

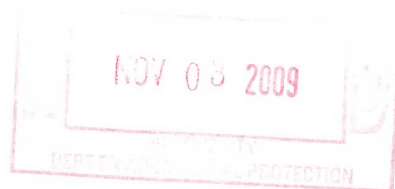


Williams Field Services-LLC  
2800 Post Oak Blvd.  
Houston, Texas 77056

October 30, 2009

Barbara Hatch, P.E.  
Environmental Engineer Manager  
Air Quality Program  
Southwest Regional Office  
Pennsylvania Department of Environmental Protection  
400 Waterfront Drive  
Pittsburgh, Pennsylvania 15222

Re: Application for General Permit BAQ-GPA/GP-5  
Springhill Compressor Station  
Laurel Mountain Midstream, LLC



Ms. Hatch,

On behalf of Laurel Mountain Midstream, LLC (LMM), Williams Midstream Field Services (Williams) is submitting a complete application for General Permit BAQ-GPA/GP-5. Complete forms, emissions estimates, and supporting documentation are included with this application.

The Springhill Compressor Station was initially permitted and operated by Atlas Pipeline Pennsylvania, LLC under GP5-26-00587. Recently, Atlas Pipeline Partners, LP and Williams Companies Incorporated engaged in a joint venture establishing a new Laurel Mountain Midstream, LLC Company. The Springhill Compressor Station is now owned and operated under LMM. Therefore LMM is submitting this application to operate under PADEP General Permit 5.

LMM also intends to install an additional 1340 horsepower, Caterpillar G3516LE, natural gas fired, lean-burn compressor engine at the site.

Additional emissions sources included in the permit application include an existing 1340 horsepower, Caterpillar 3516LE engine, an existing .25 MMBtu/hr glycol reboiler and 25 mmscfd tri-ethylene-glycol dehydration system, three existing produced water storage tanks, and an existing reboiler condensate storage tank. LMM has also included representative emissions estimates for fugitive emissions, engine startups, engine blow downs and tanker truck loading operations. Additional emissions sources (e.g lube oil day tanks) and activities may be present at the facility, but are not included in the application as the emissions are de minimus in quantity and occur on an intermittent basis.

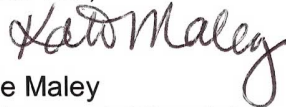
Emissions calculations and representations for these sources are based on manufacturer specifications, AP-42 factors, engineering estimates, and process

knowledge. The source of the emissions factor is documented on the emissions calculation worksheets (attached). We are also providing copies of the manufacturer specifications and supporting data.

The glycol reboiler is subject to the area source MACT requirements for Oil and Gas (40 CFR Part 63, Subpart HH). However, based on GRI-Glycalc estimates the potential benzene emissions are below the regulatory applicability level of 1 ton per year. The facility will maintain records of GRI-Glycalc estimates as required by GP-5 and 40 CFR Part 63, Subpart HH. The facility is not a major source site for air toxics and the engines are not subject to 40 CFR Part 63, Subpart ZZZZ requirements. The engines were manufactured before the NSPS Subpart JJJJ applicability date of January 2008 (for lean burn engines less than 1350 hp).

If you have any questions, please contact me at (412) 865-2174 (work) or (307) 871-2347 (cell) or our consultant, Doug Jordan, at (281) 668-7352.

Thank You,

A handwritten signature in dark ink, appearing to read "Katie Maley", written in a cursive style.

Katie Maley  
Environmental Specialist

#### Attachments

Attachment A – Application for Authorization to Use General Permit BAQ-GPA/GP-5  
Attachment B – Air Pollution Control Act Compliance Review Form  
Attachment C – Additional Emissions Sources, Emissions Calculations, and Supporting Documentation

ATTACHMENT A

Application for Authorization to Use General Permit BAQ-GPA/GP-5



COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
BUREAU OF AIR QUALITY

APPLICATION FOR AUTHORIZATION TO USE  
GENERAL PLAN APPROVAL & GENERAL OPERATING PERMIT

General Permit BAQ-GPA/GP-5  
Natural Gas, Coal Bed Methane or Gob Gas Production or Recovery Facilities

NOV 03 2009

SECTION A.  
APPLICATION USAGE INFORMATION

This application is for:

- ☐ A new authorization     
 ☐ Renewal of an existing authorization     
 ☒ General Plan Approval & General Operating Permit (Both)
- ☐ A General Plan Approval Only     
 ☐ A General Operating Permit Only

SECTION B.  
OWNER INFORMATION

**Owner/Operator's Name and Tax ID** Laurel Mountain Midstream Operating, LLC Tax ID 25478063  
**Address Line1** 1550 Coraopolis Heights Road, 2<sup>nd</sup> Floor  
**Address Line2**  
**City State Zip+4** Moon Township PA 15108 **Phone** 412-865-2141

SECTION C.  
CONTACT INFORMATION

**Contact Name** Katie Maley  
**Contact Title** Staff Environmental Scientist  
**Address Line1** 1550 Coraopolis Heights Road, 2nd Floor  
**Address Line2**  
**City State Zip+4** Moon Township PA 15108 **Phone** 412-865-2174

SECTION D.  
FACILITY INFORMATION

**Facility Name** Springhill Compressor Station  
**Current Address**  
**Proposed Address Line1** 585 Hope Hollow Road  
**Proposed Address Line2** Lake Lynn, PA 15451  
**Municipality** **County** Fayette  
**Project Description** Application for General Permit BAQ-GPA/GP-5

COMPRESSOR ENGINE (S) INFORMATION  
Use Extra Page To Describe Additional Engine (s)

