

west virginia department of environmental protection

Division of Air Quality 601 57th Street, SE Charleston, WV 25304-2345 Phone: 304 926 0475 • Fax: 304 926 0479 Earl Ray Tomblin, Governor Randy C. Huffman, Cabinet Secretary www.dep.wv.gov

ENGINEERING EVALUATION/FACT SHEET

B ACKGROUND INFORMATION

Application No.:	R13-3224						
Plant ID No.:	103-00097						
Applicant:	Equitrans Limited Partnership						
Facility Name:	Corona Compressor Station						
Location:	Brink						
NAICS Code:	486210						
Application Type:	Construction						
Received Date:	November 12, 2014						
Engineer Assigned:	Edward S. Andrews, P.E.						
Fee Amount:	\$2,000.00						
Fee Deposit Date:	November 14, 2014						
Complete Date:	December 11, 2014						
Due Date:	March 11, 2015						
Applicant Ad Date:	November 19, 2014						
Newspaper:	Wetzel Chronicle						
UTM's:	Easting: 542.78 km Northing: 4,377.20 km Zone: 17						
Description:	The application is for the construction of compressor station for a						
	natural gas pipeline segment which includes one combustion						
	turbine, two heaters, and five micro turbine generators.						

Process Description

Equitrans Limited Partnership (EQT) proposed the new Corona Compressor Station, which will be located approximately 0.20 miles southwest of the intersection of Richwood Run (County Road 7/6) and County Road 21/3 on Richwood Road in Wetzel County, West Virginia.

Equitrans LP is seeking authorization from the Federal Energy Regulatory Commission (FERC) pursuant to Section 7(c) of the Natural Gas Act to construct and operate the proposed Corona Compressor Station (Corona) in Wetzel County, West Virginia. The project includes approximately 35.3 miles of new 30-inch diameter natural gas pipeline in Wetzel County, WV.

The new pipeline segment is primarily a greenfield project that is designed to transport up to approximately 900,000 dekatherms per day of natural gas produced in the

central Appalachian Basin into the Rockies Express Pipeline, LLC (REX) and Texas Eastern Transmission, LP (TETCO) system.

The Corona Station will be compressing gas from the mainline EQT system and will transport gas from the proposed H-313 pipeline, which will tie into the H-557 pipeline which ties into our Blacksville Station (which transports gas from WV to PA) and to the proposed H-306 extension, which will tie into the existing H-306 pipeline at the Pickenpaw meter station.

The station will consist of the following emissions units:

- One Solar Mars 100 natural gas-fired combustion turbine configured with gas compressor (Rated Heat Input of 122 MMBtu/hr) for compression and transmission of natural gas;
- Five Capstone micro-turbines (Rated Heat Input of 2.28 MMBtu/hr for each unit) for the generation of electricity;
- One 210-barrel produced fluids storage tank;
- One 100-barrel used oil storage tank;
- One 50-barrel monethylene glycol (MEG) storage tank;
- One 0.77 MMBtu/hr fuel gas heater; and
- One 0.77 MMBtu/hr start gas heater.

Natural gas from the EQT pipeline will be compressed by the centrifuge compressor with dry seals that is driven by the combustion turbine with a maximum power output of 16,400 bhp. Natural gas consumed by the turbine is preheated by a 0.77 MMBtu/hr heater. A second heater will be used to preheat the turbine for startup. This heater will be fired continuously in the event that the combustion turbine needs to be restarted.

Produced fluids generated from the filtering process before entering the compressor and during the compression process will be sent to the Produced Fluids Tank at a pressure of approximately 550 psig. The compressor station will generate its own electricity using five 200 kW micro turbines.

SITE INSPECTION

On December 9, 2014, Mr. James Jarrett, P.E., a compliance and enforcement engineer, conducted a site assessment of the proposed site. There was no sign of construction activities detected during this inspection. Mr. Jarrett estimated the nearest residence to be approximately 1600 feet from the site.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

The applicant classified the operation of the turbine into five operating modes, which are normal operation, startup/shutdown, low-load, below zero, and extreme below zero. The emissions from the proposed turbine and existing one can vary significantly between these different operating modes. Solar refers to these modes as non-SoLoNO_x modes except for normal operation, which is referred to as SoLoNO_x Mode.

