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Massachusetts Air Quality Modeling Guidance

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1.0 INTRODUCTION

The Massachusetts Department of Environmental Protection (MassDEP) developed this guidance for air permit applicants who conduct air dispersion modeling to demonstrate that air pollutant emissions from new or modified sources meet standards and guidelines that protect public health, welfare, and the environment in accordance with MassDEP's air pollution control regulations at 310 CMR 7.00.

Air dispersion modeling is a tool that can be used to estimate how a new or modified source of air pollutants will affect air quality. Estimates of modeled ambient air impacts are based on air quality dispersion models, databases, and other requirements generally approved by the U.S. Environmental Protection Agency (EPA) or specifically approved by MassDEP. The American Meteorological Society / EPA Regulatory Model (AERMOD) air quality dispersion model is the standard model used to support federal and state regulatory air permitting. This model uses emission rates, source parameters, and meteorological inputs to predict concentrations of pollutants at downwind receptor locations. Generally, the modeling is used to perform a worst-case analysis, in that it uses the maximum potential emission rates for each pollutant from each emissions unit and combines that with the most recent five years of representative hourly meteorological data to calculate and locate the highest possible concentrations over a receptor grid surrounding a proposed emissions source. These worst-case concentrations are then compared to applicable air quality standards and guidelines. Permit applicants using AERMOD should ensure that modeling analyses are conducted in accordance with EPA guidance.[1] Use of AERMOD is addressed in Appendix A of EPA's Guideline on Air Quality Models (published as Appendix W to 40 CFR Part 51). There are many other EPA guidance documents, memorandums, and EPA model clearinghouse decisions that explain modeling techniques and procedures that serve as resources for conducting modeling analyses. These are found on EPA's website at https://www.epa.gov/scram

Since each air dispersion modeling analysis is facility-specific a permit applicant should work closely with MassDEP on their proposed project and should submit all modeling documents (e.g., input/output files, modeling protocols, reports) and correspondence (e.g., emails, letters) to the MassDEP Boston air modeling staff and the appropriate MassDEP regional office. The MassDEP regional offices by community can be found on MassDEP's website at https://www.mass.gov/service-details/massdep-regional-offices-by-community. For proposed projects subject to Prevention of Significant Determination (PSD), MassDEP strongly recommends a pre-application meeting with MassDEP Boston air modeling staff and the appropriate MassDEP regional office prior to submitting a modeling protocol to identify project-specific permitting and modeling requirements.

2.0 REGULATORY AUTHORITY

MassDEP's air pollution regulations at 310 CMR 7.00 establish emission limits, pollution control standards, and permit requirements for a range of facilities and activities that are designed to prevent air pollution.

Under 310 CMR 7.02 MassDEP requires pre-construction air plan applications for new or modified facilities that will emit air pollutants, including a demonstration that the operation of a proposed or

[1] EPA modeling guidance is the Guideline on Air Quality Models (https://www.epa.gov/sites/default/files/2020-09/documents/appw_17.pdf

modified facility will not cause or significantly contribute to a violation of Massachusetts or National Air Quality Standards (MAAQS/NAAQS)[2] or Prevention of Significant Deterioration (PSD) increments (if applicable). The regulations provide specific authority for MassDEP to require air dispersion modeling [see 310 CMR7.02(5)(c)6. and 310 CMR 7.02(7)(a)]. MassDEP's Cumulative Impact Analysis regulations also establish requirements for air dispersion modeling for criteria pollutants [see 310 CMR 7.02(14)(d)] and air toxics [see 310 CMR 7.02(14)(e)3.].

3.0 OVERVIEW OF AIR QUALITY DISPERSION MODELING

MassDEP requires air dispersion modeling for significant proposed projects that require a comprehensive plan application (CPA) to demonstrate compliance with MAAQS/NAAQS. MassDEP also may require air dispersion modeling for certain limited plan applications (LPA) and projects regulated by MassDEP's Environmental Results Program (ERP) compliance certification. MassDEP also may require air dispersion modeling of air toxics pollutants and comparison to health-based screening guidelines published by MassDEP known as Allowable Ambient Limits (AALs) and Threshold Effects Exposure Limits (TELs). The comparison to AALs and TELs is on a chemical-by-chemical basis.

3.1 Definitions

The following definitions are particularly relevant to air dispersion modeling.

ACTUAL EMISSIONS - the rate that an emission unit or facility discharges air contaminants into the ambient air within a specific time period (e.g., pounds per hour, tons per year). Actual emissions are calculated using the emission unit's actual operating hours, production rates, and types of materials processed, stored, or combusted during the selected time period taking into account the efficiency of pollution control equipment, if present.

AERMOD – the American Meteorological Society / EPA Regulatory Model (AERMOD), which is a steady-state plume model that incorporates air dispersion based on planetary boundary layer (PBL) turbulence structure and scaling concepts including treatment of both surface and elevated sources, and both simple and complex terrain.

AERSCREEN – screening version of AERMOD.

AIR POLLUTION – the presence in the ambient air space of one or more air contaminants or combinations thereof in such concentrations and of such duration as to: (a) cause a nuisance; (b) be injurious, or be on the basis of current information, potentially injurious to human or animal life, to vegetation, or to property; or (c) unreasonably interfere with the comfortable enjoyment of life and property or the conduct of business.

AIR TOXIC - any air contaminant for which the MassDEP has published inhalation toxicity values or that MassDEP has determined to be toxic or potentially toxic to human health.

ALLOWABLE EMISSIONS – the maximum emissions on both a short-term and long-term (annual) basis that are allowed by Plan Approval emission limitations. Allowable emissions are typically expressed in

[2] The Massachusetts air quality standards established in 310 CMR 6.00 are identical to the NAAQS; for simplicity this guidance references only NAAQS.

pounds per hour (converted to grams per second for modeling) but also are often expressed by mass-based emission factors (e.g., lbs/MMBtu, g/BHP-hr, tons/throughput-rate).

AMBIENT AIR - the portion of the atmosphere, external to buildings, to which the general public has access.

APPLICANT – the entity or person applying for an air permit (e.g., plan application).

ATTAINMENT AREA – geographical area designated by EPA as meeting the national primary and secondary ambient air quality standard for a particular criteria pollutant.

BACKGROUND AIR QUALITY - ambient air pollutant levels attributable to existing sources including major and minor stationary sources, mobile sources, natural sources, and long-range transport.

CLASS I AREA – an area defined by Congress that is afforded the greatest degree of air quality protection. Class I areas are deemed to have special natural, scenic, or historic value and under the PSD regulations have special protection. There are no Class I areas in Massachusetts.

CLASS II AREA – an area defined by Congress where a moderate degree of emissions growth is allowed. The entirety of Massachusetts is a Class II area.

CRITERIA POLLUTANT – these include ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), volatile organic compounds (VOC), carbon monoxide (CO), and lead (Pb).

EMISSION UNIT (EU) - any individual piece of equipment from which any air contaminant is emitted to the ambient air (e.g., an individual boiler, a single degreaser).

