pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

MEMO

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FROM Andrew W. Fleck AWF
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Division of Air Resource Management

DATE March 19, 2015

RE Air Quality Analysis for Prevention of Significant Deterioration
Shell Chemical Appalachia LLC
Application for Plan Approval 04-00740A
Proposed Petrochemicals Complex
Center Township and Potter Township, Beaver County

The Pennsylvania Department of Environmental Protection (DEP) received a Plan Approval Application from Shell Chemical Appalachia LLC (Shell) on May 1, 2014, for the proposed construction of a petrochemicals complex for the manufacture of ethylene and polyethylene in Center Township and Potter Township, Beaver County. The DEP notified Shell on May 15, 2014, that the Plan Approval Application was administratively complete.[1] The DEP received a technical supplement to the Plan Approval Application on September 23, 2014, and a revision on March 3, 2015. The Plan Approval Application was prepared by RTP Environmental Associates (RTP), on behalf of Shell.

Shell's proposed project is subject to the Prevention of Significant Deterioration (PSD) rules promulgated in 40 CFR § 52.21. These federal PSD rules are adopted and incorporated by reference in their entirety in 25 *Pa. Code* § 127.83 and the Commonwealth's State Implementation Plan (SIP) codified in 40 CFR § 52.2020. In accordance with these PSD rules, Shell's Plan Approval Application includes an air quality analysis for emissions of carbon monoxide (CO), nitrogen oxides (NO_X), and particulate matter less than or equal to 10 micrometers in diameter (PM-10). The DEP received an update to Shell's air quality analysis on October 9, 2014, and October 16, 2014, to support the technical supplement to the Plan Approval Application. The DEP also received an update to Shell's air quality analysis on March 3, 2015, as part of the revision to Shell's Plan Approval Application.

[1] Letter from Alan A. Binder, DEP to Sharon M. Keller, Shell. May 15, 2014.

The DEP's technical review concludes that Shell's air quality analysis satisfies the requirements of the PSD rules and is consistent with the U.S. Environmental Protection Agency's (EPA) *Guideline on Air Quality Models* (40 CFR Part 51, Appendix W) and the EPA's air quality modeling policy and guidance. Additionally, Shell's air quality analysis is consistent with the methods and procedures described in Shell's modeling protocol[2] established with the DEP.[3]

In accordance with 40 CFR § 52.21(k), Shell's air quality analysis demonstrates that Shell's proposed emissions will not cause or contribute to air pollution in violation of the National Ambient Air Quality Standards (NAAQS) for CO, NO_2, or PM-10. Additionally, Shell's air quality analysis demonstrates that Shell's proposed emissions will not cause or contribute to air pollution in violation of the increments for NO_2 or PM-10. The degree of Class II and Class I increment consumption expected to result from the operation of the Shell facility is provided in the following tables:

Table 1 – Degree of Class II Increment Consumption from Operation of Shell Facility

Pollutant	Averaging Period	Degree of Class II Increment Consumption		Class II Increment
		micrograms/meter^3	% of Class II Increment	micrograms/meter^3
NO_2	Annual	< 0.93919	< 3.76 %	25
PM-10	24-Hour	< 8.43834	< 28.13 %	30
	Annual	< 2.34454	< 13.79 %	17

Table 2 – Degree of Class I Increment Consumption from Operation of Shell Facility

Pollutant	Averaging Period	Degree of Class I Increment Consumption		Class I Increment
		micrograms/meter^3	% of Class I Increment	micrograms/meter^3
NO_2	Annual	< 0.02342	< 0.94 %	2.5
PM-10	24-Hour	< 0.27234	< 3.40 %	8
	Annual	< 0.01954	< 0.49 %	4

In accordance with 40 CFR § 52.21(o), Shell provided a satisfactory analysis of the impairment to visibility, soils, and vegetation that would occur as a result of the Shell facility and general commercial, residential, industrial, and other growth associated with the Shell facility. In accordance with 40 CFR § 52.21(p), Shell provided notification of the proposed project to the Federal Land Managers of nearby Class I areas as well as initial screening calculations[4] to demonstrate that Shell's proposed emissions will not adversely impact visibility and air quality related values (AQRV) in nearby Class I areas.

Shell's air quality analysis utilized the EPA's recommended near-field dispersion model, the American Meteorological Society / Environmental Protection Agency Regulatory Model

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[2] RTP, 2015. Air Dispersion Modeling Protocol for the Proposed Shell Chemical Appalachia, LLC Ethane Cracker/Polyethylene Project in Beaver County Pennsylvania. February 2014.

[3] Letter from Andrew W. Fleck, DEP to David Keen, RTP. February 19, 2014.