Normal Operation: Normal operating conditions is load above 50% with ambient temperatures above zero degrees Fahrenheit. The Solar's SoLoNO_x is lean premix, dry low NO_x emission combustion system, which works very well to minimize emissions generated from the combustion turbine. Typically, the system can maintain NO_x emissions to 15 ppm with the oxygen corrected to 15% in this mode. Carbon dioxide (CO) and unburnt hydrocarbons (UHC) are maintained at 25 ppm with the oxygen level corrected to 15%. These predicted concentrations were based on elevation of an 1,575 feet, which is nearly the same as the proposed site, and temperatures from 0 to 100° F. For this Mars turbine, NO_x and CO emission rates are 7.33 and 7.44 pounds per hour respectively. EQT assumed all of the UHC emissions as VOCs. Thus, the VOC rate from the turbine is 4.27 pounds per hour.

Startup/Shut Down: Startup and Shutdown events should take approximately 10 minutes per event (10 min. startup & 10 min. shutdown) or 20 minutes for a complete startup/shut down cycle. Solar has published Product Information Letter (PIL) 170 Revision 5 for customers to estimate emissions during startup/shut down events of their turbines. To determine the annual potential emissions, EQT used 12 complete events per year to determine the annual potential to emit for the turbine. CO emissions are 272.7 pounds per complete cycle with NO_x being only 3.1 pounds per cycle. UHC and carbon dioxide emissions are predicted to be 15.6 and 1,749 pounds per complete cycle respectively.

Low-Load Operations: Low-load operation would be considered to be non-startup/shutdown modes with the turbine operating below 50% load (as determined by ambient temperatures). Solar provided guidance to estimate NOx, CO, and UHC emissions in PIL 167 Revision 4. Assuming there are 12 startup/shut downs annually, the turbine most likely will be operating for most of the hour after start up in a low load condition. The hourly rates at 50% load (61 MMBtu/hr) are 15.68 lb/hr of NO_x, 1,366.8 lb/hr of CO, and 78.01 lb/hr of UHC (assume 100% VOC).

Below Zero Operations: Cold weather operations would be considered to be when the turbine is operating at loads above 50% when ambient conditions are below zero degrees Fahrenheit. Solar provided an estimate of NOx CO and UHC emissions in PIL 167 Revision 4 for customers to estimate emissions during non-SoLoNO_x modes, which includes conditions below zero. For annual estimation purposes, EQT used 36 hours per year. CO emissions are 19.55 pounds per hour with NO_x emissions being 13.49 pounds per hour for operating the turbines during these

conditions. VOC emissions also increased to 50 ppm, which equates to an hourly mass rate of 7.01 pounds per hour.

Extreme Below Zero Operations: In addition to regular below zero operations, although very limited, there are times when the ambient temperatures fall below negative twenty degrees Fahrenheit. In PIL 167 Revision 4, Solar has additional guidelines for determining emissions of NOx, CO, and UHC at these extreme conditions. For annual estimation purpose, EQT did not anticipate operating these combustion turbines during this condition.

Venting (Blowdown)

EQT calculated emissions for compressor blowdowns from emergency shutdown, compressor venting and maintenance. It is not expected that a blowdown will occur after each shutdown. The total amount of gas vented from these activities would be 750,855 cubic feet per year. Using the gas composition, EQT estimated the blowdown emissions would be 379 tons per year of carbon dioxide equivalent and 0.03 tons per year of VOC, which would mostly be propane.

The proposed compressor will be equipped with dry seals. Leakage from the 2 seals will be contributing to fugitive leaks during continuous operations. The dry seals are losing 240 scf per hour. For annual estimates, it was assumed continuous operation. VOC emissions were estimated to be 0.09 tpy from the seals. The potential of greenhouse gases from the compressor seals would be 1,061.25 tpy.

Heaters

Fuel Gas and Start Gas Heaters are two 0.77 MMBtu/hr natural gas fired heaters. EQT used emission factors from Tables 1.4.1-1 and 1.4.1-3 of AP-42 and Subpart C of Part 98 to estimate emissions from these heaters. Presented in the following table is the estimate of emissions from the heaters.

