Texas Commission on Environmental Quality

INTEROFFICE MEMORANDUM

To: Anne Inman, P.E.
Manager
Rule Registrations Section

Date: December 30, 2010

From: Daniel Menendez
Team Leader
Air Dispersion Modeling Team (ADMT)

Subject: Modeling Report - Standard Permit for Oil & Gas Transportation and Production Facilities

1.0 Project Identification Information. This modeling report is an update to the modeling reports dated August 15, 2007 (NSRG document numbers 7825 and 8001), February 11, 2010 (NSRG document number 9871), February 22, 2010 (NSRG document number 9880), June 11, 2010 (NSRG document number 10434), and November 2, 2010 (NSRG document number 10989). After subsequent review of the blowdown parameters used in the previous analysis, the modeled parameters were determined not to be representative of the activities occurring under high pressure. The modeling results were updated to include more representative parameters for blowdowns with pressure greater than or equal to 30 pounds per square inch gauge (psig). This modeling report only includes a description of the additional modeling and updated results table for blowdowns with pressure greater than or equal to 30 psig. The results table in the previous modeling report for gas compressor and gas pipeline blowdowns (table 3 in the November 2, 2010 report NSRG document number 10989) is still valid for blowdowns with pressure less than 30 psig.

The modeling performed is in support of the Standard Permit for Oil & Gas Transportation and Production Facilities protectiveness review. Generic modeling was conducted for sources that would apply to all oil and gas production sites. Gas compressor and gas pipeline blowdown emissions were evaluated as a point source using two different stack heights.

2.0 Report Summary. The modeling results are summarized in the following tables:

Table 1. Generic Modeling Results for High Pressure Gas Compressor & Gas Pipeline Blowdown, $\mu g/m^3$ per lb/hr

Distance (feet)	6 feet	10 feet
50	51	25
100	51	25
150	51	25
200	51	25
300	51	25

Table 1. Generic Modeling Results for High Pressure Gas Compressor & Gas Pipeline Blowdown, $\mu g/m^3$ per lb/hr		
Distance (feet)	6 feet	10 feet
400	51	25
500	51	25
600	48	25
700	44	25
800	40	24
900	36	23
1000	33	21
1100	30	20
1200	28	18
1300	27	17
1400	27	16
1500	27	15
1600	27	14
1700	27	13
1800	27	13
1900	27	13
2000	27	13
2100	27	13
2200	27	13
2300	27	13
2400	27	13
2500	27	13

Table 1. Generic Modeling Results for High Pressure Gas Compressor & Gas Pipeline Blowdown, $\mu g/m^3$ per lb/hr		
Distance (feet)	6 feet	10 feet
2600	27	13
2700	26	13
2800	26	13
2900	26	13
3000	25	13
3500	23	13
4000	21	13
4500	19	13
5000	17	12
5500	16	11

3.0 Land Use. Rural dispersion coefficients and flat terrain were used in the modeling. These choices are typical for oil and gas production sites.

4.0 Modeling Emissions Inventory. Blowdown emissions were evaluated using a point source as indicated in Table 2.

Table 2. List of Sources and Modeled Representations		
Source Name	Modeled Source ID	Source Type
Blowdown Stack	BDWNHIPR	POINT

High Pressure Compressor Blowdown and Pipeline Blowdown: These sources are representative stacks used for the temporary venting of a gas compressor or temporary venting of a gas pipeline under high pressure. Reasonable worst case stack parameters were derived from a review of industry sources, and two source configurations were modeled. A stack with a height of 6 feet and a diameter of 4 inches was modeled with an exit velocity of 550 feet per second (fps), and a stack with a height of 10 feet and a diameter of 6 inches was modeled with an exit velocity of 550 fps. A minimum stack height of 6 feet is expected due to safety concerns. The initial period of the blowdown will have the greatest amount of pressure resulting in the largest exit velocity and highest plume rise. Near the end of the blowdown period, the pressure will have decreased resulting in less

exit velocity and less plume rise. For this reason, an exit velocity of 550 fps is reasonable given the initial velocity expected is 1100 fps and will decrease over time as the pressure decreases. It was determined that stack-tip downwash was not appropriate due to the small diameter of the stacks, high exit velocity, and the short duration of the activity (generally less than 30 minutes).

Table 3. Point Source Parameter Information

Source ID	Stack Height (feet)	Stack Temp (°F)	Stack Exit Velocity (feet/sec)	Stack Diameter (feet)
BDWNHIPR	6	Ambient	550	0.33
	10	Ambient	550	0.5

5.0 Building Wake Effects (Downwash). No downwash structures were included in the analysis. No significant structures would likely exist at these types of sites that would influence dispersion.

6.0 Meteorological Data. The modeling analysis used surface data from Austin and upper air data from Victoria for the years 1983, 1984, 1986, 1987, and 1988. Since the analysis is primarily for short-term concentrations, this five-year data set would include worst-case short-term meteorological conditions that could occur anywhere in the state. The wind directions were used at 10 degree intervals to be coincident with the receptor radials. This would provide predictions along the plume centerline which is a conservative result.

7.0 Receptor Grid. The modeling analysis used a polar receptor grid with 36 radials spaced every 10 degrees from true north. Receptors were located on each radial at distances of 50, 100, 150, 200, every one hundred feet out to 3000 feet, and every five hundred feet out to 5500 feet from the source. This was done to determine the plume centerline concentration, as indicated in Section 6.0.

8.0 Model Used and Modeling Techniques. ISCST3 (Version 02035) was used.

The point source was modeled with a unitized emission rate of one pound per hour. This determined a unitized maximum predicted ground-level concentration (GLCmax) for the source. The GLCmax for the source can then be divided into the ESL or standard for each compound to determine the allowable emission rate for each compound.

This document can be found in the NSRG library under document number 11177. The modeling files can be found in the NSRG library under document number 11176.

Table 3. File Listings

File Name	Description	File Extension
O&G_Generic_Blwdn_HiPressure_5500ft_1983_OTHER	Model Input File	*.BND, *.DTA, *.RUN

Table 3. File Listings		
	Model Output File	*.GRF, *.LST, *.USF
O&G_Generic_Blwdn_HiPressure_5500ft_6ft_1983_OTHER	Model Input File	*.BND, *.DTA, *.RUN
	Model Output File	*.GRF, *.LST, *.USF