Model Clearinghouse: Operational Plan

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Model Clearinghouse: Operational Plan

U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Air Quality Assessment Division
Research Triangle Park, North Carolina

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Acknowledgements

We acknowledge the contributions since 1981 from the previous and current Directors of the EPA's Model Clearinghouse (Dean Wilson, Dennis Doll, Warren Peters, Dennis Atkinson, and George Bridgers) and the continual support of their management (Joseph Tikvart and Tyler Fox) in providing the autonomy to develop the Model Clearinghouse into a respected and integral part of the regulatory air quality modeling community. We also acknowledge the instrumental assistance in this success from countless modeling scientists and other representatives in all ten EPA Regional Offices, the Office of Air Quality Planning and Standards, the Office of Research and Development, and the Office of Transportation and Air Quality over the past three-and-a-half decades.

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1. Introduction

The U.S. Environmental Protection Agency (EPA's) Model Clearinghouse, also known as the Model Clearinghouse or MCH, is the central point of consultation and coordination within the EPA for reviewing the use of air quality models and analytical techniques for demonstrating compliance or attainment with the National Ambient Air Quality Standards (NAAQS) in regulatory applications or implementation plans. All case-specific approvals of alternative models by an EPA Regional Office, hereupon referred to as Regional Office or RO, require consultation and concurrence by the MCH, per Section 3.2.2 of the *Guideline on Air Quality Models* (40 CFR Part 51 Appendix W, "*Guideline*")[1]. When appropriately engaged, the MCH ensures fairness, consistency, and transparency in regulatory air quality modeling decisions across all of the ROs.

The MCH is also a nexus of information for the regulatory air quality modeling community to gain knowledge of case-specific decisions by the EPA on the use of alternative models and analytical techniques and to understand clarifications to the requirements and recommendations of the *Guideline*. To facilitate a broad sharing of this information, the MCH conducts monthly coordination conference calls with the ROs, hosts annual Regional, State, and Local Modelers' Workshops for the co-regulating agencies and the triennial Conference of Air Quality Models for the entire regulatory air quality modeling community as required by Section 320 of the Clean Air Act (CAA)[2], maintains the Model Clearinghouse Information Storage and Retrieval System (MCHISRS) on the EPA's Support Center for Regulatory Atmospheric Modeling (SCRAM) website, and periodically produces summary reports.

1.1 Need for a Model Clearinghouse

Section 165 of the CAA states that with regard to Prevention of Significant Deterioration (PSD) analyses, "The Administrator… shall specify with reasonable particularity each air quality model or models to be used under specified sets of conditions for the purposes of this part. Any models or models designated under such regulations may be adjusted upon a determination, after notice and opportunity for public hearing, by the Administrator that such adjustment is necessary to take into account unique terrain or meteorological characteristics of an area potentially affected by emissions from a source applying for a permit required under this part." In response to this requirement and other regulatory needs, the Office of Air Quality Planning and Standards (OAQPS) issued the *Guideline of Air Quality Models*. The *Guideline* established preferred air quality models and recommends analytical techniques that may be applied to air pollution control strategy evaluations and new source reviews, including PSD. The *Guideline* is intended for use by the ROs in judging the adequacy of modeling analyses performed by the EPA, by state, local, and tribal permitting authorities, and by industry. It is appropriate for use by other federal government agencies and by state, local, and tribal agencies with air quality and land management responsibilities (co-regulating agencies). The *Guideline* serves to identify, for all interested parties, those modeling techniques and databases that the EPA considers acceptable. The *Guideline* provides requirements and makes specific recommendations concerning air quality models, databases, and general requirements for concentration estimates.

However, the *Guideline* also recognizes that: (1) there are situations where the adjustment of the "preferred" air quality models is necessary to take into account unique terrain or meteorological characteristics of an area; (2) the developing state of modeling science may provide the opportunity for application of a new or revised model which is more appropriate than

the recommended model; (3) for some classes of modeling problems the state of the modeling science does not provide a basis for identifying appropriate refined models; and (4) database availability in particular situations may warrant deviations from the *Guideline*. To allow for these situations, the *Guideline* states in Section 3.2.2(a) that when a preferred model or database is not used, the Regional Administrator may approve the use of other techniques that are demonstrated to be more appropriate. The *Guideline* then provides general criteria for determining the technical acceptability of alternative techniques. To assist the RO personnel in making such technical judgments, a mechanism is needed by which in-depth review of alternate models can be performed. Access to Agency personnel who have specialized knowledge about specific types of modeling techniques is highly desirable.

Section 301(a) of the CAA authorizes the Administrator to delegate authority for carrying out regulations and policies to the ROs. However, this Section also requires the Administrator to "…promulgate regulations establishing general applicable procedures and policies for regional officers and employees (including the Regional Administrator) to follow in carrying out a delegation… Such regulations shall be designed-

(A) to assure fairness and uniformity in the criteria, procedures, and policies applied by the various regions in implementing and enforcing the Act;

(B) to assure at least an adequate quality audit of each State's performance and adherence to the requirements of this Act in implementing and enforcing the Act, particularly in the review of new sources and in enforcement of the act; and

(C) to provide a mechanism for identifying and standardizing inconsistent or varying criteria, procedures, and policies being employed by such officers and employees in implementing and enforcing the Act."

Thus, although the Regional Administrator has the authority to specify models that are appropriate for use in a given situation, there is a need to provide for a mechanism that promotes fairness and consistency in modeling decisions among the various ROs and the co-regulating agencies.

1.2 Purposes of the Model Clearinghouse

To fulfill the needs described above in Section 1.1, the MCH has been established in OAQPS with the primary purposes to provide a mechanism whereby the proposed case-specific acceptance by a RO of a non-guideline or alternative model or analytical technique can be reviewed for national consistency before final approval by the Regional Administrator. Interrelated to ensuring this national consistency, the MCH provides a mechanism whereby the in-depth technical evaluation and/or performance evaluation of a proposed alternative model or analytical technique can be reviewed by those EPA personnel who are most familiar with the types of models or analytical techniques to be employed. Finally, the MCH provides a communication outlet for EPA's experience with the use of alternative models and analytical techniques, databases, or other deviations from the *Guideline* and current guidance.

The establishment and purpose of the MCH are formally declared in Section 3.3 of the *Guideline*. For convenient reference in the context of this Operational Plan, the text of the *Guideline*, Section 3.3 is provided in Appendix A.

1.3 Scope of this Operational Plan

The remainder of this Operational Plan describes the MCH in greater detail and how it most efficiently and effectively operates.

- Section 2 presents the functions of the MCH with expanded explanation.
- Section 3 presents the principal structure of the MCH.
- Section 4 provides the procedures to be followed in engaging with and submitting material to the MCH and how the review of material, development of comments, and the communication of relevant important information to all parties are accomplished.
- Section 5 is a list of references cited throughout this document.
- Appendix A provides the relative text from Section 3.3 of the *Guideline* concerning the MCH.
- Appendix B lists the MCH points of contact, including respective OAQPS and RO personnel.
- Appendix C presents a conceptual flow diagram of the pre-EPA submittal development steps for an alternative model or analytical technique justification by an applicant and reviewing authority and the post-EPA submittal approval steps by the RO and MCH.
- Appendix D gives an example of a RO alternative model concurrence request and subsequent MCH concurrence response memorandum.
- Appendix E provides a graphical review of the frequency of MCH formal actions from 1981 to 2016.

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2. Functions of the Model Clearinghouse

The three main functions of the MCH that address the purposes discussed above in Section 1.2 are to: (1) review proposed regulatory actions that contain modeling issues and alternative models or analytical techniques; (2) develop and maintain a historical record of alternative model and analytical technique decisions; and (3) communicate decisions on regulatory modeling issues to all users in the regulatory air quality modeling community. These functions are more fully described below in Sections 2.1 through 2.3. As a byproduct of its operation the MCH is also in a position to identify needs for clarification of and potentially changes to modeling guidance. This aspect of the MCH operation is described below in Section 2.4.

2.1 Review of Proposed Regulatory Actions

The major function of the MCH is to review case-specific proposed actions which involve interpretation of modeling guidance, deviations from strict interpretation of such guidance, and the use of options in the guidance, *e.g.*, RO acceptance of alternative models or analytical techniques and databases. This is handled in two ways:

1. The MCH, on request from the RO, reviews the Region's position on proposed (specific case) use of an alternative model or analytical technique or other deviation from the modeling guidance for technical soundness and national consistency.
2. The Clearinghouse screens regulatory actions, either in advance (upon request) or when formally submitted, for adherence to modeling policy and makes recommendations for resolution for any issues identified.

