr x 0.149 = 0.50 lb/hr. The process is repeated in Table 2, with all parameters equal except that the TDS is 11,000 ppmw. The result is that approximately 5.11 percent are smaller at 11,000 ppm. Thus, while total PM emissions are larger by virtue of a higher TDS, overall PM_{10} emissions are actually lower, because more of the solid particles are larger than 10 μm.

Table 1. Resultant Solid Particulate Size Distribution (TDS = 7700 ppmw)

EPRI Droplet Diameter (μm)	Droplet Volume (μm^3) [2][1]	Droplet Mass (μg) [3]	Particle Mass (Solids) (μg) [4]	Solid Particle Volume (μm^3)	Solid Particle Diameter (μm) [7]	EPRI % Mass Smaller
10	524	5.24E-04	4.03E-06	1.83	1.518	0.000
20	4189	4.19E-03	3.23E-05	14.66	3.037	0.196
30	14137	1.41E-02	1.09E-04	49.48	4.555	0.226
40	33510	3.35E-02	2.58E-04	117.29	6.073	0.514
50	65450	6.54E-02	5.04E-04	229.07	7.591	1.816
60	113097	1.13E-01	8.71E-04	395.84	9.110	5.702
70	179594	1.80E-01	1.38E-03	628.58	10.628	21.348
90	381704	3.82E-01	2.94E-03	1335.96	13.665	49.812
110	696910	6.97E-01	5.37E-03	2439.18	16.701	70.509
130	1150347	1.15E+00	8.86E-03	4026.21	19.738	82.023
150	1767146	1.77E+00	1.36E-02	6185.01	22.774	88.012
180	3053628	3.05E+00	2.35E-02	10687.70	27.329	91.032
210	4849048	4.85E+00	3.73E-02	16971.67	31.884	92.468
240	7238229	7.24E+00	5.57E-02	25333.80	36.439	94.091
270	10305995	1.03E+01	7.94E-02	36070.98	40.994	94.689
300	14137167	1.41E+01	1.09E-01	49480.08	45.549	96.288
350	22449298	2.24E+01	1.73E-01	78572.54	53.140	97.011
400	33510322	3.35E+01	2.58E-01	117286.13	60.732	98.340
450	47712938	4.77E+01	3.67E-01	166995.28	68.323	99.071
500	65449847	6.54E+01	5.04E-01	229074.46	75.915	99.071
600	113097336	1.13E+02	8.71E-01	395840.67	91.098	100.000

[1] Bracketed numbers refer to equation number in text.

The percentage of PM_{10}/PM was calculated for cooling tower TDS values from 1000 to 12000 ppmw and the results are plotted in Figure 1. Using these data, Figure 2 presents predicted PM_{10} emission rates for the 146,000 gpm example tower. As shown in this figure, the PM emission rate increases in a straight line as TDS increases, however, the PM_{10} emission rate increases to a maximum at around a TDS of 4000 ppmw, and then begins to decline. The reason is that at higher TDS, the drift droplets contain more solids and therefore, upon evaporation, result in larger solid particles for any given initial droplet size.

CONCLUSION

The emission factors and methodology given in EPA's AP-42[1] Chapter 13.4 *Wet Cooling Towers*, do not account for the droplet size distribution of the drift exiting the tower. This is a critical factor, as more than 85% of the mass of particulate in the drift from most cooling towers will result in solid particles larger than PM_{10} once the water has evaporated. Particles larger than PM_{10} are no longer a regulated air pollutant, because their impact on human health has been shown to be insignificant. Using reasonable, conservative assumptions and a realistic drift

droplet size distribution, a method is now available for calculating realistic PM_{10} emission rates from wet mechanical draft cooling towers equipped with modern, high-efficiency drift eliminators and operating at medium to high levels of TDS in the circulating water.

Table 2. Resultant Solid Particulate Size Distribution (TDS = 11000 ppmw)

