Wind River
Environmental Group LLC

December 11, 2014

NSR Program Manager/Attn: O&G Production Facilities
Wyoming Department of Environmental Quality
Air Quality Division
Herschler Building, 2-E
122 West 25th Street
Cheyenne, WY 82002

SUBJECT: Permit Application for Grace Bay 20-17-14-1CH

To Whom It May Concern:

On behalf of Cirque Resources LP, we are submitting an application for equipment associated with a new well site located in Laramie County, Grace Bay 20-17-14-1CH.

Based on the characteristics of the oil and process modeling using WinSim Design II, no flash emissions are expected from the oil storage tanks at Grace Bay 20-17-14-1CH. Working and breathing losses have been calculated using TANKS 4.09d for this site.

Thank you for your assistance. Should there be any questions, please contact Bill Lloyd, Cirque Resources LP, at 475 17th Street, Suite 1600, Denver, Colorado 80202, by phone at (303) 226-9500, or by e-mail at blloyd@cirqueresources.com. Alternately, you may contact me by phone at (303) 520-4861 or by e-mail at johnclouse@windriverenvironmental.com, or johnclouse@comcast.net.

Regards,

John Clouse
Wind River Environmental Group LLC

Enclosure

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division

Oil & Gas Production Facilities

Checklist for Complete Application

INDUSTRY		DEQ-AQD
X	Company Name/Contact Information	
X	Well/Facility Name and API #	
X	Legal Locations	
X	Existing Permit/Waiver #'s	
X	List of Equipment Onsite	
X	Plot Plan	
X	Process Description	
X	Current Production Rates	
X	Gas/Condensate Analyses	
X	All Pertinent Dates (date of first production, control installation date)	
X	Emission Models (Input/Output)	
X	Other Calculations (heaters, pneumatic equipment, truck loading, etc.)	
X	All Applicable Application Forms	
X	DEQ Application Cover Sheet	
X	Facility Location Specify: STATEWIDE CDA JPAD	
SCENARIO 1 SCENARIO 2 X	Dehydration Unit Presumptive BACT check appropriate box	SCENARIO 1 SCENARIO 2 NA

Form AQD-OG00

Completeness Checklist March 2010

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division

Oil & Gas Production Facilities C6 S2 Permit Application

Company Name: Cirque Resources LP

Facility Name: Grace Bay 20-17-14-1CH

To Be Completed by WDEQ-AQD

Reviewer _____

Copy to _____

Cynthia _____

D.E. _____

File: _____

Form AQD-OG0

Application March 2010

STATE OF WYOMING
Department of Environmental Quality - Air Quality Division
Oil and Gas Production Facilities C6 S2 Permit Application
Application Cover Sheet

submit (1) one signed original copy AND (1) one electronic copy of the application OR (3) paper copies, one w/ original signature

Company Name	Cirque Resources LP
Facility Name	Grace Bay 20-17-14-1CH
API Number	49-021-21146

For more than one well, list additional wells & associated API numbers on Form AQD-OG8.

OFFICIAL CONTACT PERSON

Name	Bill Lloyd	Title	Senior VP Operations
Address	475 17th Street, Suite 1600, Denver, CO 80202		
Telephone	(303) 226-9500	Fax (303) 226-9595	E-mail blloyd@cirqueresources.com

LOCATION

County	Laramie							
Legal Description	1/4 1/4	SESW	Section	20	T	15N	R	65W
Latitude	41.247359		Longitude	-104.686852				

FACILITY INFORMATION

Type of Facility:	Single Well	X	PAD	Central Tank Battery
Type of Application:	New Construction	X	Modified Facility	
	First Date of Production	10/7/2014	Date of Modification	
	Producing Field Name	Wildcat		
	Producing Formation(s)	Codell Sand		
Existing Air Quality Permit / Waiver Numbers		None		
Pending Air Quality Permit Application Numbers		None		

I, William B. Lloyd (**Responsible Official**) Senior Vice President Operations (**Title**)

state that I have knowledge of the facts herein set forth and that the same are true and correct to the best of my knowledge and belief. I further certify that the emission rates listed on this certification reflect the anticipated emissions due to the operation of this facility. The facility will operate in compliance with all Wyoming Air Quality Standards and Regulations.

Signature _____ **Date** 12.10.14

Signature Required

FORM AQD-OG1

Application Coversheet March 2010

STATE OF WYOMING
Department of Environmental Quality - Air Quality Division
Oil and Gas Production Facilities C6 S2 Permit Application

Equipment List

Company Name	Cirque Resources LP
Facility Name	Grace Bay 20-17-14-1CH

List all production equipment at the site including all pressurized vessels with the potential for flash emissions, all hydrocarbon liquids and produced water storage tanks, all dehydration units, all pneumatic pumps, all natural gas-fired burners and heaters and all emission control equipment and devices. Pressurized vessels with the potential for flash emissions are all vessels that vent vapors to the atmosphere during times other than upset or emergency conditions (water knockouts, 2-phase and 3-phase separators, heater treaters, gun barrels, scrubber pots, etc). Provide design ratings for dehys (MMCFD), process heaters, burners and pilots (MMBtu/hr, SCFH). Provide size of production & water storage tanks (BPD). For dehydration units indicate if the unit includes a glycol flash separator and/or reboiler still vent condenser. For emission control combustors/flares indicate design rating (MMBtu/hr, SCFD) and combustor/flare height (ft). Provide pneumatic pump motive gas useage (SCFH).

If more space is required, continue on page 2 of this sheet.

PROVIDE INSTALLATION DATES OF ALL EMISSION CONTROL EQUIPMENT & MONITORING DEVICES/SYSTEMS !!!

6, 400 bbl oil tanks
2, 400 bbl water tanks
1 Steffes elevated flare with 1 high pressure flare for associated gas, operational on or before 10/7/2014, with temperature monitoring system and event recorder
1 Steffes elevated flare with 1 low pressure flare for oil and water tank emissions, operational on or before 10/7/2014, with temperature monitoring system and event recorder
1 2-phase separator with no burner
1 heater-treater with 1.0 MMBtu/hr heater
1 pneumatic controller (low bleed: 0.002 scf/hr)

Example:

1 2-phase high pressure separator (unheated)

1 3-phase low pressure separator w/ 0.5 MMBtu/hr heater

2 0.5 MMBtu/hr line heaters

1 5 MMCFD TEG dehydration unit w/ 0.5 MMBtu/hr reboiler heater, glycol flash separator(0.5 MMBtu/hr heater) and overheads condenser

2 400-bbl condensate tanks

1 400-bbl produced water tank

1 30-ft enclosed combustor (3.0 MMBtu/hr, 5 MCFD) for flashing & reboiler vent/glycol flash separator emissions control installed 1/1/2007

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division
Oil and Gas Production Facilities C6 S2 Permit Application

Storage Tanks, Pressurized Vessels & Pneumatic Pumps

Use as many copies of this form as necessary to include all tanks, vessels and pumps.

Company Name Cirque Resources LP

Facility Name Grace Bay 20-17-14-1CH

STORAGE TANKS

Below, list all atmospheric tanks used to store liquids transferred from an upstream vessel or wellhead. Upstream vessels include separators, treaters, flash tanks, FWKOs, gun barrels, tanks, etc. If more than one tank of the same size is used for the same purpose, receiving fluids from the same upstream vessel, those tanks may be combined on one line.

E X A M P L E S				
2-400	condensate	100	2-phase separator	600
1-1000	produced water, skim oil	1000 water, 5 oil	treater	30
1-300	bad oil tank	5 oil	run tank	atmospheric
size (bbl)	use (condensate / oil / H_2O)	total throughput (bpd)	upstream vessel	upstream vessel pressure (psig)
6-400	Oil	155	Treater	20-30
2-400	Water	443	Treater	20-30

PRESSURIZED VESSELS List each vessel separately.

Pressurized vessels include FWKO's, heater-treaters, separators (2-phase & 3-phase), gas boots, gun barrels, flash tanks, etc…

E X A M P L E S			
HP 2-phase separator	600	well	1000
LP 3-phase separator	300	HP separator	600
3-phase heater treater	30	well	40
vessel	operating pressure (psig)	upstream vessel	upstream vessel pressure (psig)
Separator	75-80	Well	200-300
Treater	20-30	Separator	75-80

What is the API gravity of the SALES oil or condensate at this facility? 34.4

Does this facility handle sour oil / gas? YES ____ NO X

EMISSION CONTROL DEVICES & SYSTEMS for FLASH VAPORS & PRESSURE VESSEL PROCESS STREAMS

Identify each emission control system or device and the date(s) of installation for each.

E X A M P L E: 30-foot ACME smokeless combustor for tank vapor emissions control, installed 1/1/2008

One elevated high pressure flare for associated gas from separator, operational on or before 10/7/2014
One elevated low pressure flare for oil and water tank emissions, operational on or before 10/7/2014

Combustion Device Emission Controls (if applicable)

Date of Installation: Both elevated flares were installed on or before 10/7/2014

Manufacturer: Steffes, Combo flare, high pressure model SHP-6, Low pressure model SVG-3 with continuous pilot

Smokeless Design? Yes X No ____

Excess Oxygen (%) ____

VOC Destruction Effeciency (%): >98

HAP Destruction Efficiency (%) ____

Maximum Design Throughput (SCFD): 1,206,000

Minimum Design throughput (SCFD) ____

Actual Waste Gas Volume (SCFD) ____

Waste Gas Heat Content (Btu/SCF) ____

Burner Rating (MMBtu/hr) ____

Ignition System: Pilot X Electric Spark X Other

Continuous Pilot? Yes X No ____

Pilot Gas Volume (SCFM): 0.29

Is the Combustion Device Monitored? Yes X No ____ How? Thermocouple system monitors pilot and reignites if it goes out. Time and date of event are recorded.

PNEUMATIC PUMPS

Describe each pneumatic pump using natural gas as the motive gas. Indicate where motive gas is vented (atmosphere or other).

E X A M P L E: 50 SCFH Acme brand heat trace circulation pump operated w/ produced gas, vented to gas collection system.

None

Form AQD-OG3

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division
Oil and Gas Production Facilities C6 S2 Permit Application

EMISSION SUMMARY

Company Name Cirque Resources LP

Facility Name Grace Bay 20-17-14-1CH

This form must be completed for each emission source at the facility. A list of the emission sources which must be considered is found in Appendix B of the C6 S2 O&G Production Facilities Permitting Guidance.

UNCONTROLLED EMISSIONS (Tons Per Year)

These are the total uncontrolled, potential emissions from each source.

EMISSION SOURCE (i.e., tank, natural gas-fired heater, reboiler still vent, glycol flash separator, pneumatic pump, separator gas vent, water knockout vent, etc.)	VOCs	Total HAPs	NO_X	CO	SO_2	H_2S
Associated Gas Flaring	984.68	27.57	--	--	--	--
Oil tanks	11.05	0.36	--	--	--	--
Heaters	0.02	Negligible	0.31	0.26	0.002	--
Fugitives	0.42	0.03	--	--	--	--
Truck loading	2.00	Negligible	--	--	--	--
Pneumatic devices	3.05E-04	8.54E-06	--	--	--	--
						--

CONTROLLED EMISSIONS (Tons Per Year)

These are the total emissions from each source. Include controlled emissions from each controlled source and uncontrolled emissions from each source which does not require control, such as process equipment burners.

