

13th Modeling Conference - Session 3

George Bridgers:

Good morning, everyone. I'm going to call this public hearing on the 13th Conference on Air Quality Modeling back to order. Welcome back. It's good to see everybody. I saw quite a few of you last night. Somehow the air quality modeling world took over a pub down the way here. It was really interesting. It was probably -- I was trying to think, what, 10, 20? There are probably about 35 air quality modelers in this restaurant. So, I felt sorry for the staff.

[laughter]

George Bridgers:

If anybody knows the Ron Burgundy movie, there was going to have to be a little bit of a fight for the tables. And I kind of figured a trident was going to show up, and it was pretty fun. But it was a good time and hopefully the security protocols this morning ran a little more smoothly. I think they were a little more attuned to what we were doing and had the nametags all printed out. So, I am glad that it seems that everybody had any issues getting in this morning.

So, today -- the slide there. Today we're transitioning. Yesterday we had a conference session on the Conference. It was the Conference. Today we're going to transition. And the second session is the public hearing to our proposed rule. Today, I am the public hearing officer and the master of ceremonies. My name is George Bridgers. I'm with the U.S. EPA. I am the director of EPA's model clearinghouse, and I'm working the Air Quality Modeling Group within the Office of Air Quality Planning Standards.

The presentations that we're going to hear over the next session are going to be EPA only presentations. And these presentations are going to present the different pieces of our proposed rule. The representatives will present on their specific areas, and they'll need to identify themselves, have to stick a little closer to that guys today because this is more formal than yesterday. We will not be doing any question and answers because this is a public hearing. If you do have questions or you do have comments, then we ask that you submit them to the docket for the public rule. The docket link is here, and later in the morning I will have a presentation very specific on how you can offer public comments. It's the same information that's in the Preamble too.

It does look like -- I think the news was pointing to the fact that we may avert the government shutdown. So, with that said, I think the comment period will hold at December 22nd. I had some questions yesterday in my mind that if we did have a government shutdown and we had to end up delaying or extending the comment period. But we're most likely not going to have to do that, but we will stay tuned. Bigger things have happened in the last minute and it is not the point break.

So, let me get to my first presentation. I will be the first presentation George Bridgers presenting on an overview of the proposed rule. So, a lot of the slides that you're going to see in this next session -- I apologize. Many of you saw them yesterday, or at least pieces of them yesterday, or at least this particular presentation. But we felt that it was appropriate yesterday to give a teaser

of the rule for those. We have a few [new] people that are here today. But because this is the public hearing for the rule, I do need to go back through the slides very briefly. So, *Guideline on Air Quality Models*. Hopefully, most of the people in the room, most of the people who will be reading the transcripts are familiar with what the *Guideline Air Quality Models* is or are. It's Appendix W Title 40 CFR Part 51. We refer to it as the *Guideline*. We also refer to it as Appendix W.

We have some other names for it, but those are generally the names that we use externally. I've heard it called the modeling bible. I probably wouldn't go so far as calling it that. It is the EPA's regulatory document to which the preferred models are described and promulgated. Also, their modeling techniques, requirements, and recommendations on how to apply those models and then to do compliance demonstrations for many of the regulatory aspects of the air program, notably, NSR/PSD attainment demonstrations. And then there's other aspects with the general and transportation conformity.

The current version and put air quotes around in the slide. It's quotes and I'll do it audibly as air quotes around current version. The version that is in effect at the time of this public hearing is 2017 version. The link is on the screen there. It was proposed -- that particular version was proposed in 2015. It was signed in December of 2016 and delayed, or it was deferred effective date until the middle of 2017 -- until May of 2017.

What we are talking about today is our proposed 2023 version. And we mentioned this yesterday, I'll mention it again today. If there are any regulatory programs, state and locals, federal, tribal that are using the *Guideline*, they should use the 2017 version because the 2023 version is just under consideration. It's just proposed. That being said, any of the recommendations that are in the proposed 2023 version, they want to be faulted as using them as best practices. But if you're going to cite, quote or use in your state government, local government regulations, you should be using the 2017 version.

I used the word preferred earlier. I think everybody in the room will know. Hopefully, those that are reading the transcripts will learn or understand that that's one of the critical pieces of the *Guideline* is that it is the document through the regulation, through the way the EPA specifies our preferred air quality models. That's a pretty important aspect of the *Guideline* because we go through -- arguably, but we go through a rigorous scientific and performance evaluation process. We look at a number of things that's spelled out in Sections 1, 2, and 3 of the *Guideline* of how we go about selecting the preferred model. And also, there's going to need to be an alternative for regulatory application. And then it's promulgated through a rulemaking process much like what we're doing today.

The beauty of this is that one, it maintains consistency. We have models that are out there that are common across the stakeholder community, across the regulatory, local programs and state programs. The other aspect of this, and hopefully this isn't lost on anybody. The importance of having preferred models is you can use them off the shelf. You don't have to re-justify them. We've done that. So, the scientific rigor of the justification has already been done by the agency and then gone through peer review process, through the scientific performance evaluations and then promulgated.

So, you can use it as long as they're using the preferred models in a way that's consistent with our guidance and regulations, they don't have to re-justify the model. If you need to deviate from the path, that's where we have the whole Section 3.2 alternative model of approval process and some of the burden for re-justifying the alternative use of our models. It falls on the person. The burden is on the person or the entities that are trying to use the alternative model. And we approve those as an agency. The Clearinghouse will concur on it. The Regional Office will approve on it. And then once again, you have the backing of the Agency of what you've put forth, meets the requirements that we have. And so, it helps you if there's any things ever litigated.

Within air quality models preferred part of the *Guideline*, which is Appendix A, we have three preferred models. One is the AERMOD Modeling System, one's CTDMPPLUS, and the other is OCD. So, no one to this day, at least I'm not aware of, follows AERMOD, the AMS/EPA modeling -- regulatory modeling system. That's where it has its foundations. CTDMPPLUS is the complex terrain dispersion model, plus algorithms for unstable situations. I don't think I've ever used [unintelligible] for that, but that's news to me, well not news to me, but just don't normally say the plus algorithms for unstable situations part. But anyway, the last model is OCD. It's the offshore coastal dispersion model.

I mentioned this yesterday. Again, it's probably not lost on the room. The AERMOD is our workhorse. It's our preferred model for most of the near-field dispersion about 50 kilometers or less. There are situations where CTDMPPLUS is used for when you have situations where pollutants are impacting terrain above stack height. And then OCD is for overwater applications, at least, currently. The most current release of the AERMOD Modeling System is the version that we released in mid-October, and that is version 23132. It is also the version of the model that is associated with this proposed rulemaking.

But unlike what I said earlier, with the *Guideline*, you should use 2017 versus the 2023 version of the *Guideline*. In this case, the AERMOD release 23132, as will be discussed later this morning, is the current release. It is the release that should be used by state and local applicants or state local programs and applicants. We do have proposed options in this version that are tied with the rulemaking that we'll discuss across the morning. There are beta options there also usable. People are welcome to use the proposed options. They just have to go through the Section 3.2 alternative model process to use them. But again, there'll be slides on that across the morning.

Specific to the rule, we are proposing in our updates to the *Guideline* and our updates to the AERMOD Modeling System three updates, three very specific updates to the AERMOD Modeling System. You'll see this in the presentations that each of the staff will present. There's the incorporation of COARE into the AERMET processor, and that's going to open the door for AERMOD to be able to be used in overwater applications. There are some caveats, but that's just the synopsis.

We're adding a Tier 3 NO₂ option called GRSM, proposing to add, I should say. And we're also proposing to add RLINE as a source type primarily used for mobile sources. I think it's important

to point out that these are additions. There are no subtractions. We're not making any changes to the current version of the model, at least any changes to the options. And so, from the perspective of applicants, if they've already got permits and compliance demonstrations that are in process, they should continue to be able to use the previous version, which was 22112, as long as they looked at the Model Change Bulletin and make assurances to the reviewing authority that there are no substantive changes that bug fixes that would have affected their source types.

Common practice is to continue using the last version of the model, and then run a sensitivity with the new version of the model. But again, we encourage applicants, if they have permits in process, talk to your reviewing authority, talk to your Regional Office and you can work through those issues. We certainly don't want the world to come upended just because we released our annual release of the model.

Another change that we're proposing within the *Guideline*. This is not specific to AERMOD. It's actually specific to the regulatory text. Is that we're refining our recommendations regarding the determination of appropriate background concentrations. We have put together a draft guidance document that is going to be in parallel to the *Guideline*. It's non-binding. It is guidance. And so, it's recommendations and not requirements, but it -- or it parallels the language change that we're making in Section 8.3 to the *Guideline*.

There are a few other little subtle changes that we're also proposing in the *Guideline*. I'll have a presentation on all of the nuts and bolts later this morning, but the -- probably to me the most notable of those sort of kitchen sink catchall, small changes that we're making is we found out from the Federal Printing Office that the no longer allowing us to have appendices within appendices. Evidently, their style guide has been updated.

So, for decades, we've had Appendix A with an Appendix W. And that's Appendix A is where the preferred models -- the regulatory models lived. We're going to have to make a change and call them Addendum A models. We've talked with our Office of General Counsel. We've also worked with our Policy Division. We do not think that this is going to have any domino effect on any other rules. It's just a nomenclature change.

The full title of the rule is at the bottom of the screen here. The rule also was the rule that announced the 13th Conference. So, I'm hoping that many of you are aware of it because you're in the room this morning. We do have a website that is set up. I mentioned this yesterday. This is literally a Cliff Notes version of the Preamble. It steps through in the order, essentially in the order of the Preamble. The most substantive changes to the proposed changes to the *Guideline*. In addition to just having a discussion, it also has the links to the supporting documentation of the supporting studies that are footnoted in the Preamble. So, I would encourage people to spend some time looking at that. I think it's very helpful in addition to the very sort of stoic language that's in the Federal Register. And I've already mentioned the comment period runs through December 22nd.

I included this slide yesterday. I'm including this slide today. This is a slide that's specific to the 13th Conference. You are all here. You're very familiar with why you're here. I use this slide in communications with the state and local agencies, with the National Tribal Air Association in the

weeks between signature of the final rule or the proposed rule, excuse me, and this Conference. And so, I just wanted to make sure it was in the public record that I'd been using this slide. But there's no information that's new here. We're all in here.

I will note, since many of you were here yesterday, and we'll be interested in the presentations that were presented yesterday and today. The link that's on the screen to the 13th Conference there, close to the bottom, as early as late this afternoon, but probably by tomorrow morning, all the presentations from our Tuesday session and today's session of this Conference will be posted. We'll also put all of the presentations in the docket sometime over the next few weeks. With that, I will bring them the first discussion that gets into the technical aspects of what we're doing. Mr. Clint Tillerson, if you do not mind introducing yourself.

Clint Tillerson:

Yeah. So, I'm Clint Tillerson and I'm with the U.S. EPA/OAQPS Air Quality Modeling Group. This is an abbreviated presentation of what I did yesterday just in case there are new people in the room who were not here yesterday. So, there won't be quite the detail. But just so to have it on record, I will not go through the release date and versioning. And I also just realized that I fixed it in yesterday's presentation, but I need to change the day of year here, too.

So, we released version 23132 AERMET and AERMOD on October 23rd, concurrent with the publication of the proposed *Guideline* revisions. This is all repeat really of what George had said. We also released a new version of MMIF, version 4.1. And these were -- the additions to MMIF or updates to MMIF were associated with the proposed updates to Appendix W and the regulatory version of the model. We had bug fixes and enhancements, as we always do. We have some new ALPHA options. I'll mention those. We won't talk about those. You heard about those yesterday.

And then we have proposed formulation updates. I put the links to the model change bulletins to AERMOD and AERMET there. Just for convenience, it links directly to those model change bulletins. And then we also had a few extra items. Just so that you are aware, the AERSCREEN test cases were updated. There was a very minor update. I think there was a file that had been left out that James included and put on a new zip file out there.

The AERMINUTE User's Guide, there was a minor update to that. We updated the sample plot - I mean, the sample run and instructions. It includes AERMAP, AERMET, AERMOD, runs. That is pretty much an overhaul of the sample runs that had not been updated in quite a while. So, I would encourage you, if you are new to the AERMOD Modeling System, to take a look at that. And then we also updated the AERPLOT instructions.

So, really quickly, the new ALPHA options, we won't say much about these because you heard about these yesterday. The aircraft plume rise to characterize aircraft emissions from jet engines. And it involved an extension of the area and volume sources and the parameters that you can put in for those source types. And then the area meander, which you also heard about yesterday. This is adding plume meander to all of the area source types, including AREA, AREAPOLY, AREACIRC and LINE. And it applies the meander formulation used for point and volume sources to the area type sources. And then the highly buoyant plume which relates to buoyant

plumes that penetrate the top of the mixed layer into the stable layer, and I have the reference there to a journal publication.

And then what you'll hear about the next few presentations will be our proposed formulation updates.