EPRI Droplet Diameter (μm)	Droplet Volume (μm^3) [2][1]	Droplet Mass (μg) [3]	Particle Mass (Solids) (μg) [4]	Solid Particle Volume (μm^3)	Solid Particle Diameter (μm) [7]	EPRI % Mass Smaller
10	524	5.24E-04	5.76E-06	2.62	1.710	0.000
20	4189	4.19E-03	4.61E-05	20.94	3.420	0.196
30	14137	1.41E-02	1.56E-04	70.69	5.130	0.226
40	33510	3.35E-02	3.69E-04	167.55	6.840	0.514
50	65450	6.54E-02	7.20E-04	327.25	8.550	1.816
60	113097	1.13E-01	1.24E-03	565.49	10.260	5.702
70	179594	1.80E-01	1.98E-03	897.97	11.970	21.348
90	381704	3.82E-01	4.20E-03	1908.52	15.390	49.812
110	696910	6.97E-01	7.67E-03	3484.55	18.810	70.509
130	1150347	1.15E+00	1.27E-02	5751.73	22.230	82.023
150	1767146	1.77E+00	1.94E-02	8835.73	25.650	88.012
180	3053628	3.05E+00	3.36E-02	15268.14	30.780	91.032
210	4849048	4.85E+00	5.33E-02	24245.24	35.909	92.468
240	7238229	7.24E+00	7.96E-02	36191.15	41.039	94.091
270	10305995	1.03E+01	1.13E-01	51529.97	46.169	94.689
300	14137167	1.41E+01	1.56E-01	70685.83	51.299	96.288
350	22449298	2.24E+01	2.47E-01	112246.49	59.849	97.011
400	33510322	3.35E+01	3.69E-01	167551.61	68.399	98.340
450	47712938	4.77E+01	5.25E-01	238564.69	76.949	99.071
500	65449847	6.54E+01	7.20E-01	327249.23	85.499	99.071
600	113097336	1.13E+02	1.24E+00	565486.68	102.599	100.000

Figure 1: Percentage of Drift PM that Evaporates to PM10

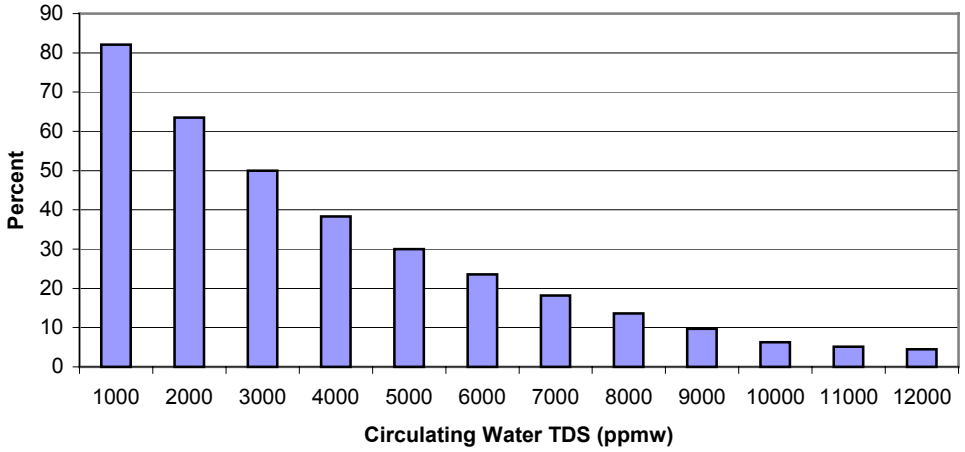
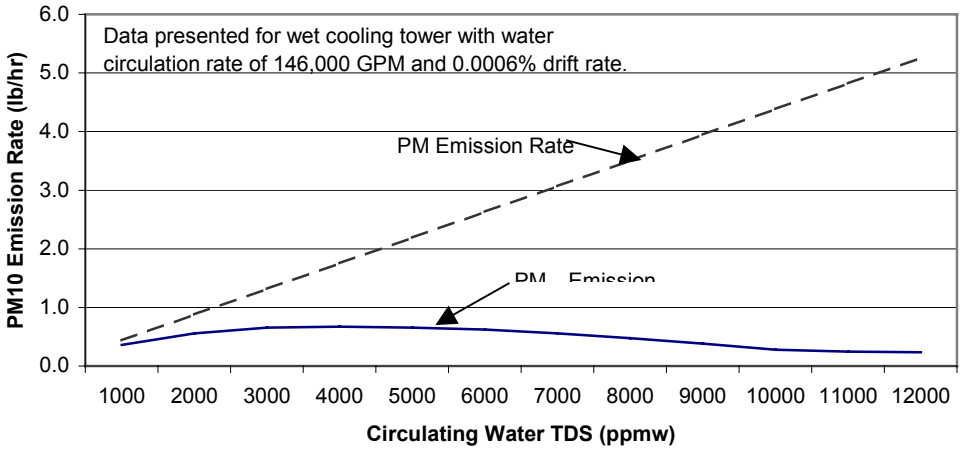


Figure 2: PM_{10} Emission Rate vs. TDS



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KEY WORDS

Drift
Drift eliminators
Cooling tower
PM_{10} emissions
TDS