pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

MEMO

TO	Melissa L. Jativa Environmental Engineering Specialist New Source Review Section Air Quality Program Southwest Regional Office
FROM	Daniel J. Roble DJR Air Quality Program Specialist Air Quality Modeling Section Division of Air Resource Management
THROUGH	Andrew W. Fleck AWF Environmental Group Manager Air Quality Modeling Section Division of Air Resource Management
DATE	December 17, 2021
RE	Summary of Air Dispersion Modeling for Estimating Radionuclide Concentrations Westmoreland Sanitary Landfill, LLC Plan Approval Application 65-00767C Proposed Installation of Leachate Evaporation System Westmoreland Sanitary Landfill, Rostraver Township, Westmoreland County

Background

The Pennsylvania Department of Environmental Protection (DEP) received a plan approval application on October 9, 2019, for Westmoreland Sanitary Landfill, LLC's (WSL) proposal to install and operate a leachate evaporation system at its Westmoreland Sanitary Landfill in Rostraver Township, Westmoreland County. On May 9, 2020, the DEP published its intent to issue Plan Approval 65-00767C.[1] On May 7, 2021, the DEP requested WSL to provide additional information relevant to radiological monitoring, among other things, at its Westmoreland Sanitary Landfill.[2] On October 1, 2021, the DEP received a response from WSL that included air dispersion modeling for estimating radionuclide concentrations to determine whether radionuclide limits would be exceeded and to support the selection of radiological

[1] *Pennsylvania Bulletin*. 50 Pa.B. 2423. May 9, 2020.
[2] Letter from Melissa L. Jativa, DEP to Rich Walton, WSL. May 7, 2021.

monitoring sites.[3] Additionally, on November 30, 2021, WSL provided a response[4] to the DEP's comments on its air dispersion modeling.[5] The air dispersion modeling was prepared by Civil & Environmental Consultants, Inc. (CEC), on behalf of WSL.

Model Selection and Options

WSL's air dispersion modeling utilized the American Meteorological Society (AMS) / U.S. Environmental Protection Agency (EPA) Regulatory Model (AERMOD) v21112. AERMOD is the EPA's required near-field air dispersion model for a wide range of regulatory applications in all types of terrain and for aerodynamic building downwash.[6] WSL utilized proprietary software, Lakes Environmental Software's AERMOD View, to prepare and execute AERMOD.

AERMOD was executed with regulatory default options. AERMOD was also executed with rural dispersion, by default, based the EPA's land use procedure.[7,8] The land use procedure was based on an evaluation of U.S. Geological Survey (USGS) National Land Cover Database (NLCD) 2016 land cover data within 3 kilometers of WSL's proposed leachate evaporator stack. Options for calculating maximum 1-hour concentrations were selected in AERMOD. Additionally, AERMOD was executed separately with and without the flagpole receptor height option. Heights of 0.91 meters (3 feet) and 1.83 meters (6 feet) were entered in AERMOD with the flagpole receptor height option.

Source Data Input

WSL's emissions of radionuclides would be emitted to the atmosphere via the leachate evaporator stack, which would be an unobstructed vertical stack. The proposed leachate evaporator stack was characterized in AERMOD as a point source.

A "unit" emission rate of 1 gram per second (g/s) was entered in AERMOD to calculate maximum 1-hour "unitized" concentrations in micrograms per cubic meter ($\mu g/m^3$) per 1 g/s. The parameters entered in AERMOD for WSL's proposed leachate evaporator stack are listed in the following table:

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[3] Attachment 4 of October 1, 2021, letter from Michael E. Zucatti, Civil Design Solutions, Inc. to Melissa L. Jativa, DEP. "Air Dispersion Modeling Report. Westmoreland Sanitary Landfill Leachate Evaporator." Prepared by Civil & Environmental Consultants, Inc., Pittsburgh, PA. Prepared for Noble Environmental, Inc., Belle Vernon, PA. September 17, 2021.
[4] E-mail with attachment from Michael E. Zucatti, Civil Design Solutions, Inc. to Daniel J. Roble, DEP. November 30, 2021.
[5] E-mail with attachment from Daniel J. Roble, DEP to Michael E. Zucatti, Civil Design Solutions, Inc. October 29, 2021.
[6] *Code of Federal Regulations*. 40 CFR Part 51, Appendix W (Guideline on Air Quality Models). Subsection 4.2.2.1(a).
[7] *Code of Federal Regulations*. 40 CFR Part 51, Appendix W (Guideline on Air Quality Models). Subsection 7.2.1.1(b)(i).
[8] AERMOD Implementation Guide (EPA-454/B-21-002, April 2021). Subsection 5.1.

Parameters for WSL's Proposed Leachate Evaporator Stack

Parameter	Metric Units	English Units
UTM easting (zone 17)	597,391.28 m	-----
UTM northing (zone 17)	4,444,662.00 m	-----
Base elevation (above mean sea level)	307.47 m	1,008.76 ft
Release height	11.89 m	39 ft
Exit temperature	347.04 K	165 deg F
Exit velocity[A]	14.56 m/s	47.76 ft/sec
Exit inside diameter	1.219 m	48 in

[A] Exit velocity was based on a flow rate of 36,012 actual cubic feet per minute.

