TETRA TECH

April 24, 2020

Ms. Claudia Young Smith
U.S. EPA Region 8
1595 Wynkoop Street
Mail Code 8ARD-PM
Denver, Colorado 80202

Re: Revised Federal Minor New Source Review Program in Indian Country, 40 CFR 49.151 Application for New Construction for the Cottonwood Mine in Uintah County, Utah

Dear Claudia:

On behalf of American Gilsonite Company (AGC), Tetra Tech, Inc. (Tetra Tech) is submitting this revised Federal Minor New Source Review Program in Indian Country, 40 CFR 49.151 Application for New Construction. This revised application replaces the Application for New Construction submitted on February 28, 2020. The revisions include:

1. The permit application is for Proposed Construction of New Equipment at an Existing Source and Proposed Modification of an Existing Source. The box for Proposed Construction of a New Source is not checked.
2. The emissions have been calculated for the following scenarios:
    a. Current actual emissions using 2019 operating hours and production for CW-3 and CW-6 (non-tiered engine);
    b. Current allowable emissions using 8,760 operating hours and calculated maximum production for CW-3 and CW-6;
    c. Post Change Potential Emissions for CW-3, CW-6 (Tier 4), Tier 4 Primary Engine (CW-7) and Tier 4 Mine Dewatering Engine using 8,760 operating hours and a calculated annual production;
    d. Post Change Allowable Emissions for the engines in sub bullet 2c using 4,524 hours for the primary engines and 8,760 hours for the mine dewatering engine. The annual production is 20,000 tons.
3. In Section E Table of Estimate Emissions Table E (i) is blank and Table E(ii) contains the estimated emissions.
4. Attachment D has been revised to add the updated emissions calculations, explain the methodology to calculate the annual production for emissions calculations using 8,760 hours and describe the change in

Tetra Tech, Inc.
2768 Compass Dr. Suite 200, Grand Junction, CO 81506
Tel 970.986.3566 www.tetratech.com

emissions. The basis for the annual production rate is discussed in Attachment D.2 Cottonwood Mine Plan.

5. Attachment D.4.1 contains the emissions factors and revised emissions calculations for the scenarios described in Bullet 2.
6. Emission calculations have been updated to reflect the manufacturer guaranteed grain loading from the baghouses.

Thank your input in preparing this permit revision. Please contact me at bill.balaz@tetratech.com or 970-260-1655 if you have any questions or need additional information.

Sincerely
Tetra Tech, Inc.

William P. Balaz Jr., PE
Project Manager

Attachment: Revised Application for New Construction for Cottonwood Mine with Attachments

Cc: Colin Schwartz, EPA Region 8
Scott Patefield, EPA Region 8
Alex North, EPA Region 8
CDX eDisclosure
Nick Lott, AGC
Mike Wilhite, AGC
Sara Lubchenco-Burson, Tetra Tech, Inc.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
FEDERAL MINOR NEW SOURCE REVIEW PROGRAM IN INDIAN COUNTRY
40 CFR 49.151

Revised Application for New Construction

(Form NEW)

Please check all that apply to show how you are using this form:

- ϒ **Proposed Construction of a New Source**
- X **Proposed Construction of New Equipment at an Existing Source**
- X **Proposed Modification of an Existing Source**
- ϒ **Other – Please Explain**

Use of this information request form is voluntary and not approved by the Office of Management and Budget. The following is a check list of the type of information that Region 8 will use to process information on your proposed project. While submittal of this form is not required, it does offer details on the information we will use to complete your requested approval and providing the information requested may help expedite the process. An application form approved by the Office of Management and Budget can be found online at https://www.epa.gov/sites/production/files/2015-12/documents/new_source_general_application_rev2017.pdf.

Please submit information to following two entities:

Federal Minor NSR Permit Coordinator
Air and Radiation Division
U.S. EPA, Region 8
1595 Wynkoop Street, 8ARD-PM
Denver, CO 80202-1129
R8airpermitting@epa.gov

The Tribal Environmental Contact for the specific reservation:

If you need assistance in identifying the appropriate Tribal Environmental Contact and address, please contact:
R8airpermitting@epa.gov

For more information, visit: http://www.epa.gov/caa-permitting/tribal-nsr-permitting-region-8

A. GENERAL SOURCE INFORMATION

1. (a) **Company Name** American Gilsonite Company (b) **Operator Name** American Gilsonite Company		2. **Facility Name** American Gilsonite Company, Cottonwood Mine Site	
3. Type of Operation Gilsonite Ore Mining		4. Portable Source? Yes ✓ No 5. Temporary Source? Yes ✓ No	
6. NAICS Code 212399 – All other nonmetallic mineral mining		7. SIC Code 1499 – Miscellaneous nonmetallic minerals, except fuels	
8. Physical Address (Or, home base for portable sources) 29950 S. Bonanza Hwy., Bonanza, Utah 84008 (office location)			
9. Reservation* CW# 1: Uintah and Ouray CW# 2: Uintah and Ouray CW# 3: Uintah and Ouray CW# 4: Uintah and Ouray CW# 5: Uintah and Ouray CW# 6: Uintah and Ouray CW# 7: Uintah and Ouray	10. County* CW# 1: Uintah CW# 2: Uintah CW# 3: Uintah CW# 4: Uintah CW# 5: Uintah CW# 6: Uintah CW# 7: Uintah	11a. Latitude (decimal format)* CW# 1: 39.899544° CW# 2: 39.900667° CW# 3: 39.898252° CW# 4: 39.903061° CW# 5: 39.904699° CW# 6: 39.897441°	11b. Longitude (decimal format)* CW# 1: -109.519913° CW# 2: -109.523920° CW# 3: -109.515233° CW# 4: -109.532772° CW# 5: -109.538394° CW# 6: -109.512153°

CW# 8: Uintah and Ouray	CW# 8: Uintah	CW# 7: 39.896700° CW# 8: 39.904025°	CW# 7: -109.509507° CW# 8: -109.535921°
12a. Quarter Quarter Section* CW# 1: SE ¼, SW ¼ CW# 2: NW ¼, SW ¼ CW# 3: SW ¼, SE ¼ CW# 4: NW ¼, SE ¼ CW# 5: SE ¼, NW ¼ CW# 6: SE ¼, SE ¼ CW# 7: SE ¼, SE ¼ CW# 8: SW ¼, NE ¼	12b. Section* CW# 1: 35 CW# 2: 35 CW# 3: 35 CW# 4: 34 CW# 5: 34 CW# 6: 35 CW# 7: 35 CW# 8: 34	12c. Township* CW# 1: 10 S CW# 2: 10 S CW# 3: 10 S CW# 4: 10 S CW# 5: 10 S CW# 6: 10 S CW# 7: 10 S CW# 8: 10 S	12d. Range* CW# 1: 21 E CW# 2: 21 E CW# 3: 21 E CW# 4: 21E CW# 5: 21 E CW# 6: 21 E CW# 7: 21 E CW# 8: 21 E

*Provide all proposed locations of operation for portable sources

B. PREVIOUS PERMIT ACTIONS (Provide information in this format for each permit that has been issued to this source. Provide as an attachment if additional space is necessary)

Facility Name on the Permit Cotton Wood #1 Mine and Cotton Wood #2 Mine
Permit Number DAQE-848-99 (State of Utah Approval Order) Note: Lexco Inc. submitted Part 1 of Title V permit application as not being a major source. Letter from EPA agreed not a major source but would provide minor source applicability decision when rules promulgated in 2004/2005. No other correspondence has been found to date.
Date of the Permit Action October 27, 1999 (**See Attachment B.1**)

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit

Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

C. CONTACT INFORMATION

Company Contact (Who is the primary contact for the company that owns this facility?**)** Nicholas J. Lott	Title Chief Operating Officer
Mailing Address 29950 S. Bonanza Hwy., Bonanza, Utah 84008	
Email Address nick@americangilsonite.com	
Telephone Number (435) 790-1930	Facsimile Number

Operator Contact (Is the company that operates this facility different than the company that owns this facility? Who is the primary contact for the company that operates this facility?) Nicholas J. Lott	Title Chief Operating Officer
Mailing Address 29950 S. Bonanza Hwy., Bonanza, Utah 84008	
Email Address nick@americangilsonite.com	
Telephone Number (435) 790-1930	Facsimile Number

Permitting Contact (Who is the person primarily responsible for Clean Air Act permitting for the company? We are seeking one main contact for the company. Please do not list consultants.) Michael Wilhite	Title Health, Safety, & Environmental Manager
Mailing Address 29950 S. Bonanza Hwy., Bonanza, Utah 84008	
Email Address mike@americangilsonite.com	

Telephone Number (435) 781-4541	Facsimile Number

Compliance Contact (Is the person responsible for Clean Air Act compliance for this company different than the person responsible for Clean Air Act permitting? Who is the person primarily responsible for Clean Air Act compliance for the company? We are seeking one main contact for the company. Please do not list consultants.) Michael Wilhite	Title Health, Safety, & Environmental Manager
Mailing Address 29950 S. Bonanza Hwy., Bonanza, Utah 84008	
Email Address mike@americangilsonite.com	

Telephone Number (435) 781-4541	Facsimile Number

D. ATTACHMENTS

Include all of the following information (see the attached instructions)

*Please do not send Part 71 Operating Permit Application Forms in lieu of the check list below.

ϒ **FORM SYNMIN -** New Source Review Synthetic Minor Limit Request Form, if synthetic minor limits are being requested.

ϒ Narrative description of the proposed production processes. This description should follow the flow of the process flow diagram to be submitted with this application.

ϒ Process flow chart identifying all proposed processing, combustion, handling, storage, and emission control equipment.

ϒ A list and descriptions of all proposed emission units and air pollution-generating activities.

ϒ Type and quantity of fuels, including sulfur content of fuels, proposed to be used on a daily, annual and maximum hourly basis.

ϒ Type and quantity of raw materials used or final product produced proposed to be used on a daily, annual and maximum hourly basis.

ϒ Proposed operating schedule, including number of hours per day, number of days per week and number of weeks per year.

ϒ A list and description of all proposed emission controls, control efficiencies, emission limits, and monitoring for each emission unit and air pollution generating activity.

ϒ **Criteria Pollutant Emissions -** Estimates of Current Actual Emissions, Current Allowable Emissions, Post-Change Uncontrolled Emissions, and Post-Change Allowable Emissions for the following air pollutants: particulate matter, PM_{10}, $PM_{2.5}$, sulfur oxides (SOx), nitrogen oxides (NOx), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, fluorides (gaseous and particulate), sulfuric acid mist (H_2SO_4), hydrogen sulfide (H_2S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates.

These estimates are to be made for each emission unit, emission generating activity, and the project/source in total. Note, there are no insignificant emission units or activities in this permitting program, only exempted units and activities. Please see the regulation for a list of exempted units and activities.

ϒ **Air Quality Review**

ϒ **ESA (Endangered Species Act)**

ϒ **NHPA (National Historic Preservation Act)**

E. TABLE OF ESTIMATED EMISSIONS

The following tables provide the total emissions in tons/year for all pollutants from the calculations required in Section D of this form, as appropriate for the use specified at the top of the form.

E(i) – Proposed New Source

Pollutant	Potential Emissions (tpy)	Proposed Allowable Emissions (tpy)	
PM			PM - Particulate Matter PM_{10} - Particulate Matter less than 10 microns in size $PM_{2.5}$ - Particulate Matter less than 2.5 microns in size SO_2 - Sulfur Dioxide NOx - Nitrogen Oxides CO - Carbon Monoxide VOC - Volatile Organic Compound Pb - Lead and lead compounds Fluorides - Gaseous and particulates H_2SO_4 - Sulfuric Acid Mist H_2S - Hydrogen Sulfide TRS - Total Reduced Sulfur RSC - Reduced Sulfur Compounds
PM_{10}			
$PM_{2.5}$			
SO_2			
NO_x			
CO			
VOC			
Pb			
Fluorides			
H_2SO_4			
H_2S			
TRS			
RSC			

Emissions calculations must include fugitive emissions if the source is one the following listed sources, pursuant to CAA Section 302(j):

(a) Coal cleaning plants (with thermal dryers);
(b) Kraft pulp mills;
(c) Portland cement plants;
(d) Primary zinc smelters;
(e) Iron and steel mills;
(f) Primary aluminum ore reduction plants;
(g) Primary copper smelters;
(h) Municipal incinerators capable of charging more than 250 tons of refuse per day;
(i) Hydrofluoric, sulfuric, or nitric acid plants;
(j) Petroleum refineries;
(k) Lime plants;
(l) Phosphate rock processing plants;
(m) Coke oven batteries;
(n) Sulfur recovery plants;
(o) Carbon black plants (furnace process);
(p) Primary lead smelters;
(q) Fuel conversion plants;
(r) Sintering plants;
(s) Secondary metal production plants;
(t) Chemical process plants
(u) Fossil-fuel boilers (or combination thereof) totaling more than 250 million British thermal units per hour heat input;

(v) Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels;
(w) Taconite ore processing plants;
(x) Glass fiber processing plants;
(y) Charcoal production plants;
(z) Fossil fuel-fired steam electric plants of more that 250 million British thermal units per hour heat input, and
(aa) Any other stationary source category which, as of August 7, 1980, is being regulated under section 111 or 112 of the Act.

E(ii) – Proposed New Construction at an Existing Source or Modification of an Existing Source

Pollutant	Current Actual Emissions (tpy)	Current Allowable Emissions (tpy)	Post-Change Potential Emissions (tpy)	Post-Change Allowable Emissions (tpy)
PM	6.16	21.33	46.74	27.51
PM_{10}	3.29	16.11	27.41	15.04
$PM_{2.5}$	2.45	14.74	22.53	11.75
SO_2	0.02	0.11	0.20	0.12
NO_x	24.41	147.62	64.69	34.01
CO	8.37	52.43	96.13	54.93
VOC	1.01	6.31	7.08	3.95
Pb	NA	NA	NA	NA
Fluorides	NA	NA	NA	NA
H_2SO_4	NA	NA	NA	NA
H_2S	NA	NA	NA	NA
TRS	NA	NA	NA	NA
RSC	NA	NA	NA	NA

Current Actual emissions assume CW-3 operated 1,308 hours and CW-6 operated 1,527 hours per year in 2019. Current Allowable emissions for CW-3 and CW-6 in 2019 are calculated using 8,760 hours per year.

Post-Change Potential Emissions calculated using 8,760 hours per year for all engines.

Post-Change Allowable Emissions assume primary engines operate 4,524 hours per year (87 hours/week) and mine dewatering engine operates 8,760 hours per year.

PM - Particulate Matter
PM_{10} - Particulate Matter less than 10 microns in size
$PM_{2.5}$ - Particulate Matter less than 2.5 microns in size
SO_2 – Sulfur Dioxide
NOx - Nitrogen Oxides
CO - Carbon Monoxide
VOC - Volatile Organic Compound
Pb - Lead and lead compounds
Fluorides - Gaseous and particulates
H_2SO_4 - Sulfuric Acid Mist
H_2S - Hydrogen Sulfide
TRS - Total Reduced Sulfur
RSC - Reduced Sulfur Compounds

[Disclaimers] The public reporting and recordkeeping burden for this collection of information is estimated to average 20 hours per response, unless a modeling analysis is required. If a modeling analysis is required, the public reporting and recordkeeping burden for this collection of information is estimated to average 60 hours per

response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

Appendix A

UAC R307-107

R307. Environmental Quality, Air Quality.
R307-107. General Requirements: Unavoidable Breakdown.
R307-107-1. Application.

R307-107 applies to all regulated pollutants including those for which there are National Ambient Air Quality Standards. Except as otherwise provided in R307-107, emissions resulting from an unavoidable breakdown will not be deemed a violation of these regulations. If excess emissions are predictable, they must be authorized under the variance procedure in R307-102-4. Breakdowns that are caused entirely or in part by poor maintenance, careless operation, or any other preventable upset condition or preventable equipment breakdown shall not be considered unavoidable breakdown.

R307-107-2. Reporting.

A breakdown for any period longer than 2 hours must be reported to the executive secretary within 3 hours of the beginning of the breakdown if reasonable, but in no case longer than 18 hours after the beginning of the breakdown. During times other than normal office hours, breakdowns for any period longer than 2 hours shall be initially reported to the Environmental Health Emergency Response Coordinator, Telephone (801) 536-4123. Within 7 calendar days of the beginning of any breakdown of longer than 2 hours, a written report shall be submitted to the executive secretary which shall include the cause and nature of the event, estimated quantity of pollutant (total and excess), time of emissions and steps taken to control the emissions and to prevent recurrence. The submittal of such information shall be used by the executive secretary in determining whether a violation has occurred and/or the need of further enforcement action.

R307-107-3. Penalties.

Failure to comply with the reporting procedures of R307-107-2 will constitute a violation of these regulations.

R307-107-4. Procedures.

The owner or operator of an installation suffering an unavoidable breakdown shall assure that emission limitations and visible emission limitations are exceeded for only as short a period of time as reasonable. The owner or operator shall take all reasonable measures which may include but are not limited to the immediate curtailment of production, operations, or activities at all installations of the source if necessary to limit the total aggregate emissions from the source to no greater than the aggregate allowable emissions averaged over the periods provided in the source's approval orders or R307. In the event that production, operations or activities cannot be curtailed so as to so limit the total aggregate emissions without jeopardizing equipment or safety or measures taken would result in even greater excess emissions, the owner or operator of the source shall use the most rapid, reasonable procedure to reduce emissions. The owner or operator of any installation subject to a SIP emission limitation pursuant to these rules shall be deemed to have complied with the provisions of R307-107 if the emission limitation has not been exceeded.

R307-107-5. Violation.

Failure to comply with curtailment actions required by R307-107-4 will constitute a violation of R307-107.

R307-107-6. Emissions Standards.

Other provisions of R307 may require more stringent controls than listed herein, in which case those requirements must be met.

KEY: air pollution, breakdown*, excess emissions*
1998 **19-2-104**

Attachment B.1 – Utah Approval Order for Addition of Underground Gilsonite Mining Operation Approval Number DAQE-848-99

State of Utah

DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY

Michael O. Leavitt
Governor
Dianne R. Nielson, Ph.D.
Executive Director
Ursula Kramer
Director

150 North 1950 West
P.O. Box 144820
Salt Lake City, Utah 84114-4820
(801) 536-4000 Voice
(801) 536-4099 Fax
(801) 536-4414 T.D.D.
Web: www.deq.state.ut.us

DAQE-848-99

October 27, 1999

James M. Lekas, President
Lexco Incorporated
582 North Vernal Avenue
P.O. Box 1198
Vernal, UT 84078

Dear Mr. Lekas:

Re: Approval Order for Addition of Underground Gilsonite Mining Operation
Uintah County, CDS-B; ATT

The attached document is an Approval Order for the above-referenced project.

Future correspondence on this Approval Order should include the engineer's name as well as the DAQE number as shown on the upper right-hand corner of this letter. Please direct any technical questions you may have on this project to Mr. Jon Black. He may be reached at (801) 536-4047.

Sincerely,

Ursula Kramer

Ursula Kramer, Executive Secretary
Utah Air Quality Board

UK:JB:re

cc: Uintah Basin District Health Department

STATE OF UTAH

Department of Environmental Quality

Division of Air Quality

APPROVAL ORDER FOR ADDITION OF UNDERGROUND GILSONITE MINE

Prepared By: Jon Black, Engineer
(801) 536-4047

APPROVAL NUMBER

DAQE-848-99

Date: October 27, 1999

Source Contact

Lexco Incorporated
James M. Lekas
(435) 545-2477

Ursula Kramer
Executive Secretary
Utah Air Quality Board

Abstract

Lexco Inc., has proposed a modification to their existing Approval Order (AO) DAQE-135-99, dated February 24, 1999, for addition of an underground gilsonite mine. The mine is located ten miles southeast off of Highway 88 from Ouray, Utah, Uintah County. Uintah County is an attainment area for all pollutants. The proposed modification would generate emissions from the installation of a diesel generator and blower exhaust from a pneumatic conveying system. The potential increase in emissions from this project will be as follows: 0.25 tons per year (tpy) of PM_{10}, 4.41 tpy of SO_2, 26.3 tpy of NO_x, 5.75 tpy of CO, and 0.17 tpy of VOC. The emissions generated from the haul road will be controlled by wet suppression. This is not a major source for any pollutant. New Source Performance Standards (NSPS) Subpart OOO (Standards of Performance for Nonmetallic Mineral Processing Plants) does not apply to the equipment listed in this AO, because no material processing equipment will be located on the surface. Therefore, Title V will not apply to this source. Because this source meets the requirements of R307-401-4 UA, a 10-day public comment period was required.

The above-referenced project has been evaluated and found to be consistent with the requirements of the Utah Administrative Code Rule 307 (UAC R307) and the Utah Air Conservation Act. A 10-day public comment period was held and all comments received were evaluated. The conditions of this AO reflect any changes to the proposed conditions which resulted from the evaluation of the comments received. This air quality AO authorizes the project with the following conditions and failure to comply with any of the conditions may constitute a violation of this order:

General Conditions:

1. This Approval Order (AO) applies to the following company:

   Site Office
   Lexco, Inc.
   582 North Vernal Avenue
   Vernal, Utah 84078
   Phone Number: (435) 545-2477
   Fax Number: (435) 545-2476

   The equipment listed below in this AO shall be operated at the following location:

   PLANT LOCATIONS:

   Ten miles southeast off of Highway 88 from Ouray, Utah, Uintah County
   (From Hwy 40 turn South on Hwy 88; travel approximately 20 miles to end of pavement; continue on gravel road (Seep Ridge road) 2 ½ miles to intersection with Bitter Creek road; stay left on Bitter Creek road. Proceed approximately 7 ½ miles; turn right on mine access road, the mine is approximately 3 miles).

   Cotton Wood #1 Mine
   Universal Transverse Mercator (UTM) Coordinate System:
   4,417.67 kilometers Northing, 626.53 kilometers Easting, Zone 12

Cotton Wood #2 Mine
Universal Transverse Mercator (UTM) Coordinate System:
4,417.76 kilometers Northing, 626.17 kilometers Easting, Zone 12

2. Definitions of terms, abbreviations, and references used in this AO conform to those used in the Utah Administrative Code Rule 307 (UAC R307), and Series 40 of the Code of Federal Regulations (40 CFR). These definitions take precedence, unless specifically defined otherwise herein.

3. Lexco Inc., shall install and operate the underground mining operation in accordance with the terms and conditions of this AO, which was written pursuant to Lexco's Notice of Intent submitted to the Division of Air Quality (DAQ) on October 25, 1996 and additional information submitted to the DAQ on December 13, 1996, March 19, 1998 and April 27, 1998.

4. This AO shall replace the AO dated February 24, 1999 (DAQE-135-99).

5. The approved installations shall consist of the following equipment or equivalent*:

Cottonwood #1 Mine
A. One (1) 670 HP or less diesel powered electric generator
B. One (1) 60 HP gasoline powered engine
C. Two (2) blower exhausts from the pneumatic conveying system with baghouses

Cottonwood #2 Mine
D. One (1) 670 HP or less diesel powered electric generator
E. One (1) 60 HP gasoline powered engine
F. Two (2) blower exhausts from the pneumatic conveying system with baghouses

* - Equivalency shall be determined by the executive secretary or their representative.

Limitations and Tests Procedures

6. Visible emissions from the following emission points shall not exceed the following values:

A. Baghouse collection system - 5% opacity
B. All diesel engines - 20% opacity
C. All other points - 20% opacity

Opacity observations of emissions from stationary sources shall be conducted according to 40 CFR 60, Appendix A, Method 9.

7. The following production limits shall not be exceeded without prior approval in accordance with R307-401, UAC:

A. 40,000 tons of gilsonite per rolling 12-month period for the combination of both Cottonwood #1 and Cottonwood #2 Mines

B. 4,000 hours per rolling 12-month period of diesel generator operation for the combination of both Cottonwood #1 and Cottonwood #2 Mines

Compliance with the annual limitations shall be determined on a rolling 12-month total. The owner/operator shall calculate a new 12-month total by the twentieth day of each month using data from the previous 12-months. Records of production shall be kept for all periods when the plant is in operation. Records of production, including rolling 12-month totals, shall be made available to the executive secretary or executive secretary's representative upon request and the records shall include the two-year period prior to the date of the request. Production shall be determined by belt scale records or vendor receipts. The records of production and generator operating hours shall be kept on a daily basis. Hours of operation shall be determined by supervisor monitoring and maintaining of an operations log.