And as George said, these are all in the model as beta options. To use them, you must go through the alternative model process, but they are there for you to use if you choose that. So, COARE was added to AERMET. It involved updates to AERMET, AERMOD, and MMIF. James Thurman will present a brief next on the COARE. The update to AERMET and the COARE algorithm being added to that. That's the Coupled Ocean - Atmosphere Response Experiment implemented in AERMET characterizes the marine boundary layer, replaces the standalone AERCOARE program.

And I believe we heard yesterday from George that we're encouraging you, if you request to use the alternative model, normally AERCOARE, you can use AERCOARE or you can use COARE in AERMET as the beta option. The generic reaction set method. You'll hear from Matt Porter about that. That is a new NO_x-to-NO₂ conversion option. It's a Tier 3 screening option. It will be in addition to OLM and PVMRM, which have been in the model for some time.

And then we have the addition of the RLINE source type in AERMOD. James Thurman will also present on that. It is adapted from the research line model developed by the EPA/ORD. It is a source type implemented for local sources specifically, but not exclusively for transportation conformity and hotspot analysis.

George Bridgers:

Thank you, Clint. As Clint mentioned, our next presenter will be James Thurman.

I apologize. You'll have to see the sausage being made here.

Dr. Thurman

James Thurman:

And once again, I'm James Thurman, Air Quality Modeling Group EPA. I'll talk for a few minutes about the implementation of COARE into AERMET. Clint says the [inaudible]. But he talked about what it meant; I can't remember what it was all of a sudden. So, this is the work Chris Misenis and I did to bring COARE into AERMET -- oh, the Coupled Ocean - Atmosphere Response Experiment. So, just an acknowledgements, Jay McAlpine, Region 10. He was kind of the gatekeeper of AERCOARE, and he also helped out with bringing us into AERMET and some of the work we did.

Ramboll [spelled phonetically] U.S. Consulting, they originally had written AERCOARE and also the MMIF. Then WSP USA, Michelle Snyder and her staff, they helped with testing. And then General Dynamics Information Technology, or we call them GDIT, did the WRF runs for the prognostic part you'll hear about later.

So, what were the objectives of bringing COARE into AERMET? That's stated in Section 1A of the *Guideline*. Basically, we wanted to add the COARE algorithm into AERMET so we could process observed or prognostic meteorological data. Bringing COARE into AERMET would ensure those algorithms get updated regularly as part of the routine AERMET maintenance. AERCOARE hadn't been updated since 2012 when it was released. The basis of the code that goes into AERMET is AERCOARE. AERCOARE was based on a set of Fortran programs called COARE that was developed as part of that COARE experiment.

Bringing COARE into AERMET would remove part of alternative model scenario for the meteorological data, for overwater applications and with AERMOD. But that would be contingent upon consultation with the EPA Regional Office and reviewing authority. And that consultation would ensure that platform downwash and shoreline fumigation are adequately considered in the modeling demonstration.

So, why COARE over standard AERMET for overwater applications? There are different reasons AERMET was really made for land-based stations, land-based data. Surface roughness over the ocean will vary with wind and wave conditions and isn't a constant and vary hourly. Whereas for a land-based application, the surface roughness is going to stay pretty stable. It's not going to vary hour to hour. It's going to vary by season depending on the land use around the tower.

AERMET uses the solar angle approach to determine stability. Basically, daytime is convective, nighttime is stable. But the ocean can be unstable at night and stable during the day. You can see that. Also, AERMET does not explicitly include the effects of moisture in temperature and wind speed profiles. And the Monin-Obukhov length and w^* calculated by AERMET do not include those effects, and that would be obviously important over waters. And then the Bowen ratio method for heat flux is overly simplistic. And because the ratio between sensible and latent heat flux is not constant. [unintelligible] 12 modeling -- I think it's 12 Modeling Conference [spelled phonetically] had the panel discussion on prognostic data. I think we did talk about overwater. And so, this is kind of an outcome of that as well.

So, what's the history of COARE and AERMOD? The first notable use of AERMOD for an overwater application was an alternative model application called AERMOD-COARE in 2011, in an ice-free Arctic environment in Alaska when Herman Wong was at Region 10. That led to the development of AERCOARE, which can be used with either measured or prognostic data. So, AERMET was being bypassed and these would go into the output from AERCOARE. We use the AERMOD for the met data.

This AERMOD -- AERCOARE/AERMOD has been approved as an alternative model for several applications since 2011, especially in the last year or two. It's -- I can't remember how many it is now. I think, George said yesterday during his presentation on Model Clearing House. '11? '11. So, '11 -- since 2011. And after, you know, after Region 10, it's been pretty easy for people, you know, just kind of point to, you know, their application.

So, what are some of the options in AERCOARE that we're bringing into AERMET? Has options for cool skin and warm layer effects, right at the ocean atmospheric interface. That was

not tested as part of the original AERCOARE work or our evaluations. We didn't have the data for that. There are also options for calculating surface roughness based on wave conditions. Again, that wasn't tested. We didn't have -- the data wasn't there. I think we have gotten the data set that we can use just to make sure the code works.

And recently, we've got a data set we can use courtesy of Region 3. There are different options for mixing heights. I'll go into those in a few minutes. And then also you can vary the minimum values for Monin-Obukhov length and mixing height. That's an option for COARE in air, but not for like standard National Weather Service data or site-specific land-based data. You can't vary those values. And maybe in the future we can, but right now you can't.

So, what were the updates we put into AERMET? This really began with AERMET overhaul in 2021. We had been wanting to put COARE into AERMET for a while, but one of the reasons for the overhaul was so we could put something like COARE in. It would been extremely difficult to do COARE into AERMET with the state of the code before 2021. Just the way the code was structured. So, we did add new on-site prognostic variables. We also updated MMIF 4.0 to 4.1. The new variables are sea surface temperature, sea surface temperature measurement depth, a significant wave height, significant wave period, and long downward wave radiation. We basically -- for MMIF 4.1, it was basically outputting the sea surface temperature and depth from when MMIF is run for AERCOARE, we added that to MMIF for AERMET as well as long wave downward radiation.

We changed AERMET to allow that overwater flag to be used with the on-site pathway. Previously, before 23132, you could only use that flag for prognostic data. But now with COARE, you can use buoy data. So, we put the overwater flag. And if AERMET sees the overland flag and you invoke COARE, it's going to ignore COARE and tell you it's going to treat it as land-based data. We did add several new subroutines for the COARE calculations to read in the different key words and also the actual calculations. We added new keywords for COARE and AERMET.

And to invoke COARE in AERMET, you do it in stage two and went back and forth on what was the best way to do it. So, I ended up using the method keyword. That's your method is used for bulk Richardson and adjust U^* . So, it's COARE method. You put COARE and then RUN_COARE. If you don't want to RUN_COARE, you can say NO_COARE or no run or something like that. And that seems kind of redundant, but it could be so if you did want to RUN_COARE, but you want to comment the line, you just put no RUN_COARE. So, something just more flexibility.

It also has IN AERMET, the warm layer options, cool skin options, the different surface roughness options, and minimum values for minimum Monin-Obukov length, mixing height. The mixing height options, you can define a gust height and a default theta lapse rate. So, a lot of the options in AERCOARE are brought into AERMET. So, again there's the warm layer options. And in red are the keywords you use for these different options, and they're in the user's guide. You have the cool skin options, the three surface roughness options. The default is kind of the COARE using U^* or surface friction velocity.

You can also calculate as a function of U^* and a significant wave period. And then z_0 can be a function of the wave measurements. You can specify sea surface temperature measurement depth if you don't have that data on an hourly basis. And this will -- this keyword acts like the OSHEIGHTS [spelled phonetically] keyword with on-site data with the height variable. So, if you have -- for example, if you have on site data with multiple levels and you have the heights in the data file, you can actually override those with the OSHEIGHTS keyword. That's if you know the heights are not exactly constant or something, or you find out they're wrong.

So, basically this is a very similar method. If you have hourly depths, you could override that with the SSTDEPTH keyword. There is a minimum value for L , the default is 5 meters. Default mixing height, minimum height is 25 meters. If you don't want to change those values, you don't have to put in anything. That's just the defaults. It's also the default value for the potential temperature lapse rate of 0.01 degrees per year. And then there's a mixing height for the COARE GUST calculations. That's default at 600 meters, and I don't anticipate that to be changed a lot. There are also the different mixing height options and go through those.

The first one is where you use -- if you have on site -- if you have input mixing heights, you can use those heights for both the convective and the mechanical mixing heights. And the mechanical mixing heights are not smooth hour to hour. And AERMET, if you have input mixing heights for the mechanical height, it is smoothed hour to hour. That's in the model formulation documents. So, that's done for either observed or calculated mechanical mixing heights. The second option is to use the observed mixing heights for the convective heights, and you would calculate mechanical mixing heights with no smoothing. The third option is to calculate the mixing height for both convective and mechanical heights, but no smoothing.

And then the fourth option is like option two, except you will calculate mechanical mixing height with smoothing, and then the 1234. Fifth option is you would calculate mixing height with smoothing, and that would apply to both convective and mechanical heights. But those first five were in AERCOARE. I added a new option just for testing that would use basically AERMET's default scheme for mixing heights.

So, in AERMET, the default is the for the convective hours. If you have input mixing heights, you would use that observed height for the convective height. But you calculate the mechanical mixing height with smoothing and AERMET. Now, for stable hours, your mechanical mixing height is set to your input mixing height, but it is smooth. And then the convective mixing height is set to missing. So, it's kind of bringing in AERMET's default scheme rates. I will say this is not working correctly for COARE. Right before release the code I realized it was not smoothing. So, that's a bug that will be fixed in the next release.

And so, for the values, the comparisons of AERCOARE and AERMET to make sure the coding was correct, I did find a couple of things needed to change in AERCOARE or AERMET. So, I decided to change AERCOARE because if I change in AERMET, I may forget to change it back. This was not trying to game the system or anything, it was trying to make the two codes and their outputs as close as possible. So, when I was doing comparisons, I wasn't tracking down a false positive or something.

So, there were two changes in AERCOARE just to make it consistent with AERMET, to make sure the code was implemented in AERMET correctly. In AIRCOARE, mechanical mixing height is based on $2,300 \times U^*$ to the one-half power. That's based on AERMET versions 12345 and earlier, the great 12345. I remember that one as well, because I was here late one night working on that to get the evaluations done. In AERMET, that used to be the case, but in the 2013 version of AERMET, it was changed to $2400 \times U^*$ to the one-half power. Because of the original Venkatram paper where that came from, the very end, it was 2400. So, Roger reset it back to 2400.

AERCOARE was released prior to that 2013 fix in AERMET, so the 2300 was there. And like I said, AERCOARE has not been updated. So, there's a slight discrepancy there. It's not a huge difference, but if you want to try to do equivalence testing on the code, that's something you had to keep tracking that down, like, "Oh, it's that -- it's not a coding error." So, I changed it to 2400 AERCOARE just so I can make that consistent for easier code error checks.

The next one was just for the code implementation evaluation. I modified the AERCOARE outputs to be consistent with AERMET. That was just the format statements. AERMET may have U^* three places past the decimal, but AERCOARE was four or five. And actually, it would make some slight differences in the AERMOD output. So, just to make sure I wasn't having any coding errors, I changed the formats in AERCOARE to be consistent with AERMET. So, that was just -- all this was just to check, to make sure that the code was being implemented correctly. I didn't have a plus sign when you have a minus sign or something like that.

So, what were the implementation evaluations? We basically compared that modified AERCOARE and an AERMET with COARE. There were four databases from the AERCOARE evaluations done by Region 10, Cameron, Louisiana, Pismo Beach. Actually, that's Pismo Beach, California, not Louisiana. Ventura, California, then the fourth one I did not list, I'll have to fix that, is Carpinteria, California. These were tested on a variety of scenarios, a change in minimum L minimum mixing height. Again, the warm layer, cool skin options were not tested, and all the cases used that default U^* approach for zo.

So, basically, what I did is compared hourly meteorological data and hourly AERMOD output, both for measured and prognostic data. And they were paired in space and time because it's basically the same data. You want to make sure that's doing the right thing. And you can get more details in this technical support document that's on SCRAM. So, basically, these are the hourly -- there were slight differences in the neurological data that's in the and that was all due to either rounding because AERCOARE is real variables, whereas AERMETs double precision. So, you get some changes there.

And then also the way AERCOARE would process data once it encountered a calm versus AERMET, I think AERCOARE would keep going. So, you might have the variables there. But this actually calm but AERMET stops when it gets to a calm, you know, it'll cycle the loop or data is missing. So, basically what this shows is on the hourly concentrations, the ratio of each receptor at the same hour is basically one. It's like 0.999 to 1.001. So, for observed MET data, it looks like COARE AERMET was working the same as AERCOARE. And then for prognostic data, we ran WRF for the same data periods and places and did prognostic just as another check

and got the same thing. So, basically, what we can see is COARE has been implemented into AERMET correctly for non-cool and non-warm layer options and the default zo option. Once we get more data to test those, we'll test those as well. We actually have got some so we can do some testing.