FUGITIVE EMISSIONS - emissions that are not vented directly from a stack or vent (e.g., storage piles, paved or unpaved roads, piping systems, and general building, silo, or tank ventilation).

INTERACTIVE SOURCE MODELING – modeling that includes additional nearby sources of air pollution in the modeling analysis to demonstrate that the cumulative criteria pollutant concentration will not exceed the NAAQS.

INTERMITTENT EMISSIONS - emissions that are emitted non-continuously for 500 or less hours in a year.

NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) – ambient air quality standards for criteria pollutants set forth by EPA regulations to protect public health, the environment and public welfare.

NEW SOURCE REVIEW (NSR) – a preconstruction review and permitting program as specified in Parts C and D of Title 1 of the Clean Air Act for new major sources and major modifications of major sources.

NONATTAINMENT AREA – a geographical area designated by EPA as not meeting the national primary or secondary ambient air quality standard for a criteria pollutant.

PLAN APPROVAL - the written approval by MassDEP of a comprehensive plan application or a limited plan application issued under 310 CMR 7.02.

POINT SOURCE – a point source of emissions that is typically represented by a stack with an exit flow and corresponding velocity in the upward vertical direction.

PREVENTION of SIGNIFICANT DETERIORATION (PSD) – the preconstruction permitting portion of the federal NSR program that is applicable to areas that are designated as Attainment or Unclassifiable with respect to individual NAAQS. MassDEP has delegated authority to implement the federal PSD program.

PROJECT – proposed construction, substantial reconstruction, or alternation at a new or existing facility requiring a Plan Approval.

PSD INCREMENT – the maximum allowable increase of an air pollutant concentration that is allowed to occur above the applicable baseline concentration for that pollutant. Baselines are expressed as calendar dates and are triggered on a pollutant- and geographic-specific basis.

RECEPTOR – a location where the public could be exposed to an air contaminant (criteria pollutant or air toxic) in the ambient air. Receptors are expressed by x, y, and z coordinates.

SENSITIVE RECEPTOR – a receptor type that represents locations with sensitive populations such as daycare centers, schools, hospitals, nursing homes, etc. Sensitive receptors include people, building fresh air intakes, and operable windows and doors.

SIGNIFICANT IMPACT LEVEL (SIL) – an ambient pollutant concentration level set by EPA that denotes a significant impact. Modeling results less than a SIL are considered de minimis and assumed to comply with ambient air quality standards for that pollutant, while those at or above a SIL require additional modeling. In addition, if modeling shows a violation of a NAAQS, the SILs are used to determine if an emission source contributes significantly to the NAAQS violation.

3.2 Screening Modeling

Applicants may use the EPA-approved AERSCREEN model for screening modeling procedures but should not proceed with AERSCREEN without first consulting with the MassDEP Boston air modeling staff or the appropriate MassDEP regional office. AERSCREEN typically provides a more conservative estimate of air quality model-predicted pollutant concentrations and is limited in model input data (e.g., single sources, limited number of nearby structures, no varying emission rates). The use of AERSCREEN may be suitable for estimating relatively simple straightforward impacts or as a potential first step in modeling.

AERSCREEN calculates model-predicted pollutant concentrations from a single emission unit only. If two or more emission units at a facility need to be evaluated, the applicant should conduct screening modeling for each unit separately and sum the individual model-predicted concentrations for comparison to applicable standards.

The AERSCREEN model and users guide can be found on EPA's Support Center for Regulatory Atmospheric Modeling (SCRAM) website at: https://www.epa.gov/scram/air-quality-dispersion-modeling-screening-models.

If screening modeling cannot demonstrate compliance, then refined modeling is required.

3.3 Refined Modeling

MassDEP recommends that applicants conduct refined modeling rather than screening modeling since refined modeling allows for a detailed treatment of physical and chemical atmospheric processes as well as site-specific project emission rates and facility physical characteristics. AERMOD is the preferred EPA

model for refined modeling. AERMOD should be run in the regulatory default mode but may be run with some non-default parameters with prior MassDEP approval. AERMOD and its associated pre-processors are frequently updated and available for download at EPA's Support Center for Regulatory Atmospheric Modeling (SCRAM) website (https://www.epa.gov/scram).

Refined modeling may include some of or all the following steps:

- Worst Case Impact Analysis – an analysis of a source or sources operating under different operating loads (e.g., 100%, 75%, 50%), fuel (e.g., natural gas, oil), or ambient conditions (e.g., temperature) to determine which of the operating cases would yield the highest predicted impacts.
- Significant Impact Analysis – an analysis that uses Significant Impact Levels (SILs) to determine whether more refined modeling is needed. When performing a significant impact analysis (SIA), the maximum concentrations from the modeling are compared to the SILs.
- NAAQS Analysis – modeling of a project's emissions to determine if a source would cause or contribute to a violation of air quality standards. A NAAQS analysis adds background air quality concentrations to model-predicted concentrations. When performing a NAAQS analysis, the total concentration (modeled plus background) is compared to the applicable NAAQS.
- Facility-Wide Analysis – the same as a NAAQS analysis with the inclusion of all existing emission sources at a facility.
- Interactive Source Modeling – along with new or modified source emissions, includes emissions from nearby sources in the modeling to determine if cumulatively, emissions would cause a violation of the NAAQS. Applicants should consult with MassDEP to determine if an interactive source modeling analysis is necessary.

The level of refined modeling and the type of analysis needed will depend on the specific proposed project. For example, criteria pollutant emissions from a single new emissions unit may be modeled at different operating loads to determine impacts in a Worst-Case Impact Analysis. That same unit in its worst-case mode may then be modeled as part of a Significant Impact Analysis with results compared to the SILs. Depending on the SIL results on a pollutant-by-pollutant and averaging time basis, the modeling may be complete for some pollutants/averaging periods or may need to proceed to a NAAQS, facility-wide or an interactive source modeling analysis for other pollutants.

3.4 Cumulative Impact Analysis Modeling

MassDEP's cumulative impact analysis (CIA) regulations [310 CMR 7.02(14)] require an applicant to conduct air dispersion modeling for criteria pollutants for all proposed projects subject to a CIA, and MassDEP also may require modeling of air toxics. For criteria pollutant modeling, the applicant must submit a modeling protocol to MassDEP for review and approval prior to commencing the modeling. In all cases the modeling must be a Facility-Wide Analysis that accounts for all existing and proposed emissions units. In addition, if the proposed project will result in significant increased emissions from vehicles owned or leased by the applicant, those emissions must be included in the modeling analysis.