8. All unpaved roads and other unpaved operational areas that are used by mobile equipment shall be water sprayed and/or chemically treated to control fugitive dust, if mobile equipment used causes fugitive dust emission to exceed 20% opacity. The application of water or chemical treatment shall be used when necessary. Treatment shall be of sufficient frequency and quantity to maintain the surface material in a damp/moist condition or unless it is below freezing. The opacity shall not exceed 20% during all times the areas are in use. If chemical treatment is to be used, the plan must be approved by the executive secretary. Records of water and/or chemical treatment shall be kept for all periods when the plant is in operation. The records shall include the following items:

A. Date
B. Number of treatments made, dilution ratio, and quantity
C. Rainfall received, if any, and approximate amount
D. Time of day treatments were made

Records of treatment shall be made available to the executive secretary or executive secretary's representative upon request and the records shall include the two-year period prior to the date of the request.

9. The haul road limitations shall be:

A. 1/4 miles in length
B. 20 miles per hour

These limitations shall not be exceeded without prior approval in accordance with R307-401, UAC. The haul road speed shall be posted, at a minimum, on site at the beginning of the haul road so that it is clearly visible from the haul road.

10. Visible fugitive dust emissions from haul-road traffic and mobile equipment in operational areas shall not exceed 20% opacity. Visible emissions determinations for traffic sources shall use procedures similar to Method 9. The normal requirement for observations to be made at 15-second intervals over a six-minute period, however, shall not apply. Six points, distributed along the length of the haul road or in the operational area, shall be chosen by the executive secretary or the executive secretary's representative. An opacity reading shall be made at each point when a vehicle passes the selected points. Opacity readings shall be made ½ vehicle length or greater behind the vehicle and at approximately ½ the height of the vehicle or greater. The accumulated six readings shall be averaged for the compliance value.

Fuels

11. The owner/operator shall use only #1 or #2 fuel oil as a fuel. If any other fuel is to be used, an AO shall be required in accordance with R307-401, UAC.

12. The sulfur content of any fuel oil or diesel burned shall not exceed 0.5 percent by weight. Sulfur content shall be decided by ASTM Method D2880-71 or D-4294-89, or approved equivalent. The sulfur content shall be tested if directed by the executive secretary. The percent by weight of the sulfur contained in the fuel can be obtained from the fuel oil certifications. Certification of fuels shall be either by Lexco's own testing or test reports from the fuel marketer. Records of fuel supplier's test report on sulfur content shall be available on-site for each load delivered.

Records & Miscellaneous

13. At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any equipment approved under this Approval Order including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the executive secretary which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source. All maintenance performed on equipment authorized by this AO shall be recorded, and the records shall be maintained for a period of two years. Maintenance records shall be made available to the executive secretary or executive secretary's representative upon request, and the records shall include the two-year period prior to the date of the request.

14. The owner/operator shall comply with R307-107, UAC. This rule addresses unavoidable breakdown reporting requirements. The full text of UAC R307-107 General Requirements, Unavoidable Breakdown, is included as Appendix A. However, to be in compliance, this facility must operate in accordance with the most current version of the UAC, R307-107.

All records referenced in this AO which are required to be kept by the owner/operator, shall be made available to the executive secretary or executive secretary's representative upon request, and the records shall include the two-year period prior to the date of the request. All records shall be kept for a period of two years. A summary of those records that are required as part of this Approval Order is included herein. This summary shall not be considered an additional requirement, but is included for informational purposes only. The condition that requires that these records be kept as part of the compliance with this AO is listed following the individual record. Records to be kept at this source shall include the following:

Production	Condition number 7
Hours of operation	Condition number 7
Fugitive emission control	Condition number 8
Maintenance records	Condition number 13
Upset, breakdown episodes	Condition number 14

The list above may not be a complete list of all records that are required to be kept by Lexco Inc. For a complete list of required records check all AO conditions, and all applicable Federal regulations such as NSPS, NESHAPS, and MACT standards that apply to this source.

Any future modifications to the equipment approved by this order must also be approved in accordance with R307-401, UAC.

The executive secretary shall be notified in writing if the company is sold or changes its name. The notification shall be submitted within 30 days of such action.

Under R307-150-1, UAC, the executive secretary may require a source to submit an emission inventory for any full or partial year on reasonable notice.

This AO in no way releases the owner or operator from any liability for compliance with all other applicable federal, state, and local regulations including UAC R307.

A copy of the rules, regulations and/or attachments addressed in this AO may be obtained by contacting the Division of Air Quality. The Utah Administrative Code R307 rules used by DAQ, the Notice of Intent (NOI) guide, and other air quality documents and forms may also be obtained on the Internet at the following web site: http://www.eq.state.ut.us/eqair/aq_home.htm

Annual emissions for this source (the entire plant) are currently calculated at the following values:

	Pollutant	Tons/yr
A.	PM_{10}	1.79
B.	SO_2	5.41
C.	NO_x	32.50
D.	CO	7.09
E.	VOC	1.17

The annual emission estimations above are for the purpose of determining the applicability of Prevention of Significant Deterioration, nonattainment area, maintenance area, and Title V source requirements of the UAC R307. They are not to be used for purposes of determining compliance.

Approved By:

Ursula Kramer

Ursula Kramer, Executive Secretary
Utah Air Quality Board

American Gilsonite Company
Minor New Source Application for New Construction
D: Attachments

Attachment D.1: No synthetic minor limits are being requested.

Attachment D.2: Narrative Description

American Gilsonite Company (AGC) operates and mines Gilsonite® uintaite (Gilsonite) from the Cottonwood Mine in Uintah County, Utah. The mine is located on the Uintah and Ouray Indian Reservation near Bonanza, Utah. The world's largest deposits of Gilsonite are located in this area, making it the most economical to mine with the largest quantities of material. AGC has been mining Gilsonite in the area since 1904 but did not purchase the Cottonwood Mine until 2009. Gilsonite is used as an additive for cementing and drilling fluids in the oil and gas industry and improves performance and quality in asphalt, inks, paints, stains, construction materials, and foundry castings.

The Gilsonite is mined by underground methods in two phases: (1) development of a main shaft and (2) driving drifts on strike along the Gilsonite vein on either side of the main shaft.

Shafts are developed by a combination of drilling the shaft with a large diameter (Teton) drill and hand sinking. The Teton drill uses a large 7-foot diameter bit to drill to a depth of generally 200 to 500 feet where the Gilsonite vein is wide enough for sinking by hand. The shaft is extended to total depth by manually mining a 26-foot cut along the vein. The shaft-support equipment is installed in conjunction with hand sinking. Each shaft consists of four compartments: two outside compartments for pipes for compressed air and the air lift; one ladderway compartment for an escapeway; and one central compartment with a mine skip for transporting miners.

Once the shaft is sunk to the proposed bottom of the mine, a drift is extended on either side of the shaft about 500 to 700 feet in the vein to provide escapeways for the initial phase of mining. An escapeway shaft is then drilled and manually sunk from the ground surface down to the escapeway. Shaft sinking resumes after Gilsonite mining stops in the intermediate level.

Gilsonite slope mining begins by developing two drifts, each drift being 200 vertical feet apart from the main shaft to the escapeway shaft. Development occurs on either side of the main shaft. When these drifts are completed, a 45° slope is driven downward from the floor of the upper drift. The slope is extended along the upper drift until the bottom of the slope intersects the lower drift. Mining then progresses from the bottom of the slope to the top of the slope. A pneumatic chipping hammer is used to cut the Gilsonite, which then slides down the 45°slope. The benches are mined sequentially until the escape shaft is reached. The remaining triangle of ore is mined from the top down to the bottom of the slope.

The Gilsonite ore is mined with pneumatic hammers equipped with a 12-inch long hardened steel moil. Compressed air for the chipping hammers comes from a 150-horsepower air compressor on the surface via a 3-inch-diameter steel pipe down the shaft to the working face (Jackson, 1985) (Boden & Tripp 2012). Manual labor is used underground to reduce contamination of the ore by the surrounding rock. Miners use air-driven chipping hammers to break the Gilsonite, working upward on a 45° angle. Broken ore falls by gravity to the bottom of a slope where it is pulled by vacuum into a vent pipe for transport to the surface.

Roof support consists of mine timbers placed on 5-foot. centers. Mine timbers are either set in hitches and wedged into place or set on cap blocks and wedged into place. The figure below (Figure 10 from Tripp and White) illustrates the Gilsonite underground mining methods. Note there is no overhead electrical power available at the Cottonwood Mine.

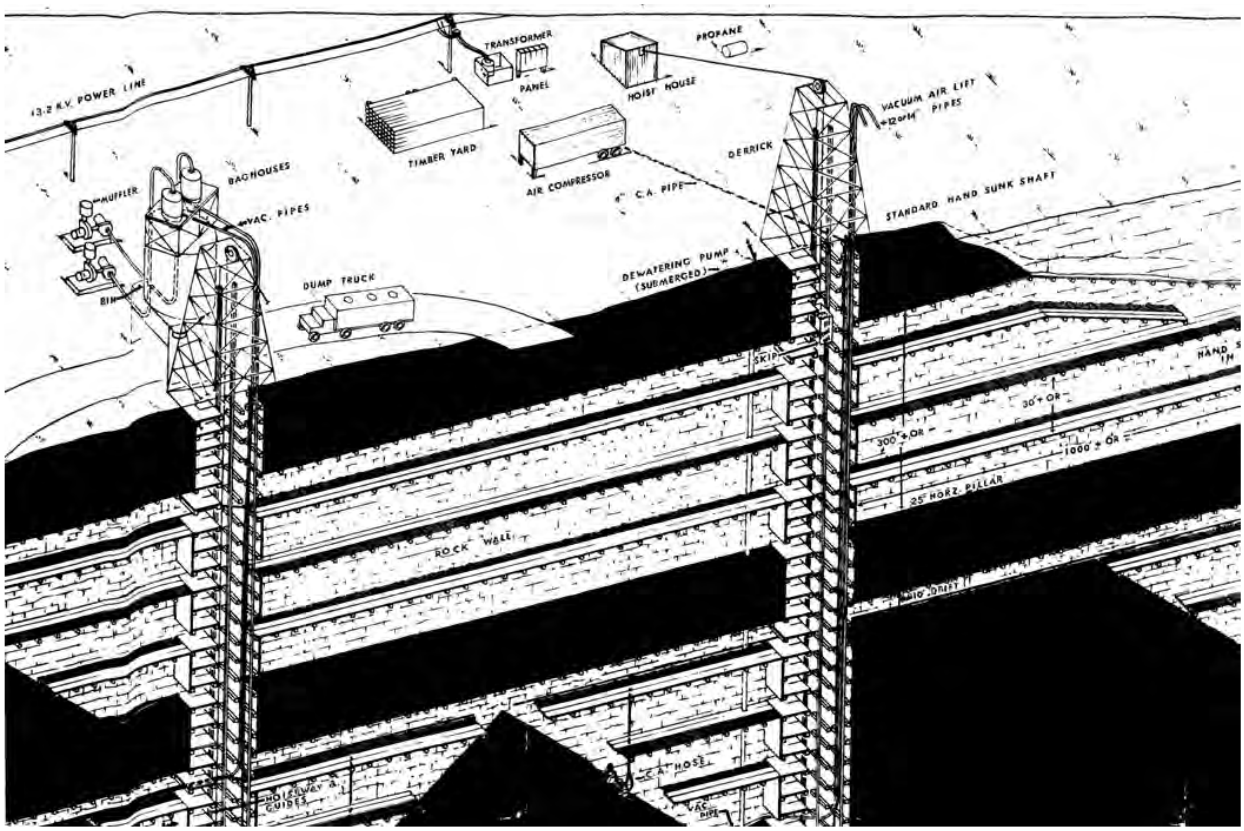
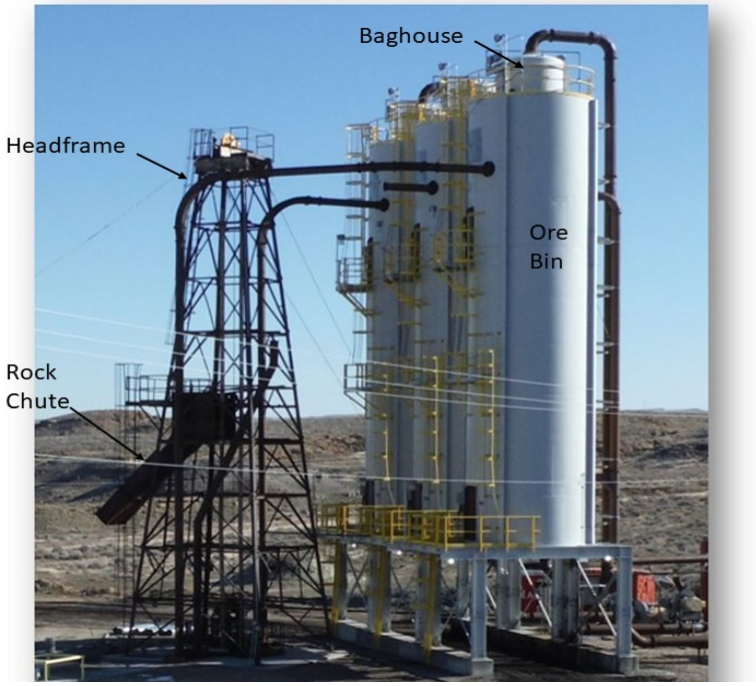


Figure 10. *Gilsonite underground mining methods (from Tripp and White, 2006, courtesy of American Gilsonite Company).*
Source: Boden & Tripp 2012[1]

[1] Taylor Boden and Bryce T. Tripp, 2012 (Boden & Tripp 2012). Gilsonite Veins of the Uinta Basin, Utah Special Study 141 Utah Geological Survey a Division of Utah Department of Natural Resources.

As active mine work progresses below the water table, the mine is dewatered by 50-horsepower submersible pumps.

AGC conveys the mined ore from the shaft, drift, or slope by means of an air lift system. The air lift also has three additional functions: (1) ventilates the mine; (2) breaks the ore into smaller pieces as it is transported; and (3) removes the small quantity of water that permeates the mine. The Cottonwood Mine airlift system consists of a single Roots positive displacement blower, a Mac Filter baghouse (baghouse), ore bin with truck loading sock and piping. Each mine or shaft has two air lift systems. Each blower is driven by a 100-horsepower electric motor that develops approximately 7,700 cubic feet per minute of air volume to pneumatically convey the Gilsonite to the surface. Gilsonite ore is then pulled into a baghouse by the vacuum system through a filter fabric sock before being dropped into the ore bin through a rotary airlock. Photograph 1 shows a picture of the bins and baghouse.



Photograph 1: Ore bins with baghouses adjacent to headframe

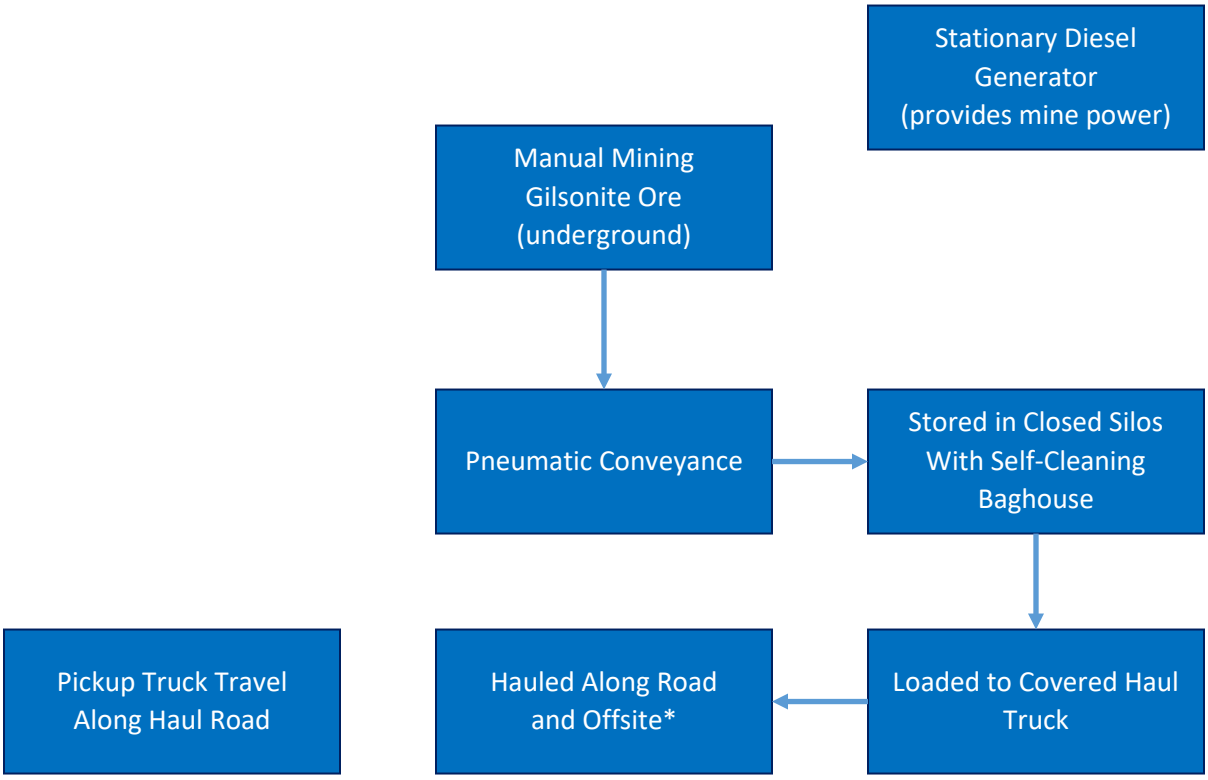
Covered trucks use a loading sock that extends into the truck (See Photograph 2).

Photograph 2: Covered haul truck being loaded with Gilsonite at CW-3

The Gilsonite ore is hauled from the Cottonwood Mine to the Bonanza operations area in a covered truck. Based on the proposed production and operating schedules in the Cottonwood mine plan, eight truck round trips per day are required to haul the projected tonnage. Seven vehicle round trips are projected per day for the mining crews and surface personnel for three mines operating.

The site roads are constructed of native materials and gravel. The length of the site road from W Sand Washington Road to the Cottonwood mines ranges from 0.37 mile for CW-3 to 0.72 mile for CW-7 (See **Figure D.2.1**). Vehicular dust on the unpaved road will be minimized by maintaining 5 mph speed limits on all on lease access roads. Roads will be watered as necessary to control dust.

No electric transmission lines are available in the area, so all power comes from diesel engines to operate any equipment. Currently two diesel engines, CW-6 (non-tiered) and CW-3 (Tier 2), provide mine power. **Figure D.2.1** shows the process flow diagram described in this section. **Figure D.2.2** shows an isometric view of the mine workings and surface facilities to illustrate the process flow diagram.



*Approximate driving distance from shaft to W. Sand Washington Road

CW-3: 0.37 mile CW-4: 0.71 mile CW-5: 1.07 miles CW-6: 0.57 mile CW-7: 0.72 mile CW-8: 1.47 miles

Figure D.2.1: Process Flow Diagram

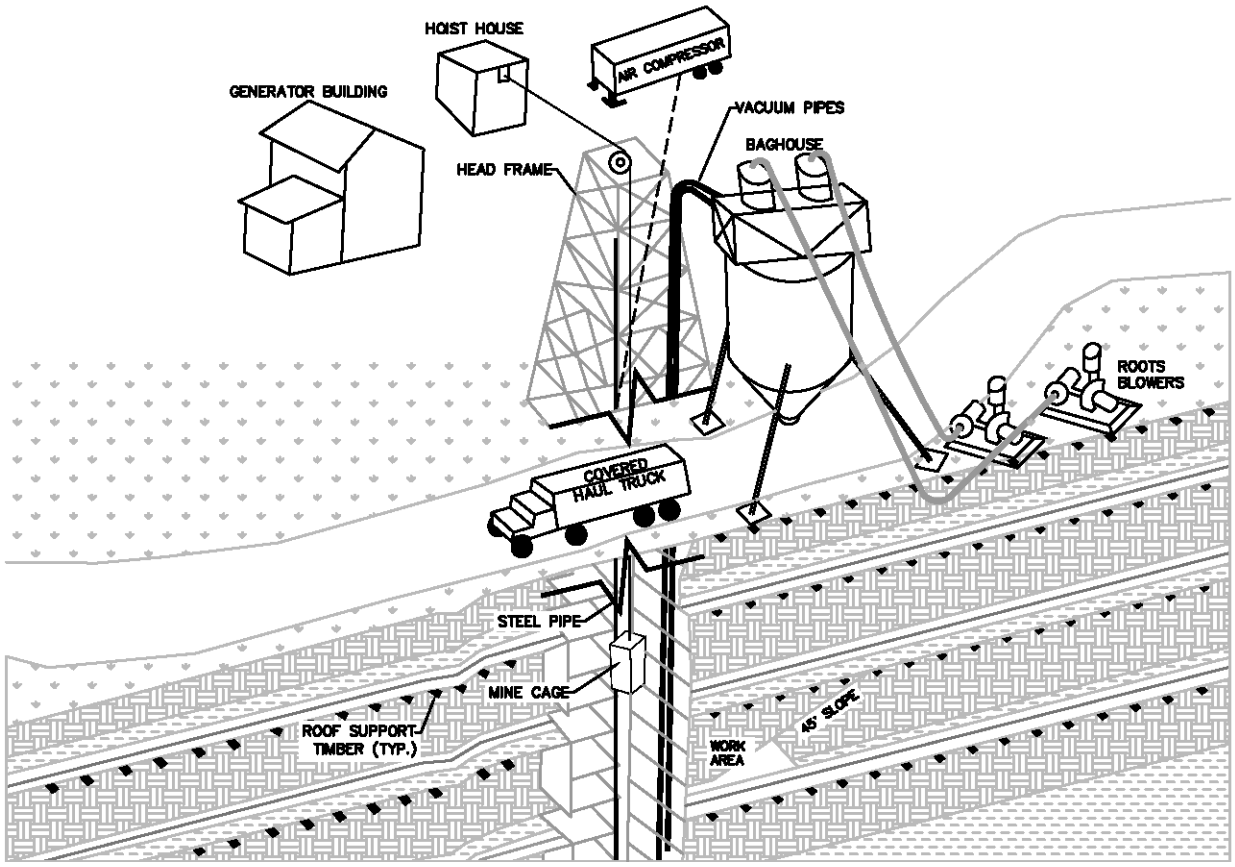


Figure D.2.2: Isometric View of Gilsonite Workings and Surface Facilities

Cottonwood Mine Plan

A 5-year mining plan was developed for AGC's Utah operations based on market demand and customer specifications. Mining from Gilsonite veins is scheduled based on each Gilsonite vein's properties as well as compliance with customer demands and may vary from year to year. Depending on market demand and ore properties, mine life, (i.e. shaft with primary engine) varies from 5 to 10 years. Mine sites may become inactive for periods of a few months up to three years until that grade of Gilsonite is required by customers. During these temporary idle periods, mine infrastructure remains on site.

Presently, CW-3 and CW-6 are currently used to generate power at the Cottonwood Mines. The annual operating hours and tons produced from 2015 to 2019 are shown in Table D.2.1.

Table D.2.1: Cottonwood Mine Annual Operating Hours and Tons Produced 2015-2019

	2015		2016		2017		2018		2019	
Mine	Hours	Tons	Hours	Tons	Hours	Tons	Hours	Tons	Hours	Tons
CW-3	545	89	545	782	0	0	0	0	1,306	1,256
CW-6	0	0	0	0	0	0	580	84	1,527	1,009

The projected annual production of Gilsonite for 2020 through 2025 ranges from 5,500 to 20,000 tons depending on market demand. **Table D.2.2** shows the proposed production schedule.