So, bringing in COARE led to the question that I thought people would ask. What about prognostic data? If you remember in the '21 draft version and 21112 AERMET, we brought in what we call pass through option for prognostic data, where MMIF would calculate U^* monthly, hourly zo, and other variables. And for overwater applications, AERMET would just use those values and pass them through to AERMOD. So, the question would be for prognostic data, is that still a viable option or should people use COARE for prognostic data?

So, you know, one of the tests that as well, that try to answer that question that came up. So, what we did here was the same for databases. We did the AERMET pass through versus COARE calculations, and that data was multilevel data. But then we also -- COARE, the AERCOARE output from MMIF is also single level. So, it's like one of the tests is the single level or multi-level data make a difference. So, you can see more in another technical support document, the evaluation of prognostic neurological data in AERMOD overwater applications. That's a different TSD than the one where we just check for the implementation of COARE and AERMET.

So, the conclusions from that and I'll show some results, was that COARE appeared to indicate better results versus the AERMET pass through. And with the exception of Carpinteria, the number of levels doesn't seem to make much difference. That database is actually a little different than the other ones. Pismo beach, Ventura and Cameron are more screening type. It's you're not looking at wind direction. You're not really looking at source receptor distance and direction relationships. It's more almost AERMOD. It's actually AERMOD in screening mode. You're just straight-line distance.

So, Carpinteria actually is looking at terrain effects as well. And it's a little more complicated than the others. But so far it looks like the number of levels didn't make much difference. And if you go back to the 2016 or 2015 proposal of Appendix W, when we brought in prognostic meteorological data, that also indicated the number of levels may not make a lot of difference. We actually found one -- sometimes, one level work and then sometimes multiple levels work better. So, this seems to support that same idea.

Here's Cameron, at the top is the robust highest concentration based on observed data. Three scenarios were run for Cameron. Basically, you can see the pass through, tended to be the worst. And you don't see a lot of difference between the single level and multi-level output, very little difference at all. Carpinteria is -- bears some more looking -- it has some more after a conference. The pass through sometimes works better, and you can -- sometimes you can see -- in this one, you can see more difference between multi-level and single level. That could be with the terrain effects, and we'll look at that some more. I think -- yeah, so look at that some more.

Pismo Beach, kind of like Cameron, not a lot of difference between the number of levels, but the pass through tended to be worse. But depending on the scenario that you ran. And the same for

Ventura. It's the same number, I forgot to update. Oh, well. So, what are our recommendations for running COARE AERMET and AERMOD for regulatory applications? This is proposed guidance. It's in Section 3.14 of the AERMET User's Guide. Again, for prognostic data, the recommended approach is to use COARE instead of the pass through. Obviously, with observed data it's COARE, use COARE. We don't believe warm layer and cool skin options should be used at this time, as they have not been fully evaluated. And the same goes with the surface roughness. It should be based on the default option of the U* option as the other two have not been evaluated.

So, for mixing heights right now, if you have input mixing heights either prognostic or observed, the recommended mixing height option is to use the MIX_OBS, where you would use the observed mixing heights or convective mixing heights for the convective hours, and the mechanical mixing heights for all hours with no smoothing of the mechanical mixing height. So, if you don't have input mixing heights, the recommended option would be to calculate the mixing heights with the mechanical mixing height smoothing. That way, both convective and mechanical will be equal. If the default AERMET option was working correctly, that would probably be the one to use because it's more like AERMET. It basically is what AERMET does, but it's not working correctly. So, it didn't want to recommend something that's not working correctly. So, we may go back and change that.

Right now, we recommend using the defaults for the GUST mixing height, the minimum mixing height, minimum length, and default theta lapse rate. Those have been pretty much the default values used in AERCOARE. I checked with Jay, and he had not seen anything differently. So, we just might as well just keep using those same values. And if you want to use those default values, you don't have to put the keywords in. You just let AERMET take care of it.

And then as Clint -- George said yesterday and Clint said just a few minutes ago, users can now use AERMET for COARE processing instead of AERCOARE or you want to use AERCOARE. AERMET will read an AERCOARE input file. It should be able to. You just have to take out the header line at the top. And actually, that's one thing I'd like to do in AERMET is to update it where if you had a header record, it would read it or ignore it. You wouldn't have to take it out. So, it would still be considered an alternative model at this point, just like AERCOARE, but you can use either one.

For AERMOD, if you're going to use AERMET, the COARE AERMET will output on the surface header line. He's got the information about location options. COARE will be at the top. AERMET reads that header line. If it sees COARE, you got to have the beta option. The beta keyword on the model opt line in the AERMOD input file because this is a beta option right now. So, we thought at best it would have the beta keyword. If you don't have the beta keywords, an error or warning, an error. I think that's an error. I think it's an error. If it sees COARE and you don't have the beta keyword, it will stop running. And I think that's it. And I think I got five minutes from that. Not as fast as I usually am. Sorry, team.

[laughter]

George Bridgers:

Thank you, Dr. Thurman.

Next up, we'll have a presentation on GRSM by Mr. Matt Porter.

Matt Porter:

Good morning, everybody. I'm Matt Porter with U.S. EPA Office of Air Quality Planning and Standards and the Air Quality Modeling Group. I'm also a member of the model development team that helped look at and evaluate this proposed new option. And I'm presenting on the proposed addition of a new Tier 3 detailed screening technique, or NO₂. That's a lot of word salad there. But we're adding something here, and it's as part of the tiered approach for NO₂ modeling, in the *Guideline*. And this is a screening technique. So, it's designed to -- the chemistry assumptions are designed to err on the side of caution with respect to preserving air quality as a resource.

So, what I'll be going through is the kind of just a brief primer on what the tiered approach is to NO₂ modeling. As you know, discussed in the *Guideline* roadmap of, you know, for how GRSM came to be proposed as a new Tier 3 option. Then I'll talk about some of the syntax in the AERMOD input files just for reference. And then go through some of the highlights from the NO₂ databases that were evaluated as made available in the technical support document.

So, first, a brief primer on the tiered approach for NO₂ modeling as prescribed under 3.2.3.4 of the *Guideline*. Starting with the most conservative option, we're looking at Tier 1. Assuming full conversion, 100 percent of your NO_x emissions input to the model would be assumed to convert to NO₂. Tier 2, the ambient ratio method is based on ambient monitoring data and the NO₂ ratio. And this is from the ratio of method as developed and proposed in the last revision to the *Guideline*. It's based on predictions of the ambient equilibrium ratio of NO₂-to-NO_x. There's a polynomial equation, fifth order if anybody cares [unintelligible]. But it's derived based on analysis of ambient monitoring data and on a national ambient monitoring data from 2000 to 2010.

And finally, more on topic with what I'm presenting today on GRSM, the tier three options. The existing options are the ozone limiting method, OLM, plume volume ratio method, PVMRM and then the proposed new option, GRSM, the generic reaction set method. And just real briefly, OLM, the predictions of NO₂ are limited based on the in-stack ratio of NO₂ to NO_x from your modeled sources, and the hourly ozone oxidation of NO converted to NO₂. PVMRM is similar to OLM, except that it also includes a calculation for plume volume and entrainment of ozone, and the subsequent oxidation of NO to NO₂.

GRSM, I'll explain that a little bit more in the next few slides. Then as far as these Tier 3 options become more relevant under the PSD modeling programs and in application -- regulatory applications since the implementation of the one-hour NO₂ NAAQS. But I would also highlight that it's also very relevant in the context of the annual NO₂ increment. [AUDIO GAP] That's all right. It's all good. It's all good. Brief interruption. Yeah. That's fine.

Okay. So, before I dive into some of the weeds surrounding this option, you know, what kind of journey? You know, just kind of laying out what the roadmap was that GRSM, you know,

followed to get to where it is as it is, you know, a proposed Tier 3 non-default regulatory option. That's some more word salad for you. But the implementation of GRSM in AERMOD started in 2015 thereabouts, and it's continued on to where it is now in 2023. Certainly, none of that is possible without acknowledging, you know, the collaborations and contributions from these organizations that are listed here.

CERC, that's the Cambridge Environmental Research Consulting Group, if I got that right. And then the API's, the American Petroleum Institute. Then of course, the EPA OAQPS and Office of Research and Development and contract support from WSP, Michelle Snyder and her group. And you know, this road to regulatory options, you know, was really started with, you know, this regulatory demand for more Tier 3, you know, refined, detailed Tier 3 NO₂ modeling options. And, you know, the GRSM proof of concept is, you know, look at some of the references in the TSD started in the ADMS model.

So, there was already kind of a proven application of this method for NO₂ modeling. And the pre-reviewed articles on GRSM originally started Azzi et. al in 1992, followed by Venkatram and his research group in 1994, bringing us to the paper on the theory and the actual implementation in AERMOD by Carruthers and his group at CERC in 2017.

MPE test databases, you know, the MPE's model performance evaluation. These test databases included two legacy databases as I'd like to refer to them. The Pala'au, Empire Abo NO₂ databases are from the early 90s, '93, '94 time period. Those are the two test databases that were used in the 2015 NO₂ TSD for evaluating PVMRM2, and the OLM that had always been part of the regulatory model. And then the two newer databases Balko and Colorado, and then there's two more databases in Alaska which I won't present on here. But just for your reference, it's included in the technical report that CERC wrote based on this version of GRSM. And that's in the docket in on SCRAM for everybody to go and thumb through.

So, the AERMOD Implementations version 15181. So, it's the 2015 version. And it was promoted to ALPHA in the 2021 version. Then later, a year or two later, promoted to BETA in the 2022 version listed there. The MDT, the model development team recommendation, as being proposed here was based on our internal testing, diagnostic sensitivity testing, you know, coupled with building downwash and a lot of other things, source, different source types and all of that kind of stuff. All the kinds of testing you would imagine to see if GRSM breaks.

And then also, you know, the regulatory, practical applications, you know, how hard is it to run, you know, interfere with other parts of the model and that kind of stuff. So, that brings us to today, you know, in this presentation, the TSD, the docket for proposing this a Tier 3 regulatory option and this current release of AERMOD.

So, some of the scientific motivations of, you know, for GRSM developing here for AERMOD are listed-- and that's what this slide is all about. There's additional treatment, you know, or mechanisms. There's the photolysis reaction during the daytime for NO₂. There's the time travel downwind chemistry and transport calculations that encapsulate all of the other calculations going on with GRSM. Then there's additional refinements with respect to the instantaneous and ensemble plumes in the presence of building downwash.

So, near the source, near the buildings farther away, downwind, 1 to 3 kilometers where we expect, you know, all of these things to kind of interact, to balance out as far as NO₂ chemistry and transport, NO_x chemistry and transport. So, it's a more comprehensive NO₂ chemistry and transport option is my understanding at this point. And so far, you know, I mean, the other thing that we're looking at here, as far as the motivation, is the consistent model behavior at the ambient boundary or the fence line of the facility for the modeling demonstration and then the near and far field receptors.

So, digging into the weeds a little bit here on the end of two mechanisms for GRSM. Similar to OLM and PVMRM as discussed before, there's the assumption of in-stack NO₂-NO_x ratio from your NO_x combustion source. There's the ozone entrainment that treats, you know, that for subsequent oxidation of NO to NO₂. And that occurs both during the night and in the daytime. GRSM adds, you know, treats the photolysis of NO₂. So, this is an NO₂ production in the reverse direction. So, it's sort of NO₂ destruction during the daytime.

You know, it tends to lower some of the daytime NO₂, net equilibrium concentrations that GRSM calculates. GRSM mechanisms are also, you know, a bunch of, you know, the time travel between the source and receptor, limiting NO₂ production based on the ozone photolysis reaction and the transport time as a function of the equilibrium between all of those competing factors, wind speed and the receptor distance from the source.

This version of GRSM includes some refinements, some updates to the formulation from the 2022 version of GRSM. So, in this current release of 23132, GRSM is there's more refined mathematical calculations dealing with multiple plume effects on ozone entrainment, instantaneous plume spread effects in the far field, and building downwash effects on instantaneous plume spread. And for your reference, I'll try to skim through this as quickly as I can. But this is sort of the syntax, you know, for your AERMOD input or control file on the control and the source pathways, examples of these are included on SCRAM. I've uploaded all of the NO₂ evaluation databases. The modeling files for all of those are available on SCRAM now on the AERMOD page. But this is, you know, just all the different inputs for running GRSM.

And you'll note, you know, these are all very similar to PVMRM and OLM. But where things get different is where you're, you know, including NO_x hourly or some static, you know, annual value in the control pathway. And it also will use any kind of NO₂ background concentrations you provide on the source pathway. And there's substitution schemes similar to PVMRM and OLM as it's listed here.

All right. The hard part is going through some of the highlights from the, you know, the evaluations databases, and I'm just going to briefly go through. So, the next six slides discuss Pala'au, the Hawaii database, you know, some of the Q-Q plots for that. Then we'll look at the Empire Abo database and the Balko Oklahoma, you know, gas compressor database. And then lastly, the Colorado, the drill rig NO₂ model evaluation database.