Table #1 – Emissions from Fuel and Start Gas Heaters							
Pollutant	Emission Factor	ner		Annual Rate for Both Heaters (tpy)			
PM/PM ₁₀ /PM _{2.5} Filterable	1.9 lb/MMcf	0.001	0.004	0.01			
PM Condensable Fraction	5.7 lb/MMcf	0.004	0.018	0.04			
Total PM	7.6 lb/MMcf	0.006	0.03	0.06			
Sulfur Dioxide (SO ₂)	20 grain/100 scf	0.04	0.18	0.36			
Oxides of Nitrogen (NO _x)	100 lb/MMcf	0.08	0.35	0.70			
Carbon Monoxide (CO)	84 lb/MMcf	0.06	0.26	0.52			
Volatile Organic Compounds (VOCs)	5.5 lb/MMcf	0.004	0.02	0.04			

Total Hazardous Air Pollutants (HAPs)	1.89 lb	0.03	0.13	0.04
Carbon Dioxide Equivalent [*] (CO ₂ e)	116.98 lb/MMBtu	90.07	394.51	789.02

Equipment Leaks

EQT has estimated the number of components by type of components for the proposed stations. Using the leakage factor by component type from Table W-1A of Subpart W of Part 98, EQT estimated a gas leakage rate by component type and total which was determined to be 386,097 cubic feet per year of . The VOC emissions were estimated as a total for compressors to be 0.40 tpy. These fugitive leaks have the potential to release greenhouse gases, which are methane and carbon dioxide. The potential CO_2e from these leaks were estimated to be 258.29 tpy.

Micro Combustion Turbines

The applicant used several sources of data, which included manufacturer's data, to estimate emissions from the proposed micro combustion turbines. Presented in the following table is the estimate of emissions from the emergency generator.

Table #2 – Emissions from the Micro Turbine Generator Sets					
	Single Capston	e	Five Capstone Turbines		
Maximum Power Output	0.200		1.000		
(MW)					
	Emissions				
Pollutant	(lb/hr) (TPY)		(TPY)		
Oxides of Nitrogen (NO _x)	0.08	0.35	1.75		
Carbon Monoxide (CO)	0.22	0.96	4.8		
Volatile Organic Compounds	0.02 0.09		0.45		
(VOCs)					
Formaldehyde [*] (HCOH)	0.48 0.12				
Carbon Dioxide (CO ₂)	266.00	1,165.08	5,825.40		

* Formaldehyde is classified as a Hazardous Air Pollutant (HAP)

Tanks

The proposed stations will have six storage vessels to support operational activities. The applicant used EPA TANKS 4.09D, which is the current version available, to estimate breathing and working loses from the vessels. To predict flash emissions, the applicant used ChemCad 6.5.5. to estimate the flash from these vessels. The following table is a breakout of the VOC emissions by vessel by type of loss.

Tank	Capacity (gallons)/bbl	Annual Throughput (gallons/yr)	Breathing Loss (lb/yr)	Working Loss (lb/yr)	Flashing Loss (lb/yr)	Total VOCs (lb/yr)
Produced Fluids Tank T-001	8,820/210	54,768	0	0.97	414.35	415.32
Used Oil Tank T-002	4,200/100	1,428	0	0.03	0	0.03
Engine Oil Tank 1 T- 003	2,100/50	714	0.51	0.01	0	0.52
Engine Oil Tank 2 T- 004	2,100/50	714	0.51	0.01	0	0.52
MEG Tank #1 T-005	2,100/50	630	0	0	0	0
MEG Tank #2 T-006	2,100/50	630	0	0	0	0
Total Emissic	ons	1	<u> </u>	<u> </u>	-1	416.39

In reviewing the applicant's flashing loss from the produced fluids tank, the writer noted that the ChemCad was predicting that 100% of produced fluids were being flashed off. In addition, the inputs did not include any water. The writer re-evaluated the potential from this vessel at the proposed station using ProMax 3.2.

The writer configured the proposed station as seen in the following figure.

