



# AERMOD Modeling System Development Activities

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# AERMOD Development

- Original goals of the AERMOD Development & Update Plan
  - Enhanced engagement and coordination with the community on research and development
  - More fully leverage alternative model approval
- Goals remain, organization slightly different than previously discussed
  - AERMOD Development and Update Plan
    - History of model development
    - Current model development processes and protocols
  - AERMOD white papers
    - Details on the current development activities/priorities
  - New AERMOD Development website to house both sets of documents
    - <https://www.epa.gov/scram/aermod-modeling-system-development>
    - Website is still under development, look for an email announcement soon



# AERMOD Development

- Enhanced engagement and coordination with the community on research and development
  - EPA priorities are clear and transparent
  - Allows feedback on planned updates
  - Identify and foster collaborative opportunities
  - Ensure EPA priorities match community needs
- More fully leverage alternative model approval
  - MCH Lean event emphasized the importance of beta options for alternative model approval
  - Maximizing scientific advancements for alternative model approval has broad benefits to the modeling community



# AERMOD Development and Update Plan

- Description of the history of AERMOD development
  - Initial model development (1995-2005)
  - Model promulgation (2000-2005)
  - Model maintenance (2005-2015)
  - Model update (2015-2017)
- Explanation of model development process
  - How does something become an alpha?
  - How does an alpha become a beta?
- Describes EPA's evaluation and update protocols
- Outlines science updates to the AERMOD Modeling System that the EPA is considering
- Internal Draft Completed, sent to RO for review



# AERMOD White Papers

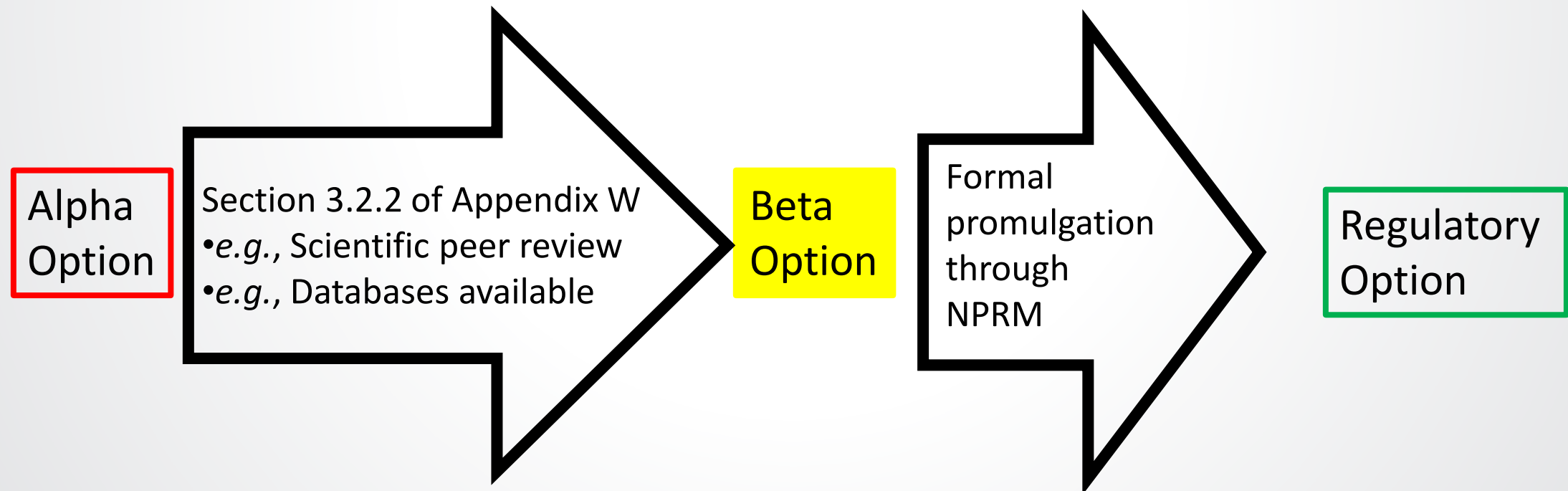
- AERMOD near-term system updates
  - Low wind conditions
    - LOW\_WIND keyword (Minimum  $\sigma_v$  value, Minimum wind speed, FRANMAX)
    - Considering additional options for minimum Monin–Obukhov length and associated parameterizations of vertical temperature gradient scale ( $\theta^*$ )
  - Downwash
    - ORD and PRIME2 alpha options available in next version of the model
    - EPA planning additional evaluations
    - ORD conducting additional development work to address other downwash issues
  - NO<sub>2</sub> enhancements
    - New field studies (API, BLM, PRCI, ERM, AECOM, EPA, City of Denver, other O&G industry groups)
    - New Tier 3 method, based on ADMS approach (API collaboration)
    - New Tier 2 method under development by (EPA)
  - Mobile sources
    - RLINE integration (FHWA Collaboration)



# AERMOD White Papers

- Overwater
  - IWAQM agreement with the Dept. of Interior's Bureau of Ocean and Energy Management (BOEM)
  - Downwash effects that are unique to offshore platforms which are raised, often open lattice structures
    - PRIME2 has some work on lattice structures, but not in upcoming alpha downwash options
    - BLM planning additional wind tunnel studies to inform algorithm development
    - OCD has platform downwash algorithms, EPA/BOEM discussing integration into AERMOD
  - Shoreline/Coastal Fumigation
    - Evaluation of screening algorithms in AERSCREEN, Shoreline Dispersion Model (SDM), and more recent published research.
  - Marine Boundary Layer Parameterization
    - Some work in using AERCOARE preprocessor for overwater meteorological data available as a counterpart to AERMET
- Saturated plumes/Plume rise
  - PLURIS is generic plume rise model (AECOM)
  - BLP-like sources been important recently