In the review of alternative models and analytical techniques, the MCH first attempts to conduct the review of the RO's request within its own resources. The basis for the review is the requirements and recommendations set forth in the *Guideline*, available relevant guidance, historical records of previous analogous cases and MCH reviews, and the technical expertise of MCH personnel. As the need arises, the MCH may call upon other EPA personnel, *e.g.*, other ROs, the Office of Research and Development (ORD), or the Office of Transportation and Air Quality (OTAQ), with specific expertise to assist in resolving complex issues or in the review of all or parts of the proposed alternative model or analytical technique. In all cases the final outcome of the review takes the form of a single concurrence or recommendation from the MCH, with supporting rationale, to the RO. This "formal action" of review and subsequent concurrence or recommendation by the MCH promotes the use of equivalent acceptance criteria by all of the ROs.

2.2 Maintaining Awareness of Current Modeling Guidance and Historical Precedents

In order for the MCH to properly judge consistency in the interpretation of modeling guidance, it is necessary to maintain awareness of current modeling guidance and to be cognizant of past decisions involving the interpretation of this guidance in specific cases. The location of the MCH in OAQPS allows for easy access and awareness of current modeling guidance. The primary basis for modeling policy considered by the MCH is the *Guideline*. Other written material also constitutes part of the modeling guidance, including workshop and conference reports, guidelines, **Federal Register** rules and regulations, and records of previous MCH concurrences and recommendations.

One very important aspect of this function is the development and maintenance of a historical record of regulatory decisions that involved interpretation of modeling guidance. Although most regulations, *e.g.*, State Implementation Plans (SIPs), are relatable to a strict interpretation of the *Guideline* and related guidance documents,[3] there are still many situations that involve a deviation from a strict reading for either technical or broad policy reasons. For example, it might be expeditious to just concur with an alternative analytical technique in a compliance demonstration for an isolated new or modifying source even though the recommended databases or perhaps the recommended model were not used in the analysis. However, it is essential to document the circumstances involved with a case-specific approval so as not to set a precedent for all sources because the environmental setting or other criteria may be different in other permitting situations.

In order for the MCH to maintain technical and policy consistency in its recommendations, it is necessary that a current database of decisions involving interpretation of or deviation from modeling guidance be maintained, easily referenceable, transparent, and openly accessible to the public. To accomplish this database of information, the MCH has established the Model Clearinghouse Information Storage and Retrieval System (MCHISRS) for the archival of clarifications to modeling guidance and all formal actions by the MCH, including all situations involving the case-specific approval by a RO with MCH concurrence of alternative models and analytical techniques. The MCHISRS forms the primary basis for the communication of decisions described in the following section.

2.3 Communication of Decisions

It is important that the regulatory air quality modeling community be made aware of significant decisions involving the interpretations of modeling guidance. To fulfill this function, the MCH utilizes numerous communication pathways, including the MCHISRS database which is publically available on the EPA's SCRAM website at https://www.epa.gov/scram/air-quality-model-clearinghouse.

Whenever there is a formal action involving the MCH, a new record in the MCHISRS database is created and includes: (1) a brief description of the situation and of the resolution; (2) the RO concurrence request memorandum along with the technical basis or justification material from the applicant and/or co-regulating agency seeking the case-specific approval of an alternative model or analytical technique; and (3) the MCH concurrence or response memorandum along with any additional technical basis documentation deemed necessary to support the EPA's decision. An electronic carbon copy of the MCH concurrence or response memorandum, including all of the information contained in the new MCHISRS record, is shared via email to all of the Regional Office Air Program Managers and appropriate Regional Office Modeling Contacts[a]. This email is subsequently shared by the ROs with their respective co-regulating agencies[b], as appropriate. Additionally, a notice of the MCH formal action is placed prominently on the EPA's SCRAM website.

The MCH conducts monthly coordination conference calls with the ROs to assist in a consistent exchange of pertinent information concerning the *Guideline*, modeling guidance and clarifications, and MCH formal actions. The RO monthly coordination calls also provide a

[a] Current list of Regional Office Modeling Contacts: https://www.epa.gov/scram/air-modeling-regional-contacts.
[b] Current list of co-regulating agency contacts: https://www.epa.gov/scram/air-modeling-state-modeling-contacts.

mechanism through which the Regional Office Modeling Contacts can share their experiences with particular permit compliance demonstration and SIP modeling issues in their respective regions to collectively broaden the knowledgebase and further promote consistency in modeling related decisions throughout all of the ROs.

Annually, the MCH hosts a Regional, State, and Local Modelers' Workshops for the co-regulating agencies. On a triennial basis, the MCH conducts a Conference of Air Quality Models for the entire regulatory air quality modeling community as required by Section 320 of the CAA. Both the workshops and conferences offer an opportunity for the MCH to summarize and present all of the business of the MCH over the previous one or three years and to gain even further feedback from the respective parts of the regulatory air quality modeling community.

Finally, the MCH is reinstituting the practice of producing a Model Clearinghouse Annual Report to summarize significant decisions that have been made and the circumstances involved over the previous year. The basis for this report is primarily details from the records maintained in the MCHISRS database and also includes relevant details from any new rules and regulations and information gleaned from the annual Regional, State, and Local Modelers' Workshop, the Conference on Air Quality Models (if conducted in that year), and other interactions with the co-regulating agencies or industrial stakeholders. The report can be used as a reference to improve consistency in future decisions and as a source of technical information.

2.4 Identifying Needs for Additional Modeling Guidance

By the very nature of its business, the MCH is in a unique position to identify areas where gaps exist and clarification is needed in EPA's modeling guidance and also in regulatory policy related to modeling. The MCH is also a valuable resource for making recommendations

and developing guidance to cover such situations because it is familiar with the circumstances involved.

As necessary, the ROs may seek clarification from the OAQPS on technical issues and areas of concern in a modeling protocol or PSD compliance demonstration. Through these interactions and subsequent resolutions of the specific issues, clarifications of preferred modeling procedures can ultimately become official EPA modeling guidance. This can happen in several ways: 1) the preferred procedures are published as regulations or guidelines; 2) the preferred procedures are formally transmitted as guidance to the Air Division Directors in the ROs; 3) the preferred procedures are formally transmitted as guidance to the Regional Office Modeling Contacts as a result of a regional consensus on technical issues; or 4) the preferred procedures are relied upon in decisions and concurrences by the MCH that effectively establish national precedent that the approach is technically sound.

3. Structure of the Model Clearinghouse

This section describes the location of the MCH within the EPA and the key personnel involved, including support staff.

The MCH is formally located within the Air Quality Modeling Group (AQMG), Air Quality Assessment Division (AQAD) of the OAQPS. As such, the MCH exists within the normal chain of command of the AQMG whose primary functions are to conduct regulatory air quality modeling for EPA actions, address regulatory and technical issues related to regulatory air quality modeling and develop regulatory air quality modeling guidance. This provides ready access to modeling policy and technical expertise on air quality modeling and its implementation in demonstrating compliance with the NAAQS and PSD increment. It also allows for efficient hierarchical clearance concerning MCH determinations on sensitive issues. The Air Quality Policy Division (AQPD) of the OAQPS and, when appropriate, the Office of General Counsel (OGC) also participates in matters involving SIP attainment strategies, NSR/PSD referrals, and related policy issues and other regulatory functions that involve broader policy decisions that need to be model by the EPA.

In order to ensure that modeling issues contained in SIP submittals and related documents are reviewed for consistency in policy and for technical credibility, there are two main modes of access to the MCH, as described above in Section 2. Regional Office requests for review of alternative models and analytical techniques and other proposed deviations from modeling guidance are handled directly by MCH personnel in the AQMG. SIP submittals and related documents, as well as requests from the Region Offices for assistance on NSR/PSD issues, are screened by MCH personnel and then coordinated with personnel in the AQPD and OGC for adherence to implementation and Agency policy. All proposed deviations from Agency policy

are flagged for examination by the AQPD and OGC and may ultimately be resolved through direct responses or clarification memoranda from the AQPD separate from any necessary formal concurrence or recommendation from the MCH on the use of an alternative model or analytical technique.

The primary responsibility for managing the MCH and ensuring that all of the functions described above in Section 2 are carried out is performed by the Model Clearinghouse Director. This individual is a full-time employee located within the AQMG and appointed by the Direction of the AQAD based on recommendation by the Group Leader of the AQMG. The Model Clearinghouse Director is responsible for ensuring that proper communication and coordination are maintained in a timely fashion on all business of the MCH within the EPA, with the co-regulating agencies, and with users in the regulatory air quality modeling community, as appropriate. Additionally, the Model Clearinghouse Director maintains the MCHISRS database, coordinates the annual Regional, State, and Local Modelers' Workshop and the triennial Conference on Air Quality Models, and produces the Model Clearinghouse Annual Report.