The CIA regulations do not require air dispersion modeling of air toxics but require an applicant to conduct a cumulative risk characterization of air toxics using MassDEP's risk screening spreadsheet tool that contains default Massachusetts-specific air dispersion factors and toxicity information for 237 air

toxics developed by MassDEP's Office of Research and Standards. To use the tool, the applicant inputs source-specific project information (emissions rates, stack height, distance to receptors, rural vs urban setting) and the screening spreadsheet tool generates cumulative cancer and noncancer risk values. Since the tool uses worst-case default air dispersion factors, the applicant may choose to conduct air dispersion modeling and manually input source-specific dispersion factors into the spreadsheet tool. Cumulative risk must be calculated for at least two receptors: distance to closest fence line and distance to a receptor in the closest nearby Environmental Justice (EJ) population. If there are nearby significant air pollutant emissions sources, the applicant should consult with MassDEP regional staff about including those source emissions in the risk characterization tool or in the air emissions modeling to complete the risk characterization. The applicant may choose to conduct air dispersion modeling and a comprehensive air toxics emissions risk characterization without using the spreadsheet tool. For additional information on cumulative impact analysis requirements, see MassDEP's Cumulative Impact Analysis Guidance available at https://www.mass.gov/info-details/cumulative-impact-analysis-in-air-quality-permitting.

3.5 Modeling Protocol

If a proposed project's emission rates are at or above the SERs for the criteria pollutants listed in Table 4-1, or if a proposed project is subject to CIA requirements in 310 CMR 7.02(14), a modeling protocol must be submitted to MassDEP for review and approval prior to performing a modeling demonstration. If a project's emissions are not above SERs but modeling has been requested by a MassDEP Regional Office, then a modeling protocol is recommended but not required.

The modeling protocol should document the models that will be used, as well as the input parameters and assumptions as further described in Section 5. The modeling protocol can take the form of a formal report, a technical memorandum, or an email. In all cases, a modeling protocol should be supported by appropriate tables and figures. Recommended contents of a modeling protocol are:

- **Models:** A description of the proposed dispersion models and options to be used. Use of alternative modeling platforms other than AERMOD must be approved by MassDEP and EPA Region 1.
- **Facility Description:** A description of the facility including site plans (with scale and the north direction shown) and appropriate topographic and/or aerial views.
- **Land Use:** A description of land use within three (3) kilometers of the proposed project along with a rural or urban dispersion designation.
- **Stack Parameters:** Maximum proposed emissions in pounds per hour and tons per year for each pollutant of concern. Stack parameters for the 100% load condition and other operating conditions (e.g., load, fuel, ambient temperature) that represent normal facility operation.
- **Nearby Sources:** A list of nearby interactive sources if a decision has been made to conduct Interactive Source Modeling through consultation with MassDEP Boston air modeling staff. All pollutants and emission rates to be modeled should be included, as well as corresponding stack parameters that are representative of the emission rate (e.g., annualized stack parameters if different than short-term stack parameters that would match up with annualized emission rates). Emission rates proposed for modeling should be derived from actual emissions if possible. Otherwise, allowable emission rates should be used following discussion with the Boston modeling staff.

- **Good Engineering Practice (GEP) Stack Height:** A GEP stack height determination should be prepared as described in Section 5.2. Plot and building plans drawn to scale indicating elevations and building dimensions of structures with the potential to cause building downwash should be included.
- **Wind Direction-Specific Dimensions:** Wind direction-specific building dimensions for all stacks below GEP following EPA guidance. MassDEP recommends EPA's Building Profile Input Program (BPIP-PRM) for wind direction-specific calculations.
- **Meteorological Data:** A description and justification of the selected Automated Surface Observing Systems (ASOS) surface and upper air meteorological data. MassDEP recommends consulting with the Boston air modeling staff prior to data selection if a proposed project is close to more than one airport-based surface station. EPA's AERSURFACE tool is required for estimating albedo, Bowen ratio, and surface roughness in the vicinity of the surface meteorological station.
- **Receptor Network:** A rationale for the receptor network to ensure that the maximum predicted air quality concentration is determined. A listing of areas of concern where additional sensitive receptors (e.g., schools, hospitals, adjacent residences) should be presented.
- **Background Air Quality Data:** A technical justification for the background criteria pollutant concentrations. Background concentrations are ambient pollutant levels attributable to existing sources including major and minor sources, natural sources, and long-range transport. MassDEP recommends consulting with the Boston air modeling staff prior to data selection.
- **Prevention of Significant Deterioration (PSD):** If a PSD permit is required, contact the MassDEP Boston air modeling staff for information on PSD baseline areas and guidance for estimating PSD increment consumption for applicable pollutants.
- **Cumulative Impact Analysis (CIA) Air Dispersion Modeling**: If a CIA is required and the applicant chooses to conduct refined modeling, consult with the MassDEP Boston air modeling staff for specific requirements.

4.0 AIR QUALITY CRITERIA

The following criteria are used when air quality modeling analyses are conducted.

4.1 Significant Emission Rates (SERs)

Significant emission rates (SERs) are used to determine PSD applicability. If emissions for a particular pollutant, expressed as tons per year (tpy), are at or above the SER, then PSD review is required. The SERs for the criteria pollutants are listed in Table 4-1**.**

Table 4-1 – Significant Emission Rates (SERs)

Pollutant	Significant Emission Rate (tons per year)
Carbon Monoxide (CO)	100
Oxides of Nitrogen (NO_x)	40
Sulfur Dioxide (SO_2)	40
Particulate matter with an aerodynamic particle diameter of less than or equal to 10 micrometers (PM_{10})	15
Particulate matter with an aerodynamic particle diameter of less than or equal to 2.5 micrometers ($PM_{2.5}$)	10

SERs also are used to identify nearby emissions sources to be included in an interactive source modeling analysis. If the actual emissions of a particular pollutant are at or above the SER and the source is within 10 kilometers of the Project location, then the nearby source should be included in the refined modeling.

4.2 Significant Impact Levels (SILs)

A Significant Impact Level (SIL) is a pollutant-specific ambient air concentration level set by EPA that denotes a significant impact. If the highest modeled concentration of an emitted pollutant is less than its SIL, the pollutant is considered de minimis and is assumed to comply with the NAAQS for that pollutant and does not require further modeling analysis. SILs are used to determine the following:

- Whether impacts due to a project's emissions are "significant" and require a detailed modeling analysis;
- Whether an emission source contributes significantly to a modeled NAAQS violation; and
- Whether additional criteria pollutant sources identified as nearby in accordance with EPA's Guideline in Appendix W (frequently referred to as "interactive sources") need to be included in the modeling analysis.

Under EPA's PSD program, areas that are in attainment of the NAAQS are categorized as either "Class I," "Class II," or "Class III," which determines the increment of air quality deterioration allowed. All international parks, national wilderness areas and national memorial parks that exceed 5,000 acres, and national parks that exceed 6,000 acres, are designated as mandatory federal Class I areas to preserve, protect and enhance air quality. All other areas that attain the NAAQS are initially designated as Class II. As shown in Table 4-2, there may be different SILs for Class I areas versus Class II areas. All of Massachusetts is designated as a Class II area; however, there are nearby federal Class I areas in Vermont, New Hampshire, and Maine. There may be instances where the Class I SILs are used to assess modeled impacts to the out-of-state nearby Class I areas for proposed major emission sources. The nearest Class I area to Massachusetts is the Lye Brook Wilderness Area located in south-central Vermont. Table 4-2 lists the SILs for Class II and Class I areas.