Table D.2.2: Proposed Production Schedule

Year	Annual Operating Days*	Production Hours per Day**	Tons per Day	Total Annual Tons***	Number of Mines	Annual Tons per Mine	Maximum Hourly Tons per Mine
2020	208	20	26.44	5,500	2	2,750	0.66
2021	208	20	76.92	16,000	3	5,333	1.28
2022	208	20	96.15	20,000	3	6,667	1.60
2023	208	20	96.15	20,000	3	6,667	1.60
2024	208	20	96.15	20,000	3	6,667	1.60
2025	208	20	96.15	20,000	3	6,667	1.60

*Based on 4 days per week, 52 weeks per year for mining

**Based on 2-10-hour shifts per day

***Total annual tonnage based on Cottonwood Mine plan

Table D.2.3 shows the proposed operating schedule.

Table D.2.3: Proposed Operating Schedule

Unit No.	Rating	Hours per Day	Days per Week*	Weeks per Year	Total Annual Hours	Comments
CW-3	Tier 2	20	4.35	52	4,524	Existing
CW-6	Tier 4	20	4.35	52	4,524	New engine that replaces existing non-tier engine
CW-7	Tier 4	20	4.35	52	4,524	New engine for new mine
TBD	Tier 4	24	7	52	8,760	Mine dewatering engine

*Based on 80 hours per week for mining and 7 hours per week for mine maintenance

AGC anticipates commencing shaft sinking for CW-7 in 2021. Three primary engines will be required when CW-7 starts shaft sinking. CW-7 is located on the southeastern end of the lease boundary. As mining is completed at CW-6, shaft sinking will begin at CW-8. CW-8 is located approximately 4,800 feet northwest of the CW-1 shaft (See **Figure D.2.3**). From CW-8, mining then progresses southeast toward CW-5 to CW-4 and CW-2 depending on mining conditions. Mining will then progress from CW-8 to the northwest.

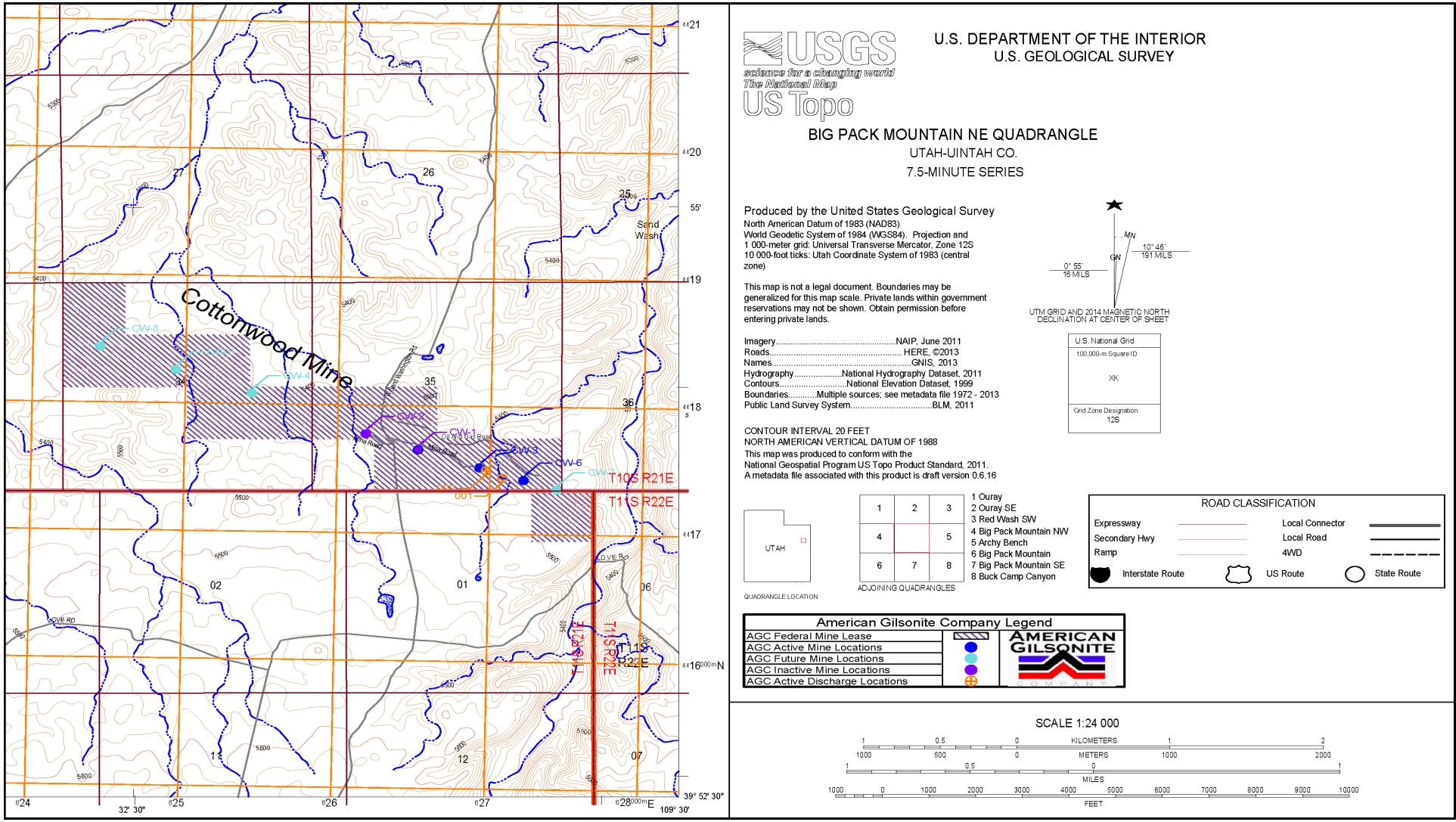


Figure D.2.3: Cottonwood Mine Site and Lease Area

Attachment D.3: Emissions Units and Controls

The emission sources from the mine are combustion emissions from the mine power generators, particulate emissions from handling of the Gilsonite, and particulate emissions from the vehicle traffic on mine roads. AGC has removed the CW-1 (non-tiered) engine from the Cottonwood Mine site and has ordered a new Tier 4 engine to replace CW-6 (a non-tiered) engine in accordance with the compliance plan. The anticipated delivery date is April 2020. A second Tier 4 engine will be ordered for delivery in 2021 to be used for CW-7. The order date for the 400 kW diesel generator for mine dewatering is also anticipated to be 2021.

AGC is proposing to utilize three primary engines to provide mine power for the Gilsonite mining operations. A fourth engine will provide electric power to mine dewatering pump(s). Table D.3.1 defines the proposed generators to be installed at AGC.

Table D.3.1: Proposed Emissions Units

Unit ID	Engine Make	Engine Model	Serial Number	Rated Horsepower	Date of Manufacture	Emissions Certification
CW-3	Cummins	QSK23-G7 NR2	00316414	1,220	04/2007	Tier 2
CW-6*	Cummins	TBD	TBD	1,080	TBD	Tier 4
CW-7	Cummins	TBD	TBD	1,080	TBD	Tier 4
Mine Dewatering	Cummins	TBD	TBD	536	TBD	Tier 4

* The new Tier 4 engine replaces the existing CW-6 non-tier engine.

Because all engines are subject to 40 CFR 60 Subpart IIII - New Source Performance Standards for Stationary Compression Ignition Internal Combustion Engines, all four engines will consume ultra-low sulfur diesel (ULSD). Table D.3.2 lists the fuel usage for each type of engine.

Table D.3.2: Fuel Usage by Engine

Engine Type	Gal/hr. (max)	Gal/day	Gal/yr
CW-3/Tier 2	55.2	1,104	249,725
Prime/Tier 4	63.9	1,278	289,084
Mine Dewatering/Tier 4	32.4	778	283,824

The Tier 4 engines will each be equipped with both a selective catalytic reduction (SCR) and diesel particular filter (DPF). CW-3 (Tier 2) has adjustments to reduce NO_x emissions and uses ULSD fuel (see Attachment D.4.1 Critical Emission Estimates for Cottonwood Mine Engine CW-3). See **Attachments D.3.1and D.3.2** for the manufacturer's engine specifications for the primary Tier 4 and mine dewatering engines respectively.

The fugitive sources have the following controls:

1. The haul roads will be sprayed with water, as necessary.
2. An enclosed air lift system conveys the Gilsonite ore from the underground working faces through a pipe into a baghouse on top of the storage silo. Gilsonite transfers from the

baghouse through a rotary airlock into the storage silo. Covered trucks are loaded with Gilsonite through a loading sock that drops into the truck.

3. When properly used and maintained, the baghouse fabric socks have a 99.99% or better mass efficiency rating on incoming dust-laden gas stream (based on 2 micron or larger dust particles). Emissions from the needled felt polyester filter fabric will not exceed an average of 0.02 grain per dry standard cubic foot of air exhausted from the fans based on manufacturer's data information from 1999 (See **Attachment D.3.3**).
4. Per Mine Safety Health Administration regulations, AGC visually inspects the baghouse each shift for any signs of dust emissions. If dust emissions are observed, the baghouse is taken out of service to clean and or replace the filter socks.
5. All vehicles and the diesel generators will have their emission controls properly maintained and documented by maintenance work orders.

Attachment D.4: Criteria Pollutant Emissions

The emissions factors and calculations are included in Attachment D.4.1.

Attachment D.5: Air Quality Review

The Cottonwood Mine is located approximately 26 miles southwest of Bonanza, Utah, and 38 miles south of Vernal, Utah. The mine is located on the Uintah and Ouray Indian Reservation. The Uinta Mountains run east to west and are north of the mine, while the Book Cliffs are south-southwest of the mine and the Wasatch Mountains are west of the mine. The mine is east-southeast of the Green River, which is approximately 10 miles away. The terrain forms the Uintah Basin, where air will stagnate and produce weather inversions particularly in the winter months.

The area is a semi-arid to arid climate with relatively little precipitation or vegetation, significant sunshine, and low relative humidity. Vernal's highest average temperature is 90 degrees Fahrenheit (°F) in July, while the lowest average temperature is 5 °F in January.[2] October typically has the highest average precipitation (1.06 inches) and February usually has the lowest average precipitation (0.48 inch). Vernal has an annual average total precipitation of 8.31 inches and annual average snow fall of 15.3 inches. The terrain is filled with scrub with only a minimal change in elevation. Each shaft site has an elevation of between 5,400 to 5,500 feet.

The Uintah Basin is pocketed with oil and gas wells. Other than activities associated with those wells, the population and development in the area is sparse. The mine land is leased from the Bureau of Land Management (BLM). The ambient air boundaries from each shaft vary between 183 to 632 feet.

The ambient air concentrations for ozone are above the 8-hour ozone 2015 standard [0.070 part per million (ppm)] National Ambient Air Quality Standards (NAAQS); therefore, the area is

[2] The Vernal, Utah average weather conditions are from the Western Regional Climate Center (wrcc.dri.edu) for the period of 1928 through 2005.

considered nonattainment for ozone, with a marginal nonattainment classification. The area is in attainment for all other NAAQS.

The stack parameters associated with the engines are shown in **Table D.5.1**:

Table D.5.1 Engine Stack Parameters

Unit	HP (derated)	Tier Standard	Flow Rate (SCFM)	Exhaust Temp (°F)	Stack Height [1](ft)	Stack Diameter[1] (inches)
CW-3	1,222 (1,222)	Tier 2	2,201	862	7.5	6
CW-6[2]	1,207 (1,080)	Tier 4	2,801	852	8	6
CW-7	1,207 (1,080)	Tier 4	2,801	852	8	6
Mine Dewatering	536 (433)	Tier 4	3.945	909	7	4

1 Values are approximate and can be defined upon source selection.
2 The new tier 4 engine replaces the existing non-tier engine in 2020.

The emissions for the Cottonwood Mine are calculated for: (1) current existing and allowable emissions for the existing diesel engines (CW-3 and CW-6); and (2) the post change potential and allowable emissions for CW-3 (Tier 2), CW-6 (Tier 4), CW-7 (Tier 4) and a mine dewatering (Tier 4) diesel generators. The current existing emissions were calculated using the operating hours for 2019 shown in **Table D.4.2.1**. The post change proposed operating hours for each engine are shown in **Table D.2.2**. The actual allowable and post change potential emissions were calculated using 8,760 hours per year.

The current actual emissions were calculated using the annual tons produced for 2019 as shown in **Table D.4.1**. The annual Gilsonite production used for the post change allowable emissions calculations is 20,000 tons. The annual production tons for the current allowable and post change potential emissions were calculated by multiplying the existing and or proposed annual production tons by the ratio of 8,760 divided by the operating hours. As an example, the annual production tons for the post change potential emissions was calculated as follows.

- Post change annual production = 20,000
- Post change proposed operating hours = 4,524
- Post change potential operating hours = 8,760

Post change annual production tons = 20,000 x 8,760/4,524 = 38,726.79 or 38,727.

Table D.5.2 below shows the current actual emissions, while **Table D.5.3** shows the current allowable emissions for CW-3 and CW-6. The post change potential and allowable emissions are shown in **Tables D.5.4** and **D.5.5** respectively.

Table D.5.2: Current Actual Emissions for Existing Engines

Current Actual Emissions for Existing Engines, tons per year							
Source	**NO_X**	**CO**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
CW-3 (Tier 2)	7.92	4.59	0.26	0.26	0.26	0.01	0.53
CW-6 (Non-Tier Engine)	16.49	3.78	0.34	0.28	0.28	0.01	0.48
Material Handling	NA	NA	1.89	1.82	1.82	NA	NA
Haul Roads	NA	NA	3.68	0.94	0.09	NA	NA
Total	***24.41***	***8.37***	***6.16***	***3.29***	***2.45***	***0.02***	***1.01***

Table D.5.3: Current Allowable Emissions for Existing Engines

Current Allowable Emissions for Existing Engines, tons per year							
Source	**NO_X**	**CO**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
CW-3 (Tier 2)	53.01	30.75	1.76	1.76	1.76	0.06	3.53
CW-6 (Non-Tier Engine)	94.61	21.68	1.94	1.59	1.59	0.05	2.78
Material Handling	NA	NA	11.66	11.24	11.24	NA	NA
Haul Roads	NA	NA	5.97	1.52	0.15	NA	NA
Total	***147.62***	***52.43***	***21.33***	***16.11***	***14.74***	***0.11***	***6.31***

Table D.5.4: Post Change Potential Emissions

Post Change Potential Emissions, tons per year							
Source	**NO_X**	**CO**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
Tier 4 - Prime Power	5.21	27.23	0.23	0.23	0.23	0.06	1.48
Tier 4 - Prime Power (CW-6)	5.21	27.23	0.23	0.23	0.23	0.06	1.48
CW-3 (Tier 2)	53.01	30.75	1.76	1.76	1.76	0.06	3.53
Tier 4 - Water Pump	1.25	10.93	0.06	0.06	0.06	0.02	0.59
Material Handling	NA	NA	23.19	19.70	19.70	NA	NA
Haul Roads	NA	NA	21.26	5.42	0.54	NA	NA
Total	***64.69***	***96.13***	***46.74***	***27.41***	***22.53***	***0.20***	***7.08***

Table D.5.5: Post Change Allowable Emissions

Post Change Allowable Emissions, tons per year							
Source	**NO_X**	**CO**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
Tier 4 - Prime Power	2.69	14.06	0.12	0.12	0.12	0.03	0.76
Tier 4 - Prime Power (CW-6)	2.69	14.06	0.12	0.12	0.12	0.03	0.76
CW-3 (Tier 2)	27.38	15.88	0.91	0.91	0.91	0.03	1.83
Tier 4 - Mine Dewatering	1.25	10.93	0.06	0.06	0.06	0.02	0.59
Material Handling	NA	NA	11.98	10.18	10.18	NA	NA
Haul Roads	NA	NA	14.32	3.65	0.37	NA	NA
Total	***34.01***	***54.93***	***27.51***	***15.04***	***11.75***	***0.12***	***3.95***

The emissions shown in **Tables D.5.4 and D.5.5** are less than the Title V major source 100 tpy threshold. **Table D.5.6** shows the net change in emissions when the post change allowable emissions are subtracted from either the current allowable or the post change potential emissions.

Table D.5.6: Change in Emissions

Change in Emissions, tons per year							
Emissions Status	**NO_X**	**CO**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
Post Change Allowable - Current Allowable	-113.61	2.50	6.18	-1.07	-2.99	0.00	-2.37
Post Change Allowable - Post Change Potential	-30.68	-41.20	-19.23	-12.37	-10.78	-0.09	-3.14

Note: Positive values are net increase in emissions. Negative values are a net reduction in emissions.

Table D.5.6 shows:

1. The changes in emissions (tpy) between the current allowable and post change allowable are 1) a net decrease in NO_x,(113.61), PM_{10} (1.07) $PM_{2.5}$,(2.99) and VOC (2.37) , 2) increases in CO (2.50) and PM (6.18) and no change in SO_2, and
2. All emissions for the post change allowable (tpy) are reduced from the post change potential emissions.

Contributing factors to the reductions in emissions include: (1) the removal of CW-1 (non-tiered diesel generator) from the Cottonwood Mine on December 11, 2019; (2) removal of the existing CW-6 (non-tiered diesel generator) in April 2020: (3) installation of the new Tier 4 diesel generator at CW-6 when the mine resumes operation in 2020; and (4) purchase of new Tier 4 engines for CW-7 and the mine dewatering pumps.

The increases in CO and PM occur from the increases in annual tons (20,000) and truck trips per day (8) for potential allowable emissions versus 14,200 annual tons and 5 truck trips per day for the current allowable emissions.

Attachment D.6: ESA (Endangered Species Act)

According to the United States Fish and Wildlife Service (USFWS), Uintah County, Utah, is within the range of 13 federally listed threatened or endangered species. The list of species is shown in **Table D.6.1**. Applicable Recovery Plans are available on the USFWS website for each species. These plans provide guidance and information on protection of each listed species and the website is included in **Table D.6.1**. American Gilsonite will abide by the Recovery Plans for each species. The USFWS Information for Planning and Consultation (IPC) was referenced to determine locations of critical habitat for each listed species.

Table D.6.1 - Federally Listed Species of Uintah County, Utah

Group	Common Name	Scientific Name	Population	Status	Recovery Plan URL
Birds	Yellow-billed Cuckoo	*Coccyzus americanus*	Western U.S. DPS	Threatened	
Birds	Mexican spotted owl	*Strix occidentalis lucida*	Wherever found	Threatened	https://ecos.fws.gov/docs/recovery_plan/MSO_Recovery_Plan_First_Revision_Dec2012.pdf
Birds	Southwestern willow flycatcher	*Empidonax traillii extimus*	Wherever found	Endangered	https://ecos.fws.gov/docs/recovery_plan/020830c_combined.pdf
Fishes	Humpback chub	*Gila cypha*	Wherever found	Endangered	https://ecos.fws.gov/docs/recovery_plan/900919c.pdf
Fishes	Colorado pikeminnow (=squawfish)	*Ptychocheilus lucius*	Wherever found, except where listed as an experimental population	Endangered	https://ecos.fws.gov/docs/recovery_plan/020828b.pdf
Fishes	Bonytail	*Gila elegans*	Wherever found	Endangered	https://ecos.fws.gov/docs/recovery_plan/060727a.pdf
Fishes	Razorback sucker	*Xyrauchen texanus*	Wherever found	Endangered	https://ecos.fws.gov/docs/recovery_plan/RazorbackSucker_2002_Plan.pdf
Flowering Plants	Shrubby reed-mustard	*Schoenocrambe suffrutescens*	Wherever found	Endangered	https://ecos.fws.gov/docs/recovery_plan/940914.pdf
Flowering Plants	Ute ladies'-tresses	*Spiranthes diluvialis*	Wherever found	Threatened	https://ecos.fws.gov/docs/recovery_plan/950921.pdf
Flowering Plants	Clay reed-mustard	*Schoenocrambe argillacea*	Wherever found	Threatened	https://ecos.fws.gov/docs/recovery_plan/940914.pdf
Flowering Plants	Pariette cactus	*Sclerocactus brevispinus*	Wherever found	Threatened	https://ecos.fws.gov/docs/recovery_plan/Pariette Cactus_Recovery Outline_Apr 2010.pdf
Flowering Plants	Uinta Basin hookless cactus	*Sclerocactus wetlandicus*	Wherever found	Threatened	https://ecos.fws.gov/docs/recovery_plan/Sclerocactus wetlandicus recovery outline_final_Apr 2010.pdf
Mammals	Black-footed ferret	*Mustela nigripes*	U.S.A. (WY and specified portions of AZ, CO, MT, SD, and UT, see 17.84(g)(9))	Experimental Population, Non-Essential	
Mammals	Canada Lynx	*Lynx canadensis*	Wherever Found in Contiguous U.S.	Threatened	https://ecos.fws.gov/docs/recovery_plan/Canada Lynx 4(f)(1) determination_final (1).pdf

Source: https://www.fws.gov/endangered/

The Yellow-billed cuckoo is a threatened species that has critical habitat greater than 13 miles away from the project area. The cuckoo typically roosts along rivers, and the nearest critical habitat is within the riparian area of the Green River. The Mexican spotted owl, another threatened species, has critical habitat that is located over 22 miles away, west of the Green River in Carbon County. This species of owl is found in mixed conifer forests and canyon settings, and the Uintah Basin project area lacks these characteristics. The endangered southwestern willow flycatcher has no noted critical habitat near the site. The flycatcher breeds in dense riparian habitat, with winter habitat including scrub-shrub or woody habitat near water. Habitat at the site is not suitable for this species. The threatened Canada lynx has no critical habitat within 100 miles and are usually found in boreal forests or boreal/hardwood features. Again, the physical characteristics of the project area are not conducive for this species. The black footed ferret has a habitat that could allow the survival of this species in the Uintah Basin but there is no designated critical habitat within the state of Utah. This specific pocket in the Uintah Basin is listed by the USFWS as an

experimental population, non-essential, however it is located more than 25 miles from the project area. The ferret has a listing status of endangered and experimental population, non-essential.

The listed threatened and endangered vegetation and fish species evaluated for the project area include shrubby reed-mustard, Ute ladies-tresses, clay reed-mustard, Pariette cactus, and Uinta Basin hookless cactus; as well as the humpback chub, Colorado pike minnow, bonytail chub, and razorback sucker. The nearest critical habit for a fish species is greater than 7 miles away, with no permanent waterbodies adjacent to the site. Much of the area around the site has previously been disturbed due to earlier mining activity, energy development, and livestock grazing. The Bureau of Land Management completed an environmental assessment for the area proposed for development. This document, *Environmental Assessment UT-USO-09-007*[3], was submitted on January 29, 2009, and concluded that no special status, threatened, or endangered plant species were present at the site.

Because the project area is not close in proximity to any threatened and endangered mammal species or the associated critical habitats, there will be no anticipated impacts to any of the referenced mammal species from construction and operation of the proposed source. No impacts to listed fish species are expected; permanent waterbodies and suitable habitat are not found at or adjacent to the site. No listed vegetation species were documented at the site during the 2009 Environmental Assessment.

Attachment D.7: National Historic Preservation Act

That National Park Service publishes a National Register of Historic Places. All properties listed on the National Register within Uintah County, Utah, are included in **Table D.7.1**. The nearest listed property is more than 30 miles from the site. The Environmental Assessment indicated that no cultural resources have been identified at the site, and the project area was cleared by the Vernal archaeologist in 2008.