Just a brief primer on what the Pala'au database includes. Guess we're kind of going in order of increasing complexity, I would say here, you know, as far as Pala'au going to Empire Abo to

Balko to Colorado. For the Pala'au database, there's only one monitor. There are five engines. You know, this is a power plant, small power plant on the island of Molokai. I believe it is sort of on the edge of town, on the west end of town.

The monitors sort of listed there on the left panel plot the 220 meters to the northwest of the facility. There are some downwash effects, of course, at that distance. The concentrations shown here, the model concentrations are definitely dominated by building downwash and in-stack ratio assumptions and things like that. Both Pala'au and Empire Abo use non varying hourly emissions for the entire annual analysis periods for those databases. So, that's of note I think for, you know, when we're trying to like, look at these results and look at really the screening performance in the comparison with the existing NO₂ tiered options that are represented here.

These are rank scattered plots on the left panels observed NO_x on the x axis and the AERMOD version 23132 model concentrations on the vertical axis. And we're -- this shows pretty much, you know, a fairly good agreement in terms of the dispersion, the dispersion performance of the model. So, that's why we're looking at NO_x. And then we're, you know, separating out how, you know, the output NO₂ concentrations from these different tiered options. The N-value there is just the number of valid observed and modeled pairs in the left panel. And the right panel is just that first panel is 7,856 times the four options that are shown. So, those are all the total number of data points shown in the NO₂ plot there.

But what we're looking at here is consistent model behavior, where the tier two concentrations are consistently biased high for ARM2, as opposed to OLM it's kind of the, you know, the hierarchies, the next level down in terms of conservatism. And then the interesting thing here to kind of notice is how consistent GRSM is compared to OLM, but just a more refinement of the screening predictions here. That in PVMRM, that maximum is actually showing a little bit of model misbehavior, I would say. Just anomalous, I would say that that's owing to some of its building downwash and plume volume assumptions. As others have pointed out in the previous presentations for the last couple of years. So, overall GRSM performance at Pala'au is consistent with the other methods and providing a fairly refined screening estimate.

Moving on to the Empire Abo database. I'd like to talk about emissions before we talk about concentrations. Because you don't know what the emissions are but in this there's all these databases, I should mention, are relatively short stacks with some building downwash monitors at different distances and directions and things like that. So, Pala'au we're looking at a NO_x emissions on the order of 88 pounds per hour for facility total. Empire Abo, on the other hand, is probably -- that includes emissions from 20 odd sources on the order of 400 pounds per hour of NO_x at monitors that are an order of magnitude farther away. But still, stacks are relatively short, you know, on the order of 20 to 30 feet tall as far as the 10 dominant sources that are, you know, NO_x combustion sources that are modeled for this database.

This is a gas plant at the Empire Abo production field New Mexico. And again, kind of the same Q-Q plot setups here. NO_x on the left and NO₂ on the right. The NO_x plot is showing the north and the south monitor model performance. We're getting a lot more some modest overprediction. The south monitor, that's farther away. All these databases include on site meteorology. So, I would say for a steady state dispersion model, some of these overestimates, you know, just above

the 1-to-1 line of arguments are acceptable. We're erring on the side of caution.

So, we're getting some decent NO_x performance for peak concentrations at the north site, which is, you know, about a kilometer length to the source. But as far as the conservative hierarchies like to refer to it for the NO₂ model predictions here, ARM2 is the highest distribution of model results versus observed. Then you have OLM and GRSM are tracking closely along with one another. And this is at the north monitor. The next plot will be the sort of the same NO_x plot, but then the south monitor. And then PVMRM again, is slightly lower, owing to its different, you know, plume volume assumptions and entrainment assumptions, and how it handles these ensemble plumes at that distance.

And so, switching to the south monitor, same NO_x plot there on the left, but different NO₂ plot on the right. We're seeing consistent over prediction of NO₂ for all the tiered options here. Again, OLM and GRSM are tracking closely with one another. And this distance, you know, we're definitely looking at more of a dispersion more, you know, dilute, you know, diluted concentrations of NO_x converted to NO₂ based on what ozone is available. You know that distance. We're not having to really consider the dominant -- more dominant features that are closer into the building, and short stacks, you know, influenced by downwash. So, again, a conservative model results here for Empire Abo. This is non-varying hourly emissions, so, you know, that should also be included in our interpretations of these results.

Moving on to the Balko, Oklahoma gas compressor station. There are two sources here, include two stroke natural gas fired engines. There's actually only one of these engines that's operating for the most of the time periods for the data pairs that are shown here for the four monitors that were evaluated, and that engines', you know, NO_x emissions or are varying the Balko and Colorado include varying hourly emissions on the order of 100 pounds per hour. And the monitors are sort of -- we're going to go through north though south field monitors, about 400m north. The north field monitor is about 140 meters north, due north. And then the next plot will go through the east fence monitors. The 100 meters to the east, and then the tower, sort of the upwind monitor is about 65 meters to the southwest.

But looking at the NO_x, similar plot set up here. NO_x on the left, NO₂ on the right. For the field site, we're getting some modest overprediction of NO_x at 400 meters downwind here. I guess I should say, you know, preface some of the results here for the Balko database have been reduced in such a way that there's the data -- so this is a one-year database, but we're only looking at, you know, less. We're looking at 1,000, you know, 1,000 or less data pairs. And those data pairs were developed based on isolating wind sectors that would signify a source receptor kind of signal. So, that's seeing a lot less data pairs here.

But for the field side, NO₂ model performance, we're seeing similar model behavior seem similar conservative hierarchy. ARM2 is performing, you know, producing really conservative results as opposed to OLM. And then PVMRM is slightly underpredicting whereas GRSM is overpredicting kind of the interquartile range is you know what I call it. But GRSM is consistently under the OLM predictions here. And then, PVMRM, the last data point there for PVMRM is overpredicting compared to OLM, which is kind of odd.

And as far as the north fence is where we see the most model-observation disagreement. I would argue that this is due to some of the source characterizations going on. The building downwash short stack influences at 140 meters away from the dominant source there. So, the upper half of the distribution for the NO_x pairings there is under-predicting. Still above the 1-to-2 outline. Then the NO₂ predictions have the same conservative hierarchy ARM2, OLM GRSM. And then PVMRM the last three data points are overpredicting compared to ARM2. So, GRSM's comparison to that is behaving in a much more consistent way.

And for the east fence, we're seeing a similar situation to what we saw for the field. You know, the field site. And this -- I should note that the east fence monitor is just on the opposite side of the building of the main stack. So, it's no surprise that there's overprediction of NO_x here, heavily influenced by building downwash. And you know, and how PRIME works and all of that. Then, you know, as far as the NO₂ predictions, the conservative hierarchy is the same consistent behavior from GRSM compared to OLM, PVMRM in the last few data points is just sort of predicting outliers in a way.

Then at the tower, the NO_x predictions are -- there's not very many pairings here for the tower, because there's not many situations where there's going to be a wind blowing in the southwesterly direction for this part of New Mexico. So, that's why there's only 149 data pairs, similar conservative hierarchy. As far as the NO₂ options shown for the tower with GRSM actually, you know, performing the best with all the data pairs falling on the 1-to-1 line.

Moving on to Colorado, which I think is the -- that's the shortest analysis period NO₂ database and also the most complex. So, that's, you know, save the best for last, I guess. But just kind of a brief primer on what this database is all about. It's a drill rig with, you know, support generators and a small boiler. The emissions totals that are hourly varying for the six-week analysis period, are on the order of 50 to 100 pounds per hour of NO_x. So, that's something to keep in mind when looking at the concentrations on the order of hundreds of micrograms of NO₂ versus, you know, almost a thousand micrograms per cubic meter for NO_x.

I would argue that, you know, there's a lot more to take away from the model NO_x comparisons at Pad 1 than Pad 2. I think there's a lot more uncertainties on the three-week period for the, you know, the monitoring that was done at Pad 2. There are four monitors that changed location three different times. And, you know, there's 12 monitors in total. I should mention that, you know, there's six upwind and six downwind. The prevailing winds just changed at Pad 2 when they, you know, had the monitors around there. The monitors were like 50 to 100 meters away from the drill rig and these generators. So, and they're surrounded by trailers and the drill rig itself. So, there's a lot of downwash and source characterizations, short stacks, influences on these results presented.

But focusing on Pad 1, I'd argue there's more consistent model behavior, you know, again, with GRSM predicting slightly less than what OLM is predicting. OLM is supposed to be the most conservative Tier 3 option, I should mention. And then PVMRM is -- it's doing its own thing. Then ARM2 is the most conservative solution for these pairings that were produced for the Colorado Evaluation database. But overall, again, you know, more consistent behavior, I would argue for GRSM, you know, as compared to the other ARM2 and the other Tier 3 options.

So, last slide, GRSM, a summary and conclusions. So, the TSD in this presentation looked at four NO₂ databases. Used to evaluate this, you know, screening of performance of GRSM as, you know, proposed Tier 3 option. All the databases include onsite meteorology and building downwash. They all included relatively short stacks. And, you know, from a regulatory perspective, I'd argue that, you know, this is where we'll have the most trouble, you know, demonstrating compliance with NO₂ one hour NAAQS.

So, this database -- the series of databases evaluated are influential from that perspective, and for Pala'au and Empire Abo databases listed the NO_x emissions there. They had 1, 2 monitors, respectively. Balko and Colorado, 120 and 20 pounds per hour of NO_x. 20 pounds per hour of NO_x for the Colorado database, just represents emissions from one of the units at Colorado, not all five of the engines. But yeah, four to 12 monitors for those databases. And just to reiterate, kind of drive the message home, GRSM shows consistent conservative Tier 3 screening model behavior when compared to the other NO₂ options listed.

Just to remind folks that the fractional bias and robust highest concentration statistics are available in the technical support document, and those also agree with some of the conclusions I've presented here. Consistent conservative hierarchy and the like. Proposed language: I should note in the revised version of Section 4.2.3.4(e), OLM, PVMRM and GRSM applied using best professional judgment and in consultation with the EPA Regional Office and appropriate viewing authority. Maybe expand on it a little bit in terms of -- there's some of the language for PVMRM and OLM that speaks to isolated sources for PVMRM versus, you know, OLM being more applicable for ground release or clusters or, you know, multiple sources and things.

You know that language has been removed. That's up to your best professional judgment and consultation with the Regional Office and your review authority. And it's, you know, it's more broadly applicable under, you know, modeling guidance. And we felt like that language needed to be pulled from a regulatory section there. So, we're proposing adoption of the GRSM regulatory non-default Tier 3 screening option method. And it's going to be beta as proposed in 23132, later promoted to a full regulatory option. So, you won't have to use beta in the control ops pathway in the 2024 version of AERMOD to be released sometime next year, right Clint? So, that's it.

George Bridgers:

Thank you, Matt. Next up, we will have another presentation by Dr. Thurman.

James Thurman:

Once again, I'm James Thurman modeling group. [unintelligible]. So, I'm going to talk about RLINE incorporation into AERMOD. And you see here it's presented by me. I did not do any work on it. This was work started by Chris Owen, he was in the modeling group. I did do a couple of runs that helped out, but very little work on my end. So, that leads to who actually did the work, in ORD David Heist and Chris Owen. And then for WSP, who did the bulk of the work, especially Michelle Snyder, on the RLINE reformulation, urban and terrain updates. As well as Laura Kent, who is no longer with WSP, and then Rebecca Miller, Melissa Buechlein who work on various parts. Michelle wrote the TSD's that you see on SCRAM. And then also

recognize Akula Venkatram or as we call them, everybody knows him as Venky on the initial RLINE development.

Then other acknowledgements, the Federal Highway Administration, Victoria Martinez, David Kall, George Noel, Chris Dresser. We talked about the interagency agreement yesterday. It's actually 2017, 2023 and then a new one starting this year. The reformulation work for RLINE for the proposal was funded in part by that. I also want to acknowledge our EPA Office of Transportation air quality OTAQ, Laura Berry, Chad Bailey, and Meg Patulski for their efforts.

So, as you know, RLINE is being proposed as an additional source type in AERMOD for transportation modeling applications. That's the main focus of the RLINE source type, that is transportation conformity PM hot-spot analyses. If you want to use RLINE in AERMOD 23132, you have to use the BETA keyword on the model RLINE. The addition of RLINE source type would not preclude the use of the other source types, area, line, and volume. For transportation source modeling at AREA and LINE are pretty much the same thing, just a different way of inputting the source.

The proposed -- we also propose that AERMOD's urban option would be applicable to the RLINE source type. Originally, RLINE did not use the source urban option, but now it will. And we also included terrain effects with the RLINE source type. As Clint said, just to make it more complete. Again, we emphasized that would not be -- the use of terrain does not supersede EPA's hot-spot guidance for FLAT terrain is recommended for those applications. And for more information about the terrain inclusion with RLINE, I'll point to the TSD to that. We're going to focus on the reformulation. That's in the TSD incorporation guide. RLINE source type and AERMOD for mobile source application.