Table 4-2 – Significant Impact Levels (SILs)

Pollutant	Averaging Period	Class II Area SIL ($\mu g/m^3$)	Class 1 Area SIL ($\mu g/m^3$)
Carbon Monoxide (CO)	1-hour	2,000	
	8-hour	500	
Sulfur Dioxide (SO_2)	1-hour	7.8*	
	3-hour	25	1.0
Particulate Matter (PM_{10})	24-hour	5	0.32
Particulate Matter ($PM_{2.5}$)	24-hour	1.2	0.27
	Annual	0.13	0.03
Nitrogen Dioxide (NO_2)	1-hour	7.5*	
	Annual	1	0.10
Note: * Interim 1-hour SO_2 and NO_2 SILs were established by EPA on August 23, 2010 (for SO_2) and June 29, 2010 (for NO_2).			

4.3 National Ambient Air Quality Standards (NAAQS)

The NAAQS are listed in Table 4-3.

Table 4-3 – National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary/Secondary	Averaging Time	NAAQS
Carbon Monoxide (CO)	Primary	1-hour	35 ppm (40,000 $\mu g/m^3$)
		8-hour	9 ppm (10,000 $\mu g/m^3$)
Lead (Pb)	Primary and Secondary	Rolling 3-month	0.15 $\mu g/m^3$
Nitrogen Dioxide (NO_2)	Primary	1-hour	100 ppb (188 $\mu g/m^3$)
	Primary and Secondary	Annual	53 ppb (100 $\mu g/m^3$)
Sulfur Dioxide (SO_2)	Primary	1-hour	75 ppb (196 $\mu g/m^3$)
	Secondary	3-hour	0.5 ppb (1,300 $\mu g/m^3$)
Ozone (O_3)	Primary and Secondary	8-hour	0.070 ppm
Particulate Matter less than 2.5 microns ($PM_{2.5}$)	Primary and Secondary	24-hour	35 $\mu g/m^3$
	Primary	Annual	9.0 $\mu g/m^3$
	Secondary	Annual	15.0 $\mu g/m^3$
Particulate Matter less than 10 microns (PM_{10})	Primary and Secondary	24-hour	150 $\mu g/m^3$
Notes: ppm = parts per million ppb = parts per billion $\mu g/m^3$ = micrograms per cubic meter			

4.4 Prevention of Significant Deterioration (PSD) Increments

The PSD program applies to new major sources or major modifications of existing major sources for pollutants where the area in which the source is located is classified as attainment or unclassifiable. PSD increments represent the maximum allowable increase in concentration due to a proposed Project's

new emissions over a baseline concentration as determined by modeling. However, baseline concentrations are not quantified; baseline dates are triggered at which point increment consumption must be tracked. There are two types of baseline dates: major source baseline and minor source baseline. Major source baseline dates were set by the federal PSD rules and reflect the date that the permitting authority is responsible for tracking increment consumption due to changes at major sources only. Minor source baseline is determined when the first PSD application in a planning or other geographic area is submitted to the permitting authority and determined to be complete. In Massachusetts, this is accomplished on a pollutant by pollutant and town by town basis. For PSD projects, the set of increments in 40 CFR 52.21 are shown in Table 4-4. An applicant should evaluate the pollutants with regard to whether they consume (or possibly expand) the PSD increments in Table 4-4 if the specific pollutant/averaging period first exceeded its corresponding SIL in Significant Impact Analysis modeling.

Table 4-4 – PSD Increments

Pollutant	Averaging Period	Class II Area Increment ($\mu g/m^3$)	Class I Area Increment ($\mu g/m^3$)
Sulfur Dioxide (SO_2)	3-hour	512	25
	24-hour	91	5
	Annual	20	2
Particulate Matter (PM_{10})	24-hour	30	8
	Annual	17	4
Particulate Matter ($PM_{2.5}$)	24-hour	9	2
	Annual	4	1
Nitrogen Dioxide (NO_2)	Annual	25	2.5

Notes:

1. There are currently no increment thresholds for 1-hour SO_2 or 1-hour NO_2.
2. All of Massachusetts is designated as a Class II area.
3. The nearest Class I area to Massachusetts is Lye Brook Wilderness Area in south-central Vermont.

Contact the appropriate Federal Land Manager (e.g., National Park Service, Fish & Wildlife Service) to determine if and what type of a Class I impact assessment is required for a proposed Project in Massachusetts.

4.5. Ambient Air Toxics Guidelines

MassDEP has published Ambient Air Limits (AALs) and Threshold Effect Exposure Limits (TELs) to evaluate potential human health risks from exposures to air toxics in the air. To determine the AALs and TELs for individual chemicals, MassDEP's Office of Research and Standards (ORS) develops:

- Non-Threshold Effects Exposure Limits (NTELs) based on known or suspected carcinogenic health effects. The NTEL is a concentration associated with a one in one million excess lifetime cancer risk over a lifetime of continuous exposure; and
- Threshold Effects Exposure Limits (TELs) based on non-cancer health effects. The TEL is a concentration intended to protect the general population, including sensitive populations such as children, from adverse health effects over a lifetime of continuous exposure. TELs take into

account the fact that people may be exposed to a chemical from other sources, including indoor air, food, soil, and water.

ORS compares the NTEL and TEL and designates the lower concentration as the AAL. Since, in general, NTELs are lower than TELs, most AALs are based on the NTEL, or risk of excess cancer. For chemicals that do not pose cancer risks, the AAL is based on the TEL, and in this case the published AAL and TEL values are the same.

These guideline values are updated periodically. Applicants should consult with the appropriate Regional Office, MassDEP ORS, and/or the Boston air modeling staff prior to modeling air toxics. The current listing of MassDEP AALs and TELs can be found at: https://www.mass.gov/service-details/massdep-ambient-air-toxics-guidelines

MassDEP requires new or modified sources of air toxics applying for a PSD permit to model the ambient concentrations caused solely by the proposed source's emissions and compare the modeled concentrations to AALs/TELs to determine if there are potentially unacceptable risks associated with the proposed source. MassDEP Regional Offices also may require air toxics modeling for non-PSD sources and comparison to AALs/TELs.

In air permitting, AALs and TELs represent screening-level guidelines that indicate the maximum ambient air concentration of a toxic pollutant that may be contributed by a single source or facility. Therefore, the modeling does not take into account background air toxics or air toxics emitted from other unrelated sources. For air toxics maximum modeled concentrations are compared to the 24-hour TEL values and annual AAL values. The modeled maximum 24-hour average is always used for comparison to the TEL and the modeled maximum annual average is used for comparison against the AAL. If modeling reveals an exceedance of a TEL or AAL after the maximum level of emissions control has been applied, an applicant may conduct a site-specific risk characterization. Applicants should consult with and obtain approval from MassDEP before conducting a risk characterization.

5.0 MODELING CONSIDERATIONS

An applicant should consider the following when developing an air dispersion modeling analysis.