[3] U.S. Department of Interior Bureau of Land Management, Environmental Assessment UT-USO-09-007, Lexco #6, #7 & #8 Shafts Mining Plan Modification, Federal Gilsonite Lease UTU-72699, Location: *T. 10 S., R. 21 E, Section 34, SWNE, NWNW, S2NW, N2SE; Section 35, N2SW, SESW, S2SE. T. 11 S., R. 21 E., Section 1, NENE.*

Table D.7.1 - Historic Sites Listed in National Register for Uintah County, Utah

Property Name	Street & Number	City
Carter Road	Ashley National Forest	Ashley National Forest
Douglass, Earl, Workshop--Laboratory	US 40	Dinosaur National Monument
Morris, Josie Bassett, Ranch Complex	US 40	Dinosaur National Monument
Quarry Visitor Center	US 40	Dinosaur National Monument
Cockleburr Wash Petroglyphs	Address Restricted	Jensen
Bank of Vernal	3 W. Main St.	Vernal
Curry, Lewis, House	189 S. Vernal Ave.	Vernal
Fenn--Bullock House	388 W 100 N	Vernal
Gibson--Sowards House	3110 N 250 W	Vernal
Little Brush Creek Petroglyphs	Address Restricted	Vernal
Martin, Manfred and Ethel, House	163 N. Vernal Ave.	Vernal
McConkie Ranch Petroglyphs	SE of Dry Fork	Vernal
Siddoway, William and Emily, House	1055 N. Vernal Ave.	Vernal
Smith, Francis 'Frank' and Eunice, House	1847 N 3000 W	Vernal
St. Paul's Episcopal Church and Lodge	226 W. Main St.	Vernal
Vernal Tithing Office	NW Corner of 500 West and 200 South	Vernal
Washington School--Vernal LDS Relief Society Hall	270 North 500 West	Vernal
Whiterocks Village Site	Address Restricted	Whiterocks

Source: https://www.nps.gov/subjects/nationalregister/database-research.htm

Attachment D.3.1 – Cummins 1,000 kW Diesel Generator Specifications

Specification sheet

Tier4 certified diesel generator set QST30 series engine

900 - 1000 kW 60 Hz

Description

Cummins® commercial generator sets are fully integrated power generation systems providing optimum performance, reliability and versatility for stationary Standby and Prime Power applications.

Features

Cummins heavy-duty engine - Rugged 4-cycle, industrial diesel delivers reliable power, low emissions and fast response to load changes.

Alternator - Several alternator sizes offer selectable motor starting capability with low reactance 2/3 pitch windings, low waveform distortion with non-linear loads and fault clearing short-circuit capability.

Cummins aftertreatment system - Fully integrated power generation systems that are certified to EPA Tier 4 standards. They provide optimum performance, reliability and versatility for stationary Standby, Prime Power and Continuous duty applications.

Permanent Magnet Generator (PMG) - Offers enhanced motor starting and fault clearing short-circuit capability.

Control system - The PowerCommand® electronic control is standard equipment and provides total genset system integration including automatic remote starting/stopping, precise frequency and voltage regulation, alarm and status message display, AmpSentry™ protection, output metering, auto-shutdown at fault detection and NFPA 110 Level 1 compliance.

Cooling system - Standard integral set-mounted radiator system, designed and tested for rated ambient temperatures, simplifies facility design requirements for rejected heat.

NFPA - The genset accepts full rated load in a single step in accordance with NFPA 110 for Level 1 systems.

Warranty and service - Backed by a comprehensive warranty and worldwide distributor network.

Generator set specifications

Governor regulation class	ISO8528 Part 1 Class G3
Voltage regulation, no load to full load	+/- 0.5%
Random voltage variation	+/- 0.5%
Frequency regulation	Isochronous
Random frequency variation	+/- 0.25%
Radio frequency emissions compliance	IEC 61000-4-2 : Level 4 Electrostatic discharge IEC 61000-4-3 : Level 3 Radiated susceptibility

Engine specifications

Bore	140 mm (5.51 in)
Stroke	165.0 mm (6.5 in)
Displacement	30.5 litres (1860 in^3)
Configuration	Cast iron, V, 12 cylinder
Battery capacity	1800 amps minimum at ambient temperature of -18 °C to 0 °C (0 °F to 32 °F)
Battery charging alternator	35 amps
Starting voltage	24 volt, negative ground
Fuel system	Direct injection: number 2 diesel fuel, fuel filter, automatic electric fuel shutoff
Fuel filter	Triple element, 10 micron filtration, spin-on fuel filters with water separator
Air cleaner type	Dry replaceable element
Lube oil filter type(s)	Four spin-on, combination full flow filter and bypass filters
Standard cooling system	High ambient radiator

Aftertreatment specifications

Model	CA451
Emissions certification	Tier4F certified
Duct diameter	1143 mm (45 in)
Duct quantity	1
Components included	Insulated aftertreatment ducts, saddle supports for aftertreatment, control panel, DEF tank, heater with ILB, harness from control panel to engine and AFT, lifting tool. Assembly required at site.

Alternator specifications

Design	Brushless, 4 pole, drip proof, revolving field
Stator	2/3 pitch
Rotor	Single bearing, flexible disc
Insulation system	Class H on low and medium voltage, Class F on high voltage
Standard temperature rise	150 ºC Standby at 40 °C ambient
Exciter type	Permanent Magnet Generator (PMG)
Phase rotation	A (U), B (V), C (W)
Alternator cooling	Direct drive centrifugal blower fan
AC waveform Total Harmonic Distortion (THDV)	< 5% no load to full linear load, < 3% for any single harmonic
Telephone Influence Factor (TIF)	< 50% per NEMA MG1-22.43
Telephone Harmonic Factor (THF)	< 3%

PowerCommand 3.3 Control System

An integrated microprocessor based generator set control system providing voltage regulation, engine protection, alternator protection, operator interface and isochronous governing. Refer to document S-1570 for more detailed information on the control.

AmpSentry – Includes integral AmpSentry protection, which provides a full range of alternator protection functions that are matched to the alternator provided.

Power management – Control function provides battery monitoring and testing features and smart starting control system.

Advanced control methodology – Three phase sensing, full wave rectified voltage regulation, with a PWM output for stable operation with all load types.

Communications interface – Control comes standard with PCCNet and Modbus interface.

Regulation compliant – Prototype tested: UL, CSA and CE compliant.

Service - InPower™ PC-based service tool available for detailed diagnostics, setup, data logging and fault simulation.

Easily upgradeable – PowerCommand controls are designed with common control interfaces.

Reliable design – The control system is designed for reliable operation in harsh environment.

Multi-language support

Operator panel features

Operator/display functions

- Displays paralleling breaker status
- Provides direct control of the paralleling breaker
- 320 x 240 pixels graphic LED backlight LCD
- Auto, manual, start, stop, fault reset and lamp test/panel lamp switches
- Alpha-numeric display with pushbuttons
- LED lamps indicating generator set running, remote start, not in auto, common shutdown, common warning, manual run mode, auto mode and stop

Paralleling control functions

- First Start Sensor System selects first generator set to close to bus
- Phase Lock Loop Synchronizer with voltage matching
- Sync check relay
- Isochronous kW and kVar load sharing
- Load govern control for utility paralleling
- Extended Paralleling (baseload/peak shave) Mode
- Digital power transfer control, for use with a breaker pair to provide open transition, closed transition, ramping closed transition, peaking and base load functions,

Alternator data

- Line-to-neutral and line-to-line AC volts
- 3-phase AC current
- Frequency
- kW, kvar, power factor kVA (three phase and total)

Engine data

- DC voltage
- Engine speed
- Lube oil pressure and temperature
- Coolant temperature
- Comprehensive FAE data (where applicable)

Other data

- Genset model data
- Start attempts, starts, running hours, kW hours
- Load profile (operating hours at % load in 5% increments)
- Fault history
- Data logging and fault simulation (requires InPower)

Standard control functions

Digital governing

- Integrated digital electronic isochronous governor
- Temperature dynamic governing

Digital voltage regulation

- Integrated digital electronic voltage regulator
- 3-phase, 4-wire line-to-line sensing
- Configurable torque matching

AmpSentry AC protection

- AmpSentry protective relay
- Over current and short circuit shutdown
- Over current warning
- Single and three phase fault regulation
- Over and under voltage shutdown
- Over and under frequency shutdown
- Overload warning with alarm contact
- Reverse power and reverse var shutdown
- Field overload shutdown

Engine protection

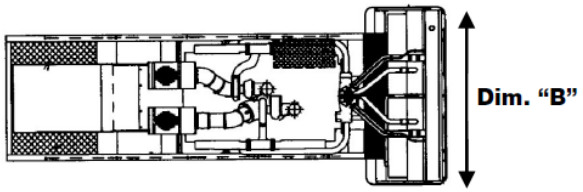
- Battery voltage monitoring, protection and testing
- Overspeed shutdown
- Low oil pressure warning and shutdown
- High coolant temperature warning and shutdown
- Low coolant level warning or shutdown
- Low coolant temperature warning
- Fail to start (overcrank) shutdown
- Fail to crank shutdown
- Cranking lockout
- Sensor failure indication
- Low fuel level warning or shutdown
- Fuel-in-rupture-basin warning or shutdown
- Full authority electronic engine protection

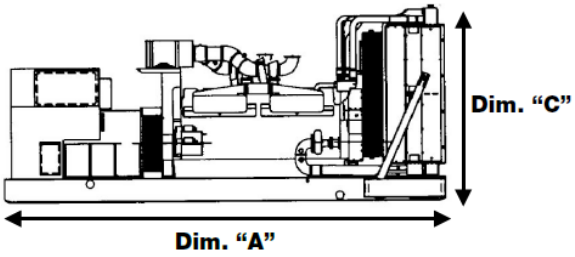
Control functions

- Time delay start and cool down
- Real time clock for fault and event time stamping
- Exerciser clock and time of day start/stop
- Data logging
- Cycle cranking
- Load shed
- Configurable inputs and outputs (4)
- Remote emergency stop

Options

- Auxiliary output relays (2)

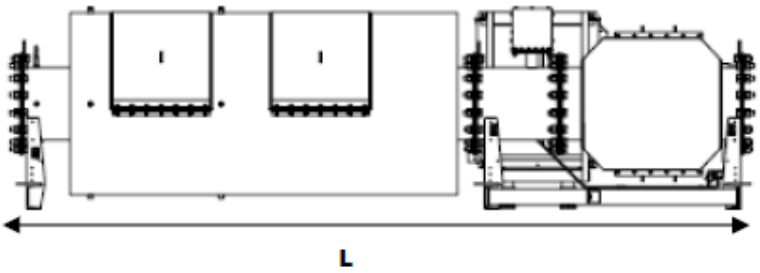


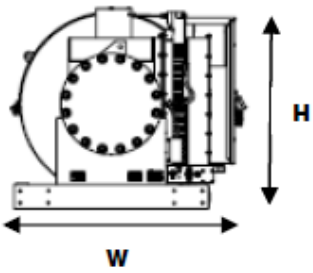


Generator set weights and dimensions

* Weights represent a set with standard features. See outline drawings for weights of other configurations.

Model	Dim “A” mm (in.)	Dim “B” mm (in.)	Dim “C” mm (in.)	Set weight* dry kg (lbs)	Set weight* wet kg (lbs)
DQFAH	4239 (167)	2000 (79)	2353 (93)	7631 (16824)	7929 (17480)





Aftertreatment weights and dimensions

* Due to multiple configurations of the CA451 model, maximum weight of the model is shown.
Note: Dimension and weights are subject to change. See submittal data for exact details.

Aftertreatment model number*	Genset model	L (Length) mm (in.)	W (Width) mm (in.)	H (Height) mm (in.)	Weight of aftertreatment system (lbs)
CA451	DQFAH	4651 (183)	1480 (58)	1260 (50)	4367

Codes and standards

Codes or standards compliance may not be available with all model configurations – consult factory for availability.

	All low and medium voltage models are CSA certified to product class 4215-01.	**ISO8528**	The generator set has been rated in accordance with ISO8528.
U.S. EPA	Engine certified to US EPA Nonroad 40CFR1039 and Stationary (Emergency and Non-Emergency) US EPA NSPS, 60CFR Subpart IIII Tier4 Emissions Standards.		This generator set is designed in facilities certified to ISO 9001 and manufactured in facilities certified to ISO 9001 or ISO 9002.
International Building Code	The genset package is certified for seismic application in accordance with the following International Building Code: IBC2012.		The Aftertreatment System bears the ETL ListedMark as proof of conformity to NFPA 79, UL 61010C-1, and CSA 22.2 No. 61010-1-12.
	The Prototype Test Support (PTS) program verifies the performance integrity of the generator set design. Cummins products bearing the PTS symbol meet the prototype test requirements of NFPA 110 for Level 1 systems.		The generator set is available listed to UL 2200 for all 60 Hz low voltage models, Stationary Engine Generator Assemblies. The PowerCommand control is Listed to UL 508 - Category NITW7 for U.S. and Canadian usage. Circuit breaker assemblies are UL 489 Listed for 100% continuous operation and also UL 869A Listed Service Equipment.

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building’s electrical system except through an approved device or after building main switch is open.

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S-1671.PDF (01/18)

Generator Set Data Sheet

Model: DQFAH
Frequency: 60 Hz
Fuel Type: Ultra Low Sulphur Diesel (15 ppm sulphur)
kW Rating: 1000 Standby
900 Prime
Emissions level: EPA Stationary Non-Emergency Tier 4

Exhaust emission data sheet Tier 4F:	**EDS-1156**
Exhaust emission compliance sheet Tier4F	**EPA-1195**
Sound performance data sheet:	**MSP-1119**
Cooling performance data sheet:	**MCP-217**
Prototype test summary data sheet:	**PTS-304**
Standard set-mounted radiator cooling outline:	**A034N275**
Optional remote radiator cooling outline:	**A034N273**
After-treatment outline drawing Tier 4F	**A041V017**

Fuel Consumption

	Standby				Prime			
	kW (kVA)				kW (kVA)			
Ratings	1000 (1250)				900 (1125)			
Load	**1/4**	**1/2**	**3/4**	**Full**	**1/4**	**1/2**	**3/4**	**Full**
US gph	21.2	36.6	53.3	70.7	19.7	33.5	48.1	63.9
L/hr	80.4	138.6	201.9	267.6	74.5	127.0	182.1	241.9

DEF Consumption

	Standby				Prime			
	kW (kVA)				kW (kVA)			
Ratings	1000 (1250)				900 (1125)			
Load	**1/4**	**1/2**	**3/4**	**Full**	**1/4**	**1/2**	**3/4**	**Full**
US gph	0.94	1.41	2.17	3.03	0.86	1.32	1.94	2.68
L/hr	3.55	5.34	8.21	11.47	3.26	5.00	7.34	10.14

Engine

	Standby rating	**Prime rating**
Engine manufacturer	Cummins Inc.	
Engine model	QST30-G17	
Configuration	Cast iron, V 12 cylinder	
Aspiration	Turbocharged and low temperature after-cooled	
Gross engine power output, kWm (bhp)	1112 (1490)	1007 (1350)
BMEP at set rated load, kPa (psi)	2427 (351)	2199 (319)
Bore, mm (in.)	140 (5.51)	
Stroke, mm (in.)	165 (6.5)	
Rated speed, rpm	1800	
Piston speed, m/s (ft/min)	9.91 (1950)	
Compression ratio	14.7:1	

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Lube oil capacity, L (qt)	132 (140)
Overspeed limit, rpm	2070
Regenerative power, kW	82

Fuel Flow

Maximum supply fuel flow, L/hr (US gph)	570 (150)
Maximum return fuel flow, L/hr (US gph)	550 (145)
Maximum fuel inlet restriction with clean filter, kPa (in Hg)	13.5 (4.0)
Maximum fuel inlet temperature, °C (°F)	71 (160)
Maximum fuel inlet restriction, kPa (in Hg)	68 (20)

Air

Combustion air, m^3/min (scfm)	87 (3067)	79 (2801)
Maximum air cleaner restriction with clean filter, kPa (in H_2O)	3.7 (15)	
Alternator cooling air, m^3/min (cfm)	204 (7300)	

Exhaust

Exhaust flow at rated load, m^3/min (cfm)	212 (7469)	193 (6829)
Exhaust temperature, °C (°F)	465 (869)	456 (852)
Maximum back pressure, kPa (in H_2O)	6.8 (27)	

Standard Set-Mounted Radiator Cooling

Ambient design at 0.5 in H_2O, °C (°F)	50 (122)
Fan load, kW_m (HP)	33.1 (44.4)
Coolant capacity (with radiator), L (US gal)	167 (44)
Cooling system air flow, m^3/min (scfm)	1097.5 (38753)
Total heat rejection, MJ/min (Btu/min)	48.9 (46455)
Maximum cooling air flow static restriction, kPa (in H2O)	0.12 (0.5)
Maximum fuel return line restriction kPa (in Hg)	67.5 (20)

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Maximum fuel return line restriction, kPa (in Hg)	67.5 (20)

[1] For non-standard remote installations contact your local Cummins representative.

Aftertreatment System

	T4F
Pressure drop across after-treatment, kPa (in H_2O)	6.2 (25)
Available back pressure for exhaust system piping, kPa (in H_2O)	0.5 (2)
Exhaust heater rating (kW)	250
Exhaust heater input requirements (Amps at 480 V)	300
DEF tank capacity (usable) L (gal)	765 (202)
Heat radiated from aftertreatment, Btu/min (MJ/min)	1820 (1.92)

DEF Flow

Maximum supply flow, L/hr (US gph)	98 (26)
Maximum return flow, L/hr (US gph)	87 (23)
Maximum static head (from pump to injector), m (ft)	6.4 (21)

Weights[1]

Unit dry weight kgs (lbs)	7633 (16824)
Unit wet weight kgs (lbs)	7931 (17480)
Aftertreatment weight kgs (lbs)	1981 (4367)

Derating Factors[2]

Standby	Engine power available up to 701 m (2300 ft) at ambient temperatures up to 40 °C (104 °F). Above these elevations, derate at 3.5% per 305 m (1000 ft) and 7% per 10 °C (18 °F).
Prime	Engine power available up to 727 m (2385 ft) at ambient temperatures up to 40 °C (104 °F). Above these elevations, derate at 3.5% per 305 m (1000 ft) and 7% per 10 °C (18 °F).

Notes:
[1] Weights represent a set with standard features. See outline drawing for weights of other configurations.
[2] Derating factors do not include after-treatment system.

Ratings Definitions

Emergency Standby Power (ESP):	**Limited-Time Running Power (LTP):**	**Prime Power (PRP):**	**Base Load (Continuous) Power (COP):**
Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power to a constant electrical load for limited hours. Limited-Time Running Power (LTP) is in accordance with ISO 8528.	Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) is in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.

Alternator Data

Voltage	Connection[1]	Temp rise degrees C	Duty[2]	Single phase factor[3]	Max surge kVA[4]	Surge kW	Alternator data sheet	Feature code
120/208-139/240	12-lead	125/105	S/P		4234	1019	ADS-312	B252

240/416-277/480	12-lead	125/105	S/P		4234	1019	ADS-312	B252
277/480	Wye, 3-phase	125/105	S/P		3866	1018	ADS-311	B276
220/380-277/480	Wye, 3-phase	125/105	S/P		4602	1018	ADS-330	B282
220/380-277/480	Wye, 3-phase	105/80	S/P		4602	1018	ADS-330	B283
210/380-277/480	Wye, 3-phase	80	S		5521	1024	ADS-331	B284
240/416-277/480	Wye	125/105	S/P		4234	1019	ADS-312	B288
347/600	3-phase	125/105	S/P		3866	1021	ADS-311	B300
347/600	3-phase	105/80	S/P		4234	1024	ADS-312	B301
347/600	3-phase	80	S		4602	1004	ADS-330	B604

Notes:

[1] Limited single phase capability is available from some three phase rated configurations. To obtain single phase rating, multiply the three phase kW rating by the Single Phase Factor3. All single phase ratings are at unity power factor.

[2] Standby (S), Prime (P) and Continuous ratings (C).

[3] Factor for the *Single phase output from Three phase alternator* formula listed below.

[4] Maximum rated starting kVA that results in a minimum of 90% of rated sustained voltage during starting.

Formulas for calculating full load currents:

Three phase output

$$\frac{\text{kW} \times 1000}{\text{Voltage} \times 1.73 \times 0.8}$$

Single phase output

$$\frac{\text{kW} \times \text{SinglePhaseFactor} \times 1000}{\text{Voltage}}$$

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

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Alternator data sheet

Frame size: HC6K

Characteristics

Weights:	Wound stator assembly:	2553 lb	1150 kg
	Rotor assembly:	2426 lb	1093 kg
	Complete alternator:	5162 lb	2325 kg
Maximum speed:		2250 rpm	
Excitation current:	Full load:	2.5 Amps	
	No load:	0.5 Amps	
Insulation system:	Class H throughout		

3 Ø Ratings (0.8 power factor)		**60 Hz**				**50 Hz**		
(Based on specific temperature rise at 40° C ambient temperature)		110/190* 220/380	120/208* 240/416	139/240* (277/480)	347/600	110/190* 220/380	120/208* 240/415	127/220* 254/440
150° C rise ratings	kW	985	1080	1220	1220	944	944	944
	kVA	1231	1350	1525	1525	1180	1180	1180
125° C rise ratings	kW	930	1020	1150	1150	888	888	888
	kVA	1163	1275	1438	1438	1110	1110	1110
105° C rise ratings	kW	865	950	1050	1050	800	800	800
	kVA	1081	1188	1313	1313	1000	1000	1000
80° C rise ratings	kW	750	824	900	900	708	708	708
	kVA	938	1030	1125	1125	885	885	885
Reactances (per unit ± 10%)		110/190* 220/380	120/208* 240/416	139/240* 277/480	347/600	110/190* 220/380	120/208* 240/415	127/220* 254/440
(Based on full load at 125° C rise rating)								
Synchronous		3.45	3.15	2.67	2.67	2.77	2.32	2.07
Transient		0.27	0.25	0.21	0.21	0.23	0.20	0.17
Subtransient		0.19	0.18	0.15	0.15	0.17	0.14	0.13
Negative sequence		0.26	0.24	0.20	0.20	0.22	0.18	0.16
Zero sequence		0.03	0.03	0.02	0.02	0.03	0.02	0.02
Motor starting		Broad range			600	Broad range		
Maximum kVA	(90% sustained voltage)	4234			4234	2875		
Time constants (sec)		Broad range			600	Broad range		
Transient		0.185			0.185	0.185		
Subtransient		0.025			0.025	0.025		
Open circuit		3.400			3.400	3.400		
DC		0.049			0.049	0.049		
Windings	(@ 20° C)	Broad range			600	Broad range		
Stator resistance	(Ohms per phase)	0.0038			0.0052	0.0038		
Rotor resistance	(Ohms)	1.8900			1.8900	1.8900		
Number of leads		6 (12 Optional)			6	6 (12 optional)		

* 12 lead reconnectible option is required to obtain low (parallel wye) voltages.

Prototype Test Support (PTS)
60 Hz test summary

Generator set models		Representative prototype	
750DQFAE	1000DQFAH	Model:	1000DQFAD
800DQFAF		Engine:	P734C
900DQFAG		Alternator:	QST30-G5 NR2

The following summarizes prototype testing conducted on the designated representative prototype of the specified models. This testing is conducted to verify the complete generator set electrical and mechanical design integrity.

Prototype testing is conducted only on generator sets not sold as new equipment.

Maximum surge power: 1055 kW

The generator set was evaluated to determine the stated maximum surge power.

Maximum motor starting: 5521 kVA

The generator set was tested to simulate motor starting by applying the specified kVA load at low lagging power factor (0.4 or lower). With this load applied, the generator set recovered to a minimum of 90% rated voltage.

Torsional analysis and testing:

The generator set on P7G was tested to verify that the design is not subjected to harmful torsional stresses. A spectrum analysis of the transducer output was conducted over the speed range of 1200 to 2000 RPM.

Cooling system: 50 °C ambient
0.5 in H2O restriction

The cooling system was tested to determine ambient temperature and static restriction capabilities. The test was performed at full rated load elevated ambient temperature under static restriction conditions.

Durability:

The generator set was subjected to endurance test replicating field duty cycles operating at variable load up to the standby rating based upon MIL-STD-705 to verify structural soundness and durability of the design.

Electrical and mechanical strength:

The generator set was tested to several single phase and three phase faults to verify that the generator can safely withstand the forces associated with short circuit conditions. The generator set was capable of producing full rated output at the conclusion of the testing.

Steady state performance:

The generator set was tested to verify steady state operating performance. It was within the specified maximum limits.

Voltage regulation:	± 0.5%
Random voltage variation:	± 0.5%
Frequency regulation:	Isochronous
Random frequency variation:	± 0.25%

Transient performance:

The generator set was tested with the listed alternator to verify single step loading capability as required by NFPA 110. Voltage and frequency response on load addition or rejection were evaluated. The following results were recorded at 0.8 power factor:

Full load acceptance:

Voltage dip:	35.5%
Recovery time:	4.6 seconds
Frequency dip:	7.3%
Recovery time:	5.2 seconds

Full load rejection:

Voltage rise:	16.7%
Recovery time:	2.2 seconds
Frequency rise:	3.0%
Recovery time:	1.7 seconds

All data based on 0.8 power factor.