EMISSION SOURCE	VOCs	Total HAPs	NO_X	CO	SO_2	H_2S
Associated Gas Flaring	19.88	0.55	6.70	1.68	0.02	--
Oil tanks	0.22	0.007	0.01	0.004	0.00004	--
Heaters	0.02	Negligible	0.31	0.26	0.002	--
Fugitives	0.42	0.03	--	--	--	--
Truck loading	2.00	Negligible	--	--	--	--
Pneumatic devices	3.05E-04	8.54E-06	--	--	--	--
						--

HAZARDOUS AIR POLLUTANT SUMMARY (Tons Per Year)

Complete this section for each emissions source if TOTAL HAPs from that source are 9 TPY or greater.

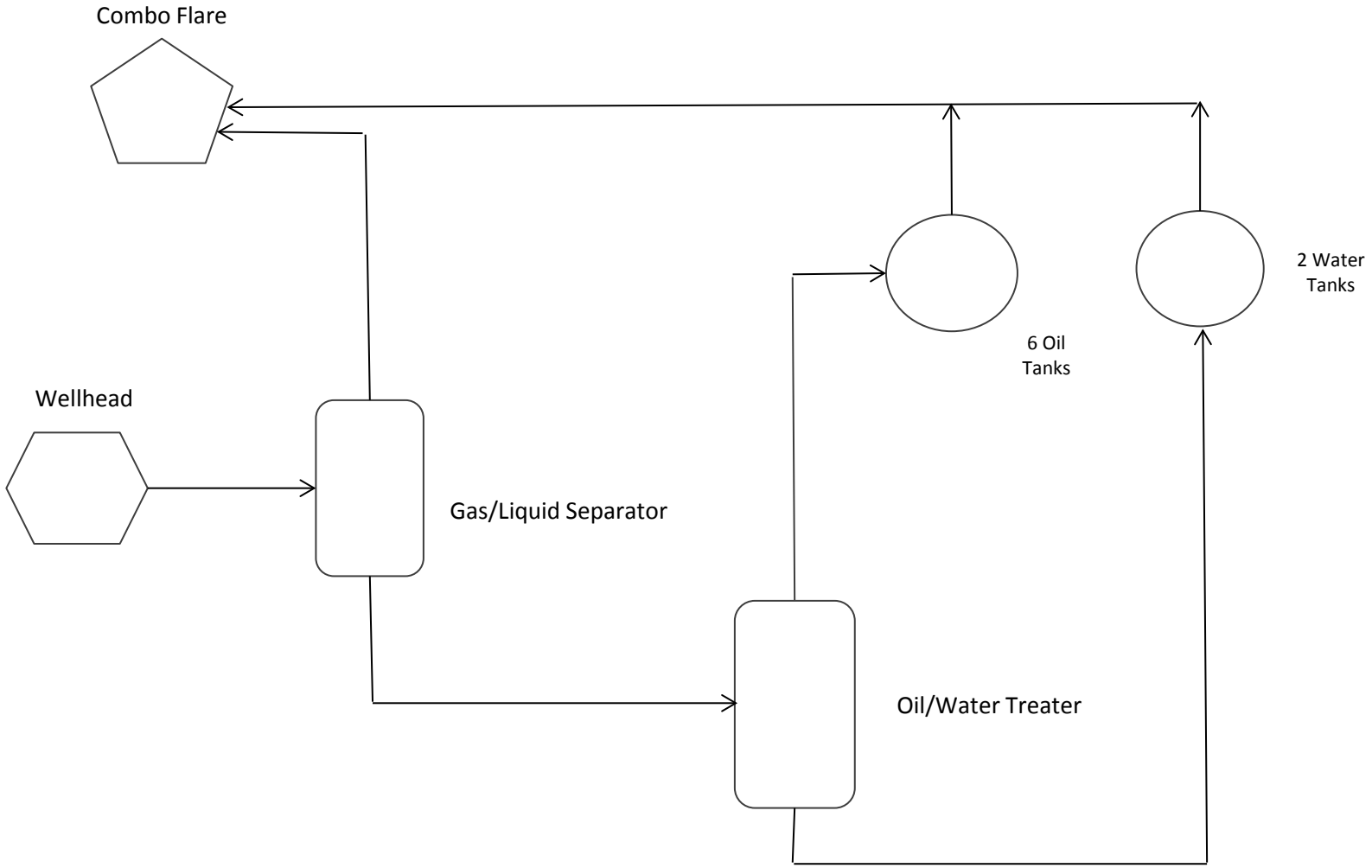
SOURCE	Benzene	Toluene	Ethyl-Benzene	Xylenes	Other

Grace Bay 20-17-14-1CH
Process Description

Fluids from the well are produced to a two-phase gas/liquid separator. Liquids route to an Oil/Water treater to separate oil and water. The oil is dumped into six 400 barrel oil tanks. The water is dumped to two 400 barrel water tanks. Emissions from the tanks are controlled with an elevated flare.

This is a low GOR oil well. Associated gas production is minimal and is used primarily onsite as lease gas to run the treater heater. Any residual gas is controlled with an elevated flare.

Grace Bay 20-17-1CH



Grace Bay 20-17-14-1CH Oil Tanks Flash & Working/Breathing Emissions

From Trimeric emission package 11/18/2014

Pollutant	Uncontrolled Emissions (tpy)	Controlled Emissions (tpy)
VOCs	11.05	0.221
Total HAPs	0.36	0.0072

Grace Bay 20-17-14-1CH
Flash (WinSim Design II) plus EPA Tanks for Working/Breathing Losses

	VOC
VOC EF, lb/bbl	0.39

$EF\ (lb/bbl) = (Emissions(lb/hr)\ \times 24hr/day)/Production(bbl/day)$

Emissions, tpy	11.05
Emissions, lb/hr	2.52
Projected Production, bbl/day	154.72
Projected Production, bbl/yr	56,474

Emissions (lb/hr) = Flashing Losses (lb/hr) + Working and Breathing Losses for Each Tank (lb/hr)

Grace Bay 20-17-14-1CH
WinSim Design II Flashing Losses

	VOC
VOC EF, lb/bbl	0.00

Emissions, tpy	0.00
Emissions, lb/hr	0.00
Projected Production, bbl/day	154.72
Projected Production, bbl/yr	56,474

Emissions (tpy) = VOC Flashing Losses Total from Bottom of p. 8

Grace Bay 20-17-14-1CH
EPA Tanks Working & Breathing Losses

(Tank 1 with one-sixth of total capacity)

	VOC
VOC EF, lb/bbl	0.39

Emissions, tpy	1.84
Emissions, lb/hr	0.42
Projected Production, bbl/day	25.79
Projected Production, bbl/yr	9,412

$Emissions\ (lb/hr) = Total\ Emissions\ (lbs/yr)$
$from\ EPA\ Tanks\ output\ on\ p.\ 11\ converted\ to\ lb/hr$

Assume all 6 tanks have identical Working and Breathing Losses
Total Working and Breathing Losses for all 6 Tanks:

Grace Bay 20-17-14-1CH
EPA Tanks Working & Breathing Losses

	VOC
VOC EF, lb/bbl	0.39

Emissions, tpy	11.05
Emissions, lb/hr	2.52
Projected Production, bbl/day	154.72
Projected Production, bbl/yr	56,474

Number of tanks	-	6	
Size of tanks	bbl	400	
API Gravity	-	34.4	*API Gravity from p. 19*
Specific Gravity	-	0.85	$Specific\ Gravity = 141.5/((API\ Gravity + 131.5))$

Total Projected Production	**56,474**	bbl/year	
	16,872,287	lb/year	*See Note 1*
Projected Production per tank	9,412	bbl/year-tank	
	395,318	gal/year-tank	

Note 1:

$$Projected\ Production\ (lb/yr) = Production(bbl/yr) \times 42 gal/bbl \times (8.34\ lb\ H2O)/gal \times Specific\ Gravity$$

Grace Bay 20-17-14-1CH
Flash (WinSim Design II) plus EPA Tanks for Working/Breathing Losses

	BTEX
BTEX EF, lb/bbl	0.0017

EF (lb/bbl) = (Emissions(lb/hr) ×24hr/day)/Production(bbl/day)

Emissions, tpy	0.049
Emissions, lb/hr	0.011
Projected Production, bbl/day	154.72
Projected Production, bbl/yr	56,474

Emissions (lb/hr) = Flashing Losses (lb/hr) + Working and Breathing Losses for Each Tank (lb/hr)

Grace Bay 20-17-14-1CH
WinSim Design II Flashing Losses

	BTEX
BTEX EF, lb/bbl	0.0000

Emissions, tpy	0.000
Emissions, lb/hr	0.000
Projected Production, bbl/day	154.72
Projected Production, bbl/yr	56,474

Emissions (tpy) = BTEX flow (lb/hr) in the flash gas (Stream 2) on p. 7-8 × Projected Actual Annual oil production (lb/yr) on p. 8 ÷ Feed Basis oil production (Stream 3, lb/hr) on p. 8 Converted to tpy

BTEX = Benzene, Toluene, Ethylbenzene, Xylenes

Grace Bay 20-17-14-1CH
EPA Tanks Working & Breathing Losses

(Tank 1 with one-sixth of total capacity)

	BTEX
BTEX EF, lb/bbl	0.0017

Emissions, tpy	0.008
Emissions, lb/hr	0.002
Projected Production, bbl/day	25.79
Projected Production, bbl/yr	9,412

Emissions (lb/hr)= Total Emissions (lbs/yr) from EPA Tanks output on p. 11 converted to lb/hr

Assume all 6 tanks have identical Working and Breathing Losses
Total Working and Breathing Losses for all 6 Tanks:

Grace Bay 20-17-14-1CH
EPA Tanks Working & Breathing Losses

	BTEX
BTEX EF, lb/bbl	0.0017

Emissions, tpy	0.049
Emissions, lb/hr	0.011
Projected Production, bbl/day	154.72
Projected Production, bbl/yr	56,474

Grace Bay 20-17-14-1CH
Flash (WinSim Design II) plus EPA Tanks for Working/Breathing Losses

	HAP
HAP EF, lb/bbl	0.013

Emissions, tpy	0.36
Emissions, lb/hr	0.08
Projected Production, bbl/day	154.72
Projected Production, bbl/yr	56,474

EF (lb/bbl) = (Emissions(lb/hr) ×24hr/day)/Production(bbl/day)

Emissions (lb/hr) = Flashing Losses (lb/hr) + Working and Breathing Losses for Each Tank (lb/hr)

Grace Bay 20-17-14-1CH
WinSim Design II Flashing Losses

	HAP
HAP EF, lb/bbl	0.000

Emissions, tpy	0.00
Emissions, lb/hr	0.00
Projected Production, bbl/day	154.72
Projected Production, bbl/yr	56,474

Emissions (tpy) = HAP flow (lb/hr) in the flash gas (Stream 2) on p. 7-8 × Projected Actual Annual oil production (lb/yr) on p. 8 ÷ Feed Basis oil production (Stream 3,lb/hr) on p. 8 Converted to tpy

HAP= BTEX, n-Hexane, 2,2,4-Trimethylpentane

Grace Bay 20-17-14-1CH
EPA Tanks Working & Breathing Losses

(Tank 1 with one-sixth of total capacity)

	HAP
HAP EF, lb/bbl	0.013

Emissions, tpy	0.06
Emissions, lb/hr	0.01
Projected Production, bbl/day	25.79
Projected Production, bbl/yr	9,412

Emissions (lb/hr)= Total Emissions (lbs/yr) from EPA Tanks output on p. 11 converted to lb/hr

Assume all 6 tanks have identical Working and Breathing Losses
Total Working and Breathing Losses for all 6 Tanks:

Grace Bay 20-17-14-1CH
EPA Tanks Working & Breathing Losses

	HAP
HAP EF, lb/bbl	0.013

Emissions, tpy	0.36
Emissions, lb/hr	0.08
Projected Production, bbl/day	154.72
Projected Production, bbl/yr	56,474

WinSim inputs are shown in bold italics and have a box around them.