No. of Units	1	Manufacturer	Caterpillar
Capacity (BHP)	1340	Date of Manufacture	4/7/06
Model No.	G3516LE	Date Installed	2009
Fuel usage metered	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
Control Type	<input type="checkbox"/> Rich Burn	<input checked="" type="checkbox"/> Lean Burn	
Control make & model		Control Efficiency	

COMPRESSOR ENGINE (S) EMISSIONS

Emission rates	gms/bhp-hr	lbs/hr	TPY	Hrs/Year Operation
NOx	2.0	5.91	25.88	8760
VOC	1	2.95	12.94	8760
CO	2.0	5.91	25.88	8760






COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
BUREAU OF AIR QUALITY

**APPLICATION FOR AUTHORIZATION TO USE  
GENERAL PLAN APPROVAL & GENERAL OPERATING PERMIT**

**General Permit BAQ-GPA/GP-5  
Natural Gas, Coal Bed Methane or Gob Gas Production or Recovery Facilities**

SECTION A. APPLICATION USAGE INFORMATION				
<b>This application is for:</b>				
<input type="checkbox"/> A new authorization	<input type="checkbox"/> Renewal of an existing authorization	<input checked="" type="checkbox"/> General Plan Approval & General Operating Permit (Both)		
<input type="checkbox"/> A General Plan Approval Only	<input type="checkbox"/> A General Operating Permit Only			
SECTION B. OWNER INFORMATION				
<b>Owner/Operator's Name and Tax ID</b>	Laurel Mountain Midstream Operating, LLC Tax ID 25478063			
<b>Address Line1</b>	1550 Coraopolis Heights Road, 2 <sup>nd</sup> Floor			
<b>Address Line2</b>				
<b>City State Zip+4</b>	Moon Township	PA	15108	<b>Phone</b> 412-865-2141
SECTION C. CONTACT INFORMATION				
<b>Contact Name</b>	Katie Maley			
<b>Contact Title</b>	Staff Environmental Scientist			
<b>Address Line1</b>	1550 Coraopolis Heights Road, 2nd Floor			
<b>Address Line2</b>				
<b>City State Zip+4</b>	Moon Township	PA	15108	<b>Phone</b> 412-865-2174
SECTION D. FACILITY INFORMATION				
<b>Facility Name</b>	Springhill Compressor Station			
<b>Current Address</b>				
<b>Proposed Address Line1</b>	585 Hope Hollow Road			
<b>Proposed Address Line2</b>	Lake Lynn, PA 15451			
<b>Municipality</b>	<b>County</b> Fayette			
<b>Project Description</b>	Application for General Permit BAQ-GPA/GP-5			
COMPRESSOR ENGINE (S) INFORMATION Use Extra Page To Describe Additional Engine (s)				
<b>No. of Units</b>	<u>1</u>	<b>Manufacturer</b>	<u>Caterpillar</u>	
<b>Capacity (BHP)</b>	<u>1340</u>	<b>Date of Manufacture</b>	<u>January 2006</u>	
<b>Model No.</b>	<u>G3516LE</u>	<b>Date Installed</b>	<u>Pending</u>	
<b>Fuel usage metered</b>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No		
<b>Control Type</b>	<input type="checkbox"/> Rich Burn	<input checked="" type="checkbox"/> Lean Burn		
<b>Control make &amp; model</b>				
<b>COMPRESSOR ENGINE (S) EMISSIONS</b>				
<b>Emission rates</b>	<b>gms/bhp-hr</b>	<b>lbs/hr</b>	<b>TPY</b>	<b>Hrs/Year Operation</b>
NOx	2.0	5.91	25.88	8760
VOC	1	2.95	12.94	8760
CO	2.0	5.91	25.88	8760

<b>DEHYDRATOR(S) INFORMATION</b>			
Use Extra Page To Describe Additional Unit (s)			
No. of Units	<u>1</u>	Manufacturer	<u>Natco</u>
Heat Input (mmBtu/hr)	<u>0.25</u>	Date of Manufacture	<u>7/2008</u>
Control Type	<u></u>	Model No.	<u></u>
Control Efficiency	<u></u>	Date Installed	<u>2009</u>
Final Exhaust Temperature	<u></u>	Glycol Circulation Rate	<u>3.5 gpm</u>
<b>DEHYDRATOR(S) EMISSIONS</b>			
Emission rates	lbs/hr	TPY	Hrs/Year Operation
VOC	1.84	8.04	8760
<b>COMPLIANCE DEMONSTRATION METHODS</b>			
<input type="checkbox"/> Performance stack testing <input checked="" type="checkbox"/> Department-approved portable analyzer <input type="checkbox"/> Department-approved test data for identical engine(s) <input type="checkbox"/> Vendor guarantee			
<input type="checkbox"/> Other Department approved methods, describe: <u></u>			
<b>SECTION E. TOTAL FACILITY EMISSIONS</b>			
Potential to Emit			Actual Emission Rate
	lbs/hr	TPY	lbs/hr      TPY
NOx	11.84	51.87	11.84      51.87
VOC	8.37	36.97	8.37      36.97
CO	11.83	51.83	11.83      51.83
<b>SECTION F. PERMIT INFORMATION</b>			
<b>Is this facility currently permitted?</b> <input checked="" type="checkbox"/> Yes (Attach copy of current permit) <input type="checkbox"/> No			
Air Quality Permit No. <u>GP5-26-00587-Issued to Atlas Pipeline</u>			
Limitation(s) imposed by permit: <u></u>			
<b>Indicate if addition of any unit(s) may result in:</b> <input type="checkbox"/> New Source Review <input type="checkbox"/> Exceed Title V thresholds <input checked="" type="checkbox"/> Not Applicable			
(Attach summary)      (Attach summary)			
<b>SECTION G. APPLICANT'S CHECKLIST</b>			
<b>I have enclosed the following:</b>			
<input type="checkbox"/> General Information Form (GIF) (For new plant only) <input checked="" type="checkbox"/> Compliance Review Form			
<input checked="" type="checkbox"/> Permit Fee for a new authorization; OR <input type="checkbox"/> Permit fee for renewal of an authorization			
<b>SECTION H. AFFIDAVIT</b>			
I certify that, subject to the penalties of Title 18 Pa. C.S.A. Section 4904 and 35 P.S. Section 4009(b)(2), I am the responsible official having primary responsibility for the design and operation of the facilities to which this application applies and that the information provided in this application is true, accurate and complete to the best of my knowledge, information and belief formed after reasonable inquiry. I further certify that the facility will be operated in conformity with all limitations and conditions of the Natural Gas, Coal Bed Methane or Gob Gas Production or Recovery Facilities General Permit (BAQ-GPA/GP-5)			
		<u>10-30-09</u>	
<b>Signature</b>		<b>Date</b>	
Jay Irwin			
<b>Typed/Printed Name</b>			