So, the history of the RLINE development began with ORD's Research Line model released in 2013, and there are the references for that matter et al, 2013 and Venkatram 2013. They were kind of partner papers. RLINE model was incorporated into AERMOD in version 19191 as the beta RLINE source type. And again, this was based on EPA, FHWA collaboration. RLINE was reformulated as part of the 20 -- this release of AERMOD with three main modification areas that we'll go over. Wind speed calculation for RLINE, and then the harmonization of RLINE with AERMOD's internal processing with the other AERMOD source types. And then updates to the dispersion coefficients for the initial sigma one and sigma z curves in RLINE.

So, for the wind speed modification, RLINE was developed with the assumption that the wind speeds input were vector average wind speeds and then within the model they were converted to a scalar average wind speed. AERMOD has a similar thing where you can say vector wind speed, and it does a conversion. So, when RLINE was incorporated in the AERMOD, that conversion was no longer needed as AERMOD input wind speeds are usually scalar averaged for the most part. That's from airport data and most tower on site tower data. Also, a correction was made in the code to ensure that the beginning wind speed, which is based on the Monin-Obukhov Similarity Theory, does not fall below the minimum wind speed enforced by RLINE. So, just another check.

The second part was harmonization with AERMOD, another AERMOD source types. Several

changes were made to better integrate RLINE within AERMOD to use AERMOD's native functions. RLINE now uses the gridded values of Sigma V used by other AERMOD source types. Prior to this version of AERMOD, RLINE calculated some values. RLINE also uses AERMOD functions to calculate the fraction of plume that's attributed to meander. And then a calculation of a vertical plume with the width of sigma z prior to this version of AERMOD, you can see sigma z was limited to square root of two divided by Pi times mixing height. With this new update, that restriction was removed and RLINE uses the AERMOD functions to account for reflections of the plume from the ground and top of the mixed layer. So, try to make RLINE be like the other source types as much as possible.

Now, bulk of the reformulation work was on the dispersion coefficients that are used for the calculation of sigma y and sigma z in RLINE. So, those were re-evaluated as the wind speed modification and harmonization changes were made. I'll share the equations just a minute. But the optimization of these coefficients occurred together. Michelle Snyder did a lot of work on that, or basically all the work, but it was a lot of work. Basically, these were all based on data set collected, Idaho Falls and the ever-famous Prairie Grass study. And I would point you to Section 2.3 for more details in the RLINE technical support document.

Here are the equations for sigma y, sigma z for both stable and convective conditions. Highlighted in the red boxes are the coefficients that were adjusted c, ds, du, a, bs and bu those are described in the TSD. I won't go into detail here. And then after -- the original values are from Venkatram et. al. in 2013 for these different coefficients. Where's the little pointer?

I don't want to use it now.

[laughter]

The original values and then a range of tested values, and then the new value that came out of the optimization for these coefficients. So, then what were the evaluations were done with the reformulation versus AERMOD 22112 that had the non-reformulated versions. The Idaho Falls Roadway study, Caltrans 99, GM sulfate and then FHWA provided a couple of real-world examples, a consequence analysis, a PM_{2.5}, and a PM₁₀ analysis, which use your standard AERMOD processing of airport data. Like most applications that we deal with. And Section 3 of the TSD can give you more details of each study area.

So, summary for Idaho Falls, only small changes in the performance, especially for neutral convective days. For the weekly stable day, highest concentrations remain relatively unchanged. The agreement between measured and model concentration was somewhat reduced on the lower end of distribution. Usually, the high end is what we care about the most. For the strongly stable day, the highest overpredictions from the AERMOD 22112 which did not have the reformulation changes have been reduced by the reformulation changes in dispersion. And here are some Q-Q plots that kind of outline what I just said. You don't see a lot of difference on the convective and neutral days. 2212 is on the left. 23132 on the right. See two differences. You see some changes and would strongly advise you to look at the TSD for more details.

Well, Caltrans 99. There were some minor differences between the two versions. The most

notable changes were reduction in these outliers. Here the upper left, you see, they reduced especially these, they're reduced. So, for the most part, not a lot of change. Because basically the receptors are really close to the road, and the reformulation was held more farther away from the roadways.

GM sulfate. This was recently added and finished right before we put out the proposal. Our predictions were at a reasonable level. Some slight underprediction, but a few predictions. You had overpredictions at 1.5- and 4.5-meter heights. There were different heights of observations. GM sulfide has a lot of metadata too. So, there's different ways to slice the data. But ORD and WSP had just finished this before we went proposal. So, there are more investigation probably needed.

There are some plots of the different heights. 1.5 meters, 4.5 meters, 10.5 meters. There were eight towers where there were measurements, and you can see the data. You know, a lot of scatter. Here's concentrations by wind speed on the left. Concentrations by wind direction on the right. So, you know, still a lot of investigation needed here.

This is the PM_{2.5} hot-spot analysis provided with FHWA. These are the maximum design concentrations for RLINE, for volume and area obviously, no difference in the 24 hour between model versions. So, we didn't change anything there. But you can see RLINE is reduced from 22 version to the 23 version on the 24 hour. Also, on the annual you can see it drops and it's, you know, between volume and area. Here it's actually lower than volume and area for the 24 hour.

Here are some Q-Q plots at the 24-hour design concentrations compared to the RLINE to other source types. And you compare RLINE 221, RLINE is on the y axis. The other source types on the x axis. 22112 is on top. 23132 is on the bottom as you can see. You go from -- compared to the other source types, RLINE goes from overprediction too. Slight underprediction for area, but pretty good agreement with volume. And this is the annual design values for PM_{2.5}, and kind of the same trend again overprediction with the 22 version of RLINE. And you get better agreement between area and volume and RLINE with 23132. And this is a comparison of RLINE to RLINE. The x axis is the 22 version 23 version on the y axis, as you can see it for 24 hours five-year annual average. The updated version concentrations are less. This is among all receptors.

A PM₁₀ hot spot for the H6H 24 hour. RLINE is reduced between versions and falls between the volume and area source types. And Q-Q plots again, kind of show what we saw with the PM_{2.5}. You know, RLINE goes from overpredicting to pretty good agreement with the other source types. And this is the RLINE compared to RLINE. As you can see, 23 version underpredicts, concentrations are lower than 22 version.

So, some summary conclusions. Idaho Falls and Caltrans 99 showed decreasing concentrations with the RLINE reformulation. GM sulfate shows good agreement to observations. More works needed. Consequence analysis for the hot-spot analysis showed RLINE concentrations drop with reformulation falling between the area and volume source concentrations, and overall shows good performance. So, this proposal to include RLINE as a source type would give modelers additional flexibility for transportation links within AERMOD. Just another tool in the toolbox, and you still have area and volume depending on what you need, so I'm not taking anything

away. We're adding another option for people to use. And so, I would urge you to read the TSDs and get more information there. That's it.

George Bridgers:

Thank you, James. Our last presentation before the break given by Alyssa Piliero. She is going to give the long-awaited presentation on what we're doing with updates to recommendations on background concentrations.

Alyssa Piliero:

Good morning. Like George said, I'll be wrapping up our presentations on the updates to the *Guideline* or major updates to the *Guideline*. My name is Alyssa Piliero, and I am a member of the Air Quality Modeling Group here at EPA. So, I'll be presenting on the proposed updates to the recommendations on the development of background concentrations.

Now, many of you that are familiar with the *Guideline on Air Quality Models* would know that Section 8 of the *Guideline* provides recommendations regarding the determination of appropriate model input data for use in NAAQS implementation modeling. Now, Section 8.3 specifically recommends that developing a representative background concentration should include contributions from all sources, including nearby and other sources.

So, these contributions from these sources are generally represented either through the ambient monitoring data or explicit modeling. And isolated source scenarios, we heavily rely on the ambient monitoring data to represent the background concentration. And in multi-source areas, we add the addition of explicit modeling of nearby sources that are not adequately represented in the ambient monitoring data. And so, in the 2017 *Guideline*, as it currently stands, in multi-source areas, it recommends that nearby sources should be selected because they cause a significant concentration gradient in the vicinity of the source under consideration.

Now, given the implementation and the knowledge that we've learned through the use of this recommendation over the past couple of years, since 2017, we've decided to propose revisions to Section 8.3 of the *Guideline*, because the recommended method for identifying nearby sources lacks definition and was used inconsistently in PSD demonstrations. Now, the proposed revisions that we have made to Section 8.3 points to a more robust framework for characterizing background concentration for cumulative modeling, but also maintain the same emphasis on identifying and modeling nearby sources in multi-source areas.

And I want to point out, as we work through this presentation and as everyone in the stakeholder community reviews the revisions to Section 8.3 as well as the associated draft guidance, we want you to keep in mind that these revisions allow the same level of flexibility as previous versions of the *Guideline*. But we're looking to shift the emphasis from the use of significant concentration gradients to the broader picture of identifying nearby sources to explicitly model through determining the representativeness of the ambient monitoring data.

Now, to dive deeper into the proposed revisions to Section 8.3, the one that kind of raises the most eyebrows and people are most interested in, is the fact that we have removed all recommendations related to selecting nearby sources that cause a significant concentration

gradient. In addition to this removal, although it seems like we're removing a big piece here, we have added refinements to the existing recommendations for defining representative background concentration to recommend using available air quality monitoring and modeling data to define that representative background concentration.

And so, the proposed revisions present a draft guidance document that recommends a framework of stepwise considerations applicable to both isolated single source and multi-source situations. In multi-source areas, defining a representative background concentration still relies on the characterization of contributions from other sources through adequately representative monitoring data, as well as the identification and characterization of contributions from nearby sources through explicit modeling.

And so, we recommend now determining the representativeness of the ambient monitoring data through visual analysis, using any relevant air quality data that may be available for the source or sources under consideration and the project area. And so, these proposed revisions to section 8.3 are supported by the draft guidance on developing background concentrations for use in modeling demonstrations. Now, we developed this draft guidance document to provide additional guidance on developing representative background concentrations that are used as part of cumulative impact analyses for NAAQS implementation modeling demonstrations.

Demonstrations that would be included under this and are applicable to this draft guidance include PSD compliance demonstrations, SIP demonstrations for inert pollutants, and SO₂ designations. And like I said before this draft guidance, it details the EPA recommended framework focusing the consideration of relevant emissions, air quality monitoring and pre-existing modeling data to appropriately represent background concentrations for cumulative impact analyses. And so, essentially what this draft guidance lays out is a framework, and then it additionally walks through applying this framework in isolated single source scenarios as well as multi-source scenarios.

So, to step through the framework very briefly, the -- it consists of four steps. The first being defining the scope of the cumulative impact analysis for isolated or multi-source situations. The second is identifying relevant and available emissions and air quality data. And the third and fourth steps here are really the big important key pieces for defining a representative background concentration. And that is determining the representativeness of the ambient monitoring data. And then in multi-source situations, determining nearby sources that need to be explicitly modeled because they are not adequately represented in that ambient monitoring data.

And so, taking a deeper look at these framework steps, the first two steps of the framework apply generally to developing cumulative impact analysis. But they are also crucial in determining a representative background concentration for both isolated single source and multi-source areas. So, in defining the cumulative -- the scope of the cumulative impact analysis, we're looking for a definition and a documentation of the applicable NAAQS standard and averaging period. Any important information about the modeling domain, the project source, as well as identifying and kind of defining the dispersion environment, and what are the key factors that are going to play into the dispersion of emissions in the project area.

And so, while working through step two of identifying relevant air quality data, this data might include, but is not limited to by any means, ambient monitoring data that could come from a state, local or tribal, or EPA air monitoring network, as well as pre-construction monitoring. And we want to highlight the use of previous dispersion modeling that may be available for the project or nearby source. In addition to any emissions data that may be available for the project or nearby sources, and then any environmental data that can be collected on the project area, and this might include information on the land use in the project area, any terrain information, as well as local meteorological data that, specifically the wind speed and wind direction, will be helpful in the process of defining a representative background concentration.

And so, when we think of applying this framework to isolated single source scenarios, the first three steps of the framework apply. And the third step will differ a little bit from multi-source situations. So, you will apply the first two steps like described previously. But in this third -- this third step is really the key part for isolated single source scenarios. Because the cumulative impact analysis will rely heavily on available ambient monitoring data to fully characterize the background concentrations near the project source.

And so, to determine the representativeness of the ambient monitoring data that may be available for the project area, we recommend performing a visual comparison of locations of ambient monitors, as well as emitting sources to the local terrain features and meteorology. So that by looking at all of the locations of the sources and monitors, as well as any factors that are going to affect the dispersion of emissions from the project source, you'll be able to work through and hopefully identify whether or which ambient monitor will be most representative of that project source.

And so, while you're working through this process, there's two key questions to keep in mind and really to help document this process. And that is, is the ambient monitor in the vicinity of the source? Sometimes there are cases where a regional background monitor may need to be selected, or a monitor that may be outside of the kind of project area but is still representative of the ambient air in that project area.