The stack height entered in AERMOD for WSL's proposed leachate evaporator stack does not exceed Good Engineering Practice (GEP) stack height.[9] Direction-specific downwash parameters, calculated by the EPA's Building Profile Input Program for Plume Rise Model Enhancements (BPIPPRM) v04274, were entered in AERMOD for WSL's proposed leachate evaporator stack.

Receptor Data Input

A 12 by 12-kilometer Cartesian receptor grid, centered on the Westmoreland Sanitary Landfill, was entered in AERMOD with receptor density decreasing with distance. The receptor grid covered all areas within and a sufficient area beyond WSL's property line. Receptors were also entered in AERMOD along WSL's property line approximately 25 meters apart. The extent and density of WSL's receptor domain were adequate for AERMOD to determine the location and magnitude of the maximum 1-hour concentrations.

Receptor elevations and hill height scales were calculated by the AERMOD terrain preprocessor (AERMAP) v18081. Two terrain scenarios, one representing current terrain and the other representing future terrain at the Westmoreland Sanitary Landfill were separately included in AERMOD. The "current" and "future" terrain scenarios utilized USGS 3D Elevation Program (3DEP) data in AERMAP. Additionally, the "future" terrain scenario utilized site-specific information to represent the Westmoreland Sanitary Landfill's projected elevations.

Meteorological Data Input

AERMOD utilized a 5-year meteorological dataset consisting of hourly records from January 1, 2016, through December 31, 2020, derived from surface and upper air data from Pittsburgh International Airport (KPIT).

The meteorological dataset was processed by the DEP with the AERMOD meteorological preprocessor (AERMET) v21112, and its associated AERMINUTE v15272 preprocessor and AERSURFACE v20060 tool. In AERMET, the surface friction velocity adjustment (ADJ_U*) option was used. This option is intended to address concerns regarding AERMOD's

[9] *Code of Federal Regulations*. 40 CFR § 51.100(ii). Definition of "good engineering practice stack height."

performance, i.e., overprediction of concentrations during stable low wind speed meteorological conditions, by adjusting the surface friction velocity based on Qian and Venkatram (2011).[10]

The fully processed dataset was appropriate for AERMOD to construct realistic boundary layer profiles to adequately represent plume transport and dispersion under both convective and stable conditions within the modeling domain.

Confirmation of Air Dispersion Modeling Results

The DEP confirmed the results of WSL's air dispersion modeling by executing AERMOD upon reviewing the appropriateness of all model input, i.e., model options, emission data, downwash data, terrain data, and meteorological data.

WSL's air dispersion modeling results for WSL's proposed leachate evaporator stack, within and beyond WSL's property line, are summarized in the following tables:

Summary of WSL Air Dispersion Modeling Results Within WSL Property Line

Scenario	Flagpole Height	Maximum 1-hour "Unitized" Concentration	Distance from Stack to Maximum 1-hour "Unitized" Concentration	Direction from Stack to Maximum 1-hour "Unitized" Concentration
	m	μg/m^3 per 1 g/s	m	
Current	0.00	240.06722	61	northwest
	0.91	283.40219		
	1.83	**315.79747**		
Future	0.00	303.15097	242	north-northeast
	0.91	303.75510		
	1.83	**315.79747**	61	northwest

Summary of WSL Air Dispersion Modeling Results Beyond WSL Property Line

Scenario	Flagpole Height	Maximum 1-hour "Unitized" Concentration	Distance from Stack to Maximum 1-hour "Unitized" Concentration	Direction from Stack to Maximum 1-hour "Unitized" Concentration
	m	μg/m^3 per 1 g/s	m	
Current	0.00	94.68056	348	southeast
	0.91	100.73233		
	1.83	**106.27397**		
Future	0.00	95.35404		
	0.91	104.68210		
	1.83	**114.02951**		

[10] Qian, W., and A. Venkatram, 2011. Performance of Steady-State Dispersion Models Under Low Wind-Speed Conditions. *Boundary Layer Meteorology*, 138, 475-491.

All input, output, and data files associated with WSL's air dispersion modeling are available in electronic format upon request.

Conclusion

The DEP's technical review concludes that WSL's air dispersion modeling for estimating radionuclide concentrations is consistent with the EPA's relevant air dispersion modeling policy and guidance. Additionally, WSL provided adequate responses to the DEP's comments on its air dispersion modeling.

WSL's air dispersion modeling results are sufficient for estimating radionuclide concentrations within and beyond WSL's property line using the calculations provided in subsection 2.7 of WSL's air dispersion modeling report. Furthermore, WSL's "plot" output files, generated by AERMOD, are sufficient for determining the areas of maximum radionuclide concentrations for supporting the selection of radiological monitoring sites.

If you have any questions regarding WSL's air dispersion modeling for estimating radionuclide concentrations, you may contact me by e-mail at droble@pa.gov or by telephone at 717.705.7689. You may also contact Andrew Fleck, manager of the Air Quality Modeling Section, by e-mail at afleck@pa.gov or by telephone at 717.783.9243.

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