**ATTACHMENT B**

**Air Pollution Control Act Compliance Review Form**



COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
BUREAU OF AIR QUALITY

## AIR POLLUTION CONTROL ACT COMPLIANCE REVIEW FORM

Fully and accurately provide the following information, as specified. Attach additional sheets as necessary.

**Type of Compliance Review Form Submittal (check all that apply)**

☒ Original Filing Date of Last Compliance Review Form Filing:  
☐ Amended Filing Oct /23/2009

**Type of Submittal**

☐ New Plan Approval ☐ New Operating Permit ☐ Renewal of Operating Permit  
☐ Extension of Plan Approval ☒ Change of Ownership ☐ Periodic Submission (@ 6 mos)  
☐ Other: \_\_\_\_\_

### SECTION A. GENERAL APPLICATION INFORMATION

**Name of Applicant/Permittee/("applicant")**  
**(non-corporations-attach documentation of legal name)**

Laurel Mountain Midstream Operating, LLC

**Address** 1550 Coraopolis Heights Road, 2nd Floor  
P.O. Box 611, Moon Township, Pennsylvania, PA 15108

**Telephone** 412-865-2141 **Taxpayer ID#** 26-4578063

**Permit, Plan Approval or Application ID#** GP5-63-00941

**Identify the form of management under which the applicant conducts its business (check appropriate box)**

☐ Individual ☐ Syndicate ☐ Government Agency  
☐ Municipality ☐ Municipal Authority ☐ Joint Venture  
☐ Proprietorship ☐ Fictitious Name ☐ Association  
☐ Public Corporation ☐ Partnership ☒ Other Type of Business, specify below:  
☐ Private Corporation ☐ Limited Partnership Limited Liability Company

**Describe below the type(s) of business activities performed.**

Natural gas gathering, processing, and transmission



**SECTION B. GENERAL INFORMATION REGARDING "APPLICANT"**

If applicant is a corporation or a division or other unit of a corporation, provide the names, principal places of business, state of incorporation, and taxpayer ID numbers of all domestic and foreign parent corporations (including the ultimate parent corporation), and all domestic and foreign subsidiary corporations of the ultimate parent corporation with operations in Pennsylvania. Please include all corporate divisions or units, (whether incorporated or unincorporated) and privately held corporations. (A diagram of corporate relationships may be provided to illustrate corporate relationships.) Attach additional sheets as necessary.

Unit Name	Principal Places of Business	State of Incorporation	Taxpayer ID	Relationship to Applicant
Laurel Mountain Midstream, LLC	Oklahoma	DE	26-4578063	Parent
See attached Organizational Chart				

**SECTION C. SPECIFIC INFORMATION REGARDING APPLICANT AND ITS "RELATED PARTIES"**

**Pennsylvania Facilities.** List the name and location (mailing address, municipality, county), telephone number, and relationship to applicant (parent, subsidiary or general partner) of applicant and all Related Parties' places of business, and facilities in Pennsylvania. Attach additional sheets as necessary.

Unit Name	Street Address	County and Municipality	Telephone No.	Relationship to Applicant
Laurel Mountain Midstream Operating, LLC - See Attached				Applicant
Laurel Mountain Midstream Ohio, LLC	1521 Locust Street, Philadelphia, PA 19102			Affiliate

**Provide the names and business addresses of all general partners of the applicant and parent and subsidiary corporations, if any.**

Name	Business Address
Williams Laurel Mountain, LLC	One Williams Center, Tulsa, Oklahoma 74172
APL Laurel Mountain, LLC	1550 Coraopolis Heights Road, 2nd Floor, P.O. Box 611, Moon Township, PA 15108


List the names and business address of persons with overall management responsibility for the process being permitted (i.e. plant manager).

Name	Business Address
Jay Irwin	1550 Coraopolis Heights Road, 2nd Floor, P.O. Box 611, Moon Township, PA 15108

Plan Approvals or Operating Permits. List all plan approvals or operating permits issued by the Department or an approved local air pollution control agency under the APCA to the applicant or related parties that are currently in effect or have been in effect at any time 5 years prior to the date on which this form is notarized. This list shall include the plan approval and operating permit numbers, locations, issuance and expiration dates. Attach additional sheets as necessary.

