

## Model Change Bulletin (MCB) 14 – AERMOD version 19191 changes by change type.

Listed with each change are the affected pollutants and source types:

### Bug Fixes

Item	Modification	Pollutants	Source Types
1	<p><b>BACKGROUND Concentrations output units</b>            Modified subroutine SUMBACK to convert background concentrations to the model output units requested via the EMISUNIT or CONCUNIT keywords. Background concentrations are converted internally in AERMOD to <math>\mu\text{g}/\text{m}^3</math> but were not being converted to the requested output units when model outputs were not <math>\mu\text{g}/\text{m}^3</math>. Background concentrations are converted to the requested model output units by dividing EMIFAC(1) by <math>1.0 \times 10^6</math> (the default conversion of grams to mg) in SUMBACK.</p>	All	All
2	<p><b>BACKGROUND Concentrations and deposition</b>            Modified subroutine SUMBACK to not include background concentrations with deposition outputs. Previously, if background concentrations were in an AERMOD run with deposition outputs, background concentrations were added to deposition fluxes.</p>	All	All
3	<p><b>Wet particle deposition and Method_2 particle deposition</b>            Modified subroutine SCAVRAT to calculate the scavenging ratio when using Method_2 particle deposition based on a parameterization of the washout ratio from Wesely 2002. Washout ratio is calculated based on the fine mass fraction, and an assumed diameter of 6 microns for the coarse mode. The washout ratio is used to calculate the collision efficiency which is then used to calculate the scavenging ratio. Previously, AERMOD used particle density and settling velocity for the fine particle to calculate wet deposition parameters when using Method 1 or 2 for particle deposition. These were inconsistent with the Method 2 inputs in that density is not an input for Method 2 and Method 2 dry deposition assumes a settling velocity of 0 m/s for the fine particle mode.</p>	Particulates	All
4	<p><b>Buoyant Line Source Minimum Release Height and Minimum Wind Speed</b>            A minimum release height of 2.0 meters is imposed. A buoyant line source release height of 0.0 meters caused AERMOD to run very slowly and produce 0.0 <math>\mu\text{g}/\text{m}^3</math> for all</p>	All	Buoyant Line

	hours and receptors. A minimum reference height wind speed of 1.0 m/s is imposed. This value is consistent with the meteorology that was produced with the CRSTER meteorological processor, the met processor for the Buoyant Line and Point (BLP) model.		
5	<b>MODELOPT Number 6</b> Previously, the AERMOD.out summary file lists two No. 6 user-specified options when user selects non-DFAULT and URBANOPT. One of the two messages incorrectly indicates a NO2 conversion is applied when non-NO2 POLLUTID used. An if statement was added for NO2 processing in inpsum.f to remove the duplicated message.	All	All
6	<b>DFAULT with ADJ_Ustar</b> Previously, a W402 warning message was returned in the AERMOD.out summary file when the DFAULT MODELOPT was used without use of the AERMET ADJ_U*. The block of code responsible for the incorrect warning message was eliminated in PFLCNV subroutine of metext.f.	All	All
7	<b>ERRMSG(18)</b> ERRMSG(18) was defined three times in modules.f, using ERRHDL numbers 133, 137, and 138, which resulted in some compilers (g95) not functioning properly. The modules.f file was reorganized sequentially and ERRMSG(18) usage of ERRHDL 137 and 138 was removed. ERRHDL 137 and 138 were replaced with ERRMSG 204 in the coset.f.	All	All
8	<b>LOW_WIND Undefined ERROR Message</b> Previously, an undefined ERROR message and “ELWD” error code was returned in the AERMOD.out summary file when the LOW_WIND MODELOPT was used without the ALPHA MODELOPT. The ERROR message code was modified to “E133” in coset.f.	All	All
9	<b>ELEVUNIT</b> Previously, the optional ELEVUNIT keyword to convert elevation units from feet to meters was not applied to LINE or BUOYLINE sources. The SOLOCA subroutine in soset.f was modified to apply the feet to meters conversion used for other source types to LINE and BUOYLINE sources.	All	Line and Buoyant Line

#### Enhancements

Item	Modification	Pollutants	Source Types
1	<b>ARM2 Enabled with BETA RLINE and ALPHA RLINEXT Source Types</b>	All	Rline and Rlinext