STREAM SUMMARY

Stream Number		1	2	3
Stream Name		Feed	0 psig vapor	0 psig liquid
Thermo Method Option		GLOBAL	GLOBAL	GLOBAL
Vapor Fraction		0		0
Temperature	F	*131*		*45.6*
Pressure	psia	*44.76*		*11.76*
Enthalpy	Btu/hr	-10600.1796		-14930.1207
Entropy	Btu/hr/R	-8.7183		-16.5978
Vapor Density	lb/ft3			
Liquid 1 Density	lb/ft3	41.1859		42.9640
Liquid 1 Specific Gravity	60F@STP	0.7175		0.7175
Vapor Cp	Btu/lbmol/R			
Vapor Cv	Btu/lbmol/R			
Liquid 1 Cp	Btu/lbmol/R	60.8517		55.1485
Vapor Viscosity	cP			
Liquid 1 Viscosity	cP	0.4597		0.5320
Vapor Thermal Conductivity	Btu/hr/ft/R			
Liquid 1 Thermal Conductivity	Btu/hr/ft/R	0.0671		0.0654
Vapor Flowrate	MMSCF/day@STP			
Liquid 1 Flowrate	bbl/day@STP	9.5525		9.5525
Liquid 2 Flowrate				
Molecular Weight		114.3346		114.3346
Molar Flowrate	lbmol/hr	0.8746		0.8746
Mass Flowrate	lb/hr	*100.0000*		100.0000
Note: All Liquid 1 Phase calculations exclude Free Water				
Molar Flowrate By Component				
49 : CARBON DIOXIDE	lbmol/hr	0.0003		0.0003
46 : NITROGEN	lbmol/hr	0.0000		0.0000
1021 : METHANOL	lbmol/hr	0.0000		0.0000
2 : METHANE	lbmol/hr	0.0024		0.0024
3 : ETHANE	lbmol/hr	0.0031		0.0031
4 : PROPANE	lbmol/hr	0.0132		0.0132
5 : I-BUTANE	lbmol/hr	0.0031		0.0031
6 : N-BUTANE	lbmol/hr	0.0174		0.0174
7 : I-PENTANE	lbmol/hr	0.0078		0.0078
8 : N-PENTANE	lbmol/hr	0.0110		0.0110
36 : CYCLOPENTANE	lbmol/hr	0.0122		0.0122
10 : N-HEXANE	lbmol/hr	0.0485		0.0485
38 : CYCLOHEXANE	lbmol/hr	0.0206		0.0206
1159 : ISOHEXANE	lbmol/hr	0.0945		0.0945
11 : N-HEPTANE	lbmol/hr	0.1206		0.1206
39 : METHYLCYCLOHEXAN	lbmol/hr	0.0405		0.0405
82 : 2,2,4-TRIMETHYLP	lbmol/hr	0.0103		0.0103
40 : BENZENE	lbmol/hr	0.0071		0.0071
41 : TOLUENE	lbmol/hr	0.0187		0.0187
45 : ETHYL BENZENE	lbmol/hr	0.0053		0.0053
42 : O-XYLENE	lbmol/hr	0.0060		0.0060
12 : N-OCTANE	lbmol/hr	0.1011		0.1011
13 : N-NONANE	lbmol/hr	0.1018		0.1018
44 : P-XYLENE	lbmol/hr	0.0034		0.0034
43 : M-XYLENE	lbmol/hr	0.0020		0.0020
15 : N-UNDECANE	lbmol/hr	0.1539		0.1539
16 : N-DODECANE	lbmol/hr	0.0696		0.0696
Total	lbmol/hr	0.8746		0.8746

Output for Stream 2 is blank because WinSim predicts no flash gas is formed

Stream Number		1	2	3
Stream Name		Feed	0 psig vapor	0 psig liquid
Molar Composition By Component				
49 : CARBON DIOXIDE	molar %	*0.0310*		0.0310
46 : NITROGEN	molar %	*0.0020*		0.0020
1021 : METHANOL	molar %	*0.0057*		0.0057
2 : METHANE	molar %	*0.2800*		0.2800
3 : ETHANE	molar %	*0.3489*		0.3489
4 : PROPANE	molar %	*1.5090*		1.5090
5 : I-BUTANE	molar %	*0.3590*		0.3590
6 : N-BUTANE	molar %	*1.9930*		1.9930
7 : I-PENTANE	molar %	*0.8916*		0.8916
8 : N-PENTANE	molar %	*1.2600*		1.2600
36 : CYCLOPENTANE	molar %	*1.3967*		1.3967
10 : N-HEXANE	molar %	*5.5501*		5.5501
38 : CYCLOHEXANE	molar %	*2.3554*		2.3554
1159 : ISOHEXANE	molar %	*10.8071*		10.8071
11 : N-HEPTANE	molar %	*13.7837*		13.7837
39 : METHYLCYCLOHEXAN	molar %	*4.6281*		4.6281
82 : 2,2,4-TRIMETHYLP	molar %	*1.1816*		1.1816
40 : BENZENE	molar %	*0.8168*		0.8168
41 : TOLUENE	molar %	*2.1331*		2.1331
45 : ETHYL BENZENE	molar %	*0.6086*		0.6086
42 : O-XYLENE	molar %	*0.6819*		0.6819
12 : N-OCTANE	molar %	*11.5620*		11.5620
13 : N-NONANE	molar %	*11.6421*		11.6421
44 : P-XYLENE	molar %	*0.3937*		0.3937
43 : M-XYLENE	molar %	*0.2302*		0.2302
15 : N-UNDECANE	molar %	*17.5909*		17.5909
16 : N-DODECANE	molar %	*7.9578*		7.9578
Total	molar %	100		100
Mass Flowrate By Component				
49 : CARBON DIOXIDE	lb/hr	0.0119		0.0119
46 : NITROGEN	lb/hr	0.0005		0.0005
1021 : METHANOL	lb/hr	0.0016		0.0016
2 : METHANE	lb/hr	0.0393		0.0393
3 : ETHANE	lb/hr	0.0918		0.0918
4 : PROPANE	lb/hr	0.5820		0.5820
5 : I-BUTANE	lb/hr	0.1825		0.1825
6 : N-BUTANE	lb/hr	1.0131		1.0131
7 : I-PENTANE	lb/hr	0.5626		0.5626
8 : N-PENTANE	lb/hr	0.7951		0.7951
36 : CYCLOPENTANE	lb/hr	0.8567		0.8567
10 : N-HEXANE	lb/hr	4.1830		4.1830
38 : CYCLOHEXANE	lb/hr	1.7337		1.7337
1159 : ISOHEXANE	lb/hr	8.1451		8.1451
11 : N-HEPTANE	lb/hr	12.0795		12.0795
39 : METHYLCYCLOHEXAN	lb/hr	3.9743		3.9743
82 : 2,2,4-TRIMETHYLP	lb/hr	1.1805		1.1805
40 : BENZENE	lb/hr	0.5580		0.5580
41 : TOLUENE	lb/hr	1.7189		1.7189
45 : ETHYL BENZENE	lb/hr	0.5651		0.5651
42 : O-XYLENE	lb/hr	0.6331		0.6331
12 : N-OCTANE	lb/hr	11.5508		11.5508
13 : N-NONANE	lb/hr	13.0590		13.0590

Stream Number		1	2	3
Stream Name		Feed	0 psig vapor	0 psig liquid
44 : P-XYLENE	lb/hr	0.3655		0.3655
43 : M-XYLENE	lb/hr	0.2137		0.2137
15 : N-UNDECANE	lb/hr	24.0478		24.0478
16 : N-DODECANE	lb/hr	11.8550		11.8550
Total	lb/hr	100.0000		100.0000
Mass Composition By Component				
49 : CARBON DIOXIDE	mass %	0.0119		0.0119
46 : NITROGEN	mass %	0.0005		0.0005
1021 : METHANOL	mass %	0.0016		0.0016
2 : METHANE	mass %	0.0393		0.0393
3 : ETHANE	mass %	0.0918		0.0918
4 : PROPANE	mass %	0.5820		0.5820
5 : I-BUTANE	mass %	0.1825		0.1825
6 : N-BUTANE	mass %	1.0131		1.0131
7 : I-PENTANE	mass %	0.5626		0.5626
8 : N-PENTANE	mass %	0.7951		0.7951
36 : CYCLOPENTANE	mass %	0.8567		0.8567
10 : N-HEXANE	mass %	4.1830		4.1830
38 : CYCLOHEXANE	mass %	1.7337		1.7337
1159 : ISOHEXANE	mass %	8.1451		8.1451
11 : N-HEPTANE	mass %	12.0795		12.0795
39 : METHYLCYCLOHEXAN	mass %	3.9743		3.9743
82 : 2,2,4-TRIMETHYLP	mass %	1.1805		1.1805
40 : BENZENE	mass %	0.5580		0.5580
41 : TOLUENE	mass %	1.7189		1.7189
45 : ETHYL BENZENE	mass %	0.5651		0.5651
42 : O-XYLENE	mass %	0.6331		0.6331
12 : N-OCTANE	mass %	11.5508		11.5508
13 : N-NONANE	mass %	13.0590		13.0590
44 : P-XYLENE	mass %	0.3655		0.3655
43 : M-XYLENE	mass %	0.2137		0.2137
15 : N-UNDECANE	mass %	24.0478		24.0478
16 : N-DODECANE	mass %	11.8550		11.8550
Total	mass %	100		100
VOC Emissions in Flash Gas				
100 lb/h Feed Basis (Simulation)				
Oil Projected Production	lb/hr		100.0000	*(Stream 3 Total Flow)*
Total VOC	lb/hr		0.0000	*(Stream 2 VOC)*
(Total VOC is the sum of the flash gas (Stream 2) component flowrates of propane and heavier, includes Methanol)				
Scaled to Actual Annual Oil Projected Production				
Annual oil projected production		bbl/year	56,474	*(from p. 3)*
		lb/yr	16,872,287	*(from p. 3)*
			lb/yr	tpy
Total VOC			0	0.00

$$Total\ VOC = (WinSim\ Feed\ Basis\ Total\ VOC \times Scaled\ Annual\ Oil\ Production(lb/yr)) / (Sim\ Feed\ Basis\ Oil\ Production)$$

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification		
User Identification:	Grace Bay 20-17-14-1CH	
City:	Cheyenne	
State:	Wyoming	
Company:	Cirque Resources	
Type of Tank:	Vertical Fixed Roof Tank	
Description:		
Tank Dimensions		
Shell Height (ft):		20.00
Diameter (ft):		12.00
Liquid Height (ft) :		19.00
Avg. Liquid Height (ft):		9.50
Volume (gallons):		16,074.56
Turnovers:		24.59
Net Throughput(gal/yr):		395,318.00
Is Tank Heated (y/n):	N	
Paint Characteristics		
Shell Color/Shade:	Gray/Light	
Shell Condition	Good	
Roof Color/Shade:	Gray/Light	
Roof Condition:	Good	
Roof Characteristics		
Type:	Dome	
Height (ft)		0.00
Radius (ft) (Dome Roof)		0.00
Breather Vent Settings		
Vacuum Settings (psig):		-0.03
Pressure Settings (psig)		0.03