Air Contamination Source	Plan Approval/ Operating Permit#	Location	Issuance Date	Expiration Date
Stewart Gas Plant	GP5-63-00945B	Mt. Pleasant Township	8/25/2009	8/25/2014
Salem Compressor Station	GP5-01000A	Salem Township	9/22/2009	9/22/2014

**Compliance Background.** (Note: Copies of specific documents, if applicable, must be made available to the Department upon its request.) List all documented conduct of violations or enforcement actions identified by the Department pursuant to the APCA, regulations, terms and conditions of an operating permit or plan approval or order by applicant or any related party, using the following format grouped by source and location in reverse chronological order. Attach additional sheets as necessary. See the definition of "documented conduct" for further clarification. Unless specifically directed by the Department, deviations which have been previously reported to the Department in writing, relating to monitoring and reporting, need not be reported.

Date	Location	Plan Approval/ Operating Permit#	Nature of Documented Conduct	Type of Department Action	Status: Litigation Existing/Continuing or Corrected/Date	Dollar Amount Penalty
NA						\$
						\$
						\$
						\$
						\$
						\$
						\$
						\$
						\$
						\$

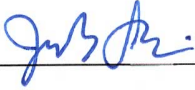
List all incidents of deviations of the APCA, regulations, terms and conditions of an operating permit or plan approval or order by applicant or any related party, using the following format grouped by source and location in reverse chronological order. This list must include items both currently known and unknown to the Department. Attach additional sheets as necessary. See the definition of "deviations" for further clarification.

Date	Location	Plan Approval/ Operating Permit#	Nature of Deviation	Incident Status: Litigation Existing/Continuing Or Corrected/Date
NA				

**CONTINUING OBLIGATION.** Applicant is under a continuing obligation to update this form using the Compliance Review Supplemental Form if any additional deviations occur between the date of submission and Department action on the application.

## VERIFICATION STATEMENT

Subject to the penalties of Title 18 Pa.C.S. Section 4904 and 35 P.S. Section 4009(b)(2), I verify under penalty of law that I am authorized to make this verification on behalf of the Applicant/Permittee. I further verify that the information contained in this Compliance Review Form is true and complete to the best of my belief formed after reasonable inquiry. I further verify that reasonable procedures are in place to ensure that "documented conduct" and "deviations" as defined in 25 Pa Code Section 121.1 are identified and included in the information set forth in this Compliance Review Form.



Signature

10-30-09

Date

Jay Irwin

Name (Print or Type)

Manager, Operations and Technical Services

Title



# SECTION C. SPECIFIC INFORMATION REGARDING APPLICANT AND ITS "RELATED PARTIES"

## LAUREL MOUNTAIN MIDSTREAM OPERATING, LLC

Unit Name	Street Address	County and Municipality	Telephone No.	Relationship to Applicant
Boone Mountain C.S.	Fire Tower Rd	Elk/Horton	412-865-2141	Operating facility
Brown C.S.	232 Falls Hollow Rd	Greene/Monongahela	412-865-2141	Operating facility
Ceylon C.S.	273 Ullery Rd	Greene/Cumberland	412-865-2141	Operating facility
Clyde C.S.	960 Bethel Cemetery Rd	Indiana/West Wheatfield	412-865-2141	Operating facility
Davis C.S.	493 Sharpnack Hollow Rd	Greene/Jefferson	412-865-2141	Operating facility
Dent C.S.		McKean/Lafayette	412-865-2141	Operating facility
Dunbar C.S.	538 Monarch Rd	Fayette/Dunbar	412-865-2141	Operating facility
Griebel C.S.	Dairy Lane	Clarion/Knox	412-865-2141	Operating facility
Hamilton C.S.	455 Forest Rd	McKean/Hamilton	412-865-2141	Operating facility
Henry Clay C.S.	150 Flat Rock Rd	Fayette/Henry Clay	412-865-2141	Operating facility
Hermine C.S.	348 Apple Mills Rd	Westmoreland/West Newton	412-865-2141	Operating facility
Howser C.S.	255 Morris Hollow Rd	Fayette/Franklin	412-865-2141	Operating facility
Hurt C.S.	RD2 N. Wilmington	Mercer/Jackson	412-865-2141	Operating facility
Irishtown G.P.	309 Sand Rd	McKean/Lafayette	412-865-2141	Operating facility
Jackson Center C.S.	189 Hosack Rd	Mercer/Jackson	412-865-2141	Operating facility
Joseph C.S.	420 Vanderbilt Rd	Fayette/Dunbar	412-865-2141	Operating facility
Lake Wilhelm C.S.	223 Grange Rd	Mercer/Deer Creek	412-865-2141	Operating facility
Prah C.S.		Fayette/German	412-865-2141	Operating facility
Pritts C.S.	534 Dawson Scottdale Rd	Fayette/Lower Tyrone	412-865-2141	Operating facility
Robin Hill G.P.	1400 Bigger Rd	Washington/Robinson	412-865-2141	Operating facility
Salem C.S.	171 Tucker Rd	Westmoreland/Salem	412-865-2141	Operating facility
Springhill 2 C.S.	585 Hope Hollow Rd	Fayette/Springhill	412-865-2141	Operating facility
SR 59 C.S.	State Route 59	McKean/Lafayette	412-865-2141	Operating facility
Stewart G.P.	70 Caldwell Rd	Washington/Mt. Pleasant	412-865-2141	Operating facility
Townville C.S.	14499 Maplewood Rd	Crawford/Randolph	412-865-2141	Operating facility
Union City C.S.	17451 Route 8	Erie/Pine Valley	412-865-2141	Operating facility