[4] U.S. Forest Service, National Park Service, and U.S. Fish and Wildlife Service, 2010. Federal Land Managers' Air Quality Related Values Work Group (FLAG): Phase I Report – Revised (2010). Natural Resource Report NPS/NRPC/NRR – 2010/232. National Park Service, Denver, CO. Subsection 3.2.

(AERMOD).[5] AERMOD was executed with regulatory default options with the exception of the non-default Plume Volume Molar Ratio Method (PVMRM) option in the air quality analysis for the 1-hour NO_2 NAAQS. The DEP requested and received approval for the use of the PVMRM.[6,7]

Shell's proposed emissions of CO, NO_X, and PM-10 would be emitted to the atmosphere via typical stacks and flares, and also as fugitive emissions. In AERMOD, the stacks and flares, with the exception of a multipoint ground flare, are characterized as point sources. The multipoint ground flare and fugitive emissions are characterized as volume sources. The DEP concurred with Shell's emission rate calculations.[8] Direction-specific downwash parameters, calculated by the EPA's Building Profile Input Program modified for the Plume Rise Model Enhancements algorithms (BPIPPRM), are entered in AERMOD for Shell's point sources. Emissions data from nearby sources are entered in AERMOD in the cumulative NAAQS and increment analyses. Additionally, appropriate background data from nearby air quality monitors was utilized in the NAAQS analyses.

Receptors were entered in AERMOD at locations defined to be ambient air[9] to a distance of approximately 50 kilometers from the proposed location of the Shell facility. The extent and density of AERMOD's receptor domain is adequate to determine the location and magnitude of the maximum concentrations and design values. Receptor elevations and hill height scales were calculated by the AERMOD terrain preprocessor (AERMAP) using the U.S. Geological Survey National Elevation Dataset (NED).

AERMOD utilized a 5-year (2006 – 2010) meteorological dataset derived from primary surface data from FirstEnergy's Beaver Valley Nuclear Power Station and secondary surface data and upper air data from Pittsburgh International Airport. This dataset allows AERMOD to construct a representative vertical structure of the planetary boundary layer within the modeling domain under both convective and stable conditions in order to properly characterize plume transport and dispersion. The meteorological dataset was processed with the AERMOD meteorological preprocessor (AERMET).

The impact of Shell's proposed emissions was calculated by AERMOD to be less than the established Class II significant impact levels (SIL) for the following pollutant and averaging period: NO_2/annual. The impact of Shell's proposed emissions was calculated by AERMOD to be greater than the established Class II SIL for the following pollutants and averaging periods: CO/1-hour, CO/8-hour, NO_2/1-hour, PM-10/24-hour, and PM-10/annual. The impact of Shell's proposed emissions was conservatively calculated by AERMOD to be less than the EPA's proposed Class I SILs[10] for the following pollutants and averaging periods: NO_2/annual, PM-10/24-hour, and PM-10/annual.

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[5] *Code of Federal Regulations*. 40 CFR 51, Appendix W. Guideline on Air Quality Models. Subsections 4.2.2(b) and 4.2.2(c).
[6] Letter from E. Christopher Abruzzo, DEP to Shawn M. Garvin, EPA. March 31, 2014.
[7] Letter from Shawn M. Garvin, EPA to E. Christopher Abruzzo, DEP. April 21, 2014.
[8] Email from Alan Binder, DEP to Andrew Fleck, DEP. October 28, 2014.
[9] *Code of Federal Regulations*. 40 CFR 50(e)(1).
[10] *Federal Register*. 61 FR 38249. July 23, 1996.

The impact of Shell's proposed emissions in conjunction with emissions from nearby sources was calculated by AERMOD to be less than the CO 1-hour NAAQS, CO 8-hour NAAQS, and PM-10 annual Class II increment. The impact of Shell's proposed emissions in conjunction with emissions from nearby sources was calculated by AERMOD to be greater than the NO_2 1-hour NAAQS, PM-10 24-hour NAAQS, and PM-10 24-hour Class II increment. According to the EPA's policy,[11] a Plan Approval may be issued to Shell since the impact of Shell's proposed emissions is calculated by the model to be not significant (i.e., less than the established Class II SIL) at the location and time of the modeled violations of the NAAQS and increments.

The DEP executed AERMOD to verify Shell's modeling results upon reviewing the appropriateness of all model input (emission data, downwash data, background monitoring data, terrain data, and meteorological data). The DEP's model input/output files and data to support the DEP's technical review of Shell's air quality analysis for PSD are available electronically on a disk upon request.

If you have any questions regarding the DEP's review of Shell's air quality analysis for PSD, you may contact me by e-mail at afleck@pa.gov or by telephone at 717.783.9243.

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[11] Memorandum from Gerald A. Emison, EPA to Thomas J. Maslany, EPA. July 5, 1988.