And then also, whatever monitoring data is available. Is that monitoring data representative of the background concentration at the location of the source under consideration? And are there any additional data or any additional modifications that need to be made to the ambient data record in order to ensure that that data is most accurate and representative of the background concentration in that location. So, shifting gears to multi-source areas, all four steps of the framework apply to multi-source areas. In this case, the cumulative analysis will rely on the monitoring data, supplemented with the explicit modeling of nearby sources to fully characterize the background concentration.

And so, while determining the representativeness of ambient monitoring data in multi-source areas, there's two key questions that are intertwined and will kind of become an iterative process. And that is determining what does the ambient monitor represent in terms of, does it represent the project source? Does it represent any nearby sources in the vicinity of the project source? And we recommend using the same visual analyses that were recommended for isolated single source situations and using all the available ambient monitoring data, as well as modeling and

environmental data that may be available to lay out the pieces of the data and identify which nearby sources are represented by this ambient monitoring data.

And so, through this visual analysis, you'll be able to work through which nearby sources are represented by that ambient monitoring data, and possibly be able to identify certain nearby sources that are not necessarily appropriately represented in that ambient monitoring data. Which brings us to step four of the process. And so, sources that are not adequately represented by the ambient monitoring data should undergo additional quantitative and qualitative analysis prior to explicit modeling.

And so, even though you might have this list of sources that may not be -- that you feel is not adequately represented by the ambient monitoring data, we recommend doing a little bit of additional analysis before undergoing explicit modeling of those sources to ensure that the monitor was selected properly, or that there's any data pieces that were missed along the way. And so, to determine nearby sources to explicitly model, we want you to focus on those sources that were not represented by the selected monitor from step three. And then leverage any sort of visual or qualitative analysis that was used previously. But continue to build on that with additional quantitative assessment to understand the spatial overlap of nearby and project source impacts.

And so, in this kind of step of the process, we really recommend using any available pre-existing modeling data that is available for the project source or nearby sources, because that can be used to perform a better spatial analysis of the concentration impacts from those sources. And so, through this determination, there should be a full document of the justification for any decisions that are made, including what monitor is selected, what nearby sources you feel are represented by the ambient monitoring data, as well as what nearby sources may not be, and why you have chosen to explicitly model them as part of the modeling demonstration.

And so, just to recap on the proposed revisions and this draft guidance, again, we have proposed revisions to the *Guideline* to refine and clarify the existing recommendations for developing a representative background concentration for cumulative impact analyses. I know by removing the term significant concentration gradient and those recommendations, it may feel that we are taking away items from the *Guideline* but in reality, we are refining the language in there and adding flexibility through pointing to this draft guidance document.

And so, the language in section 8.3, as well as the draft guidance, allow the same level of flexibility and inherent discretion that was available under previous versions. And we really hope that it fosters consistency across modeling demonstrations for NAAQS implementation. And so, the draft guidance presents this framework of stepwise considerations for determining that representative background concentration, and many of the technical recommendations that may have been removed from the *Guideline* through these revisions are appropriately detailed in this draft guidance. Aside from anything related to the term significant concentration gradients.

And like said, this issuing this draft guidance allows a greater flexibility to make future revisions to the draft guidance and the recommendations here. And we will be able to include examples as we gain feedback through its implementation. And so, with that, I will say that we are explicitly

requesting public review and comment on the proposed revisions to section 8 of the *Guideline*, as well as the draft guidance document here. And so, with that, written comments can be submitted to the proposed rule document. And following the comment period, we plan to take into consideration all comments and consider potential clarifications, amendments, and revisions to both the language in the *Guideline* as well as the draft guidance. And so, with that, thank you guys for your attention here. And I'll give it back to George.

George Bridgers:

Thank you, Alyssa, for your updates and also invitation for people to provide public comment on the guidance document. With the time being 10:20 a.m., which is about 10 minutes beyond what we had originally scheduled for our break. I will amend the break from 10:20 a.m. to 10:40 a.m. So, I will suspend the public hearing until 10:40 a.m., but then we'll start right back up and have our next slate of presentations.

[PUBLIC HEARING MORNING BREAK]

George Bridgers:

Now at 10:41 a.m., I'll call public hearing back to order.

We have a couple of more presentations before we transition from EPA presentations to that of stakeholders in the public. As I had mentioned earlier, we had three different parts to the updates that we were proposing to the *Guideline* and to AERMOD. We had the update specific to AERMOD that we heard about from James and from Matt, also, to a certain degree from Clint. We had the updates to the background concentration [inaudible] recommendations for development of background concentrations that you heard from Alyssa. Then said there was a hodgepodge. There are a few other things that we did in the *Guideline*. And so, just to make sure that we were clear on what we had updated there, what our proposed update, I want to make sure that we brought it to you this morning.

Some may say that this may be the more notable of these updates, but I don't think so. There were some typographical errors that we made in the 2017, when we updated from 2015 to 2017 version of the *Guideline*. So, there were some typographical errors in Tables 8-1 and Tables 8-2. I would not consider them substantive or significant errors. But they were errors nonetheless, and mostly they were associated with not having the footnotes correct. There were some footnotes that were off over the last five-ish years.

We haven't seen any significant issues there, but it was a situation that we wanted to make sure we had an opportunity the *Guideline* was open, and we wanted to tidy things up. So, we made some updates there, but again, they should not constitute any substantive changes to Tables 8-1 and to Table 8-2. The thing that was probably the reason why we republished the entire *Guideline* as part of this proposal versus just sometimes you'll see when rules are out there, they'll just be the sections that you're updating.

Was this issue with weblinks? We had so many web links scattered across the *Guideline*, including references to where you could download data, and also throughout the references that in order to do that higher order math with the Federal register of take this out, put this in, it got

really complicated. So, it was actually easier just to republish the whole *Guideline*. But we had a significant number of web links that just needed to be updated. As it happened in life, in 2017, when we released the latest or the current version of the *Guideline*, in that same year, EPA changed their backhaul server for the web server. And so, almost instantly those links became problematic. So, we updated that.

I am not committing to it today, but I will say one of the things we are thinking about is putting on SCRAM. If you go through and look at the current, the proposed version of the 2023 version of the *Guideline*, you'll see that a lot of the references have actually lost their links. They're not there. It's not that we don't want you to get to them. We're trying to prevent it becoming errored too soon. So, one of the things we've talked about is actually putting a document on SCRAM that we can update regularly. That would just be references to the links or links to the references. So, that's something that we've talked about that we may accomplish moving forward.

And then we talked about this morning, this was probably to me at first like, "Oh my God. This is going to cause big problems." But this issue with the Federal Register where we couldn't have appendices and appendices. And so, Appendix A now is becoming Addendum A. And as I mentioned in my brief overview this morning, immediately we got on the phone with OGC. And we talked to their Policy Division because we're trying to understand the broader implications of four decades of calling them Appendix A regulatory models. And now they're Addendum, you know, Addendum A regulatory models. What was, you know, is the sky falling, someone used that word yesterday, the sky will be falling. And as it turns out, we don't think that there's going to need to be any significant update to any EPA regulations or EPA guidance. It's just another switch for us.

And so, I would ask everybody to look in the Preamble and read across the very first part of Section 4 in the Preamble. And it goes section by section, including the references and including the, what's now Addendum A, it goes through each of the updates that are made. And so, they're just like little subtle things all throughout. That was pretty short and quick, and don't think I -- I may or may not have beginning that presentation, but that was presented by George Bridgers.

And George Bridgers is going to continue with one more presentation as we wrap up our presentation of our proposed updates to the *Guideline* and to AERMOD.

So, wanted to make sure it was very clear to those in the audience. Again, this is almost verbatim pull from the Preamble how people make public comment. First and foremost. This afternoon, just after lunch, we'll have a microphone set up, and anybody that wants to offer oral comments are welcome to do so. As soon as I finish this presentation, we're going to have a series of presentations by those that had requested to come and make presentations and public comments, and those are also going to be put into the record.

But for most, the comment period closes on the 22nd of December. There are a number of ways that you can submit comments. Probably the easiest is to go through the E-rulemaking portal, the regulations.gov, and the docket number is splattered all over these slides, but it's EPA-HQ-OAR-2022-0872. In saying that, some will probably wrinkle their eye when said 2022, that's when the docket was created. We had to start that way ahead of time to kind of get things in place. It just

happens to be 2022 versus 2023. That will be the docket that will remain all the way through the final rule. So, when we publish the final rule, it's still come under that docket number. There is the option to email your comments through that email address that you see there on the screen. If you have a fax machine, you're more than welcome to fax.

[laughter]

We still actually maintain one in the Modeling Group just in case. And then there are a couple of other options there that you can mail things in. Or if you just happen to be in D.C., you can stop by the Docket Office and drop it off. Actually, I think that's the William Jefferson Clinton building. So, you can go by EPA headquarters and drop off your comments. So, the other part of what I wanted to do before we transition to the public comments is just talking about where the next steps. Where is this going? So, the Conference obviously is concluding today, and we're kind of thankful that we got it in before the, what I was going to say impending shutdown.

Again, it doesn't look like that's going to happen now. But we got it in before the holidays. And I'll tell you, it's going to get scarce around here between Thanksgiving and Christmas. I can guarantee you that. Or Hanukkah, whichever your favorite winter holiday is. I can only imagine because the comment period closes on the 22nd of December. We're not going to do a whole lot between the 22nd and January 2nd. I can just kind of guess that that's going to be a quiet period.

So, as soon as we get back from the holiday break, we're going to launch and earnest on the response to comments document. To be clear, I said this yesterday, but this is on the record of the public hearing. We will not be formally responding to comments that were submitted for the Conference, but if it is submitted to the rule, we absolutely will be responding to public comments. And there was a question asked this morning. I think it's worth repeating. If there's a presentation offered today, do we respond to comments there? And the answer is yes because it's being offered to the record for the [rule].

From there, we have to go back to OMB. We will have to base on the comments that we get, we will have to resubmit to OMB a package to ask for determination of whether the rule is -- the final rule would be significant or not. It is our hope, our sincere hope that it will remain a non-significant rule. Because if that's the case, our timeline is out. If it doesn't, then there's probably going to be about three more months that will be added because we have to go through an OMB review process. We did that with the last rule. Again, we're hoping we're not going to have to do that with this rule.

Following that, we are hoping someone in that mid to late summer to have this package ready for finalization, ready for signature by the Administrator. So, we really would like, by the time we get to no later than August or early September, absolute slippage late. We want to get this done. We want to get to version 24XXX [of AERMOD]. I can't give you what those three numbers will be yet, and I'm not going to try to come up with palindromes on that just yet. But we want to try to get this done at the end of the summer.

We're not trying to get anything done, like just slip it through. We're actually purposely trying to get it done quickly. Primarily, we want to make these new options available to you as non-beta

options as soon as possible. This is part of our commitment of trying to update the model, to bring scientific improvement to it, and put it in the regulatory context as quickly as possible. This is something that we want to do in the future as well. But with the last rule, we were right there at the presidential election in 2016. It was signed just after it, and we got caught in the administrative review process. And so, that delayed the implementation or the effective date of the 27, what now is the 2007 *Guideline*. 2017 *Guideline*, excuse me. We want to avoid that. We want to get things done ahead of the silly season, as I call it. Other people just call it, you know, the presidential election season.

And that way we can just again, get into the regulatory framework just as fast as possible. I would be amiss if I did not talk about this is only the second time since 2005 that we've updated the *Guideline*, and it's based on the experience that we've gained. And then, as I was mentioning, our commitment with the last revision that we were going to try to do these more quickly, that we were going to try to do these more focused and deliberate, and that's our commitment moving forward.

We talked a bunch yesterday about things that are going on with three different IAAs, one with FAA, one with BOEM. All three are potentially bringing important pieces into the model. There are other activities that we've got in the research and development world as well that we heard about area source meanders, urban options. There are other things that may come into alpha-beta world fairly soon or thinking of being regulatory options in the future.

So, if we can make this work, if we can have this proposal and final happen within nine months, normally rulemakings take at least a year. I think it's a great model for us moving forward. So, that's what we're looking at as we get into the later 2020s. What's that? That's the last EPA presentation on the rule.

I'll bring up this slide real quick. It's not like we've seen this slide a thousand times. But before we launch into the public comment session, we're transitioning from EPA presentations to those from the stakeholder community and the public. I'm going to ask everybody that comes up to speak. These are all people that will have reserved time to speak. So, identify yourself and who you're affiliated with.

And I'll also mention if you're affiliated with a larger organization, if you work for a company and you're also representing a larger industrial group, please represent both. It will probably be in your slides, but just for the record, I'd like for you to say it out loud. Just like this morning, we're not doing any question and answers. Any questions, comments need to be submitted to the docket. And with that, I will call up our first presenter, which I think this is going to be Michael Hammer.