- Alpha options – “experimental”, i.e., developmental options not available for regulatory use
- Beta options – Peer-reviewed options that are potentially ready for consideration as alternative model(s)





# Planned 2019 AERMOD Updates

- Downwash updates
  - Two separate alpha options, based on ORD and PRIME2 work
  - ORD options include:
    - Adjusted Effective Building Dimensions (i.e., a draft BPIPPRIME)
    - Plume Spread Matching at Boundary Between Near-wake and Far-wake (discontinuity fix)
    - Effective Wind Speed (Average of the Profile) Instead of Wind Speed at Stack Height
    - Maximum Ambient Turbulence Intensity Increased
  - PRIME2 options include:
    - Effective Wind Speed at User Selected Height Instead of Wind Speed at Stack Height
    - New Formulations for Turbulence Enhancement and Velocity Deficit
  - What can the community do with the alpha downwash options?
    - Do not use for permits
    - However, we would appreciate the community using the options and letting us know generally if they made much difference for your projects





# Planned 2019 AERMOD Updates (cont)

- New RLINE option: still considering whether alpha or beta
  - Limited to FLAT terrain only
  - Barriers and depressed roadways, to be an alpha option
  - Urban option also available, likely as an alpha option
- Miscellaneous bug fixes to AERMOD
  - BLP Urban sources
- New Tier 2 NO<sub>2</sub> method: most likely as alpha
  - Based on travel time limitations of NO conversion
- API Tier 3 method: not likely in next release
- Potential additions to the LOW\_WIND option (alpha)
  - Changes to the minimum Monin-Obukhov length (may be in AERMET and not AERMOD)
  - Changes to the parameterization of the vertical temperature gradient scale ( $\theta^*$ )
- AERMET: bug fixes and overhaul (presentation by James Thurman)
- AERSURFACE (Presentation by Clint Tillerson)



# AERMOD Users/AQMG Survey

- Survey to collect information on AERMOD development and understand the stakeholder community better
- All questions are optional\*
  - \*Except the first question, which identifies generally what sector the respondent represents (i.e., RO, state, industry)
- <https://bit.ly/2H5eMCh>
  - Will post link on the new SCRAM Model Development page as well
- Feel free to share – state, local, industry
  - Target is really co-regulators, but the link is public and feedback from entire community is useful



# AERMOD “Top 10” Download Facts

- January 1st through May 1<sup>st</sup> (125 days)
- 3101 downloads of AERMOD (~1 year since last release)
- AERMET (404) vs AERMAP (370)
- SCREEN3, AERSCREEN, AERMAP

<u><a href="#">aermod_implementation_guide.pdf</a></u>	1,708
<u><a href="#">aermod_userguide.pdf</a></u>	1,323
<u><a href="#">appw_17.pdf</a></u>	1,069
<u><a href="#">aermod_quick-reference-guide.pdf</a></u>	900
<u><a href="#">aermod_sample_run.pdf</a></u>	629
<u><a href="#">aermet_userguide.pdf</a></u>	390
<u><a href="#">aermod_mcb13_v18081.pdf</a></u>	369
<u><a href="#">screen3d.pdf</a></u>	383
<u><a href="#">aerscreen_userguide.pdf</a></u>	270
<u><a href="#">2019_rsl_workshop_agenda.pdf</a></u>	260

<u><a href="#">aermod_exe.zip</a></u>	1,938
<u><a href="#">screen3.zip</a></u>	748
<u><a href="#">aermod_source.zip</a></u>	695
<u><a href="#">samplerun.zip</a></u>	627
<u><a href="#">aerscreen_code.zip</a></u>	559
<u><a href="#">aermod_exe-32.zip</a></u>	468
<u><a href="#">aermet_exe.zip</a></u>	404
<u><a href="#">aermod_test_cases_18081.zip</a></u>	392
<u><a href="#">aermap_exe.zip</a></u>	370
<u><a href="#">makemet_code.zip</a></u>	277



# AERMOD “Top 10” Download Facts

- January 1st through March 17<sup>th</sup> (76 days)
- 1735 downloads of AERMOD (~11 months since last release)
- AERMET (246) vs AERMAP (212)
- AERSCREEN, SCREEN3, AERMAP

<u><a href="#">aermod_implementation_guide.pdf</a></u>	1,025
<u><a href="#">aermod_userguide.pdf</a></u>	771
<u><a href="#">appw_17.pdf</a></u>	579
<u><a href="#">aermod_quick-reference-guide.pdf</a></u>	512
<u><a href="#">aermod_sample_run.pdf</a></u>	384
<u><a href="#">aermod_mcb13_v18081.pdf</a></u>	214
<u><a href="#">aermet_userguide.pdf</a></u>	199
<u><a href="#">sample_aerplot_run.pdf</a></u>	166
<u><a href="#">aerscreen_userguide.pdf</a></u>	163
<u><a href="#">screen3d.pdf</a></u>	158

<u><a href="#">aermod_exe.zip</a></u>	1,107
<u><a href="#">aermod_source.zip</a></u>	357
<u><a href="#">samplerun.zip</a></u>	342
<u><a href="#">aerscreen_code.zip</a></u>	337
<u><a href="#">screen3.zip</a></u>	331
<u><a href="#">aermod_exe-32.zip</a></u>	271
<u><a href="#">aermet_exe.zip</a></u>	246
<u><a href="#">aermod_test_cases_18081.zip</a></u>	225
<u><a href="#">aermap_exe.zip</a></u>	212
<u><a href="#">sample_aerplot_run.zip</a></u>	182