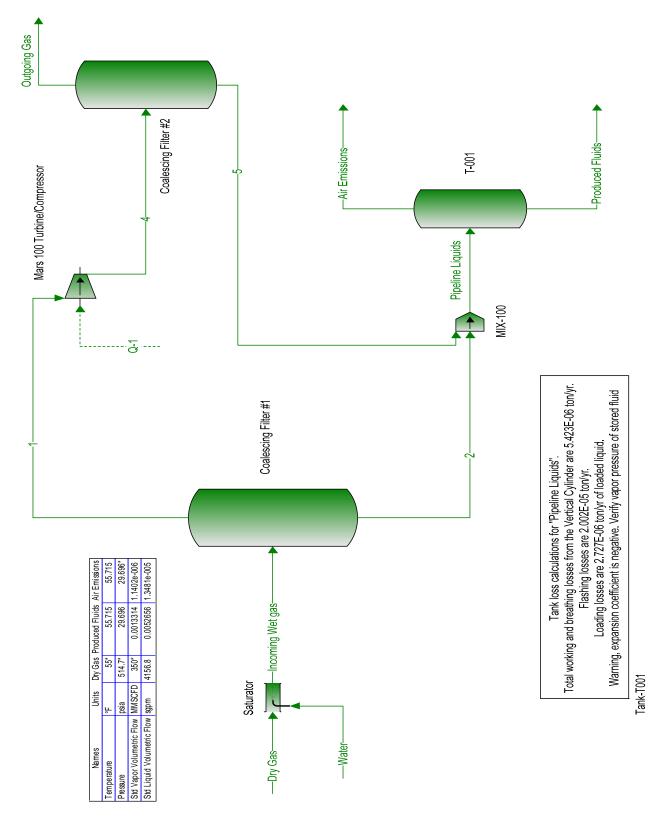


Figure 1 – Schematic of the Corona Station

The writer used the saturator function to account for moisture in the incoming natural gas. The coalescing filters are represented as 2-phase separators operating with a 10 psig pressure drop. Tank T-001 is another 2-phase separator with the tank vent going to atmospheric pressure. The tank loses were calculated using the tank loss property stencil in ProMax 3.2, which uses the working and breathing loss equations from Chapter 7.1 of AP-42 and loading loss equations from Chapter 5.2 of AP-42.

This process simulator predicted the VOC emissions from Tank T-001 to be less than 1 pound per year. The writer believes this estimate is less than what actual VOC emissions from Tank T-001. Both prediction methods are predicting the VOC emissions from Tank T-001 to be very low. Actual pipeline operational data would be needed to enhance the writer's estimation approach.

Table #3 – Potential Emissions from the Proposed New Emissions Units										
Source	Operating Mode	Cycle	Hr/Yr	NO _x	CO	PM ₁₀	PM _{2.5}	VOC	SO ₂	CO ₂ e
		S		(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)
Solar Mars	Normal Load @ 0 ⁰ F		8,700	31.89	32.32	3.50	3.50	18.53	0.05	62,164
M-100 CT	Low Temperature (< 0 ⁰ F)		36	0.24	0.35	0.01	0.01	0.13	0.001	257.15
	Very Low Temperature (< -20 ⁰ F)		0	0	0	0	0	0	0	0
	Low Load (< 50%)		12	0.09	8.20	0.00	0.00	0.47	0	86
	Startup/Shutdown	12		0.02	1.64	0.01	0.01	0.09	0.001	10.49
	Seal Leakage							0.08	0	1061.26
	Total		8,760	32.24	42.51	3.52	3.52	19.23	0.052	63,731
Blowdown								0.03		379.00
Pigging	Fugitive							0.001		4.91
Tanks	Fugitive							0.20		
Liquid Loading	Fugitive							0.001		
Equipment Leaks	Fugitive							0.02		194.89
Haul roads	Fugitive					0.50	0.05			
5 Micro Turbines	Normal		8,760	1.75	4.8	0.02	0.02	0.45	0.005	5,825.40
Fuel Gas Heater	Normal		8,760	0.35	0.26	0.03	0.03	0.02	0.18	789.02
Startup Heater	Normal		8,760	0.35	0.26	0.03	0.03	0.02	0.18	789.02
Total			34.69	47.83	4.10	3.65	19.97	0.42	71,713.24	
Major Source Threshold Values (45CSR14-2.43.b)			250	250	250	250	250	250		
Does the Proje	ect Represent a Major Sou	rce under	PSD?	No	No	No	No	No	No	

Emissions from the proposed new sources are indicated in the following table.

The proposed facility would have the potential to emit of 0.60 tons per year of total hazardous air pollutants (HAPs).