Michael Hammer:

Thank you. My name is Michael Hammer. I work for Lakes Software, and I'm representing the Air and Waste Management Association's, Atmospheric Modeling and Meteorology Subcommittee or Technical Coordinating Committee. I am the chair of the ad hoc subcommittee of that group. There's a lot of committees there. You can see from the slide, our officers currently are Tony Schroeder, who presented yesterday, chair of the committee. He presented our

comments towards the AERMOD Modeling System. Travis Hicks, our Vice Chair, and Mary Kaplan, Secretary.

These comments were prepared by our ad hoc review group. There's about 15 people who submitted comments, and then the full comments were submitted to all members of the committee. There's about 150 total members on the current roster who also contributed towards these comments on the proposed Appendix W revisions. First, we would like to acknowledge our appreciation towards EPA for their continued collaborative development efforts, which include not only working with members of APM, but also the interagency agreements, which have resulted in model options and further stakeholder engagement on options such as downwash and NO₂.

Through these collaborative efforts, we've seen a lot of new and exciting development within the AERMOD Modeling System and throughout Appendix W as well. We do encourage more frequent communication perhaps in the form of conference calls or gatherings that could help further ongoing research and development. There were comments made that in the years past, there were modeling conference calls that included stakeholders and resuming some of those could help further these development efforts.

Towards the inclusion of the generic reaction set method NO₂ option, APM broadly supports this inclusion as a regulatory Tier 3 option. But some questions do remain about its implementation. Now, one key benefit of GRSM is to institute the initial incomplete titration of NO₂. However, some questions that were raised in our comments included if studies have been done on combining GRSM with other ALPHA options and what performance effects that has upon the model. What, if any, conservative assumptions were made in its implementation? For example, ARM2 was implemented with an increased minimum ratio over what the initial development effort suggested. The initial development of ARM2 suggested a minimum ratio of 20 percent. That was increased at the regulatory suggestion to 50 percent to avoid underprediction. So, were there any similar conservative assumptions in the application of GRSM? Are there any compensating errors or issues in the GRSM algorithm? And how does it perform with multiple overlapping plumes? Some of that was addressed in the earlier presentation.

The supporting documents contend that overpredictions are addressed farther downwind, but it wasn't entirely clear how those assessments were performed. There's also no discussion on the effects of temporally adjusted background NO_x towards GRSM that was commented on. And we encourage the issuance of perhaps guidance for recommendations on the application of the different Tier 3 methods, OLM, PVMRM, and GRSM. Are there expectations for their use or is it left entirely to the modeler to decide and provide technical justification on which could increase the burden towards efficiently preparing applications?

And was consideration of TTRM in combination with other methods given? Currently as proposed, GRSM would be the only regulatory option to consider titration. TTRM does also address this as was presented yesterday. If GRSM addresses the titration, but overpredicts downwind relative to PVMRM then potentially allowing the pairing of TTRM with other methods could be an alternative way to address this potential issue.

We also wanted to include some comments about PVMRM. These issues have been raised and presented to EPA. It was commented that EPA is aware of the formulation issues within PVMRM that need correction, but we did want to put these into the public record. These corrections would satisfy Section 2.1.1(d) of the *Guideline* in building confidence that the model predictions are accurate for the right reasons. These issues that were addressed, or that needs to be addressed are the PVMRM use of minimum plume sizes for computing the plume volume as opposed to using the AERMOD dimensions. And when buildings are present, the PRIME computed plume dimensions should be used.

For mobile source modeling and the inclusion of RLINE to a regulatory option, APM recognizes the significant effort on the part of EPA and its collaborators to adding and continuing to develop the RLINE and RLINEXT sources.

Several areas for further testing have been identified in the supporting documentation highlight the need for clear guidance on its usage expectations. We do agree, or are thankful for the note that was made today in allowing for the continued use of area, line, and volumes [source types to represent road emissions]. And the note that was made that this does not preclude any existing guidance towards the use of those. But further guidance on the application of RLINE is welcome. Also, questions were raised on if EPA has a development plan in place for continuing to expand RLINE with current unsupported options such as NO₂ and deposition.

For the changes to Section 8.3 overall, we find support with the proposal to revise the methodology for calculating the background concentrations. And particularly we approve of the removal of the significant concentration gradients and related contents in 8.3.1. (a)(i) and the removal of the term from Section 8.3.3 (b) Plus removal of Section 8.2.3 (d) and the inclusion into 8.3.2 (a). The details of the proposed stepwise framework do not fully remove the ambiguity that EPA is looking to avoid in our opinion. Several commenters noted that these changes don't necessarily provide anything new. That they only publish steps that are already being taken by some reviewing authorities.

So, the clarifying efforts of removing the significant concentration gradient are welcome, but further detail could be provided. With the new approach to visually and qualitatively assess modeling domains and its characteristics as Alyssa described, the approach does not necessarily have any metrics or criteria by which to define which sources to model and which are included for explicit nearby monitoring. The lack of metrics and criteria does have flexibility to the guidance but may not necessarily result in the overall goal of achieving consistency or reducing the burden.

Towards the draft guidance documents that was supplied, comments include that it would be helpful to have more examples throughout. Alyssa did note that more examples can come in the future as those present themselves. Section 2, it was noted, mixes the discussion of isolated and multi-source areas. Definitions and examples of those weren't explicitly given although Sections 3 and 4, do a better job of sorting these out. The explicit nearby source modeling and ambient monitor use seems to rely on visual and qualitative assessment using the modeling domain and its characteristics. APM also recommends considering the use of pre-existing modeling. For some typographical updates, page 30, the fourth sentence was a fragment and requires revision.

There was also a potential conflict within the first sentence. It noted that the area where the project sources impacts equal or exceed the SIL as noted in that sentence but as an example, that was given. If concentrations drop off quickly with distance from the source, such as in one hour, NO₂ and SO₂ analyses, if these are still above the SIL, this could induce many sources to be included, which conflicts with the EPA's goal of including few nearby sources. There's also a heavy reliance on engineering judgments to make some of these determinations. And many agencies may simply hang on to old approaches such as those from the 1980s for including a screening analysis to sort out the contributions.

On pages 19 and 31 of the Draft Guidance, there were great questions asked, but it wasn't necessarily clear which answers dictate which actions on the part of the stakeholder. The last sentence also leaves the door open for screening, 20D approaches, or other methods but may need to be more explicitly stated. And we found generally that Appendix A and the information included in that appendix to the Draft Guidance is very useful. But EPA also needs to be prepared to continually support that document. As we've seen with the updates to some of the more administrative aspects of the proposed revision to the *Guideline* that URLs change frequently and will need to be maintained.

Also, using an external guidance document such as this one creates opportunities for more efficient updates rather than having to change Appendix W itself. But the question was asked, should there be changes to this guidance document in the future would that undergo public comment and review towards those future changes? Oh, it was also noted before I leave this. We approve of the mentioning of the potential of removing background values caused by exceptional events though this lacks some specificity. And it was notable that there was an inclusion of direct references to the handling of sources near environmental justice communities because environmental justice can be applied very differently in different locations.

So, this in turn invites more questions than answered in the implementation of the Draft Guides.

On the implementation of COARE, broadly, APM approves, though it is recognized that this is a fairly narrow introduction to the AERMOD Modeling System. The assumptions minimum M-O Length can help avoid the anomalous behavior for low winds cases, which is welcome. But generally, this application addresses just a small component towards the larger goal of replacing the offshore and coastal dispersion model, OCD. The transition from overwater to overland remains unaddressed, no definition of the shoreline for fumigation formulation. We understand that these are areas that are being developed. But I will also add, we'll have comments on our conclusion towards that effort. And focus on field data from offshore sources should be placed towards future efforts.

Some additional comments on the broad Appendix W update. The *Guideline* has extensive references to the requirement or recommendation of consultation with the appropriate reviewing authority under section 3.0 (b). The proposed additions also add to the inputs that could be challenged in the case of any permitting action. Use of approval or concurrence in place of consultation could provide further clarity and encourage authorities to act more decisively. Because right now, with the use of consultation, there's no real follow up to that. And well, I consulted with the authority, and I'm going to do this anyway [laughs].

In conclusion, the proposed Appendix W changes are relatively limited, and there are a lot of pending issues that need further attention as noted by our companion presentation in the Conference yesterday. Of note, what is becoming Addendum A is currently at three models and it has been stated over and over that OCD will effectively be replaced someday with AERMOD pending further testing, which would take us down to two. One of which I don't know about you, but I've never used CTDMPLUS nor seen it.

George stated that AERMOD is the workhorse. There's a saying that if the only tool you have is a hammer, the temptation exists to view every problem as a nail. And the Gaussian plume model does not solve every problem. There should be consideration towards not necessarily removing from Addendum A, but potentially expanding Addendum A. Not quite to the levels that it existed in the seventies and eighties and even nineties. But looking at other modeling systems that could potentially solve problems that are out there that maybe AERMOD is not best suited to. Right now, COARE, for example, has limited applicability, but it is a key part of the overall planned update for tackling overwater sources. But as we continue to challenge AERMOD to do some of these things, is it the right tool for that job? We still also have a lack in Appendix W of addressing long range transport. There is a flexible system in place. It doesn't have to be a full alternative model demonstration that has been made clear. But AERMOD clearly cannot be a long-range transport model. So, we have to look at other options and could there be options out there that could be formally promulgated into Addendum A accordingly.

The model core code is going to continually become complex as these issues arise, and the need to rewrite the code for AERMOD someday exists. We've already seen that process go through with AERMET successfully, but AERMOD may be another order of magnitude higher that it's been a while since I've taken my FORTRAN class. I don't know about you guys. So, the need exists out there for EPA and the broader modeling community to potentially look at, could there be an AERMIC 2, perhaps someday. To look at what could come in the future and how we can both take into account the current revisions to the *Guideline* and future revisions to the *Guideline* to best serve the modeling community, its stakeholders, and the regulatory community at large. Thank you.

George Bridgers:

Thank you, Michael. And thank you to the Air Waste Management Association for your comments.

Also requesting to speak and offer public comments. Is API, just one second, Chris. See how I make this one. You just use that.

Chris Rabideau:

Thanks, George. So, I'm Chris Rabideau. I'm with Chevron. But today, I'm presenting as the chair of the American Petroleum Institute Air Modeling Group. So, when we asked to speak, George had asked, "You want to do Tuesday or Wednesday?" And I said, "Just put us on Wednesday," because no matter what we're going to do, we're going to put in the comment anyway, so you're going to have to respond to it.

So, I just want to say that API supports improving science. We appreciate EPA's willingness to work with the public to improve the science. And just to kind of cover everything, some of the things we've been doing over the past decade plus at API, working on some of the improving of the sciences, obviously the NO₂ chemistry we, you know, did the development ARM2. We funded some PVMRM improvements.

One of the models that should not be named, I guess, CALPUFF chemistry, we worked on that back a while ago. As we've seen yesterday and today, you know, we funded the GRSM. And we also did some initial funding for TTRM. And then also some low wind speed work and also building downwash. And not on here, we've also been doing some work in photochemical modeling, but we know that's not intent of today or yesterday, so I did not put that on there.

So, for today topic of discussion, talk about the AERMOD updates, proposed recommendations for background. There's also section in there about transition period for applicability revisions. And then just a couple things that probably would've said yesterday, but we're going to again, provide in our comments anyway. So, we're working on some modifications of PRIME and then also some of the TTRM work. And then there's some other issues that we're going to hit for written comments, but I will not go into any detail today.

So, with GRSM, and again, there's been presentations on this, you know, the last day and a half. Again, we appreciate EPA's efforts and support of furthering that chemistry refinement. Again, we worked with CERC on the new Tier 3 option. And again, we're supporting EPA proposal to include it as a regulatory non-default Tier 3 NO₂ screening option. And then there's also a statement in the proposal and we support the proposal include that statement that indicates the GRSM performance maybe better than all of them in PVRRM under certain source characterization situation.

Regarding the background concentrations, again, we support any wording that is aimed at being clear to reduce the possibility of double counting. And I think as the previous presentation also said, I think providing examples throughout the document to the guidance would be of help. We also support the recommendation that monitoring network is used for developing background to conform. And also, as the guidance calls for emission data be representative of normal, we want ambient monitoring data should be representing normal conditions. It should be the same monitoring data that is going through the QAQC process. We know there's a lot of monitoring data out there that may not go through that whole QAQC process.

But if it's going to be used for background, that should be of that quality. And then also there was an additional consideration section in the draft guidance. And again, kind of goes back to being clear, but it seems like it may be unnecessary. There could be some redundancy with additional modeling that's not on top of another model. So, again, just some things that we're going to hit in our written comments. But I'm not sure about that last section there.

There's again, asking for comment on the transition period. Again, we support timely incorporation, the model updates. I think George covered that earlier today on how more frequent this update is on the previous one that was done long ago. And again, I think, our comment is that we should be doing technical advances as scientifically possible, as fast as we

can. But again, as well as long as they're tested. But we shouldn't be delaying things for several years just because, well, we got to wait for the workshop or time.