Harmonic analysis:

(per MIL-STD-705B, Method 601.4)

	Line to Line		Line to Neutral	
Harmonic	No load	Full load	No load	Full load
3	0.052	0.04	0.144	0.092
5	0.128	1.36	0.058	1.32
7	1.000	0.196	1.00	0.19
9	0.012	0.034	0.033	0.066
11	0.985	0.84	1.01	0.83
13	0.158	0.32	0.12	0.29
15	0.00	0.005	0.025	0.022

Note: THD will be slightly higher on configurations using ILB/exhaust heater specifically during low genset load/low heater load conditions.

A-weighted Sound Pressure Level @ 7 meters, dB(A)

See notes 2, 5 and 7-11 listed below

Configuration	Exhaust	Applied Load	Position (Note 2)								8 Position Average
			1	2	3	4	5	6	7	8	
Standard – Unhoused	Infinite Exhaust	0% Prime	84.4	87.4	87.3	89.4	86.4	88.7	89.8	87.5	87.9
		75% Prime	87.8	91.1	90.7	91.7	88.7	91.2	92.0	90.9	90.7
		100% Prime	88.9	92.7	92.4	93.3	89.6	92.7	93.4	92.3	92.2
		~~100% Standby~~	~~90.1~~	~~93.1~~	~~93.3~~	~~93.8~~	~~90.1~~	~~93.3~~	~~94.0~~	~~93.0~~	~~92.8~~

Average A-weighted Sound Pressure Level @ 1 meter, dB(A)

See notes 1, 5 and 7-14 listed below

Configuration	Exhaust	Applied Load	Octave Band Center Frequency (Hz)										Overall Sound Pressure Level
			16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
Standard – Unhoused	Infinite Exhaust	0% Prime	N/A	42.1	62.4	80.7	85.4	89.7	93.1	91.0	85.8	79.3	70.9	97.1
		75% Prime	N/A	44.8	63.6	81.1	86.3	91.3	94.8	94.5	91.6	86.9	77.6	99.9
		100% Prime	N/A	46.5	65.9	81.8	87.1	92.2	95.7	95.9	92.9	92.7	79.6	101.4
		~~100% Standby~~	~~N/A~~	~~47.1~~	~~66.6~~	~~82.4~~	~~87.3~~	~~92.4~~	~~96.0~~	~~96.5~~	~~93.4~~	~~94.6~~	~~81.7~~	~~102.1~~

A-weighted Sound Pressure Level @ Operator Location, dB(A)

See notes 1, 3, 5 and 7-14 listed below

Configuration	Exhaust	Applied Load	Octave Band Center Frequency (Hz)										Overall Sound Pressure Level
			16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
Standard – Unhoused	Infinite Exhaust	100% Prime	N/A	53.2	67.7	79.0	83.7	86.7	89.6	91.0	85.6	88.1	70.4	96.0
		~~100% Standby~~	~~N/A~~	~~54.0~~	~~69.3~~	~~79.5~~	~~83.5~~	~~86.7~~	~~90.2~~	~~91.7~~	~~86.0~~	~~93.8~~	~~75.3~~	~~97.9~~

A-weighted Sound Power Level, dB(A)

See notes 1, 3 and 6-14 listed below

Configuration	Exhaust	Applied Load	Octave Band Center Frequency (Hz)										Overall Sound Power Level
			16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
Standard – Unhoused	Infinite Exhaust	0% Prime	N/A	61.7	82.1	100.3	105.0	109.3	112.7	110.6	105.4	98.9	90.6	116.8
		75% Prime	N/A	64.4	83.2	100.7	106.0	111.0	114.4	114.2	111.2	106.6	97.2	119.5
		100% Prime	N/A	66.2	85.5	101.4	106.7	111.9	115.3	115.5	112.5	112.3	99.2	121.0
		~~100%~~ Standby	N/A	66.7	86.2	102.1	106.9	112.0	115.6	116.1	113.1	114.3	101.3	121.7

Global Notes:

1. Sound pressure levels at 1 meter are measured per the requirements of ISO 3744, ISO 8528-10, ANSI S1.13, ANSI S12.1 and European Communities Directive 2000/14/EC as applicable. The microphone measurement locations are 1 meter from a reference parallelepiped just enclosing the generator set (enclosed or unenclosed).
2. Seven-meter measurement location 1 is 7 meters (23 feet) from the generator (alternator) end of the generator set, and the locations proceed counter-clockwise around the generator set at 45° angles at a height of 1.2 meters (48 inches) above the ground surface.
3. Sound Power Levels are calculated according to ISO 3744, ISO 8528-10, and or CE (European Union) requirements.
4. Exhaust Sound Levels are measured and calculated per ISO 6798, Annex A.
5. Reference Sound Pressure Level is 20 µPa.
6. Reference Sound Power Level is 1 pW (10^{-12} Watt).
7. Sound data for remote-cooled generator sets are based on rated loads without cooling fan noise.
8. Sound data for the generator set with infinite exhaust do not include the exhaust noise contribution.
9. Published sound levels are measured at CE certified test site and are subject to instrumentation, measurement, installation and manufacturing variability.
10. Unhoused/Open configuration generator sets refers to generator sets with no sound enclosures of any kind.
11. Housed/Enclosed/Closed/Canopy configuration generator sets refer to generator sets that have noise reduction sound enclosures installed over the generator set and usually integrally attached to the skid base/base frame/fuel container base of the generator set.
12. Published sound levels meet the requirements India's Central Pollution Control Board (Ministry of Environment & Forests),vide GSR 371 (E), which states the A-weighted sound level at1meter from any diesel generator set up to a power output rating of 1000kVA shall not exceed 75dB(A)
13. For updated noise pollution information for India see website: http://www.envfor.nic.in/legis/legis.html
14. Sound levels must meet India's Ambient Air Noise Quality Standards detailed for Daytime/Night-time operation in Noise Pollution (Regulation and Control) Rules, 2000
15. Open exhaust with T4fc, 1x45 Exhaust Sound Power Levels are calculated by using the Insertion Loss (IL) of T4fc, 1x45 system.

Cooling System Data
DQFAH
QST30-G17

Enhanced Ambient Air Temperature Radiator Cooling System

	Fuel Type	Duty	Rating (kW)	Max cooling @ air flow static restriction, unhoused (inches water/mm water)						Housed in free air, no air discharge restriction		
				0.0/0.0	0.25/6.4	0.5/12.7	0.75/19.1	1.0/25.4	1.5/38.1	Weather	Sound level 1	Sound level 2
				Maximum allowable ambient temperature, degree C								
60 Hz	Diesel	~~Standby~~	~~1000~~	~~61.5~~	~~58.6~~	~~55.4~~	~~52.1~~	~~49.9~~	~~40.7~~	~~53.4~~	~~52.4~~	~~52.3~~
		Prime	900	60.0	57.1	54.1	51.4	48.0	39.6	53.0	52.1	52.0

Notes:

1. Data shown are anticipated cooling performance for typical generator set.
2. Cooling data is based on 1000 ft (305 m) site test location.
3. Generator set power output may need to be reduced at high ambient conditions. Consult generator set data sheet for derate schedules.
4. Cooling performance may be reduced due to several factors including but not limited to: Incorrect installation, improper operation, fouling of the cooling system, and other site installation variables.

Exhaust emission data sheet
DQFAH
60 Hz Diesel generator set
EPA emission

Engine information:

Model:	Cummins Inc. QST30-G17	Bore:	5.51 in. (140 mm)
Type:	4 Cycle, 50° V 12 cylinder diesel	Stroke:	6.50 in. (165 mm)
Aspiration:	Turbocharged and low temperature after-cooled	Displacement:	1860 cu. in. (30.5 liters)
Compression ratio:	14.7:1		
Emission control device:	SCR & DPF		
Emission level:	Stationary non-emergency, Tier4 final (with DPF)		

Performance data	1/4 Standby	1/2 Standby	3/4 Standby	Full Standby	Full Prime
BHP @ 1800 RPM (60 Hz)	371	741	1112	1482	1322
Fuel consumption (Gal/Hr)	19	36	54	72	64
Exhaust gas flow (CFM)	2780	4500	6370	7540	6950
Exhaust gas temperature (°F)	620	760	814	890	873
Exhaust emission data					
HC (Total unburned hydrocarbons)	0.02	0.01	0.03	0.04	0.03
NOx (Oxides of nitrogen as NO2)	0.72	0.40	0.35	0.42	0.39
CO (Carbon monoxide)	1.06	0.64	0.60	0.61	0.60
PM (Particular matter)	0.00	0.00	0.00	0.00	0.00
SO2 (Sulfur dioxide)	0.00	0.00	0.00	0.00	0.00
Smoke (Bosch)	0	0	0	0	0

All values are Grams/HP-Hour, Smoke is Bosch #

Test conditions

Data is representative of steady-state engine speed (± 36 RPM) at designated genset loads. Pressures, temperatures, and emission rates were stabilized.

Fuel specification:	ASTM D975 No. 2-D diesel fuel with ULSD, and 40-48 cetane number.
Fuel temperature	99 ± 9 °F (at fuel pump inlet)
Intake air temperature:	77 ± 9 °F
Barometric pressure:	29.6 ± 1 in. Hg
Humidity:	NOx measurement corrected to 75 grains H2O/lb dry air
Reference standard:	ISO 8178

The NOx, HC, CO and PM emission data tabulated here are representative of test data taken from a single engine under the test conditions shown above. Data for the other components are estimated. These data are subjected to instrumentation and engine-to-engine variability. Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures and instrumentation. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may results in elevated emission levels.

2019 EPA Tier4F Certified Exhaust Emission Compliance Statement 1000DQFAH Stationary Non-Emergency,

60 Hz Diesel generator set

Compliance Information:

The engine used in this generator set complies with Tier 4 emissions limit of U.S. EPA New Source Performance Standards for stationary non-emergency engines under the provisions of 40 CFR 60 Subpart IIII when tested per ISO8178 D2.

Engine Manufacturer:	Cummins Inc.
EPA Certificate Number:	KCEXL78.0AAA-009
Effective Date:	09/17/2018
Date Issued:	09/17/2018
EPA Engine Family (Cummins Emissions Family):	KCEXL78.0AAA

Engine Information:

Model:	QST30-G17	Bore:	5.51 in. (140 mm)
Engine Nameplate HP:	1490	Stroke:	6.50 in. (165 mm)
Type:	4 Cycle, 50°V, 12 Cylinder Diesel	Displacement:	1860 cu. in. (30.5 liters)
Aspiration:	Turbocharged & Low Temperature Aftercooled	Compression Ratio:	14.7:1
Emission Control Device:	SCR & DPF		

Diesel Fuel Emissions Limits

D2 cycle exhaust emissions	Grams per BHP-hr				Grams per kW_m-hr			
	NO_X	NMHC	CO	PM	NO_X	NMHC	CO	PM
Test Results	0.4	0.02	1.04	0.00	0.54	0.02	1.4	0.00
EPA T4F Emissions Limit	0.5	0.14	2.61	0.02	0.67	0.19	3.50	0.03

Test methods: EPA nonroad emissions recorded per 40 CFR 89 (ref. ISO8178-1) and weighted at load points prescribed in Subpart E, Appendix A for constant speed engines (ref. ISO8178-4, D2)

Diesel fuel specifications: Cetane number: 40-48. Reference: ASTM D975 No. 2-D, <15 ppm Sulfur.

Reference conditions: Air inlet temperature: 25°C (77°F), Fuel inlet temperature: 40°C (104°F). Barometric pressure: 100 kPa (29.53 in Hg), Humidity: 10.7 g/kg (75 grains H_2O/lb) of dry air; required for NOx correction, Restrictions: Intake restriction set to a maximum allowable limit for clean filter; Exhaust back pressure set to a maximum allowable limit.

Tests conducted using alternate test methods, instrumentation, fuel or reference conditions can yield different results.
Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.

Specification sheet

PowerCommand® 3.3 control system

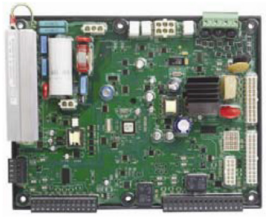
Control system description

The PowerCommand control system is a microprocessor-based genset monitoring, metering and control system designed to meet the demands of today's engine driven gensets. The integration of all control functions into a single control system provides enhanced reliability and performance, compared to conventional genset control systems. These control systems have been designed and tested to meet the harsh environment in which gensets are typically applied.

Features

- 320 x 240 pixels graphic LED backlight LCD.
- Multiple language support.
- AmpSentry™ protection - for true alternator overcurrent protection.
- Digital power transfer control (AMF) provides load transfer operation in open transition, closed transition, or soft (ramping) transfer modes.
- Extended paralleling (peak shave/base load) regulates the genset real and reactive power output while paralleled to the utility. Power can be regulated at either the genset or utility Bus monitoring point.
- Digital frequency synchronization and voltage matching.
- Isochronous load share
- Droop kW and kVAr control
- Real time clock for fault and event time stamping.
- Exerciser clock and time of day start/stop initiate a test with or without load, or a base load or peak shave session.
- Digital voltage regulation. Three phase full wave FET type regulator compatible with either shunt or PMG systems.
- Digital engine speed governing (where applicable)
- Generator set monitoring and protection.
- Utility/AC Bus metering and protection
- 12 and 24 V DC battery operation.
- ModBus® interface for interconnecting to customer equipment.
- Warranty and service. Backed by a comprehensive warranty and worldwide distributor service network.
- Certifications - Suitable for use on gensets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std. and CE standards.

PowerCommand digital genset control PCC 3300



Description

The PowerCommand genset control is suitable for use on a wide range of diesel and lean burn natural gas gensets in paralleling applications. The PowerCommand control is compatible with shunt or PMG excitation style. It is suitable for use with reconnectable or non-reconnectable generators, and it can be configured for any frequency, voltage and power connection from 120-600 VAC line-toline, 601-45,000 VAC with external PT.

Power for this control system is derived from the genset starting batteries. The control functions over a voltage range from 8 VDC to 30 VDC.

Features

- 12 and 24 VDC battery operation.
- Digital voltage regulation - Three phase full wave FET type regulator compatible with either shunt or PMG systems. Sensing is three phase.
- Digital engine speed governing (where applicable) - Provides isochronous frequency regulation.
- Full authority engine communications (where applicable) - Provides communication and control with the Engine Control Module (ECM).
- AmpSentry protection - for true alternator overcurrent protection.
- Genset monitoring - Monitors status of all critical engine and alternator functions.
- Digital genset metering (AC and DC).
- Genset battery monitoring system to sense and warn against a weak battery condition.
- Configurable for single or three phase AC metering.
- Engine starting - Includes relay drivers for starter, Fuel Shut Off (FSO), glow plug/spark ignition power and switch B+ applications.
- Genset protection – Protects engine and alternator.
- Real time clock for fault and event time stamping.
- Exerciser clock and time of day start/stop initiate a test with or without load, or a base load or peak shave session.
- Digital power transfer control (AMF) provides load transfer operation in open transition, closed transition, or soft (ramping) transfer modes.
- Extended paralleling (peak shave/base load) regulates the genset real and reactive power output while paralleled to the utility. Power can be regulated at either the genset or utility bus monitoring point.
- Digital frequency synchronization and voltage matching.
- Isochronous load share
- Droop kW and KVAr control
- Sync cCheck – The sync check function has adjustments for phase angle window, voltage window, frequency window and time delay.
- Utility/AC Bus metering and protection
- Advanced serviceability – using InPower™, a PC-based software service tool.
- Environmental protection – The control system is designed for reliable operation in harsh environments.
- The main control board is a fully encapsulated module that is protected from the elements.
- ModBus interface for interconnecting to customer equipment.
- Configurable inputs and outputs – Four discrete inputs and four dry contact relay outputs.
- Warranty and service – Backed by a comprehensive warranty and worldwide distributor service network.
- Certifications – Suitable for use on gensets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std. and CE standards.

Base control functions

HMI capability

Options – Local and remote HMI options.

Operator adjustments – The HMI includes provisions for many set up and adjustment functions.

Genset hardware data – Access to the control and software part number, genset rating in kVA and genset model number is provided from the HMI or InPower.

Data logs – Includes engine run time, controller on time, number of start attempts, total kilowatt hours, and load profile. (Control logs data indicating the operating hours at percent of rated kW load, in 5% increments. The data is presented on the operation panel based on total operating hours on the generator).

Fault history – Provides a record of the most recent fault conditions with control date and time stamp. Up to 32 events are stored in the control non-volatile memory.

Alternator data

- Voltage (single or three phase line-to-line and line-to-neutral)
- Current (single or three phase)
- kW, kVAr, power factor, kVA (three phase and total)
- Frequency

For Lean burn natural gas engine applications:

- Alternator heater status
- Alternator winding temperature (per phase)
- Alternator drive end bearing temperature
- Alternator non-drive end bearing temperature

Utility/AC Bus data

- Voltage (three phase line-to-line and line-to-neutral)
- Current (three phase and total)
- kW, kVAr, power factor, kVA (three phase and total)
- Frequency

Engine data

- Starting battery voltage
- Engine speed
- Engine temperature
- Engine oil pressure
- Engine oil temperature
- Intake manifold temperature
- Coolant temperature
- Comprehensive Full Authority Engine (FAE) data (where applicable)

For lean burn natural gas engine applications:

- Safety shutoff valve status
- Valve proving status
- Downstream gas pressure
- Gas inlet pressure
- Gas mass flow rate
- Control valve position
- Gas outlet pressure
- Manifold pressure
- Manifold temperature
- Throttle position
- Compressor outlet pressure
- Turbo speed
- Compressor bypass position
- Cylinder configuration (e.g., drive end and non-drive end configurations
- Coolant pressure 1 and 2 (e.g., HT and LT)
- Coolant temperature 1 and 2 (e.g., HT and LT)
- Exhaust port temperature (up to 18 cylinders)
- Pre-filter oil pressure
- Exhaust back pressure
- CM700 internal temperature
- CM700 isolated battery voltage
- Speed bias
- CM558 internal temperature
- CM558 isolated battery voltage
- Knock level (up to 18 cylinders)
- Spark advance (up to 18 cylinders)
- Knock count (up to 18 cylinders)
- Auxiliary supply disconnector status
- Engine heater status
- Coolant circulating pump status
- Lube oil priming pump status
- Lube oil status
- Oil heater status
- Derate authorization status
- Start system status
- Ventilator fan status
- Ventilation louvre status
- Radiator fan status
- DC PSU status
- Start inhibit/enable status and setup

Service adjustments – The HMI includes provisions for adjustment and calibration of genset control functions. Adjustments are protected by a password. Functions include:

- Engine speed governor adjustments
- Voltage regulation adjustments
- Cycle cranking
- Configurable fault set up
- Configurable input and output set up
- Meter calibration
- Paralleling setup
- Display language and units of measurement

Engine control

SAE-J1939 CAN interface to full authority ECMs (where applicable). Provides data transfer between genset and engine controller for control, metering and diagnostics. 12 VDC/24 VDC battery operations - PowerCommand will operate either on 12 VDC or 24 VDC batteries.

Temperature dependent governing dynamics (with electronic governing) - modifies the engine governing control parameters as a function of engine temperature. This allows the engine to be more responsive when warm and more stable when operating at lower temperature levels.

Isochronous governing - (where applicable) Capable of controlling engine speed within +/-0.25% for any steady state load from no load to full load. Frequency drift will not exceed +/-0.5% for a 33 °C (60 °F) change in ambient temperature over an 8 hour period.

Droop electronic speed governing - Control can be adjusted to droop from 0 to 10% from no load to full load.

Remote start mode - It accepts a ground signal from remote devices to automatically start the genset and immediately accelerates to rated speed and voltage or run at idle until engine temperature is adequate. The remote start signal will also wake up the control from sleep mode. The control can incorporate a time delay start and stop.

Remote and local emergency stop - The control accepts a ground signal from a local (genset mounted) or remote (facility mounted) emergency stop switch to cause the genset to immediately shut down. The genset is prevented from running or cranking with the switch engaged. If in sleep mode, activation of either emergency stop switch will wake up the control.

Sleep mode - The control includes a configurable low current draw state to minimize starting battery current draw when the genset is not operating. The control can also be configured to go into a low current state while in auto for prime applications or applications without a battery charger.

Engine starting - The control system supports automatic engine starting. Primary and backup start disconnects are achieved by one of two methods: magnetic pickup or main alternator output frequency. The control also supports configurable glow plug control when applicable.

Cycle cranking - Is configurable for the number of starting cycles (1 to 7) and duration of crank and rest periods. Control includes starter protection algorithms to prevent the operator from specifying a starting sequence that might be damaging.

Time delay start and stop (cooldown) - Configurable for time delay of 0-300 seconds prior to starting after receiving a remote start signal and for time delay of 0-600 seconds prior to shut down after signal to stop in normal operation modes. Default for both time delay periods is 0 seconds.

For lean burn natural gas engine applications:

Engine start inhibit/enable – The function will allow application-specific processes to be started prior to the genset/engine start (e.g., pumps, boosters, etc.).

Alternator control

The control includes an integrated three phase line-to-line sensing voltage regulation system that is compatible with shunt or PMG excitation systems. The voltage regulation system is a three phase full wave rectified and has an FET output for good motor starting capability. Major system features include:

Digital output voltage regulation - Capable of regulating output voltage to within +/-1.0% for any loads between no load and full load. Voltage drift will not exceed +/-1.5% for a 40 ºC
(104 ºF) change in temperature in an eight hour period. On engine starting or sudden load acceptance, voltage is controlled to a maximum of 5% overshoot over nominal level.

The automatic voltage regulator feature can be disabled to allow the use of an external voltage regulator.

Droop voltage regulation - Control can be adjusted to droop from 0-10% from no load to full load.

Torque-matched V/Hz overload control - The voltage roll-off set point and rate of decay (i.e. the slope of the V/Hz curve) is adjustable in the control.

Fault current regulation - PowerCommand will regulate the output current on any phase to a maximum of three times rated current under fault conditions for both single phase and three phase faults. In conjunction with a permanent magnet generator, it will provide three times rated current on all phases for motor starting and short circuit coordination purpose.

Paralleling functions

First Start Sensor™ system – PowerCommand provides a unique control function that positively prevents multiple gensets from simultaneously closing to an isolated bus under black start conditions. The First Start Sensor system is a communication system between the gensets that allows the gensets to work together to determine which genset is a system should be the first to close to the bus. The system includes an independent backup function, so that if the primary system is disabled the required functions are still performed.

Synchronizing – Control incorporates a digital synchronizing function to force the genset to match the frequency, phase and voltage of another source such as a utility grid. The synchronizer includes provisions to provide proper operation even with highly distorted bus voltage waveforms. The synchronizer can match other sources over a range of 60-110% of nominal voltage and -24 to +6 Hz. The synchronizer function is configurable for slip frequency synchronizing for applications requiring a known direction of power flow at instant of breaker closure or for applications where phase synchronization performance is otherwise inadequate.

Load sharing control – The genset control includes an integrated load sharing control system for both real (kW) and reactive (kVar) loads when the genset(s) are operating on an isolated bus. The control system determines kW load on the engine and kVar load on the alternator as a percent of genset capacity, and then regulates fuel and excitation systems to maintain system and genset at the same percent of load without impacting voltage or frequency regulation. The control can also be configured for operation in droop mode for kW or Kvar load sharing.

Load govern control – When PowerCommand receives a signal indicating that the genset is paralleled with an infinite source such as a utility (mains) service, the genset will operate in load govern mode. In this mode the genset will synchronize and close to the bus, ramp to a pre-programmed kW and kVar load level, and then operate at that point. Control is adjustable for kW values from 0- 100% of Standby rating, and 0.7-1.0 power factor (lagging). Default setting is 80% of Standby and 1.0 power factor. The control includes inputs to allow independent control of kW and kVar load level by a remote device while in the load govern mode. The rate of load increase and decrease is also adjustable in the control. In addition, the control can be configured for operation in kW or kVAr load govern droop.