Meterological Data used in Emissions Calculations: Cheyenne, Wyoming (Avg Atmospheric Pressure = 11.76 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Grace Bay 20-17-14-1CH - Vertical Fixed Roof Tank
Cheyenne, Wyoming

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 7.8)	All	52.84	43.08	62.60	47.84	3.3980	2.7672	4.1406	68.0000			92.00	Option 4: RVP=7.8, ASTM Slope=3
2,2,4-Trimethylpentane (isooctane)						0.4829	0.3585	0.6417	114.2300	0.0102	0.0020	114.23	Option 2: A=6.8118, B=1257.84, C=220.74
Benzene						0.9542	0.7163	1.2545	78.1100	0.0056	0.0021	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Ethylbenzene						0.0842	0.0587	0.1187	106.1700	0.0057	0.0002	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.5831	1.2100	2.0463	86.1700	0.0420	0.0265	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.2631	0.1907	0.3578	92.1300	0.0173	0.0018	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						3.6481	3.6191	3.6193	67.4900	0.9070	0.9671	91.94	
Xylene (-m)						0.0699	0.0486	0.0990	106.1700	0.0021	0.0001	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Xylene (-o)						0.0547	0.0377	0.0780	106.1700	0.0064	0.0001	106.17	Option 2: A=6.998, B=1474.679, C=213.69
Xylene (-p)						0.0756	0.0528	0.1064	106.1700	0.0037	0.0001	106.17	Option 2: A=7.02063, B=1474.403, C=217.773

Gasoline RVP is next highest RVP choice in EPA Tanks relative to RVP of oil sample on p. 19

Liquid Mass Fraction of BTEX and HAP components are input in EPA Tanks based on mass composition of simulated oil stream (Stream 3) on p. 8. If WinSim predicts no flash gas (Stream 2), use the wt% concentrations provided on p. 13.

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Grace Bay 20-17-14-1CH - Vertical Fixed Roof Tank
Cheyenne, Wyoming

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 7.8)	2,174.83	1,507.22	3,682.06
Hexane (-n)	57.62	39.93	97.55
2,2,4-Trimethylpentane (isooctane)	4.26	2.95	7.22
Benzene	4.63	3.21	7.84
Toluene	3.93	2.73	6.66
Ethylbenzene	0.41	0.29	0.70
Xylene (-m)	0.13	0.09	0.22
Xylene (-o)	0.30	0.21	0.51
Xylene (-p)	0.24	0.17	0.41
Unidentified Components	2,103.30	1,457.65	3,560.95

EMPACT ANALYTICAL SYSTEMS INC.
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303-637-0150

EXTENDED NATURAL GAS LIQUID ANALYSIS (*DHA)

MAIN PAGE

PROJECT NO. :	201410093	ANALYSIS NO. :	01
COMPANY NAME :	CIRQUE RESOURCES LP	ANALYSIS DATE:	OCTOBER 17, 2014
ACCOUNT NO. :		SAMPLE DATE :	OCTOBER 16, 2014
PRODUCER :		CYLINDER NO. :	2012
LEASE NO. :		SAMPLED BY :	JOHN MOSER
NAME/DESCRIP :	OIL TREATER 14:10 GRACE BAY 20-17-14-1CH		EMPACT
FIELD DATA		SAMPLE TEMP. :	131
SAMPLE PRES. :	33	AMBIENT TEMP.:	
VAPOR PRES. :		GRAVITY :	
COMMENTS :	SPOT; NO PROBE; PULLED FROM HORIZONTAL TREATER - EMPACT		

COMPONENT	MOLE %	MASS %	VOL %
ALCOHOLS	0.0057	0.0030	0.0028
NITROGEN (AIR)	0.0020	0.0005	0.0005
CARBON DIOXIDE	0.0310	0.0120	0.0109
METHANE	0.2800	0.0395	0.0981
ETHANE	0.3490	0.0922	0.1927
PROPANE	1.5090	0.5846	0.8587
I-BUTANE	0.3590	0.1833	0.2425
N-BUTANE	1.9930	1.0177	1.2977
I-PENTANE	0.8916	0.5652	0.6740
N-PENTANE	1.2600	0.7987	0.9424
HEXANES PLUS	93.3197	96.7033	95.6797
TOTALS	100.0000	100.0000	100.0000

BTEX COMPONENTS	MOLE%	MASS%
BENZENE	0.8168	0.5605
TOLUENE	2.1331	1.7267
ETHYLBENZENE	0.6086	0.5677
XYLENE	1.3057	1.2178
TOTAL BTEX	4.8642	4.0727

(CALC: GPA STD 2145-94 & TP-17 @14.696 & 60 F)

	TOTAL SAMPLE	C6+ FRACTION	
Specific Gravity (H2O=1) =	0.7448	0.7522	60/60
API Gravity =	58.48	56.61	60/60
Molecular Weight =	113.82	118.675	
Absolute Density =	6.21	6.27	LBS/GAL
Heating Value Liq. Idl Gas=	126086	127610	BTU/GAL
Vapor/Liquid =	20.76	20.19	CUFT/GAL
Vapor Pressure =	22.87	1.64	PSIA @100 F

**(DETAILED HYDROCARBON ANALYSIS/NJ 1993) ; ASTM D6730*

THIS DATA HAS BEEN ACQUIRED THROUGH APPLICATION OF CURRENT STATE-OF-THE-ART ANALYTICAL TECHNIQUES. THE USE OF THIS INFORMATION IS THE RESPONSIBLITY OF THE USER. EMPACT ANALYTICAL SYSTEMS, ASSUMES NO RESPONSIBLITY FOR ACCURACY OF THE REPORTED INFORMATION NOR ANY CONSEQUENCES OF IT'S APPLICATION.

NOTE: Sample Temp., Sample Press. and Component Mole % from this page are used as inputs in the WinSim flash model. Speciated xylenes are found on page 16. Average Molecular Weight of Decanes plus on this page is used to speciate decanes plus hydrocarbons.

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EXTENDED NATURAL GAS LIQUID ANALYSIS (*DHA)

E & P TANK / GLYCALC INFORMATION

PROJECT NO. :	201410093	ANALYSIS NO. :	01
COMPANY NAME :	CIRQUE RESOURCES LP	ANALYSIS DATE:	OCTOBER 17, 2014
ACCOUNT NO. :		SAMPLE DATE :	OCTOBER 16, 2014
PRODUCER :		CYLINDER NO. :	2012
LEASE NO. :		SAMPLED BY :	JOHN MOSER
NAME/DESCRIP :	OIL TREATER 14:10		EMPACT
	GRACE BAY 20-17-14-1CH		
FIELD DATA		SAMPLE TEMP. :	131
SAMPLE PRES. :	33	AMBIENT TEMP.:	
VAPOR PRES. :		GRAVITY :	
COMMENTS :	SPOT; NO PROBE; PULLED FROM HORIZONTAL TREATER - EMPACT		

COMPONENT	Mole %		Wt %		LV %	
CARBON DIOXIDE	0.0310		0.0120		0.0109	
NITROGEN (AIR)	0.0020		0.0005		0.0005	
METHANE	0.2800		0.0395		0.0981	
ETHANE	0.3490		0.0922		0.1927	
PROPANE	1.5090		0.5846		0.8587	
I-BUTANE	0.3590		0.1833		0.2425	
N-BUTANE	1.9930		1.0177		1.2977	
I-PENTANE	0.8916		0.5652		0.6740	
N-PENTANE	1.2600		0.7987		0.9424	
CYCLOPENTANE (N-C5)	1.3967		0.8606		0.8430	
N-HEXANE	5.5501		4.2032		4.7149	
CYCLOHEXANE (OTHER C6)	2.3554		1.7416		1.6554	
OTHER HEXANES	10.8071		8.0932		8.5910	
OTHER HEPTANES	13.7837		12.0315		12.5178	
METHYLCYCLOHEXANE (OTHER C7)	4.6281		3.9924		3.8376	
2,2,4 TRIMETHYLPENTANE	1.1816		1.0193		1.0074	
BENZENE	0.8168		0.5605		0.4728	
TOLUENE	2.1331		1.7267		1.4708	
ETHYLBENZENE	0.6086		0.5677		0.4835	
XYLENES	1.3057		1.2178		1.0347	
OTHER OCTANES	11.5620		11.6634		11.7640	
OCTANES PLUS	----	51.8487	----	63.4936	----	61.5764
NONANES	11.6421		12.9596		12.7330	
DECANES PLUS	25.5487		36.0658		34.5538	
SUB TOTAL	99.9943		99.9970		99.9972	
ALCOHOLS	0.0057		0.0030		0.0028	
TOTAL	100.0000		100.0000		100.0000	

API Gravity	=	**58.48**	60/60
Vapor Pressure	=	**22.87**	PSIA & 100 F
Average Molecular Weight of Decanes plus	=	**160.67**	
Average Specific Gravity of Decanes plus	=	**0.7770**	

THE DATA PRESENTED HEREIN HAS BEEN ACQUIRED THROUGH JUDICIOUS APPLICATION OF CURRENT STATE-OF-THE ART ANALYTICAL TECHNIQUES. THE APPLICATIONS OF THIS INFORMATION IS THE RESPONSIBILITY OF THE USER. EMPACT ANALYTICAL SYSTEMS, INC. ASSUMES NO RESPONSIBILITY FOR ACCURACY OF THE REPORTED INFORMATION NOR ANY CONSEQUENCES OF IT'S APPLICATION.