5.1 Modeling Domain

The applicant should define the modeling domain, which is a three-dimensional geographical area large enough to include all sources (including nearby interactive sources if appropriate) and receptors. The domain also should include any significant terrain elevations defined as at or above a 10% slope from all receptors in the network. Applicants should consult the AERMAP User's Guide on the EPA SCRAM website for a full explanation of significant terrain and how it is determined (https://www.epa.gov/scram/air-quality-dispersion-modeling-related-model-support-programs#aermap). AERMAP may require the use of additional National Elevation Data (NED) or Digital Elevation Model (DEM) files to meet the 10% slope requirement. This requirement will mainly affect sources located in the central and western portions of Massachusetts where complex terrain exists.

5.2 Good Engineering Practice (GEP) Stack Height Determination

The applicant should prepare a GEP stack height determination for the proposed facility or proposed modification at an existing facility using the following:

GEP stack height $= H_b + 1.5L$

Where:

H_b = Height of the building relative to the stack base elevation

L = Lesser of H_b or the maximum projected width (usually the plan diagonal of the building)

To determine a GEP stack height all buildings and solid structures that are within 5L of each stack must be included in the analysis. MassDEP recommends using EPA's Building Profile Input Program for Prime (BPIP-PRM) to generate direction-specific building dimensions for calculating downwash impacts in AERMOD. The applicant should provide plot and building plans, drawn to scale, indicating building elevations and dimensions (length, width, and height) of structures with the potential to cause building downwash in the final air quality modeling impact analysis report.

5.3 Emissions Data

Applicants should consider the following when calculating emissions for an air quality modeling impact analysis.

Emission Rates: Applicants should calculate both short-term maximums and long-term averages of potential emissions for the project undergoing review, and either actual or potential emissions for existing sources at the facility and for nearby interactive sources. Model a new or modified emission unit with its maximum short-term not-to-exceed (NTE) emission rates to demonstrate compliance with all applicable short-term standards. For annual standards, model the emission unit with an annual average emission rate or to be conservative use the short-term NTE emission rate.

When modeling particulate matter emissions, both the filterable and condensable fractions should be calculated and provided in the modeling protocol and plan approval application.

Fugitive Emissions

Consult MassDEP Boston modeling staff on how fugitive emissions should be characterized in the modeling analysis. Fugitive emissions are typically modeled as area or volume sources in AERMOD. Area and volume source parameters should be approved by MassDEP. Consultation with MassDEP also is necessary for modeling fugitive air toxic emissions associated with process systems or nuisance odors.

Intermittent Emissions of NO_x and SO_2

Applicants should model intermittent emissions in accordance with EPA guidance, "*based on an average hourly rate, rather than the maximum hourly emissions.*" Applicants should follow EPA's March 1, 2011 model clarification memorandum entitled *Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO2 National Ambient Air Quality Standard*. This methodology avoids over-estimating the impacts from an intermittent emission source.

Emissions with less than 500 Hours of Operation

In accordance with EPA's guidance, an emission source with 500 hours of intermittent operation or less should be considered a noncontinuous emission source with an average hourly rate for the corresponding operational hours. For 1-hour NO_2 modeling, maximum short-term NO_x emission rates for emergency engines and other intermittent emergency combustion equipment can be scaled by the ratio of the operating hours to the number of hours in a year (e.g., 500/8760 = 0.0571).

Other scaling factors can be developed based on other operating limits or time periods of interest or by statistical methods.

Worst-Case Operating Conditions

Emissions from combustion equipment are a function of load, fuel, and, in some cases, ambient conditions. Applicants should model a range of load levels, such as 100, 75, and 50 percent, that represent the full range of normal operations. Modeling should include the various operating fuel types such as distillate oil and natural gas. A range of ambient temperatures also should be considered for determining worst-case modeled predicted concentrations if temperature affects the performance of the equipment.

MassDEP recommends that applicants work with MassDEP regional staff to determine an appropriate set of operating case scenarios to include in the Worst-Case impact modeling.

Point Sources with Horizontal/Downward Discharges

Applicants must properly characterize stacks in AERMOD that do not have vertical discharges. In AERMOD, the POINTHOR keyword should be used for a stack that discharges horizontally or downward. The keyword, POINTCAP, should be used for a stack that has a rain cap that changes the outlet flow from vertical to horizontal. The stack parameters base elevation, stack height, stack exit diameter (inner), stack exit temperature, stack exit velocity, flow rate, and discharge configuration also should be defined in the modeling inputs.

Emission Sources to Include

All emissions sources associated with a proposed project should be included in the impact analysis including those emissions that may be permitted separately from the Plan Application under review (e.g., emergency engines or other emission units being self-reported in the Environmental Results Program).

If the modeling proceeds to a facility-wide or an interactive source analysis, significant sources of additional emissions should be included, generally units with heat inputs rates greater than 10 MMBtu/hr.

MassDEP recommends that applicants consult with Boston air modeling staff to determine what interactive sources should be included.

5.4 Ambient Air Considerations

Modeling may need to consider the areas on and adjacent to a facility as "ambient air" if there is no fence or physical barrier to preclude the public from gaining access to the property. If a physical

boundary does exist, the area within the physical boundary may be excluded from ambient air (i.e., excluded from the receptor grid) in the modeling analysis. Consult the EPA policy – *Revised Policy on Exclusions from "Ambient Air"* dated December 2019. The applicant should consult with MassDEP Boston air modeling staff when determining exclusions to ambient air.

5.5 Receptor Placement

Applicants should design the modeling receptor grid to be sufficiently dense and extend an appropriate distance to ensure that the maximum predicted impacts from the modeled sources are captured. At a minimum, the grid should include all sources in the modeling analysis, the SIA, and any significant terrain features nearby that may influence model predicted impacts.

MassDEP recommends use of a nested Cartesian grid receptor network instead of a polar grid type. Cartesian grids provide more thorough and evenly spaced coverage. Use of polar or other type of receptor grid other than Cartesian may be approved on a case-by-case basis.

Fence line or property line receptors should be incorporated into the receptor grid at a spacing of 10 to 20 meters. Receptors within the property line may be omitted provided public access is precluded by a fence or other physical barrier in accordance with an exclusion from ambient air (see Section 5.4).