Again, so this is kind of going into some of the downwash issues that we think still exist. But just wanted to kind of cover one of the things that we are working with, Ron Peterson and CPP on some dispersion and wake computations using the wind tunnel and also the Balko field observation dataset. Again, this has been covered in previous presentations, and Ron has also presented this to EPA, so they are aware of this. But again, this is something we're working on that kind of goes after. There's still a lot of work to be done in building downwash. That's really the bottom line of the comment there.

But we found out that the PRIME wake velocity and turbulence conditions do not agree with the tunnel results which is also supported by BOEM study. The PRIME wake height and width do not agree with the wind tunnel observations. And there's sigma y and sigma z overprediction, but they agree better with the wind tunnel observations than the PRIME2 due to offsetting errors. Again, there's some underestimation, overestimation depending on what you're looking at. And basically, the bottom line is that last statement on the PRIME, plume rise predictions need improvement.

So, then kind of just the summary. AREMOD/PRIME had the overall worst agreement with the field observation. PRIME2 with updated building wake dispersion constants provided the best agreement with field observations. The new wake growth equation did not improve because of other problems with PRIME.

Again, going after the cavity length criteria for sigma y and sigma z. And the PRIME2 velocity deficit and turbulence enhancement and the BOEM wake growth equation should replace the PRIME equations once the following changes are made and can be evaluated. So, again, omitting the criterion that the building downward calculations are made if the top plume rise is less than the height of the wake. And then also changing the code so that cavity length does not affect the sigma y sigma z calculation, but it can still be used for the streamline calculation.

TTRM and TTRM2, I think there's been quite a few comments and the presentation yesterday. Again, I think, the bottom line here is we're in support of elevating TTRM2 into that beta or completely integrated into the ARM2 OLM and the PVMRM for reasons that we've seen and were presenting here today and yesterday. Again, to allow for that time transient in the Tier 3 and the Tier 2 options. So, as for other issues that we will address in our written comments that will be submitted by December 22nd, is we're going to also talk about the downwash from offshore platforms and overwater dispersion. Also, some low wind comments.

Again, improvements needed for more downwash issues. Also, kind of tied to the background arguments more on the PM_{2.5} NAAQS modeling. And also, about Appendix W allowing model approaches that account for emissions variability and partial utilization of the source. Also surface roughness. Some comments there. And also, I think we've made these comments at the last modeling workshop, but also there's updates needed for the model evaluation procedures as well.

George Bridgers:

Thank you, Chris. And thank you to the American Petroleum Institute for your comments.

We have one additional request to present that you do not see on your agenda, but it came in yesterday and we're going to accommodate it before lunch, because I'll get into why here in just a minute after Bob presents. But Bob Paine with AECOM would like to provide some comments to the record as well. So, Bob.

Bob Paine:

And I'll say it myself. I'm Bob Paine, still working at AECOM. I'm going to talk about a few things that have impressed me in the last day or so. Shoreline issues with installing OCD features in AERMOD since I worked on OCD development 40 years ago. I had that experience. Creating maps of criteria pollutant concentrations from existing resources that would help in the background concentration estimates that we've been talking about today. Accounting for retirements of emission sources for monitoring background assessments. And accounting for reductions in precursor emissions in the modeling of secondarily-formed PM_{2.5} or ozone. I want to caveat these comments saying they're my own. They do not necessarily represent the views of AECOM or any client of AECOM.

I worked with the Minerals Management Service in the 1980s, about 40 years ago, on developing OCD, and naming OCD. Consider a shoreline like this – it's pretty easy. This is near Jacksonville, Florida, a pretty straight shoreline. I think CALPUFF has - like - a linear depiction of a shoreline. And what you need to know about, that is, when the plume from an offshore source crosses the shoreline, that it will encounter a thermal internal boundary layer that's built up as the winds blow from offshore to onshore across a convective boundary layer during the day. But suppose we have this area near Bar Harbor, Maine. Where is the shoreline? Well, now we look at that yellow arrow. Well, it's pretty obvious where we hit the shoreline, but what about that aqua blue arrow. Now, is that first island the shoreline? Where is it [laugh]?

So, you can imagine, I was tearing my hair out in the 1980s trying to figure out how do I define the shoreline for OCD? Here's another example. Well, we've got barrier islands here in the Eastern Virginia capes here. Do we count the barrier island, or do you have to go inland? Where is it? So, what we had to do is we had to basically institute a rule. Well, we had to define - this is old, ancient technology - but it was the state of the art four years ago, and it still exists: L's and W's. And initially we had to do it by hand, but then someone provided a pre-processor GEOCAB [MAKEGEO] or whatever. They had digital databases of the shoreline.

So, the L's and W's could be done without laboriously putting them in by hand. But basically, OCD as I vaguely recall, had a rule where you had to have enough of those L cells. The plume had to pass over enough L cells to be entrained into the TIBL. There's like a one in 10 slope roughly for the TIBL. So, if you wanted to have a hundred-meter-high plume to get into the TIBL, you'd have to have a kilometer fetch over the land. But this type of situation will have to be considered when OCD is put into AERMOD.

But how do you define the shoreline when you have, oops, I'm going the wrong direction here, conditions like this; you have to think about this. So, I'm just putting out the challenge to you. I

faced this 40 years ago, and now you have to do it all over again [laughs]. I'm very encouraged to see this study actually published just this summer by Dr. Michelle Snyder and others. They do look at a lot of studies on the development of the thermal internal boundary layers. All this work seems to have done in the 1980s. There's not a lot of work in recent decades.

So, that's interesting as well as field studies. There were all the ones offshore that were done back then that we were talking about earlier today. There's Nanticoke, a power plant on Lake Erie in Canada. That might be a potential database, but there's not a lot of recent databases that I'm aware of. You have to go back decades to find the evaluation databases for this type of shoreline fumigation effect. Probably it should be evaluated in the new AERMOD that accommodates the OCD features.

Now, we've been talking about looking at modeling and background monitors to figure out what is the most accurate or representative monitor for my project site. And it would be helpful to have maps that have monitored concentration patterns for the pollutant of interest. And then you could basically take the relative magnitude of the concentration estimate at the monitor from whatever database you develop that map from and compare it to the project site.

And if at the actual monitor it's equal to or higher, then that would be a conservative estimate. And I'm going to talk about two potential sources for these maps which really aren't being, maybe, appreciated or developed yet. One is the extension of what James Thurman talked about yesterday - the AirToxScreen to include criteria pollutants, because there's a lot of work done to develop these maps for air toxics. Why not do it also for criteria pollutants? And also, I'm going to talk about maps of satellite monitoring of criteria pollutant concentrations by NOAA.

So, I talked to Dr. Thurman yesterday. He said, "Well, with a little more work you could, and you got the inventory from the National Emissions Inventory. You've got the model set up; you've got the meteorology. You'd have to do some AERMOD modeling for some of the, you know, within-grid concentrated sources." But EPA could develop maps of at least annualized concentration averages for criteria pollutants to inform our choice of monitors that are representative of background concentrations.

And you could even maybe improve that if you took the actual annual averages at the monitors, you might be able to even improve that mapping. And then you could use this to say, "Okay, I've got a monitor here according to this map. The concentration estimate here versus my project site is pretty good." I would have a new tool to inform that rather than to have to start from scratch, reinvent the wheel, whereas the wheel is sort of almost invented for us. Why not take advantage of this setup and extend AirToxScreen to criteria pollutants?

Now, you'd want to get a map sort of like this, but this is actually a map that NOAA already provides from satellite data. Actually, one-kilometer resolution and here's a website that shows this. So, this is another, and I'm not sure whether this is a column average or near-surface concentration, but various satellites have different criteria for defining the concentration, whether it's a vertical sum or is it near the surface of the Earth. But this is another tool: you either model, use a model and your emissions inventory, or you actually take something like looking down on the Earth and getting the real picture.

So, this is another tool to get a similar type of map which you could also refine with actual monitoring data. There's even a new satellite called TEMPO, which stands for the Tropospheric Emissions: Monitoring of Pollution, just launched this year. It's geostationary and provides 1-hour resolution of various pollutants above North America. It tracks ozone aerosols, which I would presume be PM, sulfur dioxide, and formaldehyde. Here is an example of such an image on August 2nd, 2023, in the mid-afternoon.

So, with this type of information maybe you could do less than annual averages to get more of a picture of shorter averaging times. But EPA should look into the availability of newly available satellite data to help inform concentration patterns to help our users do better in background concentration estimates.

All right, a couple more things and I'll be done. Sometimes we are using, you know, three years of monitored concentrations to estimate monitored background, but then we see, oh, you know, that a source just shut down. Do I have to wait three more years to get a more up-to-date estimate of the background? That would be a shame. Instead of waiting another three years, one possibly could exclude impacts from that source by taking the direction sector and excluding impacts when the wind is blowing from that source, which is now gone, in determining the background. That capability is already in Appendix W and would just have to be extended to accommodate sources that retire.

One other thing, the MERPs guidance, I don't think those go into detail as to how to account for reductions in emissions of one precursor pollutant that could offset the effects of emission increase of the second precursor pollutant. And I would say you could use the relative MERPs results to try to do this. Here's an example. The example says 100 tons per year of increased SO₂ emissions results in an additional two micrograms per cubic meter of PM_{2.5}. And 100 tons per year of increased NO_x emissions results in additional one microgram per cubic meter of PM_{2.5}.

But suppose you had an offset, suppose you had an increase of 100 tons per year in a proposed project of SO₂, but a reduction of 100 tons per year of NO_x. Why don't you just say two minus one equals one [laughs]? And that would be one way to accommodate, I think fairly, increases and decreases in precursor pollutants. That concludes my comments.

George Bridgers:

Thank you, Bob. Prior to Bob's presentation, I did mention I would explain why I would let Bob go before lunch. So, at this point, we do not have any additional requested presentations for public comment. So, what we'll do is we're going to break for lunch now and at... well, we'll pull an audible. We're going to do two things. I realize that some of you may have plans to leave for the day at the lunch hour. I have to open the session this afternoon because the public hearing was announced to be in the afternoon as well.

So, 1: 00 p.m., we'll come back, we'll reopen the session. But having no requested presentations to speak, it would only be people that wanted to offer comments at the microphone. Because some of you may leave and we've got a few minutes, I don't think lunch is going to be that much of an issue that kind of proved itself yesterday. I'm going to go ahead and open the Conference

now for anyone that wants to offer public comment to the record. Unfortunately, facilities didn't know I was going to pull this audible, so you have to come up to the podium and use this microphone because the stand microphone's not in the room. But if anyone, especially if you were considering leaving for the day at lunch, if you felt that you wanted to give comments to the record, this is your time.

I'll just mention, this was the slide I was going to put up right after lunch, is that you saw this yesterday also with the Conference, is we'll try to limit comments to 10 minutes. You need to identify yourself and your affiliation, and we're not going to allow questions and comments to any presenter. So, is there anybody that would like to offer comments to the record at this time? And if not, we'll have it again and we'll have the session open if anyone's interested. Please come forward. Just identify yourself and your affiliation.

Chi Wan:

Thank you, George and thank you everybody. My name is Chi. I'm working with GHD. I would like to, you know, offer a little bit, a very small suggestion. I talked to George yesterday about AERMOD, probably like a couple minutes. We know that there is an hourly emissions, you know, file that, you know, AERMOD, you know, offers that you can put, you know, hourly varying emissions, stack temperature and velocity, you know, hour by hour. But it does not allow the variation of stack height or stack diameter hour by hour, which makes sense.

However, last year when we were doing a project for a client, trying to evaluate their flare impact kind of like hour by hour for 500 hours, you know. We do have a need for, you know, equivalent stack diameter and hourly varying equivalent stack heights in some cases. So, you know, just would like to take this opportunity to offer this suggestion. I know this is not, you know, a priority, you know, at this point. I totally understand, but, you know, it could be a, you know, small side project for one of, you know, our EPA program folks, you know, to think about. That's my comment. Thank you.

George Bridgers:

Thank you very much.

Again, the offer is on the table, if anyone would like to offer public comment to the record and you're more than welcome to also come back at 1:00 p.m. And if you would like to think about it over lunch, come and present, I can also have that option.

[Insert a few seconds of pause awaiting anyone wishing to present additional public comments]

So, for the record, I will note that at this point I don't see any hands or anybody making a motion they want to present. So, with that, we are going to break now for lunch. We'll end this at 11:34 a.m. now, and we'll take our lunch until 1:00 p.m. Just because that was what's put in the agenda.

And when we reconvene, it will just be for those that want to offer comments. So, there's no other reserved presentations. So, if you do not stay with us for the afternoon session, I will mention that we already have all the presentations posted on SCRAM. That's what I was doing over there on the side. So, that's already available. And wish you safe, travels home, but I'll

repeat all of that this afternoon. So have a nice lunch. And with that, I adjourn the Conference until 1:00 p.m. for the public hearing.

[PUBLIC HEARING LUNCH BREAK]

[end of transcript]