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303-637-0150

EXTENDED NATURAL GAS LIQUID ANALYSIS (*DHA)

BY CARBON NUMBER

PROJECT NO. :	201410093	ANALYSIS NO. :	01
COMPANY NAME :	CIRQUE RESOURCES LP	ANALYSIS DATE:	OCTOBER 17, 2014
ACCOUNT NO. :		SAMPLE DATE :	OCTOBER 16, 2014
PRODUCER :		CYLINDER NO. :	2012
LEASE NO. :		SAMPLED BY :	JOHN MOSER
NAME/DESCRIP :	OIL TREATER 14:10		EMPACT
	GRACE BAY 20-17-14-1CH		
FIELD DATA		SAMPLE TEMP. :	131
SAMPLE PRES. :	33	AMBIENT TEMP.:	
VAPOR PRES. :		GRAVITY :	
COMMENTS :	SPOT; NO PROBE; PULLED FROM HORIZONTAL TREATER - EMPACT		

COMPONENT / CARBON NUMBER		MOLE%	MASS %	VOLUME %
ALCOHOLS		0.0057	0.0030	0.0028
NITROGEN		0.0020	0.0005	0.0005
CARBON DIOXIDE		0.0310	0.0120	0.0109
	C1	0.2800	0.0395	0.0981
	C2	0.3490	0.0922	0.1927
	C3	1.5090	0.5846	0.8587
	C4	2.3520	1.2010	1.5402
	C5	3.5483	2.2245	2.4594
	C6	19.5294	14.5985	15.4341
	C7	20.5449	17.7506	17.8262
	C8	14.6579	14.4682	14.2896
	C9	11.6421	12.9596	12.7330
	C10	9.8993	11.8892	11.4091
	C11	5.4461	7.1098	6.6780
	C12	2.9057	4.1028	3.9416
	C13	2.3016	3.6159	3.4951
	C14	1.9065	3.3229	3.2418
	C15	1.7338	3.2357	3.1205
	C16	0.8363	1.6638	1.5941
	C17	0.3298	0.6968	0.6656
	C18	0.1558	0.3484	0.3318
	C19	0.0279	0.0658	0.0623
	C20	0.0057	0.0142	0.0134
	C21	0.0002	0.0005	0.0005
	C22	0.0000	0.0000	0.0000
	C23	0.0000	0.0000	0.0000
	C24	0.0000	0.0000	0.0000
	C25	0.0000	0.0000	0.0000
	C26	0.0000	0.0000	0.0000
	C27	0.0000	0.0000	0.0000
	C28	0.0000	0.0000	0.0000
	C29	0.0000	0.0000	0.0000
	C30+	0.0000	0.0000	0.0000
	Total	100.0000	100.0000	100.0000

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303-637-0150

EXTENDED NATURAL GAS LIQUID ANALYSIS (*DHA)

DHA COMPONENT LIST

PROJECT NO. :	201410093	ANALYSIS NO. :	01
COMPANY NAME :	CIRQUE RESOURCES LP	ANALYSIS DATE:	OCTOBER 17, 2014
ACCOUNT NO. :		SAMPLE DATE :	OCTOBER 16, 2014
PRODUCER :		CYLINDER NO. :	2012
LEASE NO. :		SAMPLED BY :	JOHN MOSER
NAME/DESCRIP :	OIL TREATER 14:10		EMPACT
	GRACE BAY 20-17-14-1CH		
FIELD DATA		SAMPLE TEMP. :	131
SAMPLE PRES. :	33	AMBIENT TEMP.:	
VAPOR PRES. :		GRAVITY :	
COMMENTS :	SPOT; NO PROBE; PULLED FROM HORIZONTAL TREATER - EMPACT		

COMPONENT	PIANO #	MOLE %	MASS %	VOL %
Nitrogen	NHC	0.0020	0.0005	0.0005
Carbon Dioxide	NHC	0.0310	0.0120	0.0109
Methane	P1	0.2800	0.0395	0.0981
Ethane	P2	0.3490	0.0922	0.1927
Propane	P3	1.5090	0.5846	0.8587
i-Butane	I4	0.3590	0.1833	0.2425
n-Butane	P4	1.9930	1.0177	1.2977
2,2-Dimethylpropane	I5	0.0066	0.0042	0.0052
i-Pentane	I5	0.8850	0.5610	0.6688
i-Propanol	X3	0.0057	0.0030	0.0028
n-Pentane	P5	1.2600	0.7987	0.9424
2,2-Dimethylbutane	I6	0.0341	0.0258	0.0294
Cyclopentane	N5	1.3967	0.8606	0.8430
2,3-Dimethylbutane	I6	0.3357	0.2542	0.2838
2-Methylpentane	I6	3.2177	2.4362	2.7581
3-Methylpentane	I6	2.1961	1.6627	1.8510
n-Hexane	P6	5.5501	4.2032	4.7149
2,2-Dimethylpentane	I7	0.0186	0.0164	0.0179
Methylcyclopentane	N6	5.0219	3.7131	3.6674
2,4-Dimethylpentane	I7	0.2063	0.1816	0.1999
2,2,3-Trimethylbutane	I7	0.0198	0.0174	0.0186
Benzene	A6	0.8168	0.5605	0.4728
3,3-Dimethylpentane	I7	0.0171	0.0150	0.0160
Cyclohexane	N6	2.3554	1.7416	1.6554
2-Methylhexane	I7	1.1643	1.0249	1.1185
2,3-Dimethylpentane	I7	0.6108	0.5377	0.5701
1,1-Dimethylcyclopentane	N7	0.4925	0.4249	0.4168
3-Methylhexane	I7	1.7045	1.5005	1.6129
1c,3-Dimethylcyclopentane	N7	1.2434	1.0726	1.0657
1t,3-Dimethylcyclopentane	N7	1.1816	1.0193	1.0074
3-Ethylpentane	I7	0.1678	0.1477	0.1562
1t,2-Dimethylcyclopentane	N7	2.2050	1.9021	1.8733
2,2,4-Trimethylpentane	I8	0.0773	0.0776	0.0827
UnknownC6s	U6	0.0016	0.0012	0.0013
n-Heptane	P7	3.9316	3.4610	3.7449
1c,2-Dimethylcyclopentane	N7	0.2336	0.2015	0.1931
Methylcyclohexane	N7	4.6281	3.9924	3.8376
2,2-Dimethylhexane	I8	0.7597	0.7624	0.8109
Ethylcyclopentane	N7	0.4394	0.3791	0.3661
2,5-Dimethylhexane	I8	0.1022	0.1026	0.1094
2,2,3-Trimethylpentane	I8	0.0386	0.0387	0.0400
2,4-Dimethylhexane	I8	0.1874	0.1881	0.1996

1c,2t,4-Trimethylcyclopentane	N8	0.5208	0.5134	0.4978
3,3-Dimethylhexane	I8	0.0558	0.0560	0.0584
2,3,4-Trimethylpentane	I8	0.1031	0.1035	0.1065
2,3,3-Trimethylpentane	I8	0.0018	0.0018	0.0018
Toluene	A7	2.1331	1.7267	1.4708
2,3-Dimethylhexane	I8	0.2999	0.3010	0.3130
2-Methyl-3-ethylpentane	I8	0.1327	0.1332	0.1370
1,1,2-Trimethylcyclopentane	N8	0.0111	0.0109	0.0104
2-Methylheptane	I8	1.3507	1.3555	1.4347
4-Methylheptane	I8	0.3313	0.3325	0.3434
3-Methyl-3-ethylpentane	I8	0.0926	0.0929	0.0946
3,4-Dimethylhexane	I8	0.0745	0.0748	0.0769
1c,2c,4-Trimethylcyclopentane	N8	0.0442	0.0436	0.0418
1c,3-Dimethylcyclohexane	N8	0.0290	0.0286	0.0276
3-Methylheptane	I8	0.5212	0.5231	0.5489
1c,2t,3-Trimethylcyclopentane	N8	1.2976	1.2792	1.2292
3-Ethylhexane	I8	0.2011	0.2018	0.2095
1t,4-Dimethylcyclohexane	N8	0.5788	0.5706	0.5540
1,1-Dimethylcyclohexane	N8	0.1340	0.1321	0.1253
3c-Ethylmethylcyclopentane	N8	0.0063	0.0062	0.0060
3t-Ethylmethylcyclopentane	N8	0.1928	0.1901	0.1836
2t-Ethylmethylcyclopentane	N8	0.1633	0.1610	0.1550
1,1-Methylethylcyclopentane	N8	0.5328	0.5252	0.4980
2,2,4-Trimethylhexane	I9	0.0555	0.0625	0.0647
1t,2-Dimethylcyclohexane	N8	0.7926	0.7814	0.7458
1c,2c,3-Trimethylcyclopentane	N8	0.0037	0.0036	0.0034
1t,3-Dimethylcyclohexane	N8	0.0023	0.0023	0.0022
UnknownC7s	U7	0.1474	0.1298	0.1404
n-Octane	P8	2.3026	2.3108	2.4341
1c,4-Dimethylcyclohexane	N8	0.5571	0.5492	0.5195
i-Propylcyclopentane	I8	0.0751	0.0740	0.0706
2,4,4-Trimethylhexane	I9	0.0312	0.0352	0.0361
2,2,3,4-Tetramethylpentane	I9	0.0215	0.0242	0.0249
2,3,4-Trimethylhexane	I9	0.0304	0.0343	0.0352
1c,2-Dimethylcyclohexane	N8	0.1912	0.1885	0.1753
2,3,5-Trimethylhexane	I9	0.1391	0.1567	0.1607
2,2-Dimethylheptane	I9	0.0152	0.0171	0.0178
1,1,4-Trimethylcyclohexane	N9	1.0077	1.1176	1.0722
2,2,3-Trimethylhexane	I9	0.3861	0.4351	0.4417
2,4-Dimethylheptane	I9	0.0334	0.0376	0.0389
4,4-Dimethylheptane	I9	0.0548	0.0618	0.0639
Ethylcyclohexane	N8	0.6250	0.6161	0.5792
n-Propylcyclopentane	N8	0.2414	0.2380	0.2269
1c,3c,5-Trimethylcyclohexane	N9	0.0369	0.0409	0.0392
2,5-Dimethylheptane	I9	0.0755	0.0851	0.0879
3,3-Dimethylheptane	I9	0.1006	0.1134	0.1171
3,5-Dimethylheptane	I9	0.0655	0.0738	0.0762
2,6-Dimethylheptane	I9	0.0602	0.0678	0.0708
1,1,3-Trimethylcyclohexane	N9	0.1699	0.1884	0.1807
Ethylbenzene	A8	0.6086	0.5677	0.4835
1c,2t,4t-Trimethylcyclohexane	N9	0.2309	0.2561	0.2410
2,3-Dimethylheptane	I9	1.2320	1.3882	1.4158
1,3-Dimethylbenzene (m-Xylene)	A8	0.2302	0.2147	0.1839
1,4-Dimethylbenzene (p-Xylene)	A8	0.3936	0.3671	0.3155
3,4-Dimethylheptane	I9	0.0343	0.0386	0.0391
3,4-Dimethylheptane (2)	I9	0.1932	0.2177	0.2204
4-Ethylheptane	I9	0.0295	0.0332	0.0344
4-Methyloctane	I9	0.2633	0.2967	0.3048
2-Methyloctane	I9	0.3308	0.3728	0.3868
1c,2t,4c-Trimethylcyclohexane	I9	0.0558	0.0629	0.0642
3-Ethylheptane	I9	0.0845	0.0952	0.0970
3-Methyloctane	I9	0.4576	0.5156	0.5296
3,3-Diethylpentane	I9	0.0733	0.0826	0.0811
1c,2t,3-Trimethylcyclohexane	N9	0.0696	0.0772	0.0726
1,1,2-Trimethylcyclohexane	N9	0.0407	0.0451	0.0424
1,2-Dimethylbenzene (o-Xylene)	A8	0.6819	0.6360	0.5353
i-Butylcyclopentane	N9	0.3235	0.3588	0.3403
UnknownC8s	U8	0.1120	0.1124	0.1184
n-Nonane	P9	1.6502	1.8595	1.9184
1,1-Methylethylcyclohexane	N9	0.4395	0.4952	0.5124
i-Propylbenzene	A9	0.2232	0.2357	0.2021
i-Propylcyclohexane	N9	0.1158	0.1284	0.1186
2,2-Dimethyloctane	I10	0.0647	0.0809	0.0810
2,4-Dimethyloctane	I10	0.0931	0.1164	0.1166