In addition to the Model Clearinghouse Director, personnel or contacts with assigned areas of specialty or technical expertise in the AQMG are included in the organizational structure of the MCH. Each of the MCH contacts has, as part of his/her normal assignment outside of the MCH, responsibility for a specific modeling or regulatory program, *e.g.*, SO_2, NO_2, secondary formation of Ozone or $PM_{2.5}$, mobile air quality modeling, etc. Thus it is appropriate for these individuals to also include technical support to the MCH function as part of their routine responsibilities.

Although these personnel comprise the formal operation of the MCH and most of the work of the MCH can be done by them, it may be necessary on occasion to draw upon modeling

and policy expertise throughout the Agency to assist in resolving complex issues or parts of a proposed alternative model or analytical technique. Thus, the MCH may call upon the ROs, ORD, OTAQ, etc. with specific expertise to assist in resolving complex issues or in the review of all or parts of the proposed alternative model or analytical technique. However as identified earlier, the MCH is responsible for resolving and condensing all comments received into a single concurrence or recommendation memorandum on the issue.

Appendix B provides a list of the central personnel included in the organizational structure of the MCH and their contact information. Appendix B also identifies the key RO, ORD, and OTAQ personnel most often involved in the business of the MCH. Periodically as needed, Appendix B will be revised to reflect changes in these personnel or their contact information.

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4. Model Clearinghouse Procedures

This section describes the procedures that the MCH follows to review alternative models and analytical techniques proposed for specific applications, screen regulatory packages/issues for adherence to modeling policy, and document decisions and communicate results. For reference and easy of understanding, Appendix C presents a conceptual flow diagram of the pre-EPA submittal development steps for an alternative model or analytical technique justification by an applicant and reviewing authority and the post-EPA submittal approval steps by the RO and MCH. For additional clarity, the location of the "Formal Model Clearinghouse Process" within the flow diagram is highlight.

4.1 Clarification on Model Clearinghouse Formal Actions

Throughout the year of its existence, there has been continual confusion by the co-regulating agencies and broader regulatory air quality modeling community as to when the MCH is formally reviewing a case-specific alternative model or analytical technique, often referred to as "in the Clearinghouse." There are numerous occasions during which AQMG technical experts through the MCH may participate in discussions and other levels of coordination on a case-specific alternative model or analytical technique before it has been submitted by the co-regulating agency for consideration and case-specific approval by the RO. However, the MCH is not formally engaged in the review of a case-specific situation until the RO has formally transmitted a concurrence request memorandum to the MCH stating the Region's position on proposed use of an alternative model or analytical technique or other deviation from the modeling guidance for technical soundness and national consistency.

The best example of such an occasion that the MCH may be involved in discussions on a

case-specific situation is a model protocol coordination conference call that the RO and co-regulating agency may invite the MCH to participate. During such a call, the MCH may offer advice and help clarify requirements of Section 3.2.2 of the *Guideline* on what would be necessary to appropriately justify the use of an alternative model or analytical technique in a regulatory application. However, the participation by and advice offered during this conversation does not constitute the MCH formally being engaged in a review. Rather, these occasions should be viewed as opportunities for the MCH to gain situational awareness of a particular unique situation, interrelated to the previous discussion in Section 2.2 above, that may eventually result in formal engagement of the MCH by the RO and to provide additional guidance to the RO and co-regulating agency and indirectly to the representatives of the new or modifying source on developing a technically feasible alternative model or analytical technique justification. Often, these early opportunities for technical collaboration between the RO, co-regulating agency, representatives of the new or modifying source, and MCH will significantly reduce the amount of time that the RO needs to develop their position on a case-specific application and, subsequently, the amount of time that the MCH requires to review the formal RO concurrence request.

4.2 Review of Alternative Models and Analytical Techniques

The *Guideline* provides criteria in Section 3.2.2 that allows the Regional Administrator with consultation of the MCH to approve the use of alternative models or analytical techniques not specifically recommended in the *Guideline* when it is determined: (1) that a preferred air quality model is not appropriate for the particular application; (2) that a more appropriate model or technique is available and applicable; or (3) that the *Guideline* does not require a specific

technique.

The RO should first develop a position on the proposed application of the alternative model or analytical technique and substantiate that position with its own thorough appropriate analysis before formally requesting review by the MCH. Consistent with the example shown in Appendix D, it is vitally important that the RO provide the MCH with: (1) a project overview; (2) background information on the particular alternative model or analytical technique being proposed; (3) key aspects of how the justification provided by the co-regulating agency and facility fulfill the requirements of Section 3.2.2 of the *Guideline*; (4) additional analysis performed by the RO to support their proposed regulatory action; (5) a conclusion with the RO's recommended action; and (6) all pertinent information relative to the alternative model or analytical technique and its application provided by the co-regulating agency and/or facility.

This information sharing should be accomplished in the RO's formal concurrence request memorandum or an attached technical report to this memorandum (reference Appendix D for a comprehensive example of a RO concurrence request memorandum). However, the RO should reach out to the MCH at the start of their evaluation of a proposed alternative model or analytical technique. Similar to a pre-application or modeling protocol meeting that discussed in Section 9.2.1 of the *Guideline*, early engagement with the MCH promotes broad situational awareness within the Agency, ensures that the RO does not expend unnecessary resources on their evaluation, avoids the applicant and/or co-regulating agency developing potentially unacceptable justification material, and promotes timely resolution of the alternative model or analytical technique request. Through early engagement, milestones and suitable timelines for all parties involved can be discussed and agreed upon. Additionally, the RO is strongly encouraged to share a draft form of their concurrence request and supporting technical evaluation with the MCH in

advance of formal submittal such that additional collaboration on specific issues can occur prior to the formal review by the MCH.

Formal requests to the MCH for review of alternative models and analytical techniques should be sent by the ROs directly to:

George Bridgers, Model Clearinghouse Director
Air Quality Modeling Group, Air Quality Assessment Division
Office of Air Quality Planning and Standards
109 T.W. Alexander Drive
U.S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711.

Upon receipt of a formal concurrence request from a RO, the MCH first attempts to conduct the review of the RO's request within its own resources. The basis for the review is the requirements and recommendations set forth in the *Guideline*, available relevant guidance, historical records of previous analogous cases and MCH reviews, and the technical expertise of AQMG personnel. If any regulatory policy issues or proposed deviations from Agency policy are also interrelated to the RO request, then the MCH will engage with the appropriate personnel in the AQPD and OGC. As the need arises, the MCH may call upon other EPA personnel, *e.g.*, other ROs, the Office of Research and Development (ORD), or the Office of Transportation and Air Quality (OTAQ), with specific expertise to assist in resolving complex issues or in the review of all or parts of the proposed alternative model or analytical technique. If the issue(s) involved are of broad national significance, it may be necessary to obtain a consensus of all the ROs before the MCH finalizes a response.

The MCH makes every effort to provide a written response to the RO within four weeks of receipt of the formal concurrence request memorandum. As discussed above, early

engagement with the MCH at the start of the RO evaluation increases the situational awareness of the issues and will further expedite the review by the MCH. The primary exceptions to the four-week estimated timeframe are those cases where additional collaboration is required with other EPA personnel or a consensus opinion of all the ROs is needed.

Again, it should be remembered that the MCH is an internal service within the EPA and primarily provided to the ROs. The MCH does not interact directly with the co-regulating agencies or with industrial stakeholders on case-specific situations, since this would compromise the MCH's function as an independent, second-level reviewer in the process of approving alternative models and analytical techniques as defined in Sections 3.2 and 3.3 of the *Guideline*. However, there are circumstances where it is important for the MCH, Regional, Office, co-regulating agency, and representatives of the industrial facility in question to collaborate on a specific case. In such circumstances, the co-regulating agency and respective RO should closely work together to arrange a mutually agreed-upon flow of information and/or conversations.

4.3 Review of Regulatory Packages and Policy Issues

All **Federal Register** action packages (advanced opinion, proposal or final) or NSR/PSD questions on specific applications submitted to OAQPS are screened by MCH for consistency with current modeling guidance. If significant deviations from guidance are identified, these issues are then discussed within the MCH and with the appropriate personnel in the AQPD and OGC. (Where there are significant deviations from guidance, the RO should have presented a position, with appropriate justification, in the **Federal Register** package supporting either approval or disapproval.) In all cases final resolution of the regulatory action rests with AQPD, with input from the AQAD and OGC. The MCH, if at all possible, reaches a decision on the

acceptability of the approach being utilized in the regulatory action within the normal review period for SIP processing. If particularly complex issues are involved, which require additional evaluation and more lengthy coordination with personnel outside the MCH, the MCH coordinates with the AQPD on an extension to the regular review period in accordance with the "SIP Processing Manual."[4] All significant decisions involving modeling in regulatory packages are included in the MCHISRS database, presentations at the Regional, State, and Local Modelers' Workshops and/or Conferences on Air Quality Models, and the Model Clearinghouse Annual Reports.