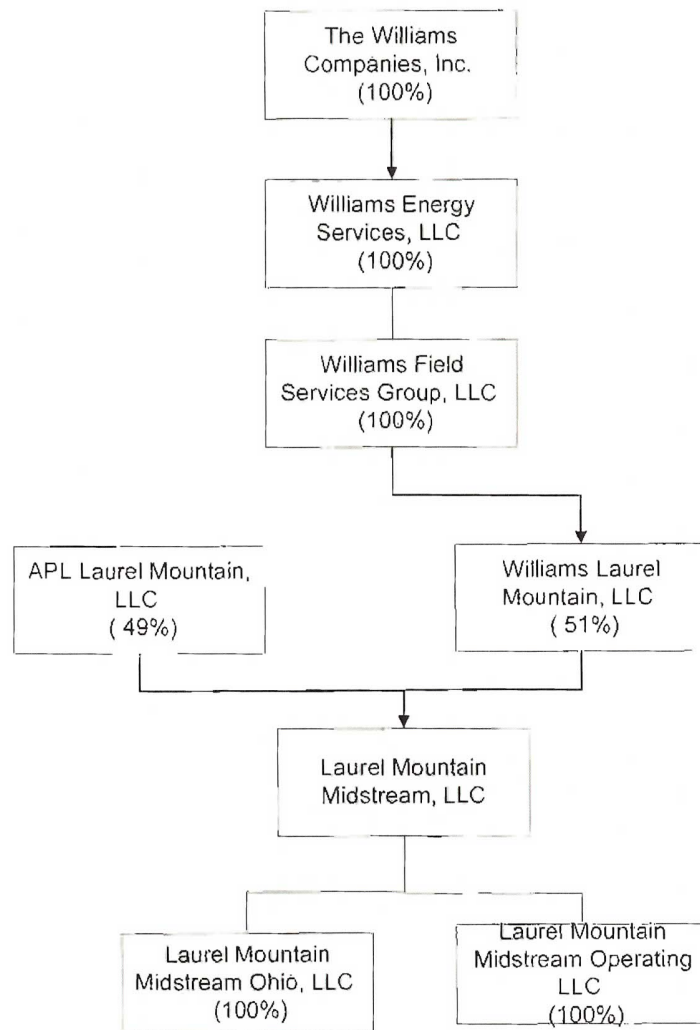
C.S = Compressor Station G.P. = Gas Plant

Facilities previously owned/operated by Atlas Pipeline and permitted under GP-5 or SOOP .

# Ownership Chart for Laurel Mountain Midstream, LLC

Effective Date: 8/25/2009

Created Date: 8/25/2009



## ATTACHMENT C

Additional Emissions Sources, Emissions Calculations, and Supporting Documentation

**LAUREL MOUNTAIN MIDSTREAM, LLC**  
**Springhill Compressor Station**  
**General Permit BAQ-GPA/GP-5 Application**  
**Emissions Summary**

Unit	Description	NOx Emission Rate (lb/hr)	NOx Emission Rate (tpy)	CO Emission Rate (lb/hr)	CO Emission Rate (tpy)	VOC Emission Rate (lb/hr)	VOC Emission Rate (tpy)
Engine 1	Caterpillar G3516LE, 1340 hp	5.91	25.88	5.91	25.88	2.95	13.10
Engine 2	Caterpillar G3516LE, 1340 hp	5.91	25.88	5.91	25.88	2.95	13.10
Glycol Reboiler	Glycol reboiler	0.02	0.11	0.02	0.07	1.84	8.04
Misc	Fugitives, tanks, tank truck loading					0.62	2.72
Totals		11.84	51.87	11.83	51.83	8.37	36.97
NSR Threshold (tpy)		-	100	-	100	-	50
GP-5 Applicable			Y		Y		Y



**LAUREL MOUNTAIN MIDSTREAM, LLC**  
**Springhill Compressor Station**  
**General Permit BAQ-GPA/GP-5 Application**  
**Engine Emission Calculations**

Notes: 1 - Assumed engines operate 8760 hours per year.

Unit	Engine Manufacturer	Model	Power (hp)	Pollutant	Emission Factor (g/hp-hr)	Emission Factor Source	Emission Rate (lb/hr)	Emission Rate (tpy)
Engine 1	Caterpillar	G3516LE	1340	NOx	2	Caterpillar spec sheet	5.91	25.88
				CO	2	Caterpillar spec sheet	5.91	25.88
				NM/EHC*	1	Caterpillar spec sheet	2.95	12.94
Engine 2	Caterpillar	G3516LE	1340	NOx	2	Caterpillar spec sheet	5.91	25.88
				CO	2	Caterpillar spec sheet	5.91	25.88
				NM/EHC*	1	Caterpillar spec sheet	2.95	12.94

NM/EHC\* Laurel Mountain Midstream is representing an enforceable limit of 1 g/hp-hr non Methane/Ethane VOCs

	Starting Gas		Blowdown		total gas vented	NM/E VOC tpy
	cubic feet	Events/year	cubic feet	Events/year	scf/year	
Engine 1	Caterpillar	1700	365	212	697880	0.1637
Engine 2	Caterpillar	1700	365	212	697880	0.1637

Starting gas and blowdown volumes obtained from William's Engineering estimates for units at Stewart Gas Plant  
 Actual volumes for the Springfield compressors may be different, but assumed daily startup/shutdown (blowdown) is conservative  
 NM/E VOC = .0005 lbs.scf based on October 8, 2009 gas analysis