2,6-Dimethyloctane	I10	0.0141	0.0176	0.0182
2,5-Dimethyloctane	I10	0.0556	0.0695	0.0696
n-Butylcyclopentane	N9	0.2186	0.2694	0.2497
3,3-Dimethyloctane	I10	0.0644	0.0805	0.0807
n-Propylbenzene	A9	0.3113	0.3287	0.2819
3,6-Dimethyloctane	I10	0.1930	0.2413	0.2416
3-Methyl-5-ethylheptane	I10	0.3004	0.3385	0.3454
1,3-Methylethylbenzene	A9	0.2586	0.2731	0.2323
1,4-Methylethylbenzene	A9	0.2766	0.2921	0.2484
1,3,5-Trimethylbenzene	A9	0.1575	0.1663	0.1424
2,3-Dimethyloctane	I10	0.0608	0.0760	0.0761
5-Methylnonane	I10	0.2204	0.2755	0.2785
1,2-Methylethylbenzene	A9	0.5114	0.5400	0.4569
2-Methylnonane	I10	0.0464	0.0580	0.0591
3-Ethyloctane	I10	0.0488	0.0610	0.0611
3-Methylnonane	I10	0.2356	0.2945	0.2974
1,2,4-Trimethylbenzene	A9	0.0589	0.0622	0.0526
t-Butylbenzene	A10	0.5004	0.5901	0.5047
i-Butylcyclohexane	N10	0.2132	0.2627	0.2397
1t-Methyl-2-n-propylcyclohexane	I10	0.0620	0.0699	0.0713
i-Butylbenzene	A10	0.0453	0.0534	0.0464
sec-Butylbenzene	A10	0.0473	0.0558	0.0480
UnknownC9s	U9	1.4486	1.6323	1.6840
n-Decane	P10	1.2063	1.5079	1.5295
1,2,3-Trimethylbenzene	A9	0.2694	0.2845	0.2358
1,3-Methyl-i-propylbenzene	A10	0.0884	0.0933	0.0789
1,4-Methyl-i-propylbenzene	A10	0.1180	0.1246	0.1054
Sec-Butylcyclohexane	N10	0.3645	0.4492	0.4094
1,2-Methyl-i-propylbenzene	A10	0.1838	0.2167	0.1832
3-Ethylnonane	I10	0.0378	0.0472	0.0481
1,3-Diethylbenzene	A10	0.1492	0.1759	0.1509
1,3-Methyl-n-propylbenzene	A10	0.0558	0.0658	0.0566
1,4-Diethylbenzene	A10	0.1173	0.1383	0.1189
1,4-Methyl-n-propylbenzene	A10	0.1661	0.1959	0.1691
n-Butylbenzene	A10	0.0661	0.0779	0.0670
1,3-Dimethyl-5-ethylbenzene	A10	0.0651	0.0768	0.0658
1,2-Diethylbenzene	A10	0.1620	0.1910	0.1609
1,2-Methyl-n-propylbenzene	A10	0.1124	0.1325	0.1124
1,4-Dimethyl-2-ethylbenzene	A10	0.1495	0.1763	0.1489
1,3-Dimethyl-4-ethylbenzene	A10	0.0133	0.0157	0.0133
1,2-Dimethyl-4-ethylbenzene	A10	0.1980	0.2335	0.1979
1,3-Dimethyl-2-ethylbenzene	A10	0.1323	0.1560	0.1298
1t,2c,4-Trimethylcyclopentane	A10	0.7422	0.7317	0.7248
1,2-Dimethyl-3-ethylbenzene	A10	0.1119	0.1319	0.1096
1,2-Ethyl-i-propylbenzene	A10	0.0747	0.0881	0.0745
1,4-Methyl-t-butylbenzene	A11	0.1990	0.2347	0.1984
UnknownC10s	U10	3.0061	3.7576	3.8114
n-Undecane	P11	1.0529	1.4459	1.4463
1,4-Ethyl-i-propylbenzene	A11	0.0737	0.0869	0.0735
1,2,4,5-Tetramethylbenzene	A11	0.1426	0.1682	0.1407
1,2-Methyl-n-butylbenzene	A11	0.0819	0.0966	0.0816
1,2,3,5-Tetramethylbenzene	A11	0.1613	0.1902	0.1583
1,2-Methyl-t-butylbenzene	A11	0.0946	0.1115	0.0942
5-Methylindan	A11	0.0308	0.0461	0.0456
4-Methylindan	A11	0.0122	0.0183	0.0181
1,2-Ethyl-n-propylbenzene	A11	0.1563	0.1843	0.1558
2-Methylindan	A11	0.0633	0.0947	0.0937
1,3-Methyl-n-butylbenzene	A11	0.1160	0.1368	0.1156
1,3-Di-i-propylbenzene	A11	0.1156	0.1363	0.1152
sec-Pentylbenzene	A11	0.1178	0.1389	0.1174
n-Pentylbenzene	A11	0.0541	0.0705	0.0608
1t-M-2-(4MP)cyclopentane	P12	0.0709	0.1061	0.1050
1,2-Di-n-propylbenzene	A11	0.0981	0.1157	0.0978
1,4-Di-i-propylbenzene	A11	0.1908	0.2250	0.1902
Tetrahydronaphthalene	A10	0.1121	0.1322	0.1117
t-Decahydronaphthalene	A10	0.1024	0.1207	0.1020
Naphthalene	A10	0.0985	0.1109	0.0937
1-t-Butyl-3,5-dimethylbenzene	A12	0.0562	0.0663	0.0560
1,4-Ethyl-t-butylbenzene	A11	0.1172	0.1382	0.1168
UnknownC11s	U11	2.1214	2.9132	2.9140
n-Dodecane	P12	0.8993	1.3458	1.3313
1,3-Di-n-propylbenzene	A12	0.0822	0.0969	0.0819
1,3,5-Triethylbenzene	A12	0.0198	0.0209	0.0179
1,2,4-Triethylbenzene	A12	0.3673	0.3878	0.3279

1,4-Methyl-n-pentylbenzene	A12	0.0687	0.0810	0.0685
n-Hexylbenzene	A12	0.1309	0.1866	0.1612
1,2,3,4,5-Pentamethylbenzene	A13	0.2542	0.2998	0.2534
2-Methylnaphthalene	A11	0.2612	0.3263	0.2758
1-Methylnaphthalene	A11	0.1853	0.2315	0.1682
UnknownC12s	U12	1.2104	1.8114	1.7919
n-Tridecane	P13	0.8119	1.3150	1.2855
UnknownC13s	U13	1.2355	2.0011	1.9562
n-Tetradecane	P14	0.6581	1.1470	1.1190
UnknownC14s	U14	1.2484	2.1759	2.1228
n-Pentadecane	P15	0.4698	0.8768	0.8456
UnknownC15s	U15	1.2640	2.3589	2.2749
n-Hexadecane	P16	0.2385	0.4745	0.4546
UnknownC16s	U16	0.5978	1.1893	1.1395
n-Heptadecane	P17	0.1071	0.2263	0.2162
UnknownC17s	U17	0.2227	0.4705	0.4494
n-Octadecane	P18	0.0207	0.0463	0.0441
UnknownC18s	U18	0.1351	0.3021	0.2877
n-Nonadecane	P19	0.0042	0.0099	0.0094
UnknownC19s	U19	0.0237	0.0559	0.0529
n-Eicosane	P20	0.0016	0.0040	0.0038
UnknownC20s	U20	0.0041	0.0102	0.0096
n-Heneicosane	P21	0.0002	0.0005	0.0005
TOTAL		100.0000	100.0000	100.0000

THE DATA PRESENTED HEREIN HAS BEEN ACQUIRED THROUGH JUDICIOUS APPLICATION OF CURRENT STATE-OF-THE ART ANALYTICAL TECHNIQUES. THE APPLICATIONS OF THIS INFORMATION IS THE RESPONSIBILITY OF THE USER. EMPACT ANALYTICAL SYSTEMS, INC. ASSUMES NO RESPONSIBILITY FOR ACCURACY OF THE REPORTED INFORMATION NOR ANY CONSEQUENCES OF IT'S APPLICATION.

EMPACT

CRUDE OIL ASSAY

PROJECT NO. :	201410093	ANALYSIS NO. :	02
COMPANY NAME :	CIRQUE RESOURCES LP	ANALYSIS DATE:	OCTOBER 17, 2014
ACCOUNT NO. :		SAMPLE DATE :	OCTOBER 16,2 2014
PRODUCER :		CYLINDER NO. :	1L GLASS JAR
LEASE NO. :		SAMPLED BY :	JOHN MOSER
NAME/DESCRIP :	PRODUCTION TANK 14:20		EMPACT
	GRACE BAY 20-17-14-1CH		
FIELD DATA		SAMPLE TEMP. :	66
SAMPLE PRES. :		AMBIENT TEMP.:	
VAPOR PRES. :		GRAVITY :	
COMMENTS :	SPOT		

SPECIFICATION		TEST METHOD	UNITS	RESULTS
API GRAVITY			API 60/60	34.4
RVP @100 DEG F		D323	PSIG	7.7
TOTAL SULFUR		D2622	WT %	N/A
TOTAL CHLORIDE		D4929	ug/g	N/A
ORGANIC CHLORIDE		D4929	ug/g	N/A
FLASH POINT		D93	° F	N/A
HEATING VALUE		D4809	BTU/ LB	N/A
VISUAL APPEARANCE				BLACK
BS&W		D96		
Crude Oil			VOL %	N/A
Water			VOL %	N/A
Emulsion			VOL %	N/A
Sediment			VOL %	N/A
DISTILLATION:		D86		
INITIAL POINT			DEG F	N/A
50%			DEG F	N/A
90%			DEG F	N/A
END POINT			DEG F	N/A
DISTILLATION:	@TEMP	D445		
Average Centipoise	20°C			N/A
Average Centipoise	30°C			N/A
Average Centipoise	80°C			N/A
Kinetic Viscosity	20°C		cSt (mm2/s)	N/A
Kinetic Viscosity	30°C		cSt (mm2/s)	N/A
Kinetic Viscosity	80°C		cSt (mm2/s)	N/A

ND: NOT DETECTED
N/A: NO TEST PREFORMED FOR THIS PARAMETER

The data presented herein has been acquired by means of current analytical techniques and represents the judicious conclusion EMPACT Analytical Systems, Inc. Results of the analysis can be affected by the sampling conditions, therefore, are only warranted through proper lab protocol. EMPACT assumes no responsibility for interpretation or any consequences from application of the reported information and is the sole liability of the user. The reproduction in any media of this reported information may not be made, in portion or as a whole, without the written permission of EMPACT Analytical Systems, Inc.

EMPACT Analytical Systems Inc. 365 S Main St Brighton, CO 80601 303-637-0150

Grace Bay 20-17-14-1CH
Associated Gas

Source Description Uncontrolled portion of associated gas

155 mcfd produced Based on 1st 30-days production

TotalBleed rate (cfh)	6,458	MW gas	28.9
Potential operating time	8,760 hr/yr	VOC wt fraction	46%
		HAP wt fraction	1.3%

Potential Emissions

Pollutant	Bleed Rate (cfh)	Hours per year	Estimated Uncontrolled Emissions (lb/hr)	Estimated Uncontrolled Emissions (tpy)	Controlled (tpy)
VOC	6,458	8,760	224.813	984.68	19.69
HAPs	6,458	8,760	6.295	27.57	0.55

Notes

MW and VOC wt fraction based on 11/24/14 analysis of gas from the well

GAS TESTING AND MEASUREMENT
PETROLEUM LABORATORY
PHYSICAL TEST
GAS SURVEY

GAS PRODUCTION SURVEYS
BACK PRESSURE TESTS
ELECTRONIC VOLUMES
CHART INTEGRATION

THURMOND-McGLOTHLIN, INC.