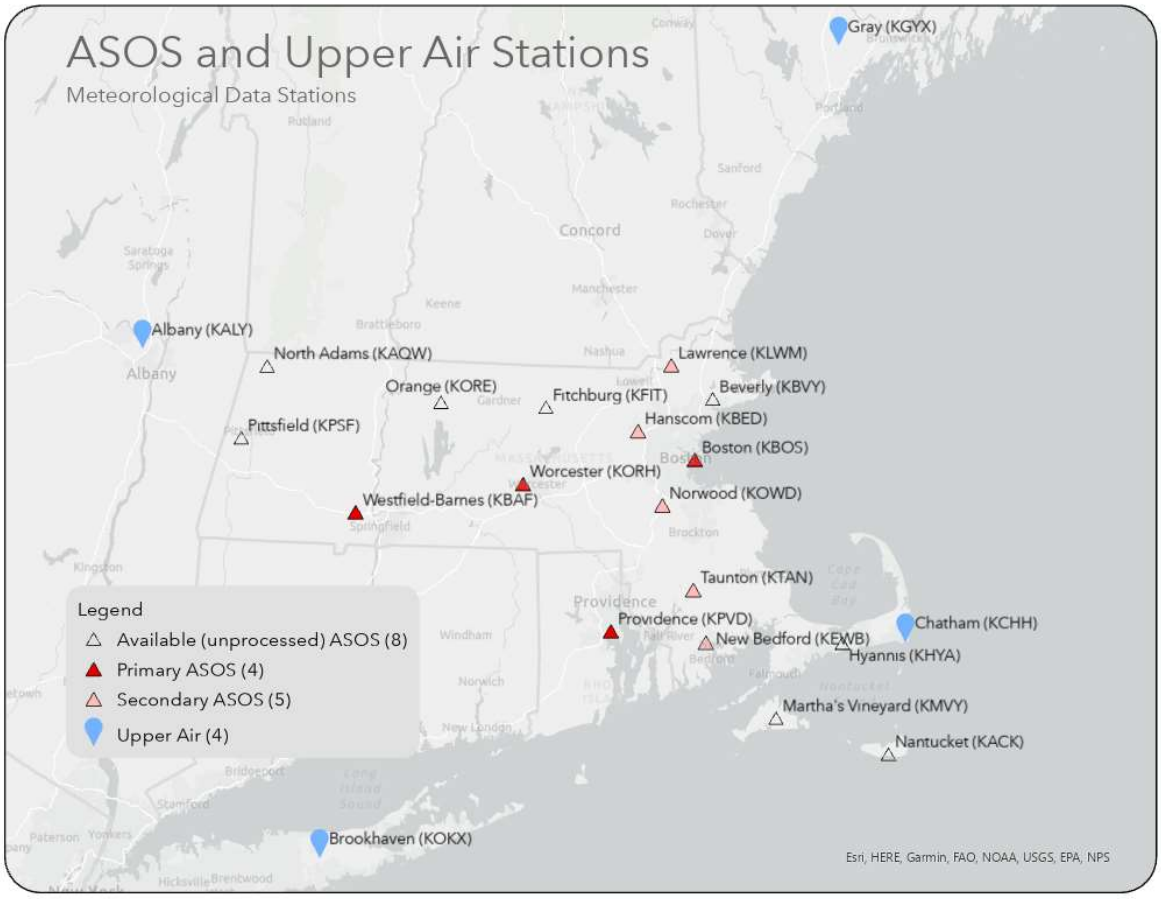
If the nearfield grid is not sufficiently dense, discrete receptors should be located at nearby sensitive locations such as nearby residences, daycare centers, schools, hospitals, or any other structure/activity of concern. Flagpole receptors should be utilized as appropriate when elevated public spaces exist in the nearfield (e.g., parking garages, uncovered elevated walkways, and rooftop dining/garden/function spaces).

The AERMAP pre-processor should be used to determine receptor elevations and hill height for all receptors. National Elevation Dataset (NED) data, as opposed to Digital Elevation Model (DEM) data, should be used since it is more recent and considered more accurate. More information on the use of AERMAP can be found at:
https://gaftp.epa.gov/Air/aqmg/SCRAM/models/related/aermap/aermap_userguide_v18081.pdf

5.6 Meteorology

The primary source of meteorological data is the network of surface-based Automated Surface Observing Systems (ASOS) stations located at airports around the State. Figure 5-1 depicts the primary meteorological data stations designated by MassDEP based on historical use and availability of data. Data from the remaining stations, while not frequently used in modeling efforts, are available to use if the Applicant can demonstrate they are representative, have adequate data capture rates (≥ 90%), and can be processed properly with EPA's AERMOD Meteorological Preprocessor (AERMET) and related software (AERMINUTE and AERSURFACE).

Figure 5-1: Meteorological Data Stations



During preprocessing of the meteorological data, the surface data should be merged with upper air data from one of four upper air observations stations located in the region: Chatham, MA (temporarily offline as of April 2021 pending station relocation), Brookhaven, NY (available to use in lieu of Chatham upper air), Gray, ME, and Albany, NY. Gray, ME upper air data should be paired with surface data from most of the ASOS stations in eastern portions of the State (generally near or within the area bounded by Interstate 495). Chatham, MA (and temporarily Brookhaven, NY) upper air data should be paired with surface data from southeastern ASOS stations located near coastal areas including Cape Cod and the Islands. For the remainder of the state (Worcester/Fitchburg and all ASOS stations to the west), Albany, NY upper air data should be paired with surface data.

Attachment 1 provides meteorological station data including ASOS and upper air station coordinates (latitude/longitude or UTMs), station elevations (profile base elevation parameter in AERMOD), and anemometer height. The appropriate preprocessed meteorological data in an AERMOD-ready format for the nine primary and secondary ASOS stations is available on MassDEP's Air Plan Approval Applications website under Air Quality Modeling.

If applicants need to prepare meteorological datasets for other ASOS stations, they should preprocess the meteorological data with AERMET and its companion tools AERMINUTE and AERSURFACE to prepare the hourly input files. MassDEP recommends use of the AERMINUTE utility program to convert ASOS 1-

minute data into hourly values that can be input to AERMET. Although hourly wind data is available directly from the ASOS stations, MassDEP recommends that the 1-minute data be used in lieu of the hourly data to maximize data availability and reduce the number of hours reported as missing or calm during the preprocessing.

MassDEP recommends using AERSURFACE for estimating albedo, Bowen ratio, and surface roughness in the vicinity of the surface meteorological station.

MassDEP allows the use of onsite meteorological data or a monitoring program to collect the data. For these options, applicants should provide all data and calibration/audit reports, along with all raw data used in preprocessing with AERMET and AERSURFACE, to MassDEP Boston air modeling staff for review and approval.

5.7 Background Air Quality Concentrations

MassDEP operates a network of ambient air quality monitoring stations across the state that measure criteria pollutant concentrations. These stations contain instruments based on either a federal reference method (FRM) or a federal equivalent method (FEM). The collected data are summarized in an annual air monitoring report published by MassDEP. The report includes basic summary statistics including annual averages and values representing the "form of the standard" (for example, 98th percentile value for 1-hour NO_2). These are the data from which Tier 1 (most conservative) background values are developed for use in a modeling analysis.

Applicants should select data from the nearest representative monitoring station to the modeled source. However, not all criteria pollutants are collected at each MassDEP monitoring station and significant terrain or land use differences may exist between the modeled source and the monitoring station. Applicants should choose the monitoring station that best represents the modeled source: urban, suburban, or rural. For example, modeling of a greater Boston area source should use background data derived from one or more of the Boston area urban-based stations. The same approach would apply to a Worcester source; data from the Worcester Summer Street station should be used for background. However, for a source in one of the rural areas just outside of Worcester, it might be more appropriate to use background data from the monitoring station in Ware.