4.4 Documentation and Communication of Case-Specific Reviews

As discussed above in Section 2.3, one of the three primary functions of the MCH is the communication of decisions. Whether the MCH is engaged in the review of alternative models or analytical techniques for specific applications or screening regulatory packages/issues for adherence to modeling policy, there is a formal documentation process that the MCH adheres.

First, the MCH develops a concurrence or response memorandum on all reviews of proposed regulatory actions and provide it to the requesting RO along with any additional technical basis documentation deemed necessary to support the EPA's decision. An electronic carbon copy of the MCH concurrence or response memorandum and associated supporting material is shared via email to all of the Regional Office Air Program Managers and appropriate Regional Office Modeling Contacts. As mentioned previously, this email is subsequently shared by the ROs with their respective co-regulating agencies, as appropriate. A notice of the MCH formal action is also be placed prominently on the EPA's SCRAM website.

All documentation related to any MCH formal action are archived in the MCHISRS

database. A case-specific record is created to which all material associated with the MCH's review is entered. This includes the RO concurrence request memorandum along with the technical basis or justification material from the applicant and/or co-regulating agency seeking the approval of an alternative model or analytical technique and also includes the MCH concurrence or response memorandum along with any additional technical basis documentation deemed necessary to support the EPA's decision. The case-specific MCHISRS record also includes key words and other tracking information such that the MCHISRS database is broadly searchable for relevant issues by the MCH, ROs, co-regulating agencies, and regulatory air quality modeling community.

Annually, the MCH is recommitting to producing a Model Clearinghouse Annual Report. This report summarizes significant decisions that have been made and the circumstances involved over the previous year and also includes relevant details from any new rules and regulations. Additional information gleaned from the annual Regional, State, and Local Modelers' Workshop, the Conference on Air Quality Models (if conducted in that year), and other interactions with the co-regulating agencies or industrial stakeholders will be included in the Model Clearinghouse Annual Report, as appropriate.

Finally, as needed, the MCH will continue to provide other communications and assistance services that have been previously found useful. These include (but are not limited to): periodic visits to ROs, often during Region specific modeling meetings and workshops, to exchange information and maintain the rapport of the MCH; status reports and presentations on the MCH and its activities for stakeholder meetings and conferences; and identification of areas where modeling guidance is lacking or ambiguous and make recommendations for clarifying these problems.

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5. References

1 U.S. Environmental Protection Agency, 2016. *Guideline on Air Quality Models*. 40 CFR Part 51 Appendix W. https://www3.epa.gov/ttn/scram/guidance/guide/AppendixW_2016.pdf.

2 U.S. Congress, 1990. *Clean Air Act Amendments of 1990*. 104 Stat. 2468, P.L. 101-549.

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Appendix A: The *Guideline,* Section 3.3

The establishment and purpose of the MCH is formally declared in Section 3.3 of the *Guideline*. For convenient reference in the context of this Operational Plan, the text of the *Guideline,* Section 3.3 is provided:

3.3 *EPA's Model Clearinghouse*

a. The Regional Administrator has the authority to select models that are appropriate for use in a given situation. However, there is a need for assistance and guidance in the selection process so that fairness, consistency, and transparency in modeling decisions are fostered among the EPA Regional Offices and the state, local, and tribal agencies. To satisfy that need, the EPA established the Model Clearinghouse to serve a central role of coordination and collaboration between EPA headquarters and the EPA Regional Offices. Additionally, the EPA holds periodic workshops with EPA Headquarters, EPA Regional Offices, and state, local, and tribal agency modeling representatives.

b. The appropriate EPA Regional Office should always be consulted for information and guidance concerning modeling methods and interpretations of modeling guidance, and to ensure that the air quality model user has available the latest most up-to-date policy and procedures. As appropriate, the EPA Regional Office may also request assistance from the EPA's Model Clearinghouse on other applications of models, analytical techniques, or databases or to clarify interpretation of the *Guideline* or related modeling guidance.

c. The EPA Regional Office will coordinate with the EPA's Model Clearinghouse after an initial evaluation and decision has been developed concerning the application of an alternative model. The acceptability and formal approval process for an alternative model is described in section 3.2.

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Appendix B: Model Clearinghouse Points of Contact

Model Clearinghouse Points of Contact

Revised: December 15, 2016

Model Clearinghouse Primary Contacts (AQMG, AQAD)

Name	Responsibility	Telephone	Email
George Bridgers	Model Clearinghouse Director	919-541-5563	bridgers.george@epa.gov
Tyler Fox	AQMG Leader	919-541-5562	fox.tyler@epa.gov
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** Most Regional Offices have several modeling contacts, but only the lead Regional Modeling Contacts are listed here.*