## G3516 LE

GAS ENGINE TECHNICAL DATA  
DM5155 - 5

CATERPILLAR®

ENGINE SPEED (rpm):	1400	FUEL:	Nat Gas
COMPRESSION RATIO:	8:1	FUEL SYSTEM:	HPG IMPCO with Air Fuel Ratio Control
AFTERCOOLER WATER INLET (°F):	130		
JACKET WATER OUTLET (°F):	210	FUEL PRESSURE RANGE (psig):	35.0-40.0
COOLING SYSTEM:	JW+OC, AC	RATED METHANE NUMBER:	80
IGNITION SYSTEM:	EIS	FUEL LHV (Btu/scf):	905
EXHAUST MANIFOLD:	ASWC	ALTITUDE CAPABILITY (ft):	4900
COMBUSTION:	Low Emission	INLET AIR TEMP. (°F):	77
NOx EMISSION LEVEL (g/bhp-hr):	1.5	APPLICATION:	Gas Compression

ENGINE DATA	NOTES	UNLOAD	100%	75%	50%
ENGINE POWER	(1)	bhp	1340	1005	670
ENGINE EFFICIENCY (ISO 3046/1)	(2)	%	34.4	33.2	31.3
ENGINE EFFICIENCY (NOMINAL)	(2)	%	33.7	32.6	30.7

ENGINE DATA	NOTES	UNLOAD	100%	75%	50%
FUEL CONSUMPTION (ISO 3046/1)	(3)	Btu/bhp-hr	7401	7657	8128
FUEL CONSUMPTION (NOMINAL)	(3)	Btu/bhp-hr	7543	7806	8286
AIR FLOW (@ 0 C, 101.3 kPa) (WET)	(4)	Nm³/bk W-hr	4.5	4.64	4.4
AIR FLOW (@ 77 F, 14.7 psia) (WET)	(4)	scfm	2886	2232	1413
AIR FLOW (WET)	(4)	lb/hr	12795	9896	6263
COMPRESSOR OUT PRESSURE		Hg(abs)	79.9	76.2	57.3
COMPRESSOR OUT TEMPERATURE		F	334	306	228
AFTERCOOLER AIR OUT TEMPERATURE		F	132	129	129
INLET MAN. PRESSURE	(5)	Hg(abs)	69.9	55	39.1
INLET MAN. TEMPERATURE (MEASURED IN PLENUM)	(6)	F	139	137	136
TIMING	(7)	BTDC	33	33	33
EXHAUST STACK TEMPERATURE	(8)	F	854	840	842
EXHAUST GAS FLOW (@ 0 C 101.3 kPa) (WET)	(9)	Nm³/bk W-hr	4.8	4.96	4.74
EXHAUST GAS FLOW (@ Stack Temp. 14.5 psia) (WET)	(9)	ft³/min	7651	5853	3738
EXHAUST MASS FLOW (WET)	(9)	lb/hr	13305	10292	6543

EMISSIONS DATA	NOTES	UNLOAD	100%	75%	50%
NOx (as NO2) (corr. 5% O2)	(10)	mg/nm³ dry	604	574	598
NOx (as NO2) (uncorrected)	(10)	ppm dry exh	233	226	240
NOx (as NO2)	(10)	ton/year	19.41	14.56	9.7
NOx g/bhp-hr (as NO2)	(10)	g/bhp-hr	1.5	1.5	1.5
NOx g/bk W-hr (as NO2)	(10)	g/bk W-hr	2.01	2.01	2.01
NOx ppm (as NO2) (corr. 5% O2)	(10)	ppm dry exh	294	280	291
CO (corr. 5% O2)	(11)	mg/nm³ dry	739	752	755
CO (uncorrected)	(11)	ppm dry exh	481	486	498
CO	(11)	ton/year	24.41	19.06	12.26
CO g/bhp-hr	(11)	g/bhp-hr	1.89	1.96	1.9
CO g/bk W-hr	(11)	g/bk W-hr	2.53	2.63	2.54
CO ppm (corr. 5% O2)	(11)	ppm dry exh	607	601	604
THC (molecular wt. of 15.84) (corr. 5% O2)	(11)	mg/nm³ dry	1236	1301	1436
THC (molecular wt. of 15.84) (uncorrected)	(11)	ppm dry exh	1386	1488	1674
THC (molecular wt. of 15.84)	(11)	ton/year	39.75	33	23.31
THC g/bhp-hr (molecular wt. of 15.84)	(11)	g/bhp-hr	3.07	3.4	3.6
THC g/bk W-hr (molecular wt. of 15.84)	(11)	g/bk W-hr	4.12	4.56	4.83
THC ppm (molecular wt. of 15.84) (corr. 5% O2)	(11)	ppm dry exh	1749	1841	2032
NMHC (molecular wt. of 15.84) (corr. 5% O2)	(11)	mg/nm³ dry	185	195	215
NMHC (molecular wt. of 15.84) (uncorrected)	(11)	ppm dry exh	208	223	251
NMHC (molecular wt. of 15.84)	(11)	ton/year	5.96	4.95	3.5
NMHC g/bhp-hr (molecular wt. of 15.84)	(11)	g/bhp-hr	0.46	0.51	0.54
NMHC g/bk W-hr (molecular wt. of 15.84)	(11)	g/bk W-hr	0.62	0.68	0.72
NMHC ppm (molecular wt. of 15.84) (corr. 5% O2)	(11)	ppm dry exh	262	276	305
NMNEHC (molecular wt. of 15.84) (corr. 5% O2)	(11)	mg/nm³ dry	124	130	144
NMNEHC (molecular wt. of 15.84) (uncorrected)	(11)	ppm dry exh	139	149	167
NMNEHC (molecular wt. of 15.84)	(11)	ton/year	3.97	3.3	2.33
NMNEHC g/bhp-hr (molecular wt. of 15.84)	(11)	g/bhp-hr	0.31	0.34	0.36
NMNEHC g/bk W-hr (molecular wt. of 15.84)	(11)	g/bk W-hr	0.41	0.46	0.48
NMNEHC ppm (molecular wt. of 15.84) (corr. 5% O2)	(11)	ppm dry exh	175	184	203
HCHO (Formaldehyde) (corr. 5% O2)	(11)	mg/nm³ dry	101	106	120
HCHO (Formaldehyde) (uncorrected)	(11)	ppm dry exh	60	64	74
HCHO (Formaldehyde)	(11)	ton/year	3.24	2.68	1.94
HCHO g/bhp-hr (Formaldehyde)	(11)	g/bhp-hr	0.25	0.28	0.3