REGULATORY APPLICABLILITY

The Corona Compressor Station as proposed in the submittal of this application is classified as a minor source under Prevention of Significant Deterioration (PSD), which is State Rule 45 CSR 14, and an Area Source for Hazardous Air Pollutants (HAPs). The applicant demonstrated that the proposed station does not have the potential to emit at or over 250 tpy of any criteria pollutants and less than 25 tpy of total HAPs with no single HAP being of more than 10 tpy.

NSPS

New Source Performance Standards (NSPS) apply to certain new, modified, or reconstructed sources meeting criteria established in 40 CFR 60.

The fuel and starting preheater are rated with an heat input 0.77 MMBtu/hr. The definition of affected source in Subpart Dc (Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units) is units between 10 MMBtu/hr and up to 100 MMBtu/hr. Thus, the proposed fuel preheater is not an affected source and is not subject to the standards under Subpart Dc.

The Mars-100 turbine is used to drive compressors at a transmission station for a natural gas pipeline system. Subpart OOOO (Standards of Performance for Crude Oil and Natural Gas Production) establishes standards for certain process equipment at oil and natural gas production sites. This regulation defines sites from the wellhead and the point of custody transfer to the natural gas transmission and storage segment. The Corona Compressor is downstream of the custody transfer point of EQT's transmission system. Therefore, the proposed natural gas compressor is not an affected source and not subject to the performance standards of Subpart OOOO.

The produced fluids tank (T-001) will receive pipeline liquids from the collection point of the pipeline system located within the station. This tank may be subject to Subpart OOOO if the VOC potential is 6 tons per year or greater (40 CFR 60.5365(e)). Potential emission from the tank must include flash, working, and breathing losses. The applicant's analysis indicts the vessel has a potential of 0.20 tons per year of VOCs which less than the applicability threshold value.

Subpart KKKK

U.S. EPA has promulgated a NSPS for stationary combustion turbines constructed, modified, or reconstructed after February 18, 2005, in Subpart KKKK. Subpart KKKK applies to combustion turbines with a peak heat input of 10 MMBtu/hr and greater. The proposed Solar

Mars 100 turbine is rated at 122.04 MMBtu/hr (at 0^0 F). Therefore, the purposed turbine is an affected source under this subpart. However, the micro-turbines have a maximum heat input of 2.28 MMBtu/hr, which is less than 10 MMBtu/hr. The micro turbines are not affected sources under this subpart.

Sources subject to Subpart KKKK are exempt from the requirements of Subpart GG (NSPS for combustion turbines constructed/modified/reconstructed after October 3, 1977).

This subpart establishes emissions standards for NO_x and SO_2 . These turbines would be limited to 0.060lb of SO_2 per MMBtu/hr of heat input. The turbine will be burning pipeline quality natural gas with a maximum sulfur content of 20 grains per 100 standard cubic feet of gas. Under 40 CFR §60.4365, a source is exempt from monitoring fuel sulfur content if the source burns natural gas that is covered by a transportation agreement (Federal Energy Regulatory Commission tariff limit) with a maximum of 20 grains of sulfur per 100 standard cubic feet of gas (40 CFR §60.4365(a)).

According to EQT (Section 6.4[1](iii) of the General Terms and Conditions), except as otherwise provided, all natural gas delivered to EQT at Receipt Point(s) and all natural gas delivered by EQT at the Delivery Point(s) shall conform to the following specifications: Total Sulfur - The gas shall not contain more than 170 parts per million, on a volumetric basis, or ten (10.0) grains of total sulfur per one hundred (100) cubic feet of gas.

40 CFR §60.4325 establishes NO_x standards for affected units as specified in Table 1 of Subpart KKKK. The proposed Mars 100 turbine is a new turbine firing natural gas with a heat input of greater than 50 MMBtu/hr and less than 850 MMBtu/hr. In this subcategory, these turbines are limited to a NO_x standard of 25 ppm at 15 percent oxygen (O₂) content or 150 nana gram /Joule of useful output. The selected turbines are equipped with a dry low NO_x emission combustion system, known as SoLoNO_xTM, which has been developed to provide the lowest emissions possible during normal operating conditions. Solar Taurus (manufacturer) predicts that the NO_x emissions with the SoLoNO_xTM combustion controls from the turbine to be 15 ppm when the ambient temperatures are at or above 0⁰ F.