Background air quality values are added to modeled predicted concentrations of each criteria pollutant to demonstrate compliance with the applicable NAAQS. MassDEP requires use of the most recent three years of available data to develop a single value in the form of the standard (i.e., design value) for each combination pollutant/averaging-period. MassDEP discourages using the overall maximum values for each pollutant/averaging period.

A Tier 2 approach can be developed if an Applicant wants to develop background values that are less conservative than Tier 1 values. Tier 2 approaches represent different time periods such as months, seasons, or times of day. The combination season by time-of-day approach (SEASHR keyword in AERMOD) is recommended for 1-hour NO_2 and 24-hour $PM_{2.5}$ modeling. Use of other time periods or combinations should be described and justified in a modeling protocol submitted to MassDEP Boston air modeling staff for review.

Use of sequential hourly or 24-hour background data used as direct input to the model, referred to as the "summed pairs" approach, is not allowed.

MassDEP Boston air modeling staff are available to work with the Applicant to determine the appropriate background monitoring site and data to use in an analysis. Upon request, MassDEP Boston air modeling staff will provide the appropriate background data for the modeling analysis.

6.0 SPECIAL MODELING PROCEDURES

This section contains specific information for several types of particular modeling scenarios.

6.1 NO_2 Modeling

NO_2 modeling requires special consideration due to the complex chemical transformation from NO_x emitting sources to NO_2 in the atmosphere. EPA has issued modeling guidance memorandums (2011 and 2014) that provide options for demonstrating compliance with the 1-hour NO_2 NAAQS at the following website links:

https://www.epa.gov/sites/production/files/2015-07/documents/appwno2_2.pdf

https://www.epa.gov/sites/production/files/2020-10/documents/no2_clarification_memo-20140930.pdf

Below is a summary of the multi-tiered approach as outlined in EPA memoranda and EPA's Guideline in Appendix W.

Tier 1 Full Conversion: The Tier 1 approach assumes full conversion of emitted NO_x to NO_2, and model results are compared directly to the NAAQS. This approach is the most conservative of the tiered methods. Prior approval from the MassDEP Boston air modeling staff for the use of the Tier 1 method is not required.

Tier 2 Ambient Ratio Method2 (ARM2): In the ARM2 approach the model internally scales Tier 1 impacts by the Ambient Ratio Method using default or source-specific ambient ratio data. The ARM2 national default minimum and maximum ratios are 0.5 and 0.9, respectively. Use of the Tier 2 ARM2 method with these default ratios does not require prior approval from the MassDEP Boston air modeling staff. However, the MassDEP Boston modeling staff should be consulted on the use of non-default NO_2/NO_x ratios prior to conducting NO_2 modeling.

Tier 3 Ozone Limiting Method (OLM) and Plume Volume Molar Ratio Method (PVMRM): These methods are the most complex of the three-tiered methods and require additional model inputs: 1) default or source specific in-stack ratios (default = 0.50 for a Project's emission units or nearby existing sources; 0.20 for more distant interactive sources), 2) default equilibrium ratio (default = 0.90), and 3) hourly ozone background data. Prior approval from the MassDEP Boston modeling staff is required for the use of the Tier 3 method for NO_2 modeling.

Default in-stack ratio data can be used as part of the Tier 3 approach or if determined to be different, can be manually entered into AERMOD. EPA maintains a database of NO_2 in-stack ratios at:

https://www.epa.gov/scram/nitrogen-dioxidenitrogen-oxide-stack-ratio-isr-database

When hourly ozone background data is used in a Tier 3 method, it must exactly match the 5-year data set of meteorological data being used in the modeling analysis. The hourly ozone data record must be 100 percent complete with no missing data. In some cases, this may require the use of ozone data from

multiple monitoring stations, with one site designated as the primary data source and the others used to fill in missing data. For example, if the most representative ozone data for an impact assessment is from a monitoring station that has a malfunction resulting in a large amount of missing data, a second or even third station's data must be used to fill-in data gaps. The ozone data hierarchy scheme for gap filling should be described and justified in a modeling protocol.

6.2 Interactive Source Modeling

If the proposed emissions from a new facility or proposed emission increases from an existing facility are at or above significant emission rates (SERs), actual emissions from nearby sources (of the pollutants that exceed the SER) that could significantly interact with the proposed project's emissions under review should be included in the refined modeling. Sources within 10 kilometers that emit significant actual emissions for the pollutant of interest are typically considered to be nearby sources. The MassDEP Boston air modeling staff or appropriate MassDEP Regional Office staff should be consulted to help identify nearby interactive sources and calculate their actual emission rates and operating conditions. EPA's Guideline in Appendix W contains information on determining actual emissions for interactive sources to be used in a modeling analysis.

Emergency generators and other emergency combustion equipment should not be included in interactive source modeling because of their limited hours of operation.

6.3 Start-up/Shut-down Modeling

Start-up/shut-down (SU/SD) modeling is a special case of modeling intermittent emissions. This modeling is typically requested at the discretion of the MassDEP Regional Office staff for large sources that SU/SD on a frequent basis such as power plants. These emissions may have an adverse impact on air quality when the emissions rates are greater than steady-state emission rates. The SU/SD modeling must analyze maximum emission rates and associated stack parameters.

An Applicant may submit justification that SU/SD emissions are intermittent and should not be modeled in the modeling protocol submitted to MassDEP. Applicants also may choose to take a limit on operating hours, or number of SU/SD occurrences, as an enforceable permit condition to classify a source as intermittent for modeling purposes. MassDEP will approve such proposals on a case-by-case basis based on factors such as the source emission rates and distance to sensitive receptors.

6.4 Environmental Results Program (ERP) Modeling

MassDEP's ERP establishes performance standards for certain emissions sources and a compliance certification process without the need for upfront MassDEP approval. MassDEP's air regulations at 310 CMR 7.26 establish standards for the use of clean fuels, equipment maintenance, and record keeping requirements for some emergency engines and small emergency combustion turbines, small non-emergency engines, and small boilers.

For example, in keeping with good engineering practice, for emergency engines the regulations require:

> *An engine with a rated power output equal to or greater than one MW shall be equipped with an exhaust stack with a minimum stack height of 1.5 times the height of the building on which the stack is located or higher than the height of a structure that is within 5L of the stack (5L being*

five times the lesser of the height or maximum projected width of the structure). (See 310 CMR 7.26(42)(d)3c)

If this configuration cannot be achieved, the regulations require air dispersion modeling to show compliance with the NAAQS.

Similar requirements exist for boilers (310 CMR 7.26(35)(a)1-2) and non-emergency engines (310 CMR 7.26(43)(d)3d).

A modeling protocol is not required for ERP modeling; however, MassDEP encourages applicants to consult with and provide information to MassDEP on appropriate modeling inputs and options.