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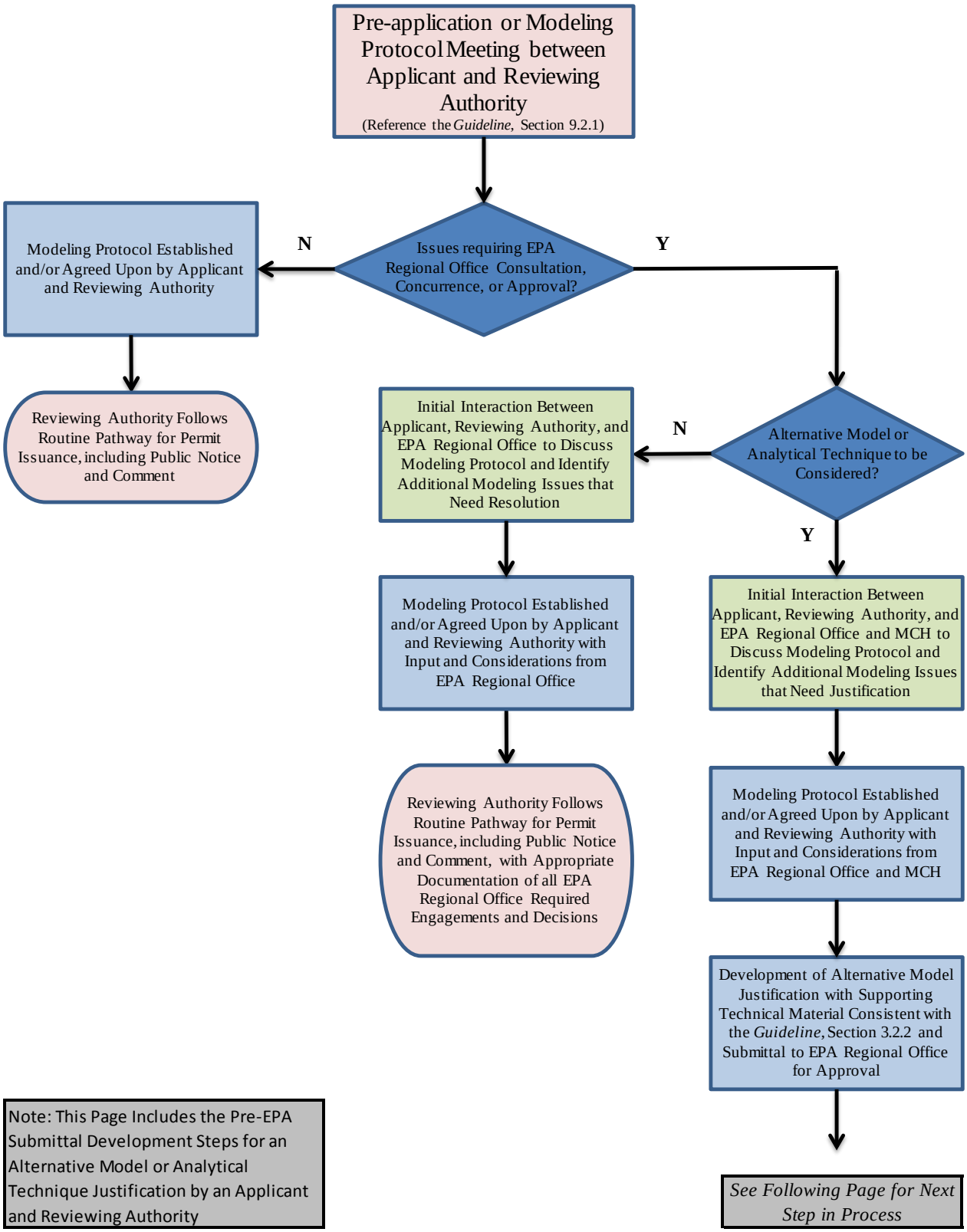
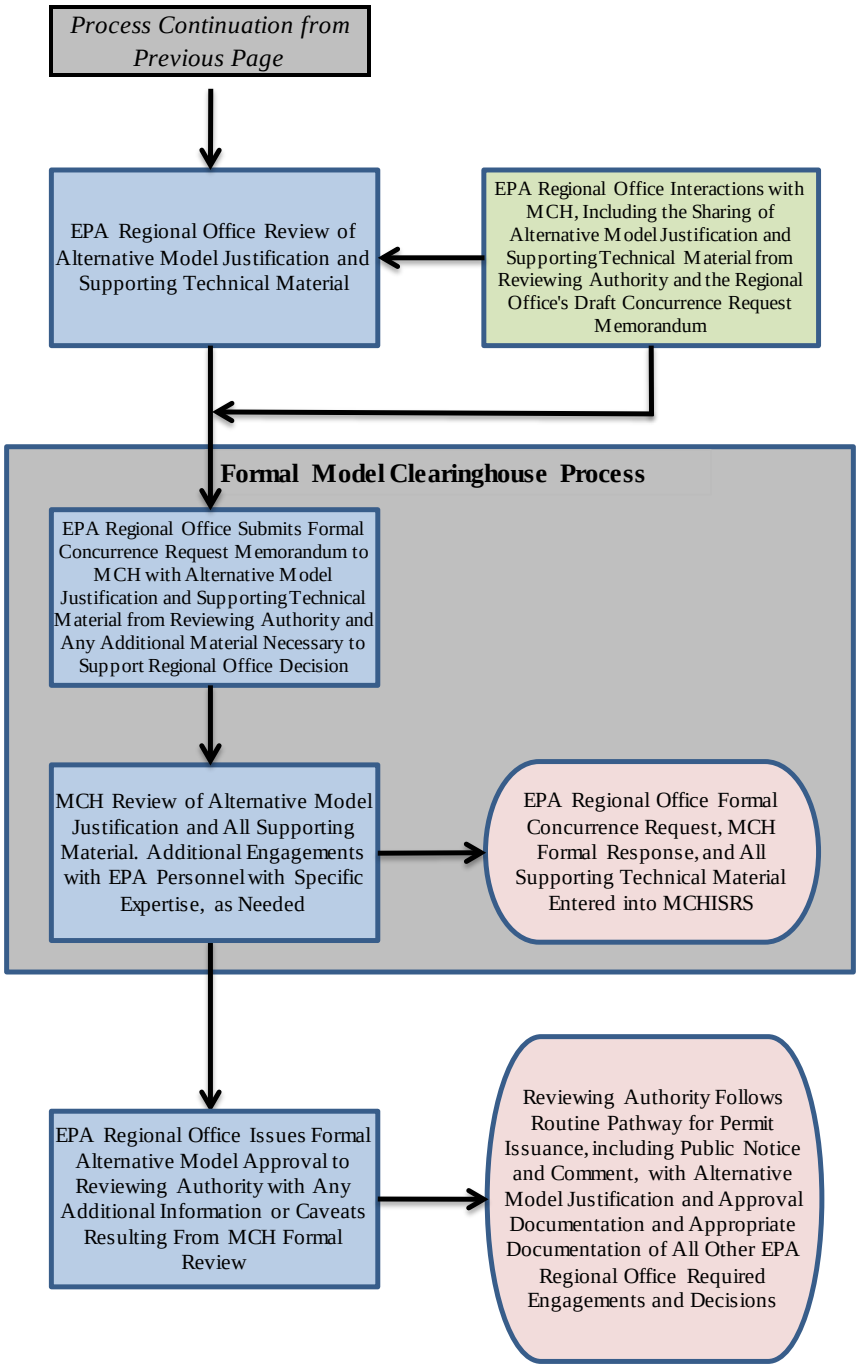
Appendix C: Conceptual Flow Diagram for Alternative Model Approvals





Note: This Page Includes the Post-EPA Submittal Approval Steps for an Alternative Model or Analytical Technique Justification by the EPA Regional Office and MCH

Appendix D: Example Model Clearinghouse Request/Response Memoranda

This appendix contains an example of a concurrence request on a proposed regulatory action by a RO and the resulting MCH response. Both the request and the response are formal memoranda signed by the appropriate personnel for this situation. This example is provided for reference of a MCH formal action and the types of information that should be included in the memoranda from the RO and MCH. The particular facility and alternative model justification in this example is not significant and included only for illustrative purposes.

Page D-2 is the RO concurrence request memorandum. Pages D-3 through D-9 are a technical report developed by the RO to provide the MCH with a project overview, background information on the particular alternative model or analytical technique being proposed, key aspects of how the justification provided by the co-regulating agency and facility fulfill the requirements of Section 3.2.2 of the *Guideline*, additional analysis performed by the RO to support their proposed regulatory action, and a conclusion with the RO's recommended action. Pages D-10 through D12 are the MCH concurrence response memorandum.

It should be noted that additional information from the co-regulating agency and facility were attached to the RO request, including the facility's full modeling report, but are not include here for space/printing conservation purposes. Anyone wishing to review these additional materials can search the MCHISRS database, record 16-I-01, on the EPA's SCRAM website at https://www.epa.gov/scram/air-quality-model-clearinghouse.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
5 POST OFFICE SQUARE, SUITE 100
BOSTON, MA 02109-3912

APR 0 7 2016

MEMORANDUM

SUBJECT: Request to approve the use of the beta alternative formulation of surface friction velocity (u_*) non-regulatory default option in AERMET version 15181; alternative refined model demonstration

FROM: Leiran Biton, Physical Scientist
Air Permits, Toxics and Indoor Programs Unit, Air Programs Branch, Region 1

TO: George Bridgers, Director of Model Clearinghouse
Air Quality Modeling Group, Office of Air Quality Planning and Standards

THRU: David Conroy, Chief
Air Programs Branch, Region 1

EPA Region 1 seeks concurrence from the Model Clearinghouse on approval of the use of the beta alternative formulation of surface friction velocity (u_*) non-regulatory default option (ADJ_U*) in AERMET version 15181. EPA Region 1 has concluded that the second condition of Section 3.2.2(b) of Appendix W has been satisfied by the submittal from the New Hampshire Department of Environmental Services (DES), and would like to approve the use of the beta ADJ_U* option (either with or without the Bulk Richardson option) in AERMET version 15181 as the meteorological preprocessor for AERMOD version 15181 for this modeling. In support of this requested approval, we have prepared a technical report that reviews the DES submittal and documents our basis for decision-making. The technical report is attached for your reference.

Thank you for your careful attention to this matter and we look forward to your response. Please feel free to contact me at 617-918-1267 with any questions about this request or the attachment.

Attachment

Technical Report

Evaluation of the request for use of the beta adjust u_* option in AERMET for modeling for the 2010 1-hour sulfur dioxide standard at Schiller Station in Portsmouth, New Hampshire

Leiran Biton
EPA Region 1 Modeling Contact
April 7, 2016

The New Hampshire Department of Environmental Services (DES) submitted a request for the use of an alternative model to the U.S. Environmental Protection Agency (EPA) Region 1 Office in a letter dated March 18, 2016. DES proposed to use an alternative formulation for the surface friction velocity (u_*) in the AERMET meteorological preprocessor (version 15181) to the AERMOD model (version 15181) in its modeling of Schiller Station, operated by Eversource Energy, LLC, in Portsmouth, New Hampshire. Specifically, DES has submitted the request for the adjusted surface friction velocity technique, known as the beta adjust u_* option, for modeling intended to demonstrate compliance with the 2010 1-hour sulfur dioxide (SO_2) National Ambient Air Quality Standards (NAAQS). The modeling demonstration would apply to the Response to Order on Title V Petition VI-2014-04 regarding the issuance of a proposed Title V Operating Permit TV-0053 for Schiller Station, and also to commitments made by DES in its January 5, 2016 submittal under the SO_2 Data Requirements Rule.

This technical report provides an assessment of the submitted request for use of the beta adjust u_* option in AERMET and describes the rationale for a recommendation regarding the request. The submittal by DES included an attachment prepared by Exponent Inc. on behalf of Eversource Energy. DES has explicitly stated that it concurs with the request for use of the beta adjust u_* option in AERMET as an alternative model; therefore, this report treats the Exponent attachment as DES's own justification. The DES submittal is attached to this report.