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## GAS ENGINE TECHNICAL DATA DM5155 - 5

CATERPILLAR®

EMISSIONS DATA (cont.)		NOTES	% LOAD	100%	75%	50%
HCHO g/bkW-hr (Formaldehyde)		(11)	g/bkW-hr	0.34	0.37	0.4
HCHO ppm (Formaldehyde)	(con. 5% O <sub>2</sub> )	(11)	ppm dry exh	75	79	89
CO <sub>2</sub>	(con. 5% O <sub>2</sub> )	(11)	mg/nm <sup>3</sup> dry	156	157	177
CO <sub>2</sub>		(11)	ton/year	6348	4926	3486
CO <sub>2</sub> % Dry	(uncorrected)	(11)	% Dry	7.97	7.99	9.01
CO <sub>2</sub> g/bhp-hr		(11)	g/bhp-hr	491	508	539
CO <sub>2</sub> g/bkW-hr		(11)	g/bkW-hr	658	681	722
EXHAUST O <sub>2</sub>		(12)	% Dry	8.3	8	7.8
LAMBDA		(12)		1.58	1.57	1.41

ENERGY BALANCE		NOTES	% LOAD	100%	75%	50%
LHV INPUT		(13)	Btu/min	168509	130756	92523
HEAT REJECTION TO JACKET		(14)	Btu/min	41216	34469	29653
HEAT REJECTION TO ATMOSPHERE		(15)	Btu/min	5313	4428	3543
HEAT REJECTION TO LUBE OIL		(16)	Btu/min	6517	5450	4689
HEAT REJECTION TO EXHAUST (LHV to 25C)		(17)	Btu/min	47381	35910	22892
HEAT REJECTION TO EXHAUST (LHV to 177C)		(17)	Btu/min	30096	22591	14530
HEAT REJECTION TO AFTERCOOLER		(18)	Btu/min	10426	7047	2497
PUMP POWER		(19)	Btu/min	838	838	838

### CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1. (Standard reference conditions of 77F, 29.6 in Hg barometric pressure, 500 ft altitude.) No overload permitted at rating shown. Consult altitude curves for applications above maximum rated altitude and/or temperature. Emission levels are at engine exhaust flange prior to any after treatment. Values are based on engine operating at steady state conditions, adjusted to the specified NOx level at 100% load. Tolerances specified are dependent upon fuel quality. Fuel methane number cannot vary more than +/- 3. Part load data may require engine adjustment.



## G3516 LE

GAS ENGINE TECHNICAL DATA  
DMS155 - 5

CATERPILLAR

FUEL ISACT (GUESS)													
CAT METHANE NUMBER	25	30	35	40	45	50	55	60	65	70	75	80	100
IGNITION TIMING	0.00	19	21	22	23	24	26	27	28	30	31	33	33
DERATION FACTOR	0.00	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

AIR TO TURBO *F													
130	1.00	1.00	1.00	0.98	0.94	0.91	0.87	0.84	0.81	0.77	0.74	0.71	0.68
120	1.00	1.00	1.00	1.00	0.96	0.92	0.89	0.85	0.82	0.79	0.76	0.72	0.70
110	1.00	1.00	1.00	1.00	0.98	0.94	0.90	0.87	0.83	0.80	0.77	0.74	0.71
100	1.00	1.00	1.00	1.00	0.99	0.96	0.92	0.88	0.85	0.81	0.78	0.75	0.72
90	1.00	1.00	1.00	1.00	1.00	0.97	0.94	0.90	0.86	0.83	0.80	0.76	0.73
80	1.00	1.00	1.00	1.00	1.00	0.99	0.95	0.92	0.88	0.84	0.81	0.78	0.75
70	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.93	0.90	0.86	0.83	0.79	0.76
60	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.95	0.91	0.88	0.84	0.81	0.78
50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.93	0.89	0.86	0.82	0.79
ALTITUDE (FEET ABOVE SEA LEVEL)													
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000

AFTERCOOLER HEATER LOCATION FACTOR													
130	1.36	1.42	1.48	1.54	1.60	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66
120	1.28	1.34	1.40	1.46	1.52	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58
110	1.21	1.27	1.33	1.39	1.45	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
100	1.14	1.20	1.25	1.31	1.37	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
90	1.07	1.12	1.18	1.23	1.29	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35
80	1.00	1.05	1.10	1.16	1.22	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
70	1.00	1.00	1.03	1.08	1.14	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19
60	1.00	1.00	1.00	1.01	1.06	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
50	1.00	1.00	1.00	1.00	1.00	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
ALTITUDE (FEET ABOVE SEA LEVEL)													
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000

MINIMUM SPEED CAPABILITY AT MAXIMUM TORQUE (RPM)													
130	1110	1190	1340	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
120	1080	1150	1270	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
110	1050	1120	1190	1350	1400	1400	1400	1400	1400	1400	1400	1400	1400
100	1020	1090	1160	1280	1400	1400	1400	1400	1400	1400	1400	1400	1400
90	1000	1060	1120	1200	1360	1400	1400	1400	1400	1400	1400	1400	1400
80	1000	1030	1090	1160	1290	1400	1400	1400	1400	1400	1400	1400	1400
70	1000	1000	1060	1120	1200	1370	1400	1400	1400	1400	1400	1400	1400
60	1000	1000	1030	1090	1160	1300	1400	1400	1400	1400	1400	1400	1400
50	1000	1000	1000	1060	1120	1200	1370	1400	1400	1400	1400	1400	1400
ALTITUDE (FEET ABOVE SEA LEVEL)													
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000