There are alternative standards for units operating at less than 75 percent of peak load or when operating temperatures are less than 0^0 F. The alternative limit is 150 ppm at 15% O₂ is listed Table 1 to Subpart KKKK. The manufacturer predicts that the NO_x rate for the proposed turbines would increase up to 120 ppm for subzero operations. For low load operations, the manufacturer predicts that the NO_x concentrations to increase slightly to 70 ppm for loads at or less than 50% of peak output and 50 ppm at idle conditions. The proposed turbines are capable of meeting the NO_x limitations under this subpart at normal and other than normal conditions.

This subpart requires sources to use one of two options in monitoring compliance with the standard, which are testing or continuous monitoring system. Sources can conduct testing every year and reduce the subsequent testing to every two years if the NO_x results are at or less than 75% of the standard, which equates to 15 ppm for these two turbines. The applicant has elected to use the testing option at this time. The permit will be structured on the 15 ppm as the

short term limit, which is 75% of the applicable limit, for the short term limit with initial testing and subsequent testing every two years. Under the subpart, sources electing to conduct testing are only required to submit test reports of the results in lieu of submitting excess emissions and monitor downtime reports in accordance with 40 CFR §60.7(c).

The station will be classified as an area source of HAPs. There are no area-source subparts under Part 63 that are applicable to this facility. Under 45 CSR 30, the station will be classified as a deferred Title V Facility. This means that the facility will only be subject to the fee program part of 45 CSR 30, which includes submitting Certified Emission Statements on an annual basis.

The proposed facility will be a minor source with potential emissions greater than 6 pounds per hour and 10 tons per year for criteria pollutants, therefore the facility is required to obtain a construction permit under 45 CSR 13. The applicant submitted a complete application, paid the required filing fees, and published a class I legal ad in the *Wetzel Chronicle* on November 19, 2014.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

The majority of non-criteria regulated pollutants fall under the definition of HAPs which, with some revision since, were 188 compounds identified under Section 112(b) of the Clean Air Act (CAA) as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects. The following HAPs are routinely emitted from combustion units: Benzene, Ethylbenzene, Formaldehyde, Toluene, and Xylene. The following table lists each HAP's carcinogenic risk (as based on analysis provided in the Integrated Risk Information System [IRIS]):

Table # X			
HAP	Туре	Known/Suspected	Classification
		Carcinogen	
Formaldehyde	VOC	Yes	Category B1 - Probable Human
-			Carcinogen
Benzene	VOC	Yes	Category A - Known Human Carcinogen
Ethylenebenzene	VOC	No	Inadequate Data
Toluene	VOC	No	Inadequate Data
Xylenes	VOC	No	Inadequate Data

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health effects may be associated with a wide range of ambient concentrations and exposure times and are influenced by source-specific characteristics such as emission rates and local meteorological conditions. Health impacts are also dependent on multiple factors that affect variability in humans such as genetics, age, health status (e.g., the presence of pre-existing disease) and lifestyle. As stated previously, *there are no federal or state ambient air quality standards for*

these specific chemicals. For a complete discussion of the known health effects of each compound refer to the IRIS database located at <u>www.epa.gov/iris</u>.

AIR QUALITY IMPACT ANALYSIS

Based on the annual emission rates, the proposed facility is not classified as a major source as defined by 45CSR14, so air quality modeling was not required.

MONITORING OF OPERATIONS

Monitoring of the proposed Mars turbine should be focused on the different operating modes (i.e. normal, low load, low temperature, etc.) in terms of hours per month. This monitoring will be used to determine actual emissions to show compliance with the annual limits. Fuel usage for the heater should be adequate to determine actual emissions. Tracking hours of operation through the hour-meter should be adequate for the micro turbines.

Other monitoring being proposed in the draft permit comes from Subpart OOOO, the Subpart OOOO requires the potential to emit of the Tank T-001 to be based on the throughput of liquids from the first 30 days the vessel was placed into service.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates that the Corona Station should meet applicable requirements of state rules and federal regulations. It is recommended that EQT Equitrans Limited Partnership be granted a 45CSR13 construction permit for the proposed construction of Corona Compressor Station.

Edward S. Andrews, P.E. Engineer

May 13, 2015 Date