	ARM2 was extended for application to sources and source groups that include the BETA RLINE and ALPHA RLINEXT line sources.		
2	<b>EVENT Processing Enabled with BETA RLINE and ALPHA RLINEXT Source Types</b> EVENT processing was extended for application to sources and source groups that include RLINE and RLINEXT line sources.	All	Rline and Rlinext
3	<b>Urban Stability Enabled with BETA RLINE and ALPHA RLINEXT Source Types</b> The URBAN option was extended for application to sources and source groups that include RLINE and RLINEXT line sources.	All	Rline and Rlinext
4	<b>Buoyant Line Source Urban Stability</b> Previously, AERMOD treated a buoyant line source in an urban environment as a source in a rural environment, as is done in the Buoyant Line and Point (BLP) model. The capability to process a buoyant line source in an urban environment was added as an ALPHA option. The surface roughness (SFCZ0), Monin-Obukhov length (OBULEN), and mixing height (ZI) are adjusted for an urban environment and a new value of the Pasquill-Gifford (P-G) stability category (KST) is computed using the subroutine LTOPG.	All	Buoyant Line

Formulation updates – Regulatory

None

Formulation updates – BETA

1	<b>RLINE Source Type</b> The RLINE source type was added to model roadways, or similar line-type releases, which uses the dispersion calculations from the R-LINE model (version 1.2) and requires the BETA and FLAT model options. The RLINE source type has identical inputs to the LINE source type  R-LINE model: current version 1.2, last updated November 2013 ( <a href="https://www.cmascenter.org/r-line">https://www.cmascenter.org/r-line</a> ).	All	Rline
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Formulation updates – ALPHA

1	<p><b>Enhanced Building Downwash Options</b>  Options to examine the effects of enhanced building downwash algorithms for point sources was added. The user can selectively apply one or more of these options in the AERMOD input control file. Two new keywords are added to the CO pathway: ORD_DWNW and AWMADWNW. Each of these keywords has several parameters that control downwash processing. For ORD_DWNW, the parameters are: ORDUEFF to control the height at which an effective wind speed is calculated for main plume concentrations; ORDTURB to control an adjustment for the non-dimensional vertical turbulence intensity, wiz0, from 0.6 to 0.7; and ORDCAV to shift the point at which the vertical and lateral dispersion coefficients begin to grow with downwind distance from the lee edge of the building to the end of the cavity. Parameters available for the AWMADWNW keyword are: AWMAUEFF to control the height at which an effective wind speed is calculated for main plume concentrations; AWMAUTURB to specify new lower and upper bounds for calculating the effective parameters ueff, sweff, sveff, and tgeff; and STREAMLINE (or STREAMLINED) to perform downwash for a streamlined building such as a cooling tower. Any combination of parameters is allowed <b>EXCEPT</b> ORDUEFF and AWMAUEFF cannot both be specified in the same model run. In addition, STREAMLINE (or STREAMLINED) requires the AWMAUTURB option to also be specified. If any of these keywords and parameters are used, the ALPHA option must be specified on the MODELOPT record. An optional debug file is available for the options associated with the AWMADWNW keyword by specifying AWMADW on the DEBUGOPT keyword. If none of these options are applied, the standard AERMOD building downwash algorithms will be used.</p>	All	Point
2	<p><b>RLINEXT Source Type</b>  The RLINEXT source type was added to model roadways, or similar line-type releases, using the dispersion calculations from the R-LINE model (version 1.2) and requires the ALPHA and FLAT model options. The RLINEXT source has inputs and capabilities identical to the R-LINE model. The RLINEXT source has capability to model depressed roadways and roadside barriers; the RLINE source does not have these capabilities.</p> <p>R-LINE model: current version 1.2, last updated November 2013 (<a href="https://www.cmascenter.org/r-line">https://www.cmascenter.org/r-line</a>).</p>	All	Rlinext

3	<p><b>Method 2 particle deposition and gas deposition ALPHA Option</b></p> <p>Gas deposition and method 2 particle deposition were switched from non-DEFAULT to ALPHA options. While the two deposition options were previously non-DEFAULT, there has been little evaluation of their use in AERMOD. It was decided to make these two options ALPHA options while the deposition algorithms undergo evaluation. Note that METHOD 1 particle deposition is still allowed with the DEFAULT option as it is based on a method from a previous model, the Acid Deposition and Oxidant model (ADOM)</p>	Gaseous and particulates using Method 2	All
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