SOUND PRESSURE LEVEL (dB)											
			Octave Band Center Frequency (OBCF)								
100% Load Data			dbA	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	5 kHz
EXHAUST SOUND	Distance From the Engine(ft.)	33	113.5	102.9	105.5	109.5	105.6	106.9	106.6	107.1	104
		23	100.1	88.1	94.6	94.9	91.6	94.3	93.2	93.8	89.1
		49.2	93.5	81.5	87.9	88.2	84.9	87.6	86.6	87.2	82.5
MECHANICAL SOUND	Distance From the Engine(ft.)	33	98.1	93.8	95.3	91.3	90	93.1	92.8	88.8	85.2
		23	88.3	84.2	85.7	81.9	80.4	83.5	83.2	79.2	75.6
		49.2	83.2	78.9	80.4	76.6	75.1	78.2	77.9	75.9	68.3



**FUEL USAGE GUIDE NOTE**

This table shows the derate factor required for a given fuel. Note that deration occurs as the methane number decreases. Methane number is a scale to measure detonation characteristics of various fuels. The methane number of a fuel is determined by using the Caterpillar Methane Number Calculation program.

**ALTITUDE DERATION FACTORS NOTE**

This table shows the deration required for various air inlet temperatures and altitudes. Use this information along with the fuel usage guide chart to help determine actual engine power for your site.

**ACTUAL ENGINE RATING**

To determine the actual rating of the engine at site conditions, one must consider separately, limitations due to fuel characteristics and air system limitations. The Fuel Usage Guide deration establishes fuel limitations. The Altitude/Temperature deration factors and RPC (reference the Caterpillar Methane Program) establish air system limitations. RPC comes into play when the Altitude/Temperature deration is less than 1.0 (100%). Under this condition, add the two factors together. When the site conditions do not require an Altitude/Temperature derate (factor is 1.0), it is assumed the turbocharger has sufficient capability to overcome the low fuel relative power, and RPC is ignored. To determine the actual power available, take the lowest rating between 1) and 2). 1) Fuel Usage Guide Deration 2)  $1 - ((1 - \text{Altitude/Temperature Deration}) + (1 - \text{RPC}))$

**AFTERCOOLER HEAT REJECTION FACTORS NOTE**

Aftercooler heat rejection is given for standard conditions of 77°F and 500 ft altitude. To maintain a constant air inlet manifold temperature, as the inlet air temperature goes up, so must the heat rejection. As altitude increases, the turbocharger must work harder to overcome the lower atmospheric pressure. This increases the amount of heat that must be removed from the inlet air by the aftercooler. Use the aftercooler heat rejection factor to adjust for inlet air temp and altitude conditions. Multiply this factor by the standard aftercooler heat rejection. Failure to properly account for these factors could result in detonation and cause the engine to shutdown or fail.

**SOUND DATA NOTE**

Data determined by methods similar to ISO Standard DIS-8528-10, Accuracy Grade 3.

**MINIMUM SPEED CAPABILITY AT MAX SITE TORQUE NOTE**

This table shows the minimum allowable engine operating speed for various air inlet temperatures and altitudes.

**Notes**

1. Engine rating is with two engine driven water pumps. Tolerance is +/- 3% of full load.
2. ISO 3046/1 engine efficiency tolerance is (+)0, (-)5% of full load % efficiency value. Nominal engine efficiency tolerance is +/- 3.0% of full load % efficiency value.
3. ISO 3046/1 fuel consumption tolerance is (+)5, (-)0% of full load data. Nominal fuel consumption tolerance is +/- 3.0% of full load data.
4. Undried air. Flow is a nominal value with a tolerance of +/- 5 %.
5. Inlet manifold pressure is a nominal value with a tolerance of +/- 5 %.
6. Inlet manifold temperature is a nominal value with a tolerance of +/- 9F.
7. Timing indicated is for use with the minimum fuel methane number specified. Consult the appropriate fuel usage guide for timing at other methane numbers.
8. Exhaust stack temperature is a nominal value with a tolerance of (+)63F, (-)54F.
9. Exhaust flow value is on a #wet# basis. Flow is a nominal value with a tolerance of +/- 6 %.
10. NOx tolerances are +11%, -9% of specified value.
11. CO, CO2, THC, NMHC, NMNEHC, and HCHO values are "not to exceed" levels.
12. Exhaust Oxygen tolerance is +/- 0.5; Lambda tolerance is +/- 0.05. Lambda and Exhaust Oxygen level are the result of adjusting the engine to operate at the specified NOx level.
13. LHV rate tolerance is +/- 3.0%.
14. Heat rejection to jacket water value displayed includes heat to jacket water alone. Value is based on treated water. Tolerance is +/- 10 % of full load data. Total heat to jacket water circuit = Jacket Heat + Lube Oil Heat
15. Heat rejection to atmosphere based on treated water. Tolerance is +/- 30% of full load data.
16. Lube oil heat rate based on treated water. Tolerance is +/- 20% of full load data.
17. Exhaust heat rate based on treated water. Tolerance is +/- 10% of full load data.
18. A/C Heat (based on treated water) = A/C Heat x A/C Heat Rej. Factor. Tolerance is +/- 5 % of full load data.
19. Pump power includes engine driven jacket water and aftercooler water pumps. Engine brake power includes effects of pump power.