THE NATURAL GAS MEASUREMENT COMPANY
309 North American Road Unit 13
Cheyenne, WY 82007
307-632-2298 OFFICE

FRACTION ANALYSIS:

COMPONENTS		MOL %	GPM
			14.73
CARBON DIOXIDE	CO2	4.5417	
NITROGEN	N2	1.1120	
METHANE	C1	64.7722	
ETHANE	C2	9.8336	2.6377
PROPANE	C3	11.3760	3.1433
iso-BUTANE	IC4	1.2178	0.3997
n-BUTANE	NC4	4.3289	1.3688
iso-PENTANE	IC5	0.8462	0.3104
n-PENTANE	NC5	0.9148	0.3326
HEXANE +	NC6+	1.0568	0.4625
OXYGEN	O2	0.0000	
HYDROGEN SULFIDE:	H2S	0.0000	
	TOTAL	100.0000	

DATE RUN: 11/24/2014

COMPANY: Cirque
LEASE: Grace Bay 20-17-14-1CH-F
STATION: 130C
PILOT:
PRESSURE: 36.00 PSIG
TEMPERATURE: 48.00 F
CYLINDER: 12-WY-01
ANALYSIS BY: Dakota Messenger
SECURED BY: Shane Rogers
DATE SAMPLED: 11/24/2014
RUN NUMBER: WY6890N Data1L295
SAMPLE TYPE: S

GASOLINE CONTENT @ 60F

ETHANE & HEAVIER	8.6550
PROPANE & HEAVIER	6.0173
BUTANE & HEAVIER	2.8740
PENTANE & HEAVIER	1.1055

REMARKS:

H2S: 0.00 PPM
H20: lb/mmcf
RESULTS TO: Cirque

GROSS HEATING VALUE
BTU @ 60F IDEAL 14.73

DRY 1430.9759
WET 1406.8576

SPECIFIC GRAVITY Z = 0.9946

REAL 0.9075

*Based on GPA 2145 & 2172

Natural Gas is one of our Most Valuable and Profitable Properties. Careful Conservation and Expert Handling will Pay Abundant Dividends.

Grace Bay 20-17-14-1CH
Flare

Source ID Number	Flare HP		
Equipment ID			
Source Description	High pressure flare for combustion of associated gas		
Equipment Usage			
Equipment Make		Potential operation	8,760 hr/yr
Equipment Model			
Serial Number			
Date in Service			
Equipment Configuration			
Emission Controls			

Fuel Heating Value	1406.9	Btu/scf
Heat Duty	10.933	MMBtu/hr
Gas flow	0.0078	MMscf/hr

Permit Status

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)		Heat Duty (MMBtu/hr)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	(tpy)	Source of Emission Factor
NOx	0.14	lb/MMBtu	10.93	8760	1.53	6.70	WDEQ 3/10 Guidance Appendix B
CO	0.035	lb/MMBtu	10.93	8760	0.38	1.68	WDEQ 3/10 Guidance Appendix B
VOC*	5.5	lb/MMscf		8760	0.04	0.19	AP-42, Chapter 1.4
SOx	0.6	lb/MMscf		8760	0.005	0.02	AP-42, Chapter 1.4
PM10	7.6	lb/MMscf		8760	0.06	0.26	AP-42, Chapter 1.4

*VOC value only includes combustion emissions.
The 2% remaining uncontrolled portions of the feed streams are shown under the respective sources.

Estimating burner duty based upon streams to be controlled.
then applying a factor of 1.2

	Well Gas	Pilot*	Total
Btu/scf	1,407	1,407	
mcfd	155.0	0.4	155.4
Btu/d	218,062,928	587,504	218,650,432
MMBtu/h	9.09	0.02	9.11

* assume heat content same as well gas

Grace Bay 20-17-14-1CH
Flare

Source ID Number	Flare LP		
Equipment ID			
Source Description	Low pressure flare for combustion of tank emissons		
Equipment Usage			
Equipment Make		Potential operation	8,760 hr/yr
Equipment Model			
Serial Number			
Date in Service			
Equipment Configuration			
Emission Controls			

Flash gas heating value	1406.9	Btu/scf
Heat Duty	0.024	MMBtu/hr
Gas flow	0.00002	MMscf/hr

Permit Status

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)		Heat Duty (MMBtu/hr)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	(tpy)	Source of Emission Factor
NOx	0.14	lb/MMBtu	0.024	8760	0.003	0.015	WDEQ 3/10 Guidance Appendix B
CO	0.035	lb/MMBtu	0.024	8760	0.001	0.004	WDEQ 3/10 Guidance Appendix B
VOC*	5.5	lb/MMscf		8760	0.0001	0.0004	AP-42, Chapter 1.4
SOx	0.6	lb/MMscf		8760	0.00001	0.00004	AP-42, Chapter 1.4
PM10	7.6	lb/MMscf		8760	0.0001	0.001	AP-42, Chapter 1.4

*VOC value only includes combustion emissions.
The 2% remaining uncontrolled portions of the feed streams are shown under the respective sources.

Estimating burner duty based upon streams to be controlled.
then applying a factor of 1.2

	Tank Gas *	Pilot**	Total
Btu/scf	1,407	0	
mcfd ***	0.3	0.0	0.3
Btu/d	475,228	0	475,228
MMBtu/h	0.02	0.00	0.02

*no flash so assume heat content same as well gas
** Pilot included with flare associated gas
*** mcfd = 379.5 scf/lb-mole * total gas (lb/yr) / MW (lb/lb-mole)/365 days/yr/1000 scf/Mscf

Grace Bay 20-17-14-1CH
Heater Detail Sheet

Source ID Number	Treater heater					
Equipment ID						
Source Description	Heaters					
Equipment Usage						
Equipment Make		Potential operation	8760	hr/yr		
Equipment Model						
Serial Number						
Date in Service		Potential fuel usage	6.23	MMscf/yr	7.11E-04	MMscf/hr
Equipment Configuration		Each tank				
Emission Controls						

Fuel Heating Value	1406.9	Btu/scf	# of Heaters	1
Heat Rate	1.000	MMBtu/hr		

Permit Status

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Hrs of Operation (hrs/yr)	Estimated Emissions Each burner (lb/hr)	(tpy)	All burners (tpy)	Source of Emission Factor
NOx	100	8760	0.07	0.31	0.31	AP-42, Chapter 1.4
CO	84	8760	0.06	0.26	0.26	AP-42, Chapter 1.4
VOC	5.5	8760	0.004	0.02	0.02	AP-42, Chapter 1.4
SOx	0.6	8760	0.0004	0.002	0.002	AP-42, Chapter 1.4
PM10	7.6	8760	0.005	0.02	0.02	AP-42, Chapter 1.4

Truck Loading Emissions

Grace Bay 20-17-14-1CH

Total Throughput = 2,376,150 gallons

Production: **155** bbl/day

S=	**0.60**		saturation factor
P=	**2.3**	psia	true vapor pressure @50 deg F for unheated tanks
M=	**50**	lb/lb-mol	molecular weight of vapors
T=	**510**	°R	temperature where °R = °F + 460
L_L=	1.69	lb/1000 gallons	Loading Losses

Total Loss= 2.00 tons VOC

controlled NA tons VOC

L_L= 12.46*S*P*M/T lb/1000 gallons

AP-42 Tables

Table 5.2-1. SATURATION (S) FACTORS FOR CALCULATING PETROLEUM LIQUID LOADING LOSSES

Cargo Carrier	Mode Of Operation	S Factor
Tank trucks and rail tank cars	Submerged loading of a clean cargo tank	0.50
	Submerged loading: dedicated normal service	0.60
	Submerged loading: dedicated vapor balance service	1.00
	Splash loading of a clean cargo tank	1.45
	Splash loading: dedicated normal service	1.45
	Splash loading: dedicated vapor balance service	1.00

Table 7.1-2. PROPERTIES (MV, PVA, WL) OF SELECTED PETROLEUM LIQUIDS

Petroleum Liquid	vapor molecular wieght at 60 °F (lb/lb-mole)	condensate vapor density at 60 °F (lb/gal)	liquid density at 60 °F (lb/gal)	true vapor pressure (psi) at various temperatures in °F						
				40	50	60	70	80	90	100
	"M"			"P"						
Gasoline RVP 7	68.0	5.6		2.3	2.9	3.5	4.3	5.2	6.2	7.4
Crude Oil RVP 5	50	4.5	7.1	1.8	2.3	2.8	3.4	4	4.8	5.7

Grace Bay 20-17-14-1C Gas Analysis

MW and VOC wt fraction based on 11/24/14 analysis of gas from the well
Heat content: 1407 Btu/scf

COMPONENTS	Measured MOLE%	MW	Measured Avg. MW	Weight %	Wt. % VOC			
HELIUM	0.00	4	0.00	0.00%				
HYDROGEN	0.00	2	0.00	0.00%				
OXYGEN/ARGON	0.00	31.98	0.00	0.00%				
NITROGEN	1.11	28.02	0.31	1.08%				
CO2	4.54	44.01	2.00	6.92%				
METHANE	64.77	16.04	10.39	35.99%				
ETHANE	9.83	30.07	2.96	10.24%				
PROPANE	11.38	44.10	5.02	17.38%	17.38%			
ISOBUTANE	1.22	58.12	0.71	2.45%	2.45%			
N-BUTANE	4.33	58.12	2.52	8.72%	8.72%			
ISOPENTANE	0.85	72.15	0.61	2.12%	2.12%			
N-PENTANE	0.91	72.15	0.66	2.29%	2.29%			
HEXANES+	1.06	350.00	3.70	12.81%	12.81%			
TOTAL	100.00							

Calculated MW	28.87	VOC	45.8%	
Measured SG	0.995	HAP	1.3%	HAP wt% assumed to be
Calculated SG	0.995			one tenth of C6+ wt%

(MW of Hexanes+ is changed to make calculated and measured SG agree)

Fugitive Emission Factors **Grace Bay 20-17-14-1CH**

Total Facilities: 1

THC Leak Emission Factor (lb/day/component):

Component	Gas	Heavy Oil (≤20° API)	Light Oil (>20° API)	H_2O/Cond[2]
Connector	0.011	0.000400	0.0110	0.00580
Flanges	0.021	0.000021	0.0058	0.00015
Open Ended Lines	0.110	0.007400	0.0740	0.01300
Pump Seals	0.130		0.6900	0.00130
Valves	0.240	0.000440	0.1300	0.00520
Other[1]	0.470	0.001700	0.4000	0.74000

[1] Other includes compressor seals, pressure relief valves, dump level arms, polished rod pumps, thief hatches and miscellaneous components.

[2] Applies to streams with a water content between 50% and 99%.