Project overview

Schiller is a 150-MW capacity wood and fossil fuel-fired electricity generating facility located in Portsmouth, New Hampshire. Schiller Station consists of three 50-MW capacity electric utility steam boilers, two of which (Units 4 and 6) burn coal or oil and one of which (Unit 5) burns biomass. Schiller is owned and operated by Eversource Energy, LLC, previously known as Public Service of New Hampshire. Emissions from Schiller are released through three tall stacks—one per boiler—ranging approximately 68-70 m in height at elevations of 6.4-7.3 m. The temperature of stack releases ranges from 431 K (316 °F) to 450 K (350 °F). Stack and emissions specifications are described in Table 1 of the DES submittal.

Terrain in the immediate area (within around 10 km) around Schiller is simple, consisting of water bodies and low-elevation, flat or gently rolling features. Beyond the immediate area, terrain becomes increasingly complex, with complex terrain features (i.e., features with elevations above the height of the stack) beginning at around 16 km from the source. Specifically, Mount Agamenticus (elevation 211 m; about 16 km from Schiller) in York, Maine

is the nearest complex terrain feature, and some further features in the 50 km square domain around the source are even higher in elevation.

In addition to Schiller, it is anticipated that Newington Station will be included in the modeling. Newington, located within 1 km of Schiller, is a natural gas and oil-fired electricity generating facility with rated capacity of approximately 400 MW and stack height of 125 m.

Based on these project details, the releases from Schiller and Newington are well characterized as buoyant plumes emitted from tall stacks in a region with complex terrain.

Background on default surface friction velocity and the beta adjust u_* option

Starting in version 12345, AERMOD has included non-regulatory default options (identified with the "beta" keyword) to address concerns regarding model performance under low wind speed conditions. Specifically, in the current formulation, the model routinely underpredicts u_* during stable boundary layer conditions under low wind speeds. The u_* parameter is key in determining the height of mechanical mixing. Therefore, underestimating u_* results in underestimates in mixing layer height, leading to overestimates in concentrations in the mixed layer.

The beta adjust u_* option, designated by the beta ADJ_U* keyword introduced in version 12345 of the AERMET meteorological processor and augmented in subsequent versions, is one of the tools available to address these concerns. The beta adjust u_* option has been developed based on peer-reviewed work by Qian and Venkatram (2011) and Luhar and Rayner (2009), as described in the AERMOD Model Formulation Document Addendum (EPA 2015a). Additional non-regulatory default beta options—specifically LOWWIND1, LOWWIND2, and LOWWIND3—are also available as keywords in the AERMOD model. However, DES has requested only the use of the beta adjust u_* option for this modeling analysis, so the beta low wind options are not discussed further in this report.

EPA has conducted model performance evaluations of the beta adjust u_* option and the current regulatory default AERMOD system (EPA 2015b). The evaluations were performed against results from monitoring field studies to investigate diffusion under low wind speed conditions, and against results from a field study with a tall stack in complex terrain where stable and low wind speed conditions can also be important. The results of these evaluations indicated significant overprediction using the regulatory default AERMET/AERMOD, and better performance—though still somewhat overpredicting—using the beta adjust u_* option. Based in part on the results of these evaluations, EPA has proposed to designate the beta adjust u_* option as the default regulatory formulation in AERMET for estimating u_* under stable conditions with low wind speeds in the Guideline on Air Quality Models (i.e., 40 CFR Part 51 Appendix W; hereafter, Appendix W).[1]

[1] Revision to the Guideline on Air Quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches To Address Ozone and Fine Particulate Matter; Proposed Rule. Federal Register, Vol. 80, No. 145, 45340-45387, 2015 July 29.

Process for approving an alternative model

According to Section 3.2.2(a) of Appendix W, the EPA Regional Office is responsible for determining the acceptability of a model. Specifically,

> Where the Regional Administrator finds that an alternative model is more appropriate than a preferred model, that model may be used subject to the recommendations of this subsection. This finding will normally result from a determination that (1) a preferred air quality model is not appropriate for the particular application; or (2) a more appropriate model or analytical procedure is available and applicable.

Section 3.2.2(b) of Appendix W goes on to describe the approval process for an alternative model:

> There are three separate conditions under which such a model may normally be approved for use: (1) If a demonstration can be made that the model produces concentration estimates equivalent to the estimates obtained using the preferred model; (2) if a statistical performance evaluation has been conducted using measured air quality data and the results of that evaluation indicate the alternative model performs better for the given application than [the preferred model]; or (3) if the preferred model is less appropriate for the specific application, or there is no preferred model.

DES has indicated its intention to use the second condition as its justification, subject to the procedures for determining the acceptability of the alternative model using "established procedures and techniques" as described in Section 3.2.2(d) of Appendix W. This subsection also states that preparation and implementation of the evaluation protocol should be acceptable to the state regulatory agency and EPA, as well as the regulated entity. EPA Region 1 held a conference call on March 2, 2016 with representatives from the EPA Model Clearinghouse, DES, Eversource Energy, and Exponent Inc. to discuss the process for demonstrating appropriateness of an alternative model. This discussion satisfied the requirements for state, EPA, and industry participation in the development of an evaluation protocol described in Section 3.2.2(d) of Appendix W.

In December 2015, EPA issued a memorandum that clarified the approval process for non-regulatory beta options in AERMOD that have been proposed as regulatory options in the proposed revision to Appendix W (EPA 2015c). This memorandum confirmed that the use of all non-default beta options, including the beta adjust u_* option, in regulatory modeling must receive EPA Regional Office approval.

In response to a request for the use of the beta adjust u_* option by the Alaska Department of Conservation (ADEC) to characterize air quality resulting from the Donlin Mine, EPA Region 10 approved the request based on demonstration supplied by ADEC and the relevance of the model evaluations described in the previous sections (EPA 2015d). In its approval, EPA Region 10 supplied additional analysis of the influence of adjust u_* on other meteorological parameters. This analysis showed relatively moderate impacts on parameters for power plant sources compared to the effects on sources with lower release heights. Subsequently, the EPA Model Clearinghouse concurred on that approval and indicated that the justification was well-reasoned,

thoroughly documented, and demonstrated that the beta adjust u_* option performed better than the regulatory default option for that application (EPA 2016).

Statistical performance evaluation

The DES submittal cites several published statistical analyses as the basis for justifying the use of the beta adjust u_* option in the Schiller modeling. Specifically, DES presents information from Paine et al. (2015) and EPA model evaluation studies presented at the 11th Conference on Air Quality Modeling,[2] specifically the Cordero Rojo surface coal mine fugitive dust study, the 1974 NOAA Oak Ridge study for low-level release, and the 1974 NOAA Idaho Falls tracer study for low-level release.

The Cordero Rojo, Oak Ridge, and Idaho Falls studies are less directly applicable to the Schiller scenario because the release heights from those studies are low-level, whereas Schiller (and Newington) release buoyant plumes from tall stacks. The evaluation for the Gibson Generating Station presented in Paine et al. (2015) is similarly limited in relevance to Schiller because of the flat terrain of the area around Gibson.

The Lovett evaluation database, which is not explicitly mentioned by DES, but which is presented in the most recent AERMOD model evaluation document (EPA 2015b), provides a more comparable scenario to that of Schiller. The Lovett database consists of 2,595 hours of ambient SO_2 monitoring data from 12 monitors near the Lovett Power Plant, located in a rural area with mountainous terrain along the Hudson River in New York. Some of the monitors had elevations above the release height of Lovett's 145 m stack, and at distances from the source of 2-3 km. For the Lovett evaluation database, correlation is better with the beta adjust u_* option than the regulatory default option at relevant concentrations.[3] In fact, the relevant modeled concentrations at Lovett are actually higher using the beta adjust u_* option compared with those using the regulatory default. This suggests greater modeled impacts using the beta adjust u_* option at near-source locations (i.e., within several kilometers) than at more remote locations, where impacts have been shown in the DES submittal to be lower. Therefore, it is likely that impacts at nearer source impacts would be higher using the beta adjust u_* option.

The Mercer County, ND evaluation described by Paine et al. (2015) is also highly relevant to the Schiller scenario. The Mercer County database consists of approximately four years of SO_2 monitoring data focused on two facilities in a region with complex terrain, and includes three monitors at elevations near or above some stack release heights at distances of nearly 10 km. For one of these monitoring locations (DGC#17), modeled concentrations were significantly closer to monitored values, though still somewhat overpredicting, with the use of the beta adjust u_* option as compared to the regulatory default options; predictions at other monitoring locations did change with use of the beta adjust u_* option for this study.