Load demand control – The control system includes the ability to respond to an external signal to initiate load demand operation. On command, the genset will ramp to no load, open its paralleling breaker, cool down, and shut down. On removal of the command, the genset will immediately start, synchronize, connect, and ramp to its share of the total load on the system.

Sync check – The sync check function decides when permissive conditions have been met to allow breaker closure. Adjustable criteria are: phase difference from 0.1-20 deg, frequency difference from 0.001-1.0 Hz, voltage difference from 0.5-10%, and a dwell time from 0.5-5.0 sec. Internally the sync check is used to perform closed transition operations. An external sync check output is also available.

Genset and utility/AC Bus source AC metering – The control provides comprehensive three phase AC metering functions for both monitored sources, including:

3-phase voltage (L-L and L-N) and current, frequency, phase rotation, individual phase and totalized values of kW, kVAr, kVA and Power Factor; totalized positive and negative kW-hours, kVAr-hours, and kVA-hours. Three wire or four wire voltage connection with direct sensing of voltages to 600V, and up to 45kV with external transformers. Current sensing is accomplished with either 5 amp or 1 CT secondaries and with up to 10,000 amp primary. Maximum power readings are 32,000kW/kVAR/kVA.

Power transfer control – provides integrated automatic power transfer functions including source availability sensing, genset start/stop and transfer pair monitoring and control. The transfer/retransfer is configurable for open transition, fast closed transition (less than 100msec interconnect time), or soft closed transition (load ramping) sequences of operation. Utility source failure will automatically start genset and transfer load, retransferring when utility source returns. Test will start gensets and transfer load if test with load is enabled. Sensors and timers include:

Under voltage sensor: 3-phase L-N or L-L under voltage sensing adjustable for pickup from 85-100% of nominal. Dropout adjustable from 75-98% of pickup. Dropout delay adjustable from 0.1-30 sec.

Over voltage sensor: 3-phase L-N or L-L over voltage sensing adjustable for pickup from 95-99% of dropout. Dropout adjustable from 105-135% of nominal. Dropout delay adjustable from 0.5-120 sec. Standard configuration is disabled, and is configurable to enabled in the field using the HMI or InPower service tools.

Over/Under frequency sensor: Center frequency adjustable from 45-65 Hz. Dropout bandwidth adjustable from 0.3-5% of center frequency beyond pickup bandwidth. Pickup bandwidth adjustable from 0.3-20% of center frequency. Field configurable to enable.

Loss of phase sensor: Detects out of range voltage phase angle relationship. Field configurable to enable.

Phase rotation sensor: Checks for valid phase rotation of source. Field configurable to enable.

Breaker tripped: If the breaker tripped input is active, the associated source will be considered as unavailable.

Timers: Control provides adjustable start delay from 0- 300 sec, stop delay from 0-800 sec, transfer delay from
0- 120 sec, retransfer delay from 0-1800 sec, programmed transition delay from 0-60sec, and maximum parallel time from 0-1800 sec.

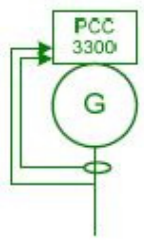
Breaker control – Utility and genset breaker interfaces include separate relays for opening and closing breaker, as well as inputs for both 'a' and 'b' breaker position contacts and tripped status. Breaker diagnostics include contact failure, fail to close, fail to open, fail to disconnect, and tripped. Upon breaker failure, appropriate control action is taken to maintain system integrity.

Extended paralleling – In extended paralleling mode (when enabled) the controller will start the genset and parallel to a utility source and then govern the real and reactive power output of the genset based on the desired control point. The control point for the real power (kW) can be configured for either the genset metering point ("base load") or the utility metering point ("peak shave"). The control point for the reactive power (kVAr or Power Factor) can also be independently configured for either the genset metering point or the utility metering point. This flexibility would allow base kW load from the genset while maintaining the utility power factor at a reasonable value to avoid penalties due to low power factor. The System always operates within genset ratings. The control point can be changed while the system is in operation. Set points can be adjusted via hardwired analog input or adjusted through an operator panel display or service tool.

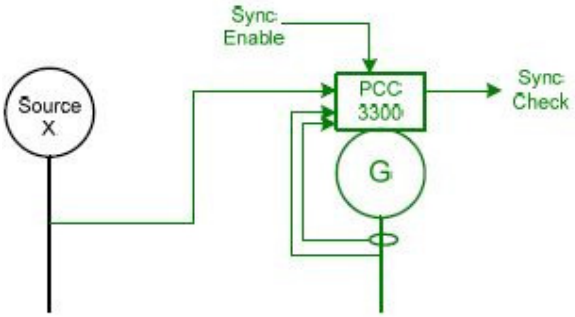
Exerciser clock –The exerciser clock (when enabled) allows the system to be operated at preset times in either test without load, test with load, or extended parallel mode. A real time clock is built in. Up to 12 different programs can be set for day of week, time of day, duration, repeat interval, and mode. For example, a test with load for 1 hour every Tuesday at 2AM can be programmed. Up to 6 different exceptions can also be set up to block a program from running during a specific date and time period.

Application types – Controller is configured to operating in one of six possible application types. These topologies are often used in combinations in larger systems, with coordination of the controllers in the system either by external device or by interlocks provided in the control. Topologies that may be selected in the control include:

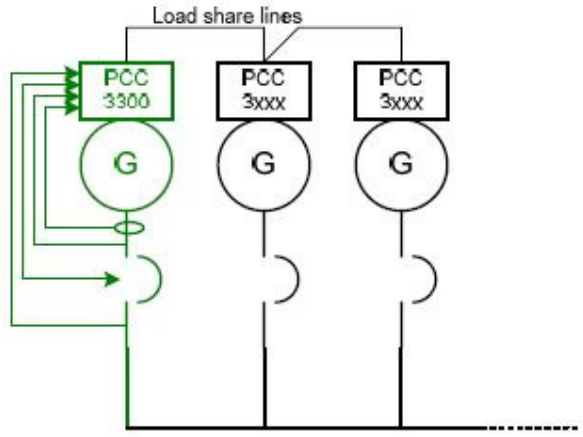
Standalone: Control provides monitoring, protection and control in a non-paralleling application.



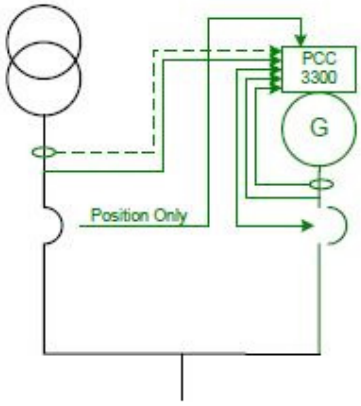
Synchronizer only: control will synchronize the genset to other source when commanded to either via a hardwired or Modbus driven input.



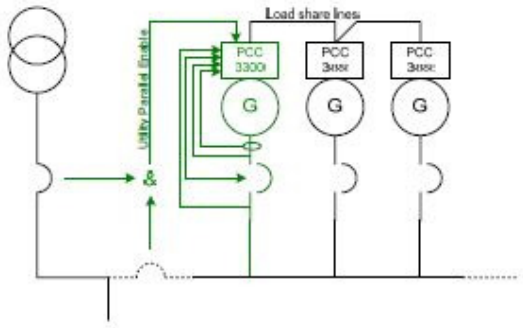
Isolated Bus: allows the genset to perform a dead bus closure or synchronize to the bus and isochronously share kW and kVAR loads with other gensets.



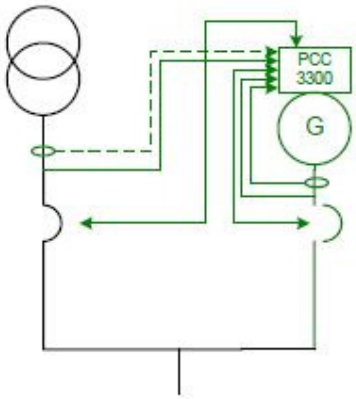
Utility single: Control monitors one genset and utility. The control will automatically start and provide power to a load if the utility fails. The control will also resynchronize the genset back to the utility and provides extended paralleling capabilities.



Utility multiple: Supports all functionality of Isolated Bus and provides extended paralleling to the utility. Extended paralleling load set points follow a constant setting; dynamically follow an analog input, ModBus register or HMI.



Power transfer control: control operates a single genset/single utility transfer pair in open transition, fast closed transition, or soft closed transition. Extended paralleling functionality also provides base load and peak shave options.



Protective functions

On operation of a protective function the control will indicate a fault by illuminating the appropriate status LED on the HMI, as well as display the fault code and fault description on the LCD. The nature of the fault and time of occurrence are logged in the control. The service manual and InPower service tool provide service keys and procedures based on the service codes provided.

Protective functions include:

Battle short mode

When enabled and the battle short switch is active, the control will allow some shutdown faults to be bypassed. If a bypassed shutdown fault occurs, the fault code and description will still be annunciated, but the genset will not shutdown. This will be followed by a fail to shutdown fault. Emergency stop shutdowns and others that are critical for proper operation (or are handled by the engine ECM) are not bypassed. Please refer to the control application guide or manual for list of these faults.

Derate

The derate function reduces output power of the genset in response to a fault condition. If a derate command occurs while operating on an isolated bus, the control will issue commands to reduce the load on the genset via contact closures or ModBus. If a derate command occurs while in utility parallel mode, the control will actively reduce power by lowering the base load kW to the derated target kW.

Configurable alarm and status inputs

The control accepts up to four alarm or status inputs (configurable contact closed to ground or open) to indicate a configurable (customer-specified) condition. The control is programmable for warning, derate, shutdown, shutdown with cooldown or status indication and for labeling the input.

Emergency stop

Annunciated whenever either emergency stop signal is received from external switch.

General engine protection

Low and high battery voltage warning - Indicates status of battery charging system (failure) by continuously monitoring battery voltage.

Weak battery warning - The control system will test the battery each time the genset is signaled to start and indicate a warning if the battery indicates impending failure.

Fail to start (overcrank) shutdown - The control system will indicate a fault if the genset fails to start by the completion of the engine crack sequence.

Fail to crank shutdown - Control has signaled starter to crank engine but engine does not rotate.

Cranking lockout - The control will not allow the starter to attempt to engage or to crank the engine when the engine is rotating.

Fault simulation –The control in conjunction with InPower software, will accept commands to allow a technician to verify the proper operation of the control and its interface by simulating failure modes or by forcing the control to operate outside of its normal operating ranges. InPower also provides a complete list of faults and settings for the protective functions provided by the controller.

For lean burn natural gas engine applications:

Off load running (protection) – This feature protects the engine in the event the genset is being called to go off load for too long.

Hydro mechanical fuel system engine protection

Overspeed shutdown – Default setting is 115% of nominal Low lube oil pressure warning/shutdown – Level is preset (configurable with InPower or HMI) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

High lube oil temperature warning/shutdown – Level is preset (configurable with InPower or HMI) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

High engine temperature warning/shutdown – Level is preset (configurable with InPower or HMI) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

Low coolant temperature warning – Indicates that engine temperature may not be high enough for a 10 second start or proper load acceptance.

Low coolant temperature warning – Can be set up to be a warning or shutdown.

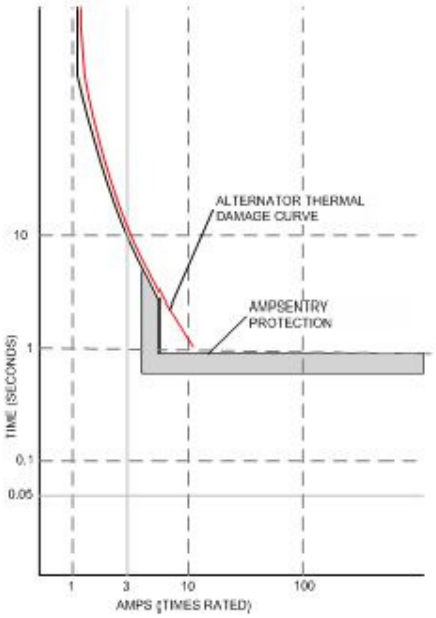
High intake manifold temperature shutdown – Level is preset (configurable with InPower or HMI) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

Full authority electronic engine protection

Engine fault detection is handled inside the engine ECM. Fault information is communicated via the SAE-J1939 data link for annunciation in the HMI.

Alternator protection

AmpSentry protective relay - A comprehensive monitoring and control system integral to the PowerCommand Control System that guards the electrical integrity of the alternator and power system by providing protection against a wide array of fault conditions in the genset or in the load. It also provides single and three phase fault current regulation so that downstream protective devices have the maximum current available to quickly clear fault conditions without subjecting the alternator to potentially catastrophic failure conditions. See document R1053 for a full size time over current curve. The control does not included protection required for interconnection to a utility (mains) service.



High AC voltage shutdown (59) - Output voltage on any phase exceeds preset values. Time to trip is inversely proportional to amount above threshold. Values adjustable from 105-125% of nominal voltage, with time delay adjustable from 0.1-10 seconds. Default value is 110% for 10 seconds.

Low AC voltage shutdown (27) - Voltage on any phase has dropped below a preset value. Adjustable over a range of 50-95% of reference voltage, time delay 2-20 seconds. Default value is 85% for 10 seconds. Function tracks reference voltage. Control does not nuisance trip when voltage varies due to the control directing voltage to drop, such as during a V/Hz roll-off or synchronizing.

Under frequency shutdown (81 u) - Genset output frequency cannot be maintained. Settings are adjustable from 2-10 Hz below reference governor set point, for a 5-20 second time delay. Default: 6 Hz, 10 seconds. Under frequency protection is disabled when excitation is switched off, such as when engine is operating in idle speed mode.

Over frequency shutdown/warning (81o) - Genset is operating at a potentially damaging frequency level. Settings are adjustable from 2-10 Hz above nominal governor set point for a 1-20 second time delay. Default: 6 Hz, 20 seconds, disabled.

Overcurrent warning/shutdown (51) - Implementation of the thermal damage curve with instantaneous trip level calculated based on current transformer ratio and application power rating.

Loss of sensing voltage shutdown - Shutdown of genset will occur on loss of voltage sensing inputs to the control.

Field overload shutdown - Monitors field voltage to shutdown genset when a field overload condition occurs.

Over load (kW) warning - Provides a warning indication when engine is operating at a load level over a set point. Adjustment range: 80-140% of application rated kW, 0-120 second delay. Defaults: 105%, 60 seconds.

Reverse power shutdown (32) - Adjustment range: 5-20% of Standby kW rating, delay 1-15 seconds. Default: 10%, 3 seconds.

Reverse Var shutdown - Shutdown level is adjustable: 15- 50% of rated Var output, delay 10-60 seconds. Default: 20%, 10 seconds.

Short circuit protection - Output current on any phase is more than 175% of rating and approaching the thermal damage point of the alternator. Control includes algorithms to protect alternator from repeated over current conditions over a short period of time.

Negative sequence overcurrent warning (46) – Control protects the generator from damage due to excessive imbalances in the three phase load currents and/or power factors.

Custom overcurrent warning/shutdown (51) – Control provides the ability to have a custom time overcurrent protection curve in addition to the AmpSentry protective relay function.

Ground fault overcurrent (51G) – Control detects a ground fault either by an external ground fault relay via a contact input or the control can measure the ground current from an external current transformer. Associated time delays and thresholds are adjustable via InPower or HMI.

Paralleling protection

Breaker fail to close warning: When the control signals a circuit breaker to close, it will monitor the breaker auxiliary contacts and verify that the breaker has closed. If the control does not sense a breaker closure within an adjustable time period after the close signal, the fail to close warning will be initiated.

Breaker fail to open warning: The control system monitors the operation of breakers that have been signalled to open. If the breaker does not open within and adjustable time delay, a Breaker Fail to Open warning is initiated.

Breaker position contact warning: The controller will monitor both ‘a’ and ‘b’ position contacts from the breaker. If the contacts disagree as to the breaker position, the breaker position contact warning will be initiated.

Breaker tripped warning: The control accepts inputs to monitor breaker trip / bell alarm contact and will initiate a breaker tripped warning if it should activate.

Fail to disconnect warning: In the controller is unable to open either breaker, a fail to disconnect warning is initiated. Typically this would be mapped to a configurable output, allowing an external device to trip a breaker.

Fail to synchronize warning: Indicates that the genset could not be brought to synchronization with the bus. Configurable for adjustable time delay of 10 -900 seconds, 120 default.

Phase sequence sensing warning: Verifies that the genset phase sequence matches the bus prior to allowing the paralleling breaker to close.

Maximum parallel time warning (power transfer control mode only): During closed transition load transfers, control independently monitors paralleled time. If time is exceeded, warning is initiated and genset is disconnected.

Bus or genset PT input calibration warning: The control system monitors the sensed voltage from the bus and genset output voltage potential transformers. When the paralleling breaker is closed, it will indicate a warning condition if the read values are different.

Field control interface

Input signals to the PowerCommand control include:

- Coolant level (where applicable)
- Fuel level (where applicable)
- Remote emergency stop
- Remote fault reset
- Remote start
- Rupture basin
- Start type signal
- Battle short
- Load demand stop
- Synchronize enable
- Genset circuit breaker inhibit
- Utility circuit breaker inhibit
- Single mode verify
- Transfer inhibit – prevent transfer to utility (in power transfer control mode)
- Retransfer inhibit – prevent retransfer to genset (in power transfer control mode)
- kW and kVAr load setpoints
- Configurable inputs - Control includes (4) input signals from customer discrete devices that are configurable for warning, shutdown or status indication, as well as message displayed

For lean burn natural gas engine applications:

- Gearbox oil pressure/temperature protection
- Fire fault
- Earth fault
- Differential fault
- DC power supply fault
- Genset Interface Box (GIB) isolator open fault
- Start inhibit/enable (x3)
- Radiator fan trip

- Ventilator fan trip
- Ventilation louvers closed
- Start system trip
- Alternator heater trip
- Alternator heater status
- Alternator winding temperature (PT100 RTDx3)
- Alternator drive end bearing temperature (PT100 RTD)
- Alternator non-drive end bearing temperature (PT100 RTD)

Output signals from the PowerCommand control include:

- Load dump signal: Operates when the genset is in an overload condition.
- Delayed off signal: Time delay based output which will continue to remain active after the control has removed the run command. Adjustment range: 0 - 120 seconds.
  Default: 0 seconds.
- Configurable relay outputs: Control includes (4) relay output contacts (3 A, 30 VDC). These outputs can be configured to activate on any control warning or shutdown fault as well as ready to load, not in auto, common alarm, common warning and common shutdown.
- Ready to load (genset running) signal: Operates when the genset has reached 90% of rated speed and voltage and latches until genset is switched to off or idle mode.
- Paralleling circuit breaker relays outputs: Control includes (4) relay output contacts (3.5 A, 30 VDC) for opening and closing of the genset and utility breakers.

For lean burn natural gas engine applications:

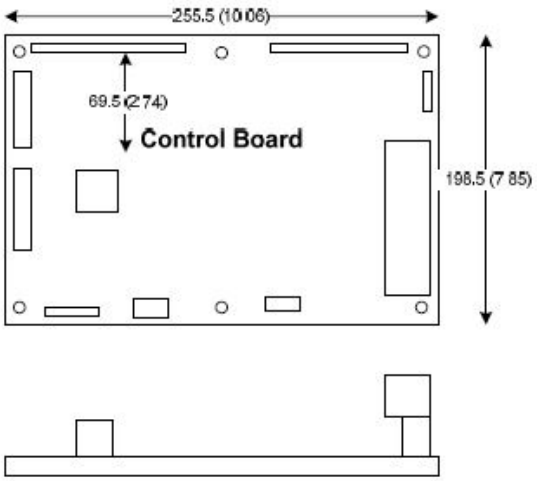
- Start inhibit/enable event
- Emergency stop event
- Ventilator fan run control
- Louvre control
- Radiator fan control
- Alternator heater control
- Engine at idle speed event

Communications connections include:

- PC tool interface: This RS-485 communication port allows the control to communicate with a personal computer running InPower software.
- ModBus RS-485 port: Allows the control to communicate with external devices such as PLCs using ModBus protocol.

  Note - An RS-232 or USB to RS-485 converter is required for communication between PC and control.
- Networking: This RS-485 communication port allows connection from the control to the other Cummins products.

Mechanical drawing



PowerCommand Human Machine Interface HMI320

Description

This control system includes an intuitive operator interface panel that allows for complete genset control as well as system metering, fault annunciation, configuration and diagnostics. The interface includes five genset status LED lamps with both internationally accepted symbols and English text to comply with customer's needs. The interface also includes an LED backlit LCD display with tactile feel soft-switches for easy operation and screen navigation. It is configurable for units of measurement and has adjustable screen contrast and brightness.

The run/off/auto switch function is integrated into the interface panel.

All data on the control can be viewed by scrolling through screens with the navigation keys. The control displays the current active fault and a time-ordered history of the five previous faults.

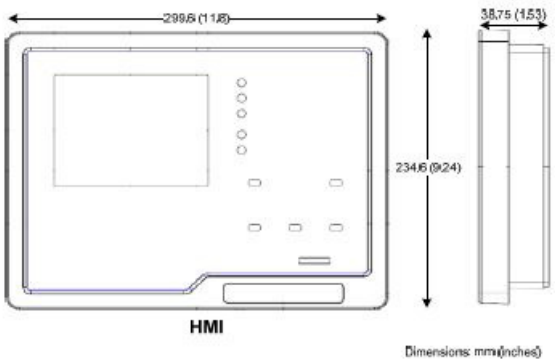
Features

- LED indicating lamps:
- Genset running
- Remote start
- Not in auto
- Shutdown
- Warning
- Auto
- Manual and stop
- Circuit breaker open (if equipped)
- Circuit breaker closed (if equipped)
- 320 x 240 pixels graphic LED backlight LCD.
- Four tactile feel membrane switches for LCD defined operation. The functions of these switches are defined dynamically on the LCD.
- Seven tactile feel membrane switches dedicated screen navigation buttons for up, down, left, right, ok, home and cancel.
- Six tactile feel membrane switches dedicated to control for auto, stop, manual, manual start, fault reset and lamp test/panel lamps.
- Two tactile feel membrane switches dedicated to control of circuit breaker (where applicable).
- Allows for complete genset control setup.
- Certifications: Suitable for use on gensets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std. and CE standards.
- LCD languages supported: English, Spanish, French, German, Italian, Greek, Dutch, Portuguese, Finnish, Norwegian, Danish, Russian and Chinese characters.

Communications connections include:

- PC tool interface - This RS-485 communication port allows the HMI to communicate with a personal computer running InPower.
- This RS-485 communication port allows the HMI to communicate with the main control board.

Mechanical drawing



Software

InPower (beyond 6.5 version) is a PC-based software service tool that is designed to directly communicate to PowerCommand gensets and transfer switches, to facilitate service and monitoring of these products.

Environment

The control is designed for proper operation without recalibration in ambient temperatures from -40 ºC (-40 ºF) to +70 ºC (158 ºF), and for storage from -55 ºC (-67 ºF) to +80 ºC (176 ºF). Control will operate with humidity up to 95%, non-condensing.

The HMI is designed for proper operation in ambient temperatures from -20 ºC (-4 ºF) to +70 ºC (158 ºF), and for storage from -30 ºC (-22 ºF) to +80 ºC (176 ºF).

The control board is fully encapsulated to provide superior resistance to dust and moisture. Display panel has a single membrane surface, which is impervious to effects of dust, moisture, oil and exhaust fumes. This panel uses a sealed membrane to provide long reliable service life in harsh environments.

The control system is specifically designed and tested for resistance to RFI/EMI and to resist effects of vibration to provide a long reliable life when mounted on a genset. The control includes transient voltage surge suppression to provide compliance to referenced standards.

Certifications

PowerCommand meets or exceeds the requirements of the following codes and standards:

- NFPA 110 for level 1 and 2 systems.
- ISO 8528-4: 1993 compliance, controls and switchgear.
- CE marking: The control system is suitable for use on generator sets to be CE-marked.
- EN 50081-1,2 residential/light industrial emissions or industrial emissions.
- EN 50082-1,2 residential/light industrial or industrial susceptibility.
- ISO 7637-2, level 2; DC supply surge voltage test.
- Mil Std 202C, Method 101 and ASTM B117: Salt fog test.
- UL 508 recognized or Listed and suitable for use on UL 2200 Listed generator sets.
- CSA C282-M1999 compliance
- CSA 22.2 No. 14 M91 industrial controls.
- PowerCommand control systems and generator sets are designed and manufactured in ISO 9001 certified facilities.