6.5 Odor Modeling

MassDEP regulates odors in ambient air under its air pollution regulations. Odor concentration can be expressed as odor units per cubic meter (OU/m^3). It also can be referred to as a dilution to threshold ratio (D/T). To calculate the odor emission rate for modeling, the odor concentration is multiplied by the exhaust air flow rate which is in units of cubic meters per second (m^3/s). The result is an emission rate of $OU/m^2/s$.

AERMOD is not designed to predict time averaged concentrations less than 1 hour and often nuisance odors occur in shorter durations. For instance, the World Health Organization (WHO) has established a nuisance odor threshold of 5 ppb with a 30-minute average. MassDEP recommends using a "peak-to-mean" approach such as the power law relationship to convert one-hour concentrations to a shorter-term average such as 5 minutes as follows:

$$C_{t1} = C_{t2}(t_2/t_1)^p$$

Where: C_{t1} = concentration at shorter time average

C_{t2} = 1-hour AERMOD concentration

t_2 = 60 minutes

t_1 = 5 minutes

p = 0.2 (as recommended by Scire et al., 2000)

Applicants may propose their own conversion approach for review by MassDEP.

Modeled odor results should include magnitude, areal extent, and frequency of occurrence above the defined threshold and can be compared to WHO odor thresholds below which a nuisance odor is not expected to occur. However, sensitivity to odors varies by individual. MassDEP recommends applicants consult with the MassDEP Regional Office prior to any odor modeling.

7.0 SINGLE SOURCE OZONE AND SECONDARY PM2.5

As described in the Guideline on Air Quality Models (Appendix W), EPA has determined that advances in chemical transport modeling science indicate it is now reasonable to provide more specific, generally applicable guidance on assessing the impact of single source emissions on ozone and secondary

$PM_{2.5}$. In Massachusetts, new sources and modifications subject to PSD review must be evaluated for secondary $PM_{2.5.}$ Since Massachusetts is in the Ozone Transport Region (OTR), major source emissions of NOx and VOCs are subject to federal Nonattainment New Source Review (NNSR). NNSR does not have specific modeling requirements.

MassDEP recommends applicants follow EPA guidance and tools to aid in the determination of what type of impact assessment is required. A list of relevant guidance and tools are as follows:

- EPA's Guideline in Appendix W Section 5, Models for Ozone and Secondarily Formed Particulate Matter.
- Guidance for $PM_{2.5}$ Permit Modeling, May 20, 2014.
- Use of Photochemical Grid Models for Single-Source Ozone and secondary impacts for Permit Program Related Assessments and for NAAQS Attainment Demonstrations for Ozone, $PM_{2.5}$ and Regional Haze, August 4, 2017.
- Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program, April 17, 2018.
- Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program, April 30, 2019.
- Guidance for Ozone and Fine Particulate Matter Permit Modeling, July 29, 2022

The Applicant should consult with Boston air modeling staff prior to submitting a modeling protocol for PSD and NNSR sources.

8.0 MODELING ANALYSIS REPORT AND DOCUMENTATION

After conducting air dispersion modeling MassDEP recommends applicants submit a modeling report with the contents listed below.

8.1 Air Quality Modeling Impact Analysis Report

The report should follow the structure of the modeling protocol that was developed (if applicable) and contain final design and modeling data.

1. Source Description – a summary of the emission units and/or facility being modeled including its purpose, size, location, and surroundings.

2. Emission Rates and Stack Parameters – a summary including a table listing emission rates for all criteria pollutants and air toxics (if applicable) for each source modeled; calculations, methodologies, and/or references for emission rates; and stack height, diameter, exit velocity, flow rate, and exhaust temperature in a tabulated form.

3. Buildings and Structures – scaled drawings that show all buildings and structures; building and structure heights should be labeled, and drawings should clearly show relative locations of the buildings and structures to each modeled emission unit.

4. Location Map and Site Plan - a map or aerial view showing emission locations and surrounding environs; a close-up view showing sources relative to the immediate vicinity as well as a wider view showing more distant areas; and a scaled site plan showing stack/source locations, buildings, and property lines.

5. Receptor Grid – receptor locations should be described and presented on a base map of the modeling domain, including a close-in view showing sources relative to receptors in the immediate vicinity and a wider view showing the entire receptor grid; description of the grid should include the source and type of elevation data (NED or DEM) and receptor density (spacing).

6. Meteorological Data – meteorological data (surface and upper air) used in the modeling; if the data was not provided by MassDEP, detailed descriptions of processing the data into an AERMOD-ready format should be presented including use of the AERMET and AERSURFACE preprocessors. A windrose should be provided.

7. Background Air Quality Data –criteria pollutant background data used in the NAAQS analysis including the three years of data used, the source of the data, identification of the stations, and a description of the methodology used to develop the background values.

8. GEP Results – all GEP calculations and stack heights (usually performed using BPIPPRM).

9. Modeling Results – tables listing model predicted impacts including the model predicted impact for each criteria pollutant (in the form of the standard) for each source of interest and all sources combined; background data for each pollutant for each averaging period and the total impact (model-predicted plus background) and comparison to the respective NAAQS (if air toxics modeling was conducted results should be listed and compared to respective TELs and AALs); and contour maps (or similar) showing the location of maximum predicted impacts in the modeling domain for each pollutant.

Electronic Modeling Files – electronic modeling files should be submitted in support of the modeling demonstration including input and output information, GEP data, meteorological data, and terrain data. MassDEP prefers to receive these files via an upload link to an archive folder that we will provide. Files may be provided on a flash drive and mailed to the MassDEP Boston air modeling staff contact.

In addition to the recommended items in Section 8.1, if a CIA is conducted the air quality modeling results should be included in the CIA Report as described in 310 CMR 7.02(14)(d)5.

Attachment 1

Meteorological Station Site Data

Station	Latitude (N)	Longitude (W)	Base Elevation	Anemometer Height
	(decimal degree)	(decimal degree)	(feet)	(feet)
Primary ASOS:				
Boston Logan Airport (KBOS)	42.360556	71.009722	20	26
Providence Green Airport (KPVD)	41.722500	71.432500	55	33
Worcester Regional Airport (KORH)	42.270556	71.873056	1009	33
Westfield-Barnes Regional Airport (KBAF)	42.160000	72.712500	271	33
Secondary ASOS:				
Hanscom Airfield (KBED)	42.468056	71.294722	133	33
Lawrence Municipal Airport (KLWM)	42.712500	71.125556	148	33
New Bedford Regional Airport (KEWB)	41.679167	70.959167	79	26
Norwood Memorial Airport (KOWD)	42.191111	71.173333	49	26
Taunton Municipal Airport (KTAN)	41.875556	71.020833	43	33
Upper Air:				
Albany, NY (KALY)	42.748000	73.803300	285	N/A
Brookhaven, NY (KOKX)	40.865600	72.865000	85	N/A
Chatham, MA (KCHH)	41.666700	69.966700	50	N/A
Gray, ME (KGYX)	43.892500	70.255000	384	N/A

Notes: N/A = Not Applicable (upper air stations do not have an anemometer height)