Total Component Counts: *All component counts are estimated*

Component	Gas	Heavy Oil (≤20° API)	Light Oil (>20° API)	H_2O/Cond[2]
Connector	20	0	20	10
Flanges	1	0	1	0
Open Ended Lines	1	0	1	1
Pump Seals	0	0	0	0
Valves	5	0	5	2
Other[1]	1	0	1	1

Average Component Counts:

Component	Gas	Heavy Oil (≤20° API)	Light Oil (>20° API)	H_2O/Cond[2]
Connector	20	0	20	10
Flanges	1	0	1	0
Open Ended Lines	1	0	1	1
Pump Seals	0	0	0	0
Valves	5	0	5	2
Other[1]	1	0	1	1

	Gas	Heavy Oil (≤20° API)	Light Oil (>20° API)	H_2O/Cond[2]
THC Leak Factor (lb/day/site)	2.02	0.00	1.35	0.82
Percent VOCs	46%	0	100%	1%
Percent HAPs	1.3%	0	8%	0
VOC Leak Factor (total lb/day)	0.92	0.00	1.35	0.01
HAP Leak Factor (total lb/day)	0.03	0.00	0.11	0.00

2.28	VOC Fugitives per Day	(lb/day)
0.14	HAP Fugitives per Day	(lb/day)
0.42	VOC Fugitives per Year	(tpy)
0.03	HAP Fugitives per Year	(tpy)

Grace Bay 20-17-14-1CH
Pneumatic Devices

Source Description Pneumatic Controllers

	Count*	Bleed Rate (cfd)	Typical Usage
Low Bleed	1	0.048	temperature, pressure, liquid level controllers
High Bleed	0		

TotalBleed rate (cfh)	0.002		MW gas	28.9
Potential operating time	8760	hr/yr	VOC wt fraction	46%
			HAP wt fraction	1.3%

Potential Emissions

Pollutant	Bleed Rate (cfh)	Hours per year	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Notes
VOC	0.002	8760	6.96E-05	3.05E-04	
HAPs	0.002	8760	1.95E-06	8.54E-06	

Notes

MW and VOC wt fraction based on 11/24/14 analysis of gas from the well

WinSim inputs are shown in bold italics and have a box around them.

STREAM SUMMARY

Stream Number		1	2	3
Stream Name		Feed	0 psig vapor	0 psig liquid
Thermo Method Option		GLOBAL	GLOBAL	GLOBAL
Vapor Fraction		0		0
Temperature	F	*131*		*45.6*
Pressure	psia	*44.76*		*11.76*
Enthalpy	Btu/hr	-10600.1796		-14930.1207
Entropy	Btu/hr/R	-8.7183		-16.5978
Vapor Density	lb/ft3			
Liquid 1 Density	lb/ft3	41.1859		42.9640
Liquid 1 Specific Gravity	60F@STP	0.7175		0.7175
Vapor Cp	Btu/lbmol/R			
Vapor Cv	Btu/lbmol/R			
Liquid 1 Cp	Btu/lbmol/R	60.8517		55.1485
Vapor Viscosity	cP			
Liquid 1 Viscosity	cP	0.4597		0.5320
Vapor Thermal Conductivity	Btu/hr/ft/R			
Liquid 1 Thermal Conductivity	Btu/hr/ft/R	0.0671		0.0654
Vapor Flowrate	MMSCF/day@STP			
Liquid 1 Flowrate	bbl/day@STP	9.5525		9.5525
Liquid 2 Flowrate				
Molecular Weight		114.3346		114.3346
Molar Flowrate	lbmol/hr	0.8746		0.8746
Mass Flowrate	lb/hr	*100.0000*		100.0000
Note: All Liquid 1 Phase calculations exclude Free Water				
Molar Flowrate By Component				
49 : CARBON DIOXIDE	lbmol/hr	0.0003		0.0003
46 : NITROGEN	lbmol/hr	0.0000		0.0000
1021 : METHANOL	lbmol/hr	0.0000		0.0000
2 : METHANE	lbmol/hr	0.0024		0.0024
3 : ETHANE	lbmol/hr	0.0031		0.0031
4 : PROPANE	lbmol/hr	0.0132		0.0132
5 : I-BUTANE	lbmol/hr	0.0031		0.0031
6 : N-BUTANE	lbmol/hr	0.0174		0.0174
7 : I-PENTANE	lbmol/hr	0.0078		0.0078
8 : N-PENTANE	lbmol/hr	0.0110		0.0110
36 : CYCLOPENTANE	lbmol/hr	0.0122		0.0122
10 : N-HEXANE	lbmol/hr	0.0485		0.0485
38 : CYCLOHEXANE	lbmol/hr	0.0206		0.0206
1159 : ISOHEXANE	lbmol/hr	0.0945		0.0945
11 : N-HEPTANE	lbmol/hr	0.1206		0.1206
39 : METHYLCYCLOHEXAN	lbmol/hr	0.0405		0.0405
82 : 2,2,4-TRIMETHYLP	lbmol/hr	0.0103		0.0103
40 : BENZENE	lbmol/hr	0.0071		0.0071
41 : TOLUENE	lbmol/hr	0.0187		0.0187
45 : ETHYL BENZENE	lbmol/hr	0.0053		0.0053
42 : O-XYLENE	lbmol/hr	0.0060		0.0060
12 : N-OCTANE	lbmol/hr	0.1011		0.1011
13 : N-NONANE	lbmol/hr	0.1018		0.1018
44 : P-XYLENE	lbmol/hr	0.0034		0.0034
43 : M-XYLENE	lbmol/hr	0.0020		0.0020
15 : N-UNDECANE	lbmol/hr	0.1539		0.1539
16 : N-DODECANE	lbmol/hr	0.0696		0.0696
Total	lbmol/hr	0.8746		0.8746

Stream Number		1	2	3
Stream Name		Feed	0 psig vapor	0 psig liquid
Molar Composition By Component				
49 : CARBON DIOXIDE	molar %	*0.0310*		0.0310
46 : NITROGEN	molar %	*0.0020*		0.0020
1021 : METHANOL	molar %	*0.0057*		0.0057
2 : METHANE	molar %	*0.2800*		0.2800
3 : ETHANE	molar %	*0.3489*		0.3489
4 : PROPANE	molar %	*1.5090*		1.5090
5 : I-BUTANE	molar %	*0.3590*		0.3590
6 : N-BUTANE	molar %	*1.9930*		1.9930
7 : I-PENTANE	molar %	*0.8916*		0.8916
8 : N-PENTANE	molar %	*1.2600*		1.2600
36 : CYCLOPENTANE	molar %	*1.3967*		1.3967
10 : N-HEXANE	molar %	*5.5501*		5.5501
38 : CYCLOHEXANE	molar %	*2.3554*		2.3554
1159 : ISOHEXANE	molar %	*10.8071*		10.8071
11 : N-HEPTANE	molar %	*13.7837*		13.7837
39 : METHYLCYCLOHEXAN	molar %	*4.6281*		4.6281
82 : 2,2,4-TRIMETHYLP	molar %	*1.1816*		1.1816
40 : BENZENE	molar %	*0.8168*		0.8168
41 : TOLUENE	molar %	*2.1331*		2.1331
45 : ETHYL BENZENE	molar %	*0.6086*		0.6086
42 : O-XYLENE	molar %	*0.6819*		0.6819
12 : N-OCTANE	molar %	*11.5620*		11.5620
13 : N-NONANE	molar %	*11.6421*		11.6421
44 : P-XYLENE	molar %	*0.3937*		0.3937
43 : M-XYLENE	molar %	*0.2302*		0.2302
15 : N-UNDECANE	molar %	*17.5909*		17.5909
16 : N-DODECANE	molar %	*7.9578*		7.9578
Total	molar %	100		100
Mass Flowrate By Component				
49 : CARBON DIOXIDE	lb/hr	0.0119		0.0119
46 : NITROGEN	lb/hr	0.0005		0.0005
1021 : METHANOL	lb/hr	0.0016		0.0016
2 : METHANE	lb/hr	0.0393		0.0393
3 : ETHANE	lb/hr	0.0918		0.0918
4 : PROPANE	lb/hr	0.5820		0.5820
5 : I-BUTANE	lb/hr	0.1825		0.1825
6 : N-BUTANE	lb/hr	1.0131		1.0131
7 : I-PENTANE	lb/hr	0.5626		0.5626
8 : N-PENTANE	lb/hr	0.7951		0.7951
36 : CYCLOPENTANE	lb/hr	0.8567		0.8567
10 : N-HEXANE	lb/hr	4.1830		4.1830
38 : CYCLOHEXANE	lb/hr	1.7337		1.7337
1159 : ISOHEXANE	lb/hr	8.1451		8.1451
11 : N-HEPTANE	lb/hr	12.0795		12.0795
39 : METHYLCYCLOHEXAN	lb/hr	3.9743		3.9743
82 : 2,2,4-TRIMETHYLP	lb/hr	1.1805		1.1805
40 : BENZENE	lb/hr	0.5580		0.5580
41 : TOLUENE	lb/hr	1.7189		1.7189
45 : ETHYL BENZENE	lb/hr	0.5651		0.5651
42 : O-XYLENE	lb/hr	0.6331		0.6331
12 : N-OCTANE	lb/hr	11.5508		11.5508
13 : N-NONANE	lb/hr	13.0590		13.0590

Stream Number		1	2	3
Stream Name		Feed	0 psig vapor	0 psig liquid
44 : P-XYLENE	lb/hr	0.3655		0.3655
43 : M-XYLENE	lb/hr	0.2137		0.2137
15 : N-UNDECANE	lb/hr	24.0478		24.0478
16 : N-DODECANE	lb/hr	11.8550		11.8550
Total	lb/hr	100.0000		100.0000
Mass Composition By Component				
49 : CARBON DIOXIDE	mass %	0.0119		0.0119
46 : NITROGEN	mass %	0.0005		0.0005
1021 : METHANOL	mass %	0.0016		0.0016
2 : METHANE	mass %	0.0393		0.0393
3 : ETHANE	mass %	0.0918		0.0918
4 : PROPANE	mass %	0.5820		0.5820
5 : I-BUTANE	mass %	0.1825		0.1825
6 : N-BUTANE	mass %	1.0131		1.0131
7 : I-PENTANE	mass %	0.5626		0.5626
8 : N-PENTANE	mass %	0.7951		0.7951
36 : CYCLOPENTANE	mass %	0.8567		0.8567
10 : N-HEXANE	mass %	4.1830		4.1830
38 : CYCLOHEXANE	mass %	1.7337		1.7337
1159 : ISOHEXANE	mass %	8.1451		8.1451
11 : N-HEPTANE	mass %	12.0795		12.0795
39 : METHYLCYCLOHEXAN	mass %	3.9743		3.9743
82 : 2,2,4-TRIMETHYLP	mass %	1.1805		1.1805
40 : BENZENE	mass %	0.5580		0.5580
41 : TOLUENE	mass %	1.7189		1.7189
45 : ETHYL BENZENE	mass %	0.5651		0.5651
42 : O-XYLENE	mass %	0.6331		0.6331
12 : N-OCTANE	mass %	11.5508		11.5508
13 : N-NONANE	mass %	13.0590		13.0590
44 : P-XYLENE	mass %	0.3655		0.3655
43 : M-XYLENE	mass %	0.2137		0.2137
15 : N-UNDECANE	mass %	24.0478		24.0478
16 : N-DODECANE	mass %	11.8550		11.8550
Total	mass %	100		100
VOC Emissions in Flash Gas				
100 lb/h Feed Basis (Simulation)				
Oil Projected Production	lb/hr		100.0000	*(Stream 3 Total Flo*
Total VOC	lb/hr		0.0000	*(Stream 2 VOC)*
(Total VOC is the sum of the flash gas (Stream 2) component flowrates of propane and heavier, includes Methan				
Scaled to Actual Annual Oil Projected Production				
Annual oil projected production		bbl/year	56,474	*(from p. 3)*
		lb/yr	16,872,287	*(from p. 3)*
			lb/yr	tpy
Total VOC			0	0.00

$$Total\ VOC = (WinSim\ Feed\ Basis\ Total\ VOC \times Scaled\ Annual\ Oil\ Production(lb/yr)) / (Sim\ Feed\ Basis\ Oil\ Production)$$