[2] https://www3.epa.gov/scram001/11thmodconf.htm

[3] Because the form of the NAAQS is based on the three-year average of 99th percentile of daily maximum SO_2 concentrations, the 5-year average 4th highest modeled SO_2 concentration is the relevant comparison against the NAAQS. This process is described in detail in an EPA memorandum on the subject (EPA 2010).

At Schiller, the relevant distances for impacts in complex terrain are 16 km or greater away from the source. Though there is no evaluation database analysis for impacts in complex terrain at this distance that match the precise characteristics of the Schiller scenario, the analyses cited above provide a sufficient basis for making an assessment regarding the adequacy of the statistical performance evaluation. Better model performance in the near field may translate into better model performance at longer distances. However, no conclusive model performance evaluation was available at the time of this review to confirm this notion, and this represents a data gap in evidence provided for this alternative model justification.

Additional site-specific evidence

The DES submittal indicates that the regulatory default options in AERMET version 15181 and AERMOD version 15181 lead to controlling concentrations at receptors on Mount Agamenticus at elevations from 129 m to 147 m. These concentrations occur during low-wind speed and stable boundary conditions. Table 2 of the submittal indicates that u_* values are very low (0.033-0.077 m/s) for hours during which concentrations at the top ten receptors in the default modeling are highest. At those receptor locations, using the beta adjust u_* option increases 5-year average u_* values 62-96% (to 0.104-0.114 m/s). As a result of the increase in u_* from the use of the beta u_* option, 5-year average 4th highest concentrations at these receptors dropped by 57-64%, from 93.9-100.6 µg/m^3 to 35.4-41.0 µg/m^3.

Significantly, the use of the beta adjust u_* option shifted the controlling concentration from the more remote ten receptors at Mount Agamenticus to a cluster of ten receptors in Eliot, Maine, directly across the Piscatequa River within 1 km from Schiller (see Table 4 and Figure 3 in the submittal). At these receptors, there were insignificant changes in u_* and relevant concentration values between the regulatory default and alternative modeling configurations; this indicates that stable low wind speed conditions are not controlling at these receptors. For these ten receptors, the 5-year average u_* values are 0.62-0.76 m/s for relevant concentrations, which range from 51.4 to 54.1 µg/m^3.

The analysis in the DES submittal indicates that the beta adjust u_* option only has significant effects in the modeling domain at receptors with elevations at or above the height of release. Specifically, the analysis showed that stable conditions with low wind speeds are the controlling meteorological conditions for receptors with elevations above 85 m, and that concentrations at these receptors are often lower by more than 50% under the beta adjust u_* formulation than under the regulatory default formulation. For receptors below 85 m, in the analysis, there is little to no change in concentration indicating that stable conditions with low wind speeds are not controlling at elevations below the release height.

In addition to the analysis of the effects from terrain height on controlling meteorological conditions as described above, the DES submittal included a comparison of the results from the two modeling techniques at the locations of nearby monitoring stations. The two monitoring locations are the Pierce Island monitor, about 4 km from Schiller, and a temporary monitor at Sawgrass Lane in Eliot, Maine, about 2 km from Schiller. The submitted analysis compares the results of the model with regulatory default options versus with the beta adjust u_* option at these monitoring sites using Q-Q plots. The comparison presented in the submittal indicate nearly identical predictions at monitor locations at values above 10 µg/m^3 for both monitoring sites. A

direct model to monitor comparison would provide an opportunity for direct model performance evaluation against observations; however, the submitted analysis suggests that such a monitor-to-model comparison would show nearly identical performance for each model.

The submittal included references to additional documents (i.e., Connors and Paine 2014, Warren 2016), but this technical report did not rely on the analyses discussed in those documents because they are not peer reviewed. The analyses discussed in this report comprise a sufficient basis for determining the appropriateness of the beta adjust u_* option for this modeling scenario without these additional citations.

Conclusions and recommendations

Based on the strength of the Lovett analysis available from EPA (2015b) and the Mercer County analysis described in Paine et al. (2015), and in light of the performance of the beta adjust u_* option as documented in other studies described by EPA (2015b, 2015d), and the additional case-specific evidence presented in the DES submittal, the statistical evaluation is sufficient to demonstrate that AERMET version 15181 with the beta adjust u_* option is superior to the regulatory default AERMET version 15181 for application in the Schiller Station modeling analysis.

The condition of Section 3.2.2(d) of Appendix W in 40 CFR 51 has been adequately addressed for justifying the use of the beta adjust u_* option (with or without the Bulk Richardson option) in AERMET version 15181 for the Schiller modeling for 1-hour SO_2 under the Data Requirements Rule and for the modeling demonstration in Response to Order on Title V Petition VI-2014-04.

References

EPA. 2010. Memorandum: Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard. From Tyler Fox, EPA Air Quality Modeling Group to EPA Regional Air Division Directors. August 23, 2010.

EPA. 2015a. AERMOD Model Formulation Document Addendum. Published online June 30, 2015.

EPA. 2015b. Addendum: User's Guide for the AMS/EPA Regulatory Model – AERMOD. September 2004, updated June 2015. EPA-454/B-03-001. Appendix F. Evaluation of Low Wind Beta Options.

EPA. 2015c. Memorandum: Clarification on the Approval Process for Regulatory Application of the AERMOD Modeling System Beta Options. From Richard A. Wayland, EPA Air Quality Assessment Division Director. December 10, 2015.

EPA. 2015d. Memorandum: Surface Friction Velocity (u_*) Non-Default/Beta Option in AERMET Version 15181; Alternative Refined Model Demonstration. From Herman Wong, EPA Region 10 Modeling Contact/Regional Atmospheric Scientist to Alan Schuler, ADEC Engineer. October 20, 2015.

EPA. 2016. Memorandum: Model Clearinghouse Review of the Use of the ADJ_U* Beta Option in the AERMET Meteorological Processor (version 15181) for the Donlin Mine Compliance Demonstration. From George Bridgers, EPA Model Clearinghouse Director to Janis Hastings, ADEC Office of Air, Waste, and Toxics Acting Director. February 10, 2016.

Luhar AK and Rayner KN. 2009. "Methods to Estimate Surface Fluxes of Momentum and Heat from Routine Weather Observations for Dispersion Applications under Stable Stratification." *Boundary-Layer Meteorology*. 132:437-454. DOI 10.1007/s10546-009-9409-z.

Qian W and Venkatram A. 2011. "Performance of Steady-State Dispersion Models Under Low Wind-Speed Conditions." *Boundary-Layer Meteorology*. 138:475-491. DOI 10.1007/s10546-010-9565-1.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

MEMORANDUM

APR 2 9 2016

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

SUBJECT: Model Clearinghouse Review of the Use of the ADJ_U* Beta Option in the AERMET Meteorological Processor (Version 15181) for the Schiller Station Modeling Demonstration

FROM: George Bridgers, Model Clearinghouse Director
Air Quality Modeling Group, C439-01

TO: David Conroy, Chief
Air Programs Branch, Region 1

INTRODUCTION

In response to your April 7, 2016 concurrence request memorandum, the Model Clearinghouse has reviewed Region 1's position on the proposed use of the ADJ_U* Beta option in the AERMET meteorological processor (version 15181) for the Schiller Station energy generating facility (Schiller Station) located in Portsmouth, New Hampshire. As noted in our February 10, 2016 response memorandum to Region 10[1], the ADJ_U* Beta option was incorporated in AERMET to address concerns regarding potential underprediction of the surface friction velocity (u*) during low-wind/stable conditions that could contribute to overprediction of ambient air impacts by the AERMOD dispersion model (version 15181) for some applications. In the case of the Shiller Station energy generating facility, excessive 1-hour SO_2 concentrations on distant terrain, 16km from the source, were projected by the regulatory default version of the AERMOD Modeling System specifically during low-wind/stable conditions when u* values were relatively small. Given this model response, it was appropriate for the ADJ_U* Beta option in AERMET to be considered for this regulatory modeling application.

MODEL CLEARINGHOUSE RESPONSE

Application of ADJ_U* Beta Option in AERMET

Appendix W, Section 3.2.2 provides three different conditions for which an alternative model is approvable. These three conditions are briefly summarized as:

1) The alternative and preferred model provide equivalent estimates;
2) The alternative model outperforms the preferred model when comparing the results to actual air quality data; or

[1] http://cfpub.epa.gov/oarweb/MCHISRS/index.cfm?fuseaction=main.resultdetails&recnum=16-X-01

3) The preferred model is less appropriate or there is no preferred model for the given scenario.