Warranty

All components and subsystems are covered by an express limited one year warranty. Other optional and extended factory warranties and local distributor maintenance agreements are available.

PCCNet COMPATIBLE

For more information contact your local Cummins distributor or visit power.cummins.com

Our energy working for you.™

S-1570 (08/18)

Attachment D.3.2 – Caterpillar 400 kW Diesel Generator Specifications

Cat® C18 DIESEL GENERATOR SETS

Standby & Prime: 60Hz, 480V

Engine Model	Cat® C18 ATTAC™ In-line 6, 4-cycle diesel
Bore x Stroke	145mm x 183mm (5.7in x 7.2in)
Displacement	18.13 L (1106.3 in³)
Compression Ratio	16.1:1
Aspiration	Turbocharged Air-to-Air Aftercooled
Fuel Injection System	Electronic Unit Injection
Governor	Electronic ADEM™ A4

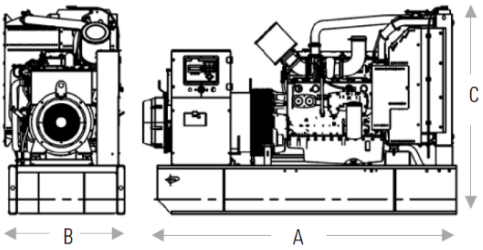
Model	Standby	Prime	Emission Strategy
C18	625 kVA, 500 ekW	569 kVA, 455 ekW	US EPA TIER IV Final Non-Road

PACKAGE PERFORMANCE

Performance	Standby	Prime
Frequency	60 Hz	60 Hz
Genset Power Rating	625 kVA	569 kVA
Gen set power rating with fan @ 0.8 power factor	500 ekW	455 ekW
Fuelling strategy	US EPA TIER IV Final Non-Road	US EPA TIER IV Final Non-Road
Performance Number	EM1017	EM1112
Fuel Consumption		
100% load with fan	135.6 L/hr, 35.8 gal/hr	122.6 L/hr, 32.4 gal/hr
75% load with fan	103.3 L/hr, 27.3 gal/hr	93.6 L/hr, 24.7 gal/hr
50% load with fan	73.5 L/hr, 19.4 gal/hr	67.0 L/hr, 17.7 gal/hr
25% load with fan	45.5 L/hr, 12.0 gal/hr	41.8 L/hr, 11.0 gal/hr
Cooling System[1]		
Radiator air flow restriction (system)	0.12 kPa, 0.48 in. Water	0.12 kPa, 0.48 in. Water
Radiator air flow	804 m³/min, 28393 cfm	804 m³/min, 28393 cfm
Engine coolant capacity	26.9 L, 7.1 gal	26.9 L, 7.1 gal
Radiator coolant capacity	61 L, 16.11 gal	61 L, 16.11 gal
Total coolant capacity	87.9 L, 23.2 gal	87.9 L, 23.2 gal
Inlet Air		
Combustion air inlet flow rate	37.9 m³/min, 1340 cfm	36.3 m³/min, 1208 cfm
Max. Allowable Combustion Air Inlet Temp	50 °C, 122 °F	50 °C, 122 °F
Exhaust System		
Exhaust stack gas temperature	447 °C, 836.8 °F	426.3°C, 799.3 °F
Exhaust gas flow rate	69.8 m³/min, 2465.3 cfm	66.5 m³/min, 2349.7 cfm
Exhaust system backpressure (maximum allowable)	10.0 kPa, 40.0 in. water	10.0 kPa, 40.0 in. water
Heat Rejection		
Heat rejection to jacket water	283 kW, 16110 Btu/min	256 kW, 14548 Btu/min
Heat rejection to exhaust (total)	514 kW, 29204 Btu/min	462 kW, 26276 Btu/min
Heat rejection to aftercooler	113 kW, 6454 Btu/min	101 kW, 5721 Btu/min
Heat rejection to atmosphere from engine	28 kW, 1603 Btu/min	26.1 kW, 1483 Btu/min
Heat rejection to atmosphere from Generator	29 kW, 1621 Btu/min	25.5 kW, 1450 Btu/min

Emissions (Nominal)[2]		
NOx	100.5 mg/Nm³, 0.2 g/hp-hr	122.8 mg/Nm³, 0.26 g/hp-hr
CO	NA	NA
HC	4.9 mg/Nm³, 0.0 g/hp-hr	3.9 mg/Nm³, 0.01 g/hp-hr
PM	2.2 mg/Nm³, 0.0 g/hp-hr	1.6 mg/Nm³, 0.0 g/hp-hr
Alternator[3]		
Voltages	**480V**	**480V**
Motor Starting Capability @ 30% Voltage Dip	1729 skVA	1729 skVA
Current	752 amps	684 amps
Frame Size	LC6124G	LC6124G
Excitation	AR	AR
Temperature Rise	105 °C, 221 °F	105 °C, 221 °F

WEIGHTS & DIMENSIONS – OPEN



Standby Rating	Dim "A" mm (in)	Dim "B" mm (in)	Dim "C" mm (in)	Generator Set Weight kg (lb)
500 ekW	5310	2286	2179	5160

Note: Weights & Dimensions are for open set on skid base

DEFINITIONS AND CONDITIONS:

[1] For ambient and altitude capabilities consult your Cat dealer. Air flow restriction (system) is added to existing restriction from factory.

[2] Emissions data measurement procedures are consistent with those described in EPA CFR 40 Part 89, Subpart D & E and ISO8178-1 for measuring HC, CO, PM, NOx. Data shown is based on steady state operating conditions of 77° F, 28.42 in HG and number 2 diesel fuel with 35° API and LHV of 18,390 BTU/lb. The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on 100% load and thus cannot be used to compare to EPA regulations which use values based on a weighted cycle.

[3] UL 2200 Listed packages may have oversized generators with a different temperature rise and motor starting characteristics. Generator temperature rise is based on a 40° C ambient per NEMA MG1-32.

APPLICABLE CODES AND STANDARDS:

AS1359, CSA C22.2 No100-04, UL142, UL489, UL869, UL2200, NFPA37, NFPA70, NFPA99, NFPA110, IBC, IEC60034-1, ISO3046, ISO8528, NEMA MG1-22, NEMA MG1-33, 2006/95/EC, 2006/42/EC, 2004/108/EC.

Note: Codes may not be available in all model configurations. Please consult your local Cat Dealer representative for availability.

STANDBY: Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year.

PRIME: Output available with varying load for an unlimited time. Average power output is 70% of the prime power rating. Typical peak demand is 100% of prime rated ekW with 10% overload capability for emergency use for a maximum of 1 hour in 12. Overload operation cannot exceed 25 hours per year

RATINGS: Ratings are based on SAE J1349 standard conditions. These ratings also apply at ISO3046 standard conditions.

FUEL RATES: Fuel Consumption reported in accordance with ISO3046-1.

LET'S DO THE WORK.™

LEHE1710-02-ISO3046 (08-19)

Attachment D.3.3 – MAC Baghouse Efficiency

TELEFAX MESSAGE COVER SHEET PAGE 1 OF 2

TO: Mr. Jim Lekas

FROM: R. Scott Campbell

Company: **LEXCO INC.**
Attn: President
Fax No.: 545-2476

CAMTEC INDUSTRIAL SALES
Date: April 7, 1998
Subject: Filter Emission Statement

REF: MAC Model 96FRB39 Filters

Dear Lekas:

I have mailed you some literature on the Screens, Vacuum Cleaning Equipment, and Storage Silo products that we offer.

You asked about a typical emission statement for the MAC Filters you purchased in February of 1996. As you know, each application will have unique operating characteristics (such as dust loading, particle size distribution, moisture content, gas volume, and temperature) that are major factors in determining the efficiency of a dust collector.

Based on 2 micron and larger dust particles, MAC EQUIPMENT guarantees their baghouse (fabric filters), when properly applied and maintained, to have a 99.99% or better mass efficiency rating on the dust laden incoming gas stream.

As a general statement, emissions from our needled felt polyester filter fabric will not exceed an average of 0.02 grains per dry standard cubic foot of air (45 mg/m3) exhausted from the fans.

The guarantee is based on particles two (2) microns and larger in diameter and on the equipment being properly installed and maintained according to standard MAC EQUIPMENT Installation and Operating Instructions.

Effluent testing, if required, would be conducted generally in accordance with the procedures as outlined in Title 40, part 60 of (US) Code of Federal Regulations. The effluent tests shall not take into consideration condensibles.

CAMTEC INDUSTRIAL SALES
P.O. Box 1700 • Sandy, Utah 84091 • (FAX 801-566-6177) • (801) 566-6000

You could calculate your maximum emissions in pounds per hour as follows:

$$\frac{3{,}000 \text{ CFM} \times 60 \text{ MIN.} \times .02 \text{ GR. / DSCF}}{7{,}000 \text{ GRAINS PER POUND}} = .514 \text{ LBS. PER HOUR}$$

I trust this will help you with your permitting work. Let me know if you have questions or need further assistance in any way. You have my assurance of prompt attention to your needs.

Sincerely,

R. Scott Campbell
Sales Engineer

RSC/s

Attachment D.4.1 – Emissions Calculations and Factors

Attachment D.4.1
Total Emissions Summary Tables

Current Actual Emissions for Existing Engines, tons per year							
Source	**NO_X**	**CO**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
CW-3 (Tier 2)	7.92	4.59	0.26	0.26	0.26	0.01	0.53
CW-6 (Non-Tier Engine)	16.49	3.78	0.34	0.28	0.28	0.01	0.48
Material Handling	NA	NA	1.89	1.82	1.82	NA	NA
Haul Roads	NA	NA	3.68	0.94	0.09	NA	NA
Total	***24.41***	***8.37***	***6.16***	***3.29***	***2.45***	***0.02***	***1.01***

* Current actual emissions based on 2019 operating hours (2,835) and tons produced (2,265).

Current Allowable Emissions for Existing Engines, tons per year							
Source	**NO_X**	**CO**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
CW-3 (Tier 2)	53.01	30.75	1.76	1.76	1.76	0.06	3.53
CW-6 (Non-Tier Engine)	94.61	21.68	1.94	1.59	1.59	0.05	2.78
Material Handling	NA	NA	11.66	11.24	11.24	NA	NA
Haul Roads	NA	NA	5.97	1.52	0.15	NA	NA
Total	***147.62***	***52.43***	***21.33***	***16.11***	***14.74***	***0.11***	***6.31***

* Current allowable emissions based on 8,760 operating hours and 14,200 tons per year

Post Change Potential Emissions, tons per year							
Source	**NO_X**	**CO**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
Tier 4 - Prime Power	5.21	27.23	0.23	0.23	0.23	0.06	1.48
Tier 4 - Prime Power (CW-6)	5.21	27.23	0.23	0.23	0.23	0.06	1.48
CW-3 (Tier 2)	53.01	30.75	1.76	1.76	1.76	0.06	3.53
Tier 4 - Water Pump	1.25	10.93	0.06	0.06	0.06	0.02	0.59
Material Handling	NA	NA	23.19	19.70	19.70	NA	NA
Haul Roads	NA	NA	21.26	5.42	0.54	NA	NA
Total	***64.69***	***96.13***	***46.74***	***27.41***	***22.53***	***0.20***	***7.08***

* Post change potential emissions based on 8,760 operating hours and 38,727 tons per year

Post Change Allowable Emissions, tons per year							
Source	**NO_X**	**CO**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
Tier 4 - Prime Power	2.69	14.06	0.12	0.12	0.12	0.03	0.76
Tier 4 - Prime Power (CW-6)	2.69	14.06	0.12	0.12	0.12	0.03	0.76
CW-3 (Tier 2)	27.38	15.88	0.91	0.91	0.91	0.03	1.83
Tier 4 - Mine Dewatering	1.25	10.93	0.06	0.06	0.06	0.02	0.59
Material Handling	NA	NA	11.98	10.18	10.18	NA	NA
Haul Roads	NA	NA	14.32	3.65	0.37	NA	NA
Total	***34.01***	***54.93***	***27.51***	***15.04***	***11.75***	***0.12***	***3.95***

* Post change allowable emissions based on 4,524 operating hours and 20,000 tons per year

Attachment D.4.1
2019 Actual Fugitive Emissions

2019 Actual Annual Production - 2,265 tpy
2019 Actual Operating Hours - 2,835

Haul Road Emission Basis

AP-42 Chapter 13.2.2 provides emission estimates for Unpaved Roads.
The emission factor calculation for unpaved industrial roads is:

$$E = k\,(s/12)^a (W/3)^b$$

Value	Description
E	Emission factor (lb/VMT)
s	silt content
W	mean vehicle weight (tons)
k	constant provided by AP-42
a	constant provided by AP-42
b	constant provided by AP-42

Constant	Value	Source/Assumption
s (%)	4.8	AP-42 Snad and gravel processing plant road mean silt content.
Empty Hual Truck (tons)	14.0	Tare standard 14
M (%)	15.00	The median value from AP-42 Table 13.2.2-3. RANGE OF SOURCE CONDITIONS USED IN DEVELOPING EQUATION 1a AND 1b for Industrial Roads was used.
Maintenance Truck Weight (tons)	5	Chevrolet 1500 LT crew cal is 7,100 lbs, payload 2,160 lbs = 9,260lbs
Avg. Hual (tons)	13	AGC
Mean Haul Weight (tons)	27.40	Per AGC - 2 year average is 27.4 whuch includes intermittend use of haul truck with pup.
Maintenance Truck (tons)	5.00	Chevrolet 1500 LT crew cal is 7,100 lbs, payload 2,160 lbs = 9,260lbs
Maximum Haul Distance to CW-6 (mile)	1.60	AGC reported 0.8 one way
Maximum Haul Distance to CW-3 (mile)	0.78	AGC reported 0.39 one way
Maximum Haul Distance to CW-7 (mile)	2.40	AGC Provided

Constants as provided by AP-42 13.2.2-2

Constant	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
k	0.15	1.5	4.9
a	0.9	0.9	0.7
b	0.45	0.45	0.45

2019 Actual Fugitive Emissions

Calculated Emission Factor	lb/Vehicle Mile Traveled (Haul Truck)	lb/Vehicle Mile Traveled (Maintenance and Worker Truck)
$PM_{2.5}$	0.18	0.08
PM_{10}	1.78	0.83
PM_{30} (TSP)	6.98	3.25

Site	Number of Haul Truck Trips/day (actual based on mine schedule)	Actual Hauls/year	Maintenance trips/year	Worker trips/year
CW-6	1	208	52	452
CW-3	1	208	52	452
CW-7	0	0	0	0

Transport Emissions	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
CW-6	0.03	0.30	1.16
CW-3	0.01	0.14	0.57
CW-7	0.00	0.00	0.00
Actual	0.04	0.44	1.73

Maintenance Emissions	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
CW-6	0.003	0.03	0.14
CW-3	0.002	0.02	0.07
CW-7	0.000	0.00	0.00
Actual	0.01	0.05	0.20

Worker Emissions	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
CW-6	0.03	0.30	1.17
CW-3	0.01	0.15	0.57
CW-7	0.00	0.00	0.00
Actual	0.04	0.45	1.75

	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
Total Emissions (TPY)	**0.09**	**0.94**	**3.68**

Attachment D.4.1
Current Allowable Fugitive Emission

Potential Annual Production - 14,200 tpy
Potential Post Change Annual Operating Hours - 8,760

Haul Road Emission Basis

AP-42 Chapter 13.2.2 provides emission estimates for Unpaved Roads.
The emission factor calculation for unpaved industrial roads is:

$$E = k\,(s/12)^a (W/3)^b$$

Value	Description
E	Emission factor (lb/VMT)
s	silt content
W	mean vehicle weight (tons)
k	constant provided by AP-42
a	constant provided by AP-42
b	constant provided by AP-42

Constant	Value	Source/Assumption
s (%)	4.8	AP-42 Snad and gravel processing plant road mean silt content.
Empty Hual Truck (tons)	14.0	Tare standard 14
M (%)	15.00	The median value from AP-42 Table 13.2.2-3. RANGE OF SOURCE CONDITIONS USED IN DEVELOPING EQUATION 1a AND 1b for Industrial Roads was used.
Maintenance Truck Weight (tons)	5	Chevrolet 1500 LT crew cal is 7,100 lbs, payload 2,160 lbs = 9,260lbs
Avg. Hual (tons)	13	AGC
Mean Haul Weight (tons)	27.40	Per AGC - 2 year average is 27.4 whuch includes intermittend use of haul truck with pup.
Maintenance Truck (tons)	5.00	Chevrolet 1500 LT crew cal is 7,100 lbs, payload 2,160 lbs = 9,260lbs
Maximum Haul Distance to CW-6 (mile)	1.60	AGC reported 0.8 one way
Maximum Haul Distance to CW-3 (mile)	0.78	AGC reported 0.39 one way
Maximum Haul Distance to CW-7 (mile)	2.40	AGC Provided

Constants as provided by AP-42 13.2.2-2

Constant	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
k	0.15	1.5	4.9
a	0.9	0.9	0.7
b	0.45	0.45	0.45

Calculated Emission Factor	lb/Vehicle Mile Traveled (Haul Truck)	lb/Vehicle Mile Traveled (Maintenance and Worker Truck)
$PM_{2.5}$	0.18	0.08
PM_{10}	1.78	0.83
PM_{30} (TSP)	6.98	3.25

Site	Number of Haul Truck Trips/day (actual based on mine schedule)	Actual Hauls/year	Maintenance trips/year	Worker trips/year
CW-6	2	416	52	452
CW-3	3	624	52	452
CW-7	0	0	0	0

Transport Emissions	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
CW-6	0.06	0.59	2.32
CW-3	0.04	0.43	1.70
CW-7	0.00	0.00	0.00
Actual	0.10	1.03	4.02

Maintenance Emissions	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
CW-6	0.003	0.03	0.14
CW-3	0.002	0.02	0.07
CW-7	0.000	0.00	0.00
Actual	0.01	0.05	0.20

Worker Emissions	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
CW-6	0.03	0.30	1.17
CW-3	0.01	0.15	0.57
CW-7	0.00	0.00	0.00
Actual	0.04	0.45	1.75

	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
Total Emissions (TPY)	**0.15**	**1.52**	**5.97**

Attachment D.4.1
Post Change Allowable Fugitive Emissions

Proposed Annual Production - 20,000 tpy
Proposed Post Change Annual Operating Hours - 4,524

Haul Road Emission Basis

AP-42 Chapter 13.2.2 provides emission estimates for Unpaved Roads.
The emission factor calculation for unpaved industrial roads is:

$$E = k\,(s/12)^a (W/3)^b$$

Value	Description
E	Emission factor (lb/VMT)
s	silt content
W	mean vehicle weight (tons)
k	constant provided by AP-42
a	constant provided by AP-42
b	constant provided by AP-42

Constant	Value	Source/Assumption
s (%)	4.8	AP-42 Snad and gravel processing plant road mean silt content.
Empty Hual Truck (tons)	14.0	Tare standard 14
M (%)	15.00	The median value from AP-42 Table 13.2.2-3. RANGE OF SOURCE CONDITIONS USED IN DEVELOPING EQUATION 1a AND 1b for Industrial Roads was used.
Maintenance Truck Weight (tons)	5	Chevrolet 1500 LT crew cal is 7,100 lbs, payload 2,160 lbs = 9,260lbs
Avg. Hual (tons)	13	AGC
Mean Haul Weight (tons)	27.40	Per AGC - 2 year average is 27.4 whuch includes intermittend use of haul truck with pup.
Maintenance Truck (tons)	5.00	Chevrolet 1500 LT crew cal is 7,100 lbs, payload 2,160 lbs = 9,260lbs
Maximum Haul Distance to CW-6 (mile)	1.60	AGC reported 0.8 one way
Maximum Haul Distance to CW-3 (mile)	0.78	AGC reported 0.39 one way
Maximum Haul Distance to CW-7 (mile)	2.40	AGC Provided

Constants as provided by AP-42 13.2.2-2

Constant	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
k	0.15	1.5	4.9
a	0.9	0.9	0.7
b	0.45	0.45	0.45

Post Change Allowable Fugitive Emissions

Calculated Emission Factor	lb/Vehicle Mile Traveled (Haul Truck)	lb/Vehicle Mile Traveled (Maintenance and Worker Truck)
$PM_{2.5}$	0.18	0.08
PM_{10}	1.78	0.83
PM_{30} (TSP)	6.98	3.25

Site	Number of Haul Truck Trips/day (actual based on mine schedule)	Actual Hauls/year	Maintenance trips/year	Worker trips/year
CW-6	3	624	52	452
CW-3	3	624	52	452
CW-7	2	416	52	452

Transport Emissions	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
CW-6	0.09	0.89	3.48
CW-3	0.04	0.43	1.70
CW-7	0.13	1.33	5.23
Actual	0.27	2.65	10.41

Maintenance Emissions	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
CW-6	0.00	0.03	0.14
CW-3	0.00	0.02	0.07
CW-7	0.01	0.05	0.20
Actual	0.01	0.10	0.40

Worker Emissions	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
CW-6	0.03	0.30	1.17
CW-3	0.01	0.15	0.57
CW-7	0.04	0.45	1.76
Actual	0.09	0.89	3.51

	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
Total Emissions (TPY)	**0.37**	**3.65**	**14.32**

Attachment D.4.1

Post Change Potential Fugitive Emissions

Potential Annual Production - 38,727 tpy

Potential Post Change Annual Operating Hours - 8,760

Haul Road Emission Basis

AP-42 Chapter 13.2.2 provides emission estimates for Unpaved Roads.

The emission factor calculation for unpaved industrial roads is:

$$E = k\,(s/12)^a (W/3)^b$$

Value	Description
E	Emission factor (lb/VMT)
s	silt content
W	mean vehicle weight (tons)
k	constant provided by AP-42
a	constant provided by AP-42
b	constant provided by AP-42

Constant	Value	Source/Assumption
s (%)	4.8	AP-42 Snad and gravel processing plant road mean silt content.
Empty Hual Truck (tons)	14.0	Tare standard 14
M (%)	15.00	The median value from AP-42 Table 13.2.2-3. RANGE OF SOURCE CONDITIONS USED IN DEVELOPING EQUATION 1a AND 1b for Industrial Roads was used.
Maintenance Truck Weight (tons)	5	Chevrolet 1500 LT crew cal is 7,100 lbs, payload 2,160 lbs = 9,260lbs
Avg. Hual (tons)	13	AGC
Mean Haul Weight (tons)	27.40	Per AGC - 2 year average is 27.4 whuch includes intermittend use of haul truck with pup.
Maintenance Truck (tons)	5.00	Chevrolet 1500 LT crew cal is 7,100 lbs, payload 2,160 lbs = 9,260lbs
Maximum Haul Distance to CW-6 (mile)	1.60	AGC reported 0.8 one way
Maximum Haul Distance to CW-3 (mile)	0.78	AGC reported 0.39 one way
Maximum Haul Distance to CW-7 (mile)	2.40	AGC Provided

Constants as provided by AP-42 13.2.2-2

Constant	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
k	0.15	1.5	4.9
a	0.9	0.9	0.7
b	0.45	0.45	0.45

Post Change Potential Fugitive Emissions

Calculated Emission Factor	lb/Vehicle Mile Traveled (Haul Truck)	lb/Vehicle Mile Traveled (Maintenance and Worker Truck)
$PM_{2.5}$	0.18	0.08
PM_{10}	1.78	0.83
PM_{30} (TSP)	6.98	3.25

Site	Number of Haul Truck Trips/day (actual based on mine schedule)	Actual Hauls/year	Maintenance trips/year	Worker trips/year
CW-6	5	1040	52	452
CW-3	5	1040	52	452
CW-7	5	1040	52	452

Transport Emissions	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
CW-6	0.15	1.48	5.81
CW-3	0.07	0.72	2.83
CW-7	0.22	2.22	8.71
Actual	0.44	4.42	17.35

Maintenance Emissions	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
CW-6	0.00	0.03	0.14
CW-3	0.00	0.02	0.07
CW-7	0.01	0.05	0.20
Actual	0.01	0.10	0.40

Worker Emissions	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
CW-6	0.03	0.30	1.17
CW-3	0.01	0.15	0.57
CW-7	0.04	0.45	1.76
Actual	0.09	0.89	3.51

	$PM_{2.5}$	PM_{10}	PM_{30} (TSP)
Total Emissions (TPY)	**0.54**	**5.42**	**21.26**

Attachment D.4.1

2019 Actual and Potential Material Handling Emissions

PM_{10} Air Emissions from Mine Air Lifts and Plant Dust Collection							
Unit	Emission Factor (gr/dscf)[1]	Oper. Hours[2]	Flowrate (ACFM)[3]	Flowrate (SCFM)[4]	Actual Emissions (TPY)[5]	Potential Oper. Hours	Potential to Emit (TPY)
CW-3	0.020	1,308	9,000	7,200	0.81	8,760	5.41
CW-6	0.020	1,527	9,000	7,200	0.94	8,760	5.41
CW-7	0.020	0	0	0	0.00	0	0.00
				Total	**1.75**		**10.81**

1. From CAMTEC INDUSTRIAL SALES Letter dated April 7, 1998
2. Assumes 87 hours per week; 52 weeks per year
3. AGC provided flowrates vary between 5,000 ACFM and 13,000 ACFM. A median ACFM of 9,000 was estimated
4. SCFM calculation methodology used by the facility was replicated for this effort
5. 14,000,000 grains per ton.