In reviewing the April 7. 2016 concurrence request memorandum from Region 1 and the attached material from the New Hampshire Department of Environmental Services (NHDES), it is noted that Region 1 and NHDES were following the second condition[2] for the basis of this alternative model approval. The Model Clearinghouse concurs that a well-reasoned justification was thoroughly documented and demonstrates that the ADJ_U* Beta option in AERMET selected for the Schiller Station modeling demonstration performs better than the default regulatory version of AERMET for the given application, i.e., a tall stack located near complex terrain, where high modeled concentrations are likely to occur under low wind, stable conditions. In this case, an isolated terrain feature, Mt. Agamenticas, is located about 15km north-northeast from the Schiller Station with a peak elevation about 200m above the stack base, with relatively flat terrain between the source and the mountain.

We appreciate the efforts of Region 1 in the Model Clearinghouse concurrence request memorandum to highlight the additional evaluation databases, namely the Lovett[3] and Mercer County, ND[4], that more directly represent the Schiller Station and surrounding terrain circumstances. In both cases, the Lovett and Mercer County, ND evaluations demonstrate a significant improvement of the modeled concentrations with the use of the ADJ_U* Beta option for a facility with tall stacks located near complex terrain, particularly during low wind, stable conditions. Combined with the Qian and Venkatram[5] and the Luhar and Rayner[6] journal article references in the NHDES alternative model submittal that provide a scientific basis for the adjustment to u*, there is a reasonable justification for the application of the ADJ_U* Beta option in the Schiller Station modeling demonstration.

The NHDES alternative model submittal package included an additional source specific model sensitivity and monitor evaluation that is worth noting in our concurrence memorandum. A model sensitivity analysis was performed to further demonstrate the appropriateness and applicability of the ADJ_U* Beta option in the Schiller Station case. The sensitivity analysis indicated that the most critical impacts at receptors on the distant terrain were only occurring at hours with the u* values were substantially low, which is indicative of low wind, stable conditions. These receptors were all at or above the emissions release height at the Shiller Station. The application of the ADJ_U* Beta option resulted in comparable increases in the u*

[2] Appendix W to 40 CFR, Part 51, Section 3.2.2.b(2).

[3] EPA's Addendum: User's Guide for the AMS/EPA Regulatory Model – AERMOD. September 2004, updated June 2015. EPA-454/B-03-001. Appendix F. Evaluation of Low Wind Beta Options.

[4] Paine. R., O. Samani. M. Kaplan, E. Knipping and N. Kumar. 2015. Evaluation of low wind modeling approaches for two tall-stack databases", Journal of the Air & Waste Management Association, 65:11, 1341-1353, DOI: 10.1080/10962247.2015.1085924.

[5] Qian, W. and A. Venkatram. 2010. "Performance of Steady-State Dispersion Models Under Low Wind-Speed Conditions." Boundary-Layer Meteorology (2011) 138:475–491 DOI 10.1007/s10546-010-9565-1. Published online December 3, 2010. Accessed August 24, 2015.

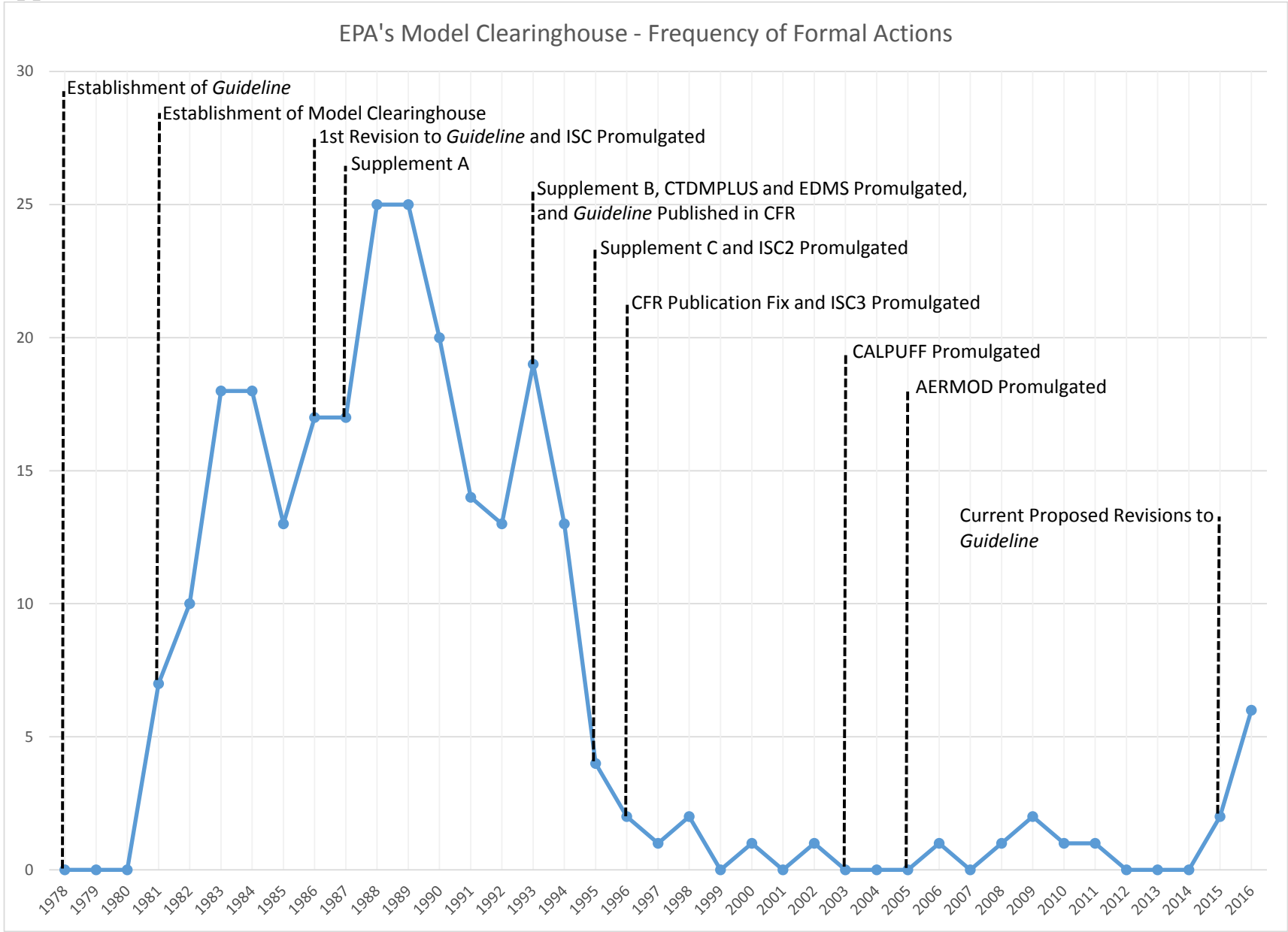
[6] Luhar AK and Rayner KN. 2009. "Methods to Estimate Surface Fluxes of Momentum and Heat from Routine Weather Observations for Dispersion Applications under Stable Stratification." Boundary-Layer Meteorology. 132:437-454. DOI 10.1007/s10546-009-9409-z.

values and reductions to the concentrations at these receptors as demonstrated in the representative Lovett and Mercy County, ND evaluations. For the receptors below the emissions release height, there was little to no change in concentrations with the application of the ADJ_U* Beta option. Additionally for the nearby controlling receptors not associated with the distant terrain feature, the critical impacts were occurring at times of much higher u* values, and these u* values were relatively unchanged with the application of the ADJ_U* Beta option. Therefore, we support that the model sensitivity analysis is providing further evidence of the relevance and appropriateness of the ADJ_U* Beta option for the Schiller Station modeling demonstration.

Lastly, there was indication in our aforementioned February 10, 2016 response memorandum to Region 10 that EPA has concerns that the use of the ADJ_U* Beta option in combination with site-specific meteorological data that includes the sigma-theta and/or sigma-w turbulence parameters may introduce a bias toward concentration underprediction. We continue to evaluate the potential for this concentration underprediction bias and caution anyone considering the use of both the ADJ_U* Beta option and meteorological data that includes the derived sigma-theta and/or sigma-w turbulence parameters in regulatory applications without consultation and approval from the appropriate permitting authority and the respective EPA Regional Office. However, it is noted that the meteorological data used in the Schiller Station modeling application were not site-specific and did not include any derived sigma-theta or sigma-w turbulence information. So, the underprediction bias concern is not a factor in this case.

cc: Leiran Biton, EPA Region 1
Richard Wayland, C304-02
Anna Wood, C504-01
Tyler Fox, C439-01
Raj Rao, C504-01
EPA Air Program Managers
EPA Regional Modeling Contacts

Appendix E: Model Clearinghouse Formal Actions from 1981 to 2016



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United States
Environmental Protection
Agency

Office of Air Quality Planning and Standards
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