			PM Air Emissions from Drop Loading			PM_{10} Air Emissions from Drop Loading		
Unit	Mine Production - Actual (TPY)[1]	Potential Production (tons)	Emission Factor (lb/ton of material)[2]	Actual Emissions (TPY)	Potential to Emit (TPY)	Emission Factor (lb/ton of material)[2]	Actual Emissions (TPY)	Potential to Emit (TPY)
CW-3	1,256	8,412	0.12	0.08	0.50	0.06	0.04	0.25
CW-6	1,009	5,788	0.12	0.06	0.35	0.06	0.03	0.17
CW-7	0	0	0.00	0.00	0.00	0.00	0.00	0.00
Total				**0.14**	**0.85**		**0.07**	**0.43**

1. Actual production provided by AGC

2. Emission factor from AP-42 Table 11.24-2 EMISSION FACTORS FOR METALLIC MINERALS PROCESSING; Material handling and transfer--all minerals except bauxite.

Total Material Handling Operations Emissions		
Source Location	PM (tpy)	PM_{10} (tpy)
Actual Emissions	1.89	1.82
PTE Emissions	11.66	11.24

Attachment D.4.1

Potential Material Handling Emissions

PM_{10} Air Emissions from Mine Air Lifts and Plant dust collection							
Unit	Emission Factor (gr/dscf)[1]	Oper. Hours[2]	Flowrate (ACFM)[3]	Flowrate (SCFM)[4]	Actual Emissions (TPY)[5]	Potential Oper. Hours	Potential to Emit (TPY)
CW-3	0.020	4,524	9,000	7,200	2.79	8,760	5.41
CW-6 (Tier 4)	0.020	4,524	9,000	7,200	2.79	8,760	5.41
CW-7	0.020	4,524	9,000	7,200	2.79	8,760	5.41
				Total	8.38		16.22

1. From CAMTEC INDUSTRIAL SALES Letter dated April 7, 1998
2. Assumes 87 hours per week; 52 weeks per year
3. AGC provided flowrates vary between 5,000 ACFM and 13,000 ACFM. A median ACFM of 9,000 was estimated
4. SCFM calculation methodology used by the facility was replicated for this effort
5. 14,000,000 grains per ton as cited by AP-42 ch 11.24 and approved by EPA.

		PM Air Emissions from Drop Loading				PM10 Air Emissions from Drop Loading			
Unit	Mine Production - Actual (TPY)[1]	Emission Factor (lb/ton of material)[2]	Actual Emissions (TPY)	Potential Production (tons)	Potential to Emit (TPY)	Emission Factor (lb/ton of material)[2]	Actual Emissions (TPY)	Potential Production (tons)	Potential to Emit (TPY)
CW-3	20,000	0.12	1.20	38,727	2.32	0.06	0.60	38,727	1.16
CW-6 (Tier 4)	20,000	0.12	1.20	38,727	2.32	0.06	0.60	38,727	1.16
CW-7	20,000	0.12	1.20	38,727	2.32	0.06	0.60	38,727	1.16
Total			3.60		6.97		1.80		3.49

1. Maximum production as assumed from AGC Data

2. Emission factor from AP-42 Table 11.24-2 EMISSION FACTORS FOR METALLIC MINERALS PROCESSING; Material handling and transfer--all minerals except bauxite.

Total Material Handling Operations Emissions		
Source Location	PM (tpy)	PM10 (tpy)
Actual Emissions	11.98	10.18
PTE Emissions	23.19	19.70

Attachment D.4.1

CRITERIA EMISSION ESTIMATES for Cottonwood Mine Engine CW-3

Make: Cummins
Model: QSK-23-G7 NR2
Serial Number: 00316414
Manufacturer HP: 1,220
Derated HP: 1,220

POLLUTANT NAME	EF (lb/MMBtu)	EF (lb/hp-hr)	EF (g/hp-hr)	EF Source[2]	CY 2019 Actual Emissions (tpy)	Requested Emissions (tpy)	Potential Emissions (tpy)
PM	-	3.29E-04	0.15	Tier II	0.262	0.907	1.757
PM_{10}[1]	-	3.29E-04	0.15	Tier II	0.262	0.907	1.757
CO	-	5.75E-03	2.61	Tier II	4.591	15.879	30.747
SO_x[3]	-	1.21E-05	5.50E-03	EPA AP-42	0.01	0.03	0.065
NO_x+HC[4]	-	1.05E-02	4.8	Tier II	8.395	29.036	56.223
NO_x[5]	-	9.92E-03	4.5	EPA Guidance	7.916	27.378	53.013
HC[5]	-	6.61E-04	0.30	EPA Guidance	0.53	1.8252	3.534

1 kw = 1.341 hp

Calulation Summary

Total hp-hr as Requested =	5,519,280
CY 2019 Actual hp-hr as Requested =	1,595,760
Annual Fuel Consumption (gal) =	249,779
Peak HP fuel consumption (gal/hr) =	55.2
Fuel Use Derated (gal/hr) =	NA
Requested Operating Hours =	4,524
2019 Actual Operating Hours =	1,308
Fuel (Btu/gal) =	138,700
BSFC (Btu/hp-hr)	6,277
Requested Total (MMBtu) =	34,644
Max Potential Operating Hours =	8,760
Potential hp-hr =	10,687,200
Potential Total (MMBtu) =	67,083

NOTES:

1.) Assumes PM_{10} emissions are equal to PM.

2.) Manufacturer's emissions unavailable, Tier II certification limits used where applicable.

3.) Fuel sulfur content is assumed to be 0.0015% by wt. EPA EF (lbs./ hp-hr) used. AP-42 Emission factor, Chapter 3, Section 4, Table 3.4-1.

4.) NOx plus non-methane hydrocarbon emissions based on Tier II emissions limit.

Assumes 87 hours per week, 52 weeks per year of operation.

Emission Cert. Conversions (EPA Data):

	g/kW-hr
PM	0.2
CO	3.5
HC	NA
NOx+HC	6.4

Certificate #: EPA Stationary Genset Emissions Limits and Timing

g/hp-hr
0.15
2.61
NA
4.77

Engine Family: 7CEXL023.AAB

EPA NSPS IIII Tier 2
Meets NESHAP ZZZZ via NSPS IIII

HAP EMISSION ESTIMATES for Cottonwood Mine Engine CW-3

HAP NAME	HAP EF[1] (Lbs/MMBtu)	Requested HAP (Lbs)	Potential HAP (Lbs)
Acenaphthylene	9.23E-06	3.20E-01	6.19E-01
Acenaphthene	4.68E-06	1.62E-01	3.14E-01
Acetaldehyde	2.52E-05	8.73E-01	1.69E+00
Acrolein	7.88E-06	2.73E-01	5.29E-01
Anthracene	1.23E-06	4.26E-02	8.25E-02
Benz(a)anthracene	6.22E-07	2.15E-02	4.17E-02
Benzene	7.76E-04	2.69E+01	5.21E+01
Benzo(b)fluoranthene	1.11E-06	3.85E-02	7.45E-02
Benzo(k)fluoranthene	2.18E-07	7.55E-03	1.46E-02
Benzo(a)pyrene	2.57E-07	8.90E-03	1.72E-02
Benzo(g,h,I)perylene	5.56E-07	1.93E-02	3.73E-02
Chrysene	1.53E-06	5.30E-02	1.03E-01
Dibenz(a,h)anthracene	3.46E-07	1.20E-02	2.32E-02
Fluoranthene	4.03E-06	1.40E-01	2.70E-01
Fluorene	1.28E-05	4.43E-01	8.59E-01
Formaldehyde	7.89E-05	2.73E+00	5.29E+00
Indeno(1,2,3-cd)pyrene	4.14E-07	1.43E-02	2.78E-02
1,3 Butadiene	3.91E-05	1.35E+00	2.62E+00
Naphthalene	1.30E-04	4.50E+00	8.72E+00
Phenanthrene	4.08E-05	1.41E+00	2.74E+00
Pyrene	3.71E-06	1.29E-01	2.49E-01
Toluene	2.81E-04	9.74E+00	1.89E+01
Xylenes	1.93E-04	6.69E+00	1.29E+01
TOTAL HAPs Emissions (lbs.)		**55.87**	**108.18**

Calulation Summary

Annual Fuel Consumption (gal) =	249,779
Peak HP fuel consumption (gal/hr) =	55.2
Fuel Use Derated (gal/hr) =	NA
Requested Operating Hours =	4,524
Requested Fuel (Btu/gal) =	138,700
Requested Total(MMBtu)=	34,644
Max Potential Operating Hours =	8,760
Potential hp-hr =	10,687,200
Potential Total (MMBtu) =	67,083

NOTES:

1.) HAP emissions factors from Tables 3.4-3 and 3.4-4 of AP-42, for engines > 600 hp.

Attachment D.4.1

CRITERIA EMISSION ESTIMATES for Cottonwood Mine Engine CW-6

Make: Cummins
Model: VTA-28-G5
Serial Number: 25310127
Manufacturer HP: 900
Derated HP: 900

POLLUTANT NAME	EF (lb/MMBtu)	EF (lb/hp-hr)	EF (g/hp-hr)	EF Source[1]	CY 2019 Actual Emissions (tpy)	Requested Emissions (tpy)	Potential Emissions (tpy)
PM	6.97E-02	-	2.23	EPA AP-42	0.337	0.999	1.94
PM_{10}	5.73E-02	-	1.83	EPA AP-42	0.277	0.822	1.59
CO	-	5.50E-03	2.49	EPA AP-42	3.779	11.197	21.68
SO_x[2]	-	1.21E-05	5.50E-03	EPA AP-42	0.008	0.02	0.048
NO_x	-	2.40E-02	10.89	EPA AP-42	16.492	48.859	94.61
HC	-	7.05E-04	0.32	EPA AP-42	0.48	1.4352	2.78

1 kw = 1.341 hp

Calulation Summary

Total hp-hr as Requested =	4,071,600
CY 2019 Actual hp-hr =	1,374,300
Annual Fuel Consumption (gal) =	206,755
Peak HP fuel consumption (gal/hr) =	45.7
Fuel Use Derated (gal/hr) =	NA
Requested Operating Hours =	4,524
CY 2019 Actual Hours =	1,527
Fuel (Btu/gal) =	138,700
BSFC (Btu/hp-hr)	7,043
Requested Total (MMBtu) =	28,677
Max **Potential** Operating Hours =	8,760
Potential hp-hr =	7,884,000
Potential Total (MMBtu) =	55,528
CY 2019 Actual (MMBtu) =	9,679

NOTES:

1.) Manufacturer's emissions unavailable. AP-42 Emission factors used, Chapter 3, Section 4, Tables 3.4-1 and 3.4-2.

2.) Fuel sulfur content is assumed to be 0.0015% by wt. EPA EF (lbs./ hp-hr) used.

Emission Cert. Conversions (EPA Data): Certificate #: EPA Stationary Genset Emissions Limits and Timing Engine Family: D15

	g/kW-hr	g/hp-hr
PM		0.00
CO		0.00
HC	NA	NA
NOx+HC		0.00

HAP EMISSION ESTIMATES for Cottonwood Mine Engine CW-6

HAP NAME	HAP EF[1] (Lbs/MMBtu)	Requested HAP (Lbs)	Potential HAP (Lbs)
Acenaphthylene	9.23E-06	2.65E-01	5.13E-01
Acenaphthene	4.68E-06	1.34E-01	2.60E-01
Acetaldehyde	2.52E-05	7.23E-01	1.40E+00
Acrolein	7.88E-06	2.26E-01	4.38E-01
Anthracene	1.23E-06	3.53E-02	6.83E-02
Benz(a)anthracene	6.22E-07	1.78E-02	3.45E-02
Benzene	7.76E-04	2.23E+01	4.31E+01
Benzo(b)fluoranthene	1.11E-06	3.18E-02	6.16E-02
Benzo(k)fluoranthene	2.18E-07	6.25E-03	1.21E-02
Benzo(a)pyrene	2.57E-07	7.37E-03	1.43E-02
Benzo(g,h,I)perylene	5.56E-07	1.59E-02	3.09E-02
Chrysene	1.53E-06	4.39E-02	8.50E-02
Dibenz(a,h)anthracene	3.46E-07	9.92E-03	1.92E-02
Fluoranthene	4.03E-06	1.16E-01	2.24E-01
Fluorene	1.28E-05	3.67E-01	7.11E-01
Formaldehyde	7.89E-05	2.26E+00	4.38E+00
Indeno(1,2,3-cd)pyrene	4.14E-07	1.19E-02	2.30E-02
1,3 Butadiene	3.91E-05	1.12E+00	2.17E+00
Naphthalene	1.30E-04	3.73E+00	7.22E+00
Phenanthrene	4.08E-05	1.17E+00	2.27E+00
Pyrene	3.71E-06	1.06E-01	2.06E-01
Toluene	2.81E-04	8.06E+00	1.56E+01
Xylenes	1.93E-04	5.53E+00	1.07E+01
TOTAL HAPs Emissions (lbs.)		**46.24**	**89.55**

Calulation Summary

Annual Fuel Consumption (gal) =	206,755
Peak HP fuel consumption (gal/hr) =	45.7
Fuel Use Derated (gal/hr) =	NA
Requested Operating Hours =	4,524
Requested Fuel (Btu/gal) =	138,700
Requested Total(MMBtu)=	28,677
Max Potential Operating Hours =	8,760
Potential hp-hr =	7,884,000
Potential Total (MMBtu) =	55,528

NOTES:

1.) HAP emissions factors from Tables 3.4-3 and 3.4-4 of AP-42, for engines > 600 hp.

CRITERIA EMISSION ESTIMATES for Cottonwood Mine Engine Tier 4 Mine Dewatering Engine

Make: Cummins
Model: TBD
Serial Number: TBD
Manufacturer HP: 536 Manufacturer kW: 400
Derated HP: 433 Derated kW: 323
Derated per manufacturer guidance

POLLUTANT NAME	EF (lb/MMBtu)	EF (lb/hp-hr)	EF (g/hp-hr)	EF Source[1]	Requested Emissions (tpy)	Potential Emissions (tpy)
PM	-	3.29E-05	0.01	Tier 4	0.062	0.062
PM_{10}	-	3.29E-05	0.01	Tier 4	0.062	0.062
CO	-	5.76E-03	2.61	Tier 4	10.925	10.925
SO_x[2]	-	1.21E-05	5.50E-03	EPA AP-42	0.02	0.023
NO_x	-	6.58E-04	0.30	Tier 4	1.249	1.249
HC	-	3.13E-04	0.14	Tier 4	0.5931	0.593

1 kw = 1.341 hp

NOTES:

1.) Manufacturer's emissions unavailable. EPA Nonroad Tier 4 emission standards used where appropriate for a 536 hp (400 kW) engine, Table 1 from 40 CFR 1039.101.

2.) Fuel sulfur content is assumed to be 0.0015% by wt. EPA EF (lbs./ hp-hr) used. AP-42 Emission factor, Chapter 3, Section 4, Table 3.4-1.

Calulation Summary

Total hp-hr as Requested =	3,794,333
Annual Fuel Consumption (gal) =	283,824
Peak HP fuel consumption (gal/hr) =	32.4
Fuel Use Derated (gal/hr) =	NA
Requested Operating Hours =	8,760
Fuel (Btu/gal) =	138,700
BSFC (Btu/hp-hr)	10,375
Requested Total (MMBtu) =	39,366
Max Potential Operating Hours =	8,760
Potential hp-hr =	3,794,333
Potential Total (MMBtu) =	39,366

Assumes approx. 168 hours per week, 52 weeks per year of operation.

HAP EMISSION ESTIMATES for Cottonwood Mine Engine Tier 4 Dewater Engine

HAP NAME	HAP EF[1] (Lbs/MMBtu)	Requested HAP (Lbs)	Potential HAP (Lbs)
Acenaphthylene	5.06E-06	1.99E-01	1.99E-01
Acenaphthene	1.42E-06	5.59E-02	5.59E-02
Acetaldehyde	7.67E-04	3.02E+01	3.02E+01
Acrolein	9.25E-05	3.64E+00	3.64E+00
Anthracene	1.87E-06	7.36E-02	7.36E-02
Benz(a)anthracene	1.68E-06	6.61E-02	6.61E-02
Benzene	9.33E-04	3.67E+01	3.67E+01
Benzo(b)fluoranthene	9.91E-08	3.90E-03	3.90E-03
Benzo(k)fluoranthene	1.55E-07	6.10E-03	6.10E-03
Benzo(a)pyrene	1.88E-07	7.40E-03	7.40E-03
Benzo(g,h,l)perylene	4.89E-07	1.93E-02	1.93E-02
Chrysene	3.53E-07	1.39E-02	1.39E-02
Dibenz(a,h)anthracene	5.83E-07	2.30E-02	2.30E-02
Fluoranthene	7.61E-06	3.00E-01	3.00E-01
Fluorene	2.92E-05	1.15E+00	1.15E+00
Formaldehyde	1.18E-03	4.65E+01	4.65E+01
Indeno(1,2,3-cd)pyrene	3.75E-07	1.48E-02	1.48E-02
1,3 Butadiene	3.91E-05	1.54E+00	1.54E+00
Naphthalene	8.48E-05	3.34E+00	3.34E+00
Phenanthrene	2.94E-05	1.16E+00	1.16E+00
Pyrene	4.78E-06	1.88E-01	1.88E-01
Toluene	4.09E-04	1.61E+01	1.61E+01
Xylenes	2.85E-04	1.12E+01	1.12E+01
TOTAL HAPs Emissions (lbs.)		**152.49**	**152.49**

NOTES:

1.) HAP emissions factors from Tables 3.3-2 of AP-42, for engines < 600 hp.

Calulation Summary

Annual Fuel Consumption (gal) =	283,824
Peak HP fuel consumption (gal/hr) =	32.4
Fuel Use Derated (gal/hr) =	NA
Requested Operating Hours =	8,760
Requested Fuel (Btu/gal) =	138,700
Requested Total(MMBtu)=	39,366
Max Potential Operating Hours =	8,760
Potential hp-hr =	3,794,333
Potential Total (MMBtu) =	39,366

CRITERIA EMISSION ESTIMATES for Cottonwood Mine Primary Engine (Tier 4)

Make: Cummins
Model: TBD
Serial Number: TBD
Manufacturer HP: 1,207 Manufacturer kW: 900
Derated HP: 1,080 Derated kW: 805
Engine derated per manufacturer. 3.5% per 100 feet above 2,385 feet above sea level.

POLLUTANT NAME	EF (lb/MMBtu)	EF (lb/hp-hr)	EF (g/hp-hr)	EF Source[1]	Requested Emissions (tpy)	Potential Emissions (tpy)
PM	-	4.94E-05	0.02	Tier 4	0.12	0.233
PM_{10}	-	4.94E-05	0.02	Tier 4	0.12	0.233
CO	-	5.76E-03	2.61	Tier 4	14.06	27.230
SO_x[2]	-	1.21E-05	5.50E-03	EPA AP-42	0.03	0.057
NO_x	-	1.10E-03	0.50	Tier 4	2.69	5.213
HC	-	3.13E-04	0.14	Tier 4	0.76	1.478

1 kw = 1.341 hp

NOTES:

1.) Manufacturer's emissions unavailable. EPA Nonroad Tier 4 emission standards used where appropriate for a 1,207 hp (900 kW) engine, Table 1 from 40 CFR 1039.101.

2.) Fuel sulfur content is assumed to be 0.0015% by wt. EPA EF (lbs./ hp-hr) used. AP-42 Emission factor, Chapter 3, Section 4, Table 3.4-1.

Calulation Summary

Total hp-hr as Requested =	4,883,847
Annual Fuel Consumption (gal) =	289,084
Peak HP fuel consumption (gal/hr) =	63.9
Fuel Use Derated (gal/hr) =	NA
2 Engine Requested Operating Hours =	4,524
Fuel (Btu/gal) =	138,700
BSFC (Btu/hp-hr)	8,210
Requested Total (MMBtu) =	40,096
Max Potential Operating Hours =	8,760
Potential hp-hr =	9,456,787
Potential Total (MMBtu) =	77,639

Assumes 87 hours per week, 52 weeks per year of operation.

HAP EMISSION ESTIMATES for Cottonwood Mine Engine Tier 4 Engine

HAP NAME	HAP EF[1] (Lbs/MMBtu)	Requested HAP (Lbs)	Potential HAP (Lbs)
Acenaphthylene	9.23E-06	3.70E-01	7.17E-01
Acenaphthene	4.68E-06	1.88E-01	3.63E-01
Acetaldehyde	2.52E-05	1.01E+00	1.96E+00
Acrolein	7.88E-06	3.16E-01	6.12E-01
Anthracene	1.23E-06	4.93E-02	9.55E-02
Benz(a)anthracene	6.22E-07	2.49E-02	4.83E-02
Benzene	7.76E-04	3.11E+01	6.02E+01
Benzo(b)fluoranthene	1.11E-06	4.45E-02	8.62E-02
Benzo(k)fluoranthene	2.18E-07	8.74E-03	1.69E-02
Benzo(a)pyrene	2.57E-07	1.03E-02	2.00E-02
Benzo(g,h,I)perylene	5.56E-07	2.23E-02	4.32E-02
Chrysene	1.53E-06	6.13E-02	1.19E-01
Dibenz(a,h)anthracene	3.46E-07	1.39E-02	2.69E-02
Fluoranthene	4.03E-06	1.62E-01	3.13E-01
Fluorene	1.28E-05	5.13E-01	9.94E-01
Formaldehyde	7.89E-05	3.16E+00	6.13E+00
Indeno(1,2,3-cd)pyrene	4.14E-07	1.66E-02	3.21E-02
1,3 Butadiene	3.91E-05	1.57E+00	3.04E+00
Naphthalene	1.30E-04	5.21E+00	1.01E+01
Phenanthrene	4.08E-05	1.64E+00	3.17E+00
Pyrene	3.71E-06	1.49E-01	2.88E-01
Toluene	2.81E-04	1.13E+01	2.18E+01
Xylenes	1.93E-04	7.74E+00	1.50E+01
TOTAL HAPs Emissions (lbs.)		**45.65**	**88.40**

NOTES:

1.) HAP emissions factors from Tables 3.4-3 and 3.4-4 of AP-42, for engines > 600 hp.

Calulation Summary

Annual Fuel Consumption (gal) =	289,084
Peak HP fuel consumption (gal/hr) =	63.9
Fuel Use Derated (gal/hr) =	NA
Requested Operating Hours =	4,524
Requested Fuel (Btu/gal) =	138,700
Requested Total(MMBtu)=	40,096
Max Potential Operating Hours =	8,760
Potential hp-hr =	9,456,787
Potential Total (MMBtu) =	77,639