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U.S. ENVIRONMENTAL PROTECTION AGENCY  
10TH CONFERENCE OF AIR QUALITY MODELS  
DAY TWO

U.S. EPA  
109 T.W. ALEXANDER DRIVE  
RESEARCH TRIANGLE PARK, NC

MARCH 14, 2012

8:30 A.M.

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GUEST SPEAKERS:

- Bret Anderson, US Forest Service
- Kirk Baker, US EPA - OAQPS
- George Bridgers, US EPA - OAQPS
- Roger Brode, US EPA - OAQPS
- Dan Dix, All4, Inc.
- Tyler Fox, US EPA - OAQPS
- Ryan Gesser, Georgia-Pacific, LLC
- Steven Hanna, Hanna Consultants
- Ralph Morris, ENVIRON
- Robert (Bob) Paine, AECOM
- Mark Podrez, RTP Environmental Associates
- Erik Snyder, US EPA - Region 6
- James Thurman, US EPA - OAQPS

1                   **U.S. ENVIRONMENTAL PROTECTION AGENCY**

2                   **10TH CONFERENCE OF AIR QUALITY MODELS**

3                   **MARCH 14, 2011**

4                   **MR. BRIDGERS:** Well, good morning

5 everybody. I think we'll get started here in about 30  
6 seconds, so if we could take our seats, it would be  
7 appreciated.

8                   While everybody is taking their seats, I  
9 wanted to just hit a few logistics that we went over  
10 yesterday. I know there may be a few new faces in the  
11 room. For those that are new this morning, welcome.  
12 For everybody who was with us yesterday, I hope you had  
13 a pleasant evening and a restful overnight period.

14                   I wanted to remind everybody that this  
15 is a public hearing. All the presentation material  
16 that's on the screen and everything that's spoken is  
17 being recorded. Be mindful of that.

18                   And to that end, during the Q and A  
19 sessions, if you would like to ask a question, we ask  
20 that you use the microphones and identify yourself  
21 before you ask the question.

22                   Also, I guess it goes without saying as  
23 you look at the agenda that we've got 20ish, 25  
24 presentations; however you want to count it across the  
25 course of the day. We've got a full agenda. So, we're

1 just asking for everybody, especially the presenters,  
2 to try to be mindful of the schedule and respectful of  
3 the other presentations, but we did pretty good  
4 yesterday staying on time. We actually got out a few  
5 minutes early.

6                   So, I am not going to say anything else  
7 because Tyler Fox is my boss and I'm not speaking for  
8 him.

9                   **MR. FOX:** Well, welcome back. It looks  
10 like everybody decided to come back and then some. As  
11 George said, we have a packed agenda for today, but I  
12 thought it would be useful for everybody if we went  
13 through the process and the scope of what we're talking  
14 about in terms of updating Appendix W to provide  
15 context for today in particular because today we'll be  
16 going through the current draft of the PM2.5 guidance  
17 which we still have to release and George will go  
18 through that. Our apologies ahead of time for not  
19 getting that out, but we needed to finish up some  
20 things and get some internal review before we put that  
21 out and that will be forthcoming, I believe, either by  
22 the end of the month or early in April to facilitate  
23 comments as part of this docket and this meeting on  
24 that.

25                   We'll also be talking about the

1 challenges with respect to the 1-hour and NO<sub>2</sub> and SO<sub>2</sub>,  
2 NAAQS, and all of those issues are things that may be  
3 ripe for consideration in terms of updating Appendix W  
4 and, at the end of the day, we'll be talking about  
5 emerging models and techniques.

6                   At the 9th Conference, we introduced the  
7 source apportionment techniques and other uses of  
8 photochemical models to account for single source  
9 impacts. Now, we have a commitment based on the grant  
10 of the Sierra Club petition by Gina McCarthy in our  
11 agreement. It's not as if she's forcing it upon us.  
12 That we address chemistry in Appendix W and update  
13 Appendix W accordingly to account for those ozone and  
14 secondary PM<sub>2.5</sub> impacts and that also overlays with the  
15 ongoing evaluations that we've been undertaking with  
16 the Federal Land Managers on long-range transport  
17 models.

18                   So, I should have started with a review  
19 yesterday in terms of our current regulatory models and  
20 status and updates. There are aspects, as you all  
21 heard, that would be ripe. So, I want to make sure  
22 that we all understand the scope. There may be issues  
23 outside of this that people want to comment on, but in  
24 terms of updating Appendix W, everything is fair game  
25 for the most part and we really need your input in

1 terms of that process.

2           So, in terms of the current regulatory  
3 models, as I said, there may be improvements or updates  
4 augmentation to the model formulations. There were a  
5 number of issues yesterday, but there may be others to  
6 consider that you all have. We'll hear maybe perhaps  
7 tomorrow in the public session. There's also the  
8 suitability of the current performance evaluations for  
9 regulatory purposes that we would welcome input and  
10 comment on and perhaps modifying.

11           As we discussed yesterday, the need for  
12 field studies or to take existing field studies and add  
13 them to the suite of studies that are used to evaluate  
14 our models as we go through the regulatory process.  
15 And, as we ended yesterday, we talked about the new  
16 beta release of the Mesoscale Model Interface Program  
17 to facilitate the use of prognostic data for CALPUFF,  
18 AERMOD, and SCICHEM. As Brett indicated, we would need  
19 to, you know, provide guidance in terms of the use of  
20 that model if put into the regulatory arena, but it may  
21 be an issue, and likely an issue that we would need to  
22 address in terms of updating Appendix W and codifying  
23 rulemaking.

24           In terms of the 1-hour NO<sub>2</sub> and SO<sub>2</sub>  
25 NAAQS, we've been dealing with that for a year and a

1 half or so. They'll be presentations about aspects  
2 that are relevant to consideration for updating  
3 Appendix W.

4 I believe Bob Paine's going to talk  
5 about an approach to account for emissions variability  
6 given the form of the standard. The averaging time has  
7 provided challenges to us. We've issued guidance on  
8 March 1st on the treatment of intermittent sources.  
9 More clarification or specificity there may be  
10 something to consider as we update Appendix W.

11 And then the current three-tiered  
12 screening approach which served us very well as we  
13 moved into the 1-hour NO<sub>2</sub> standard. The first  
14 approach, a conservative approach, of full conversion  
15 is what it is, but perhaps updates to the ambient ratio  
16 method which we'll hear about later today. Perhaps  
17 pursuing refined model status for either OLM or PVMRM  
18 as techniques within AERMOD and, you know, that gets to  
19 both improvements or augmentation of those model  
20 formulations as well as doing sufficient evaluation of  
21 those techniques to provide the confidence necessary in  
22 order to establish it as refined techniques.

23 The benefit of that would be that it  
24 wouldn't be a case-by-case justification. There would  
25 be things that -- that you could just take and use. Of

1 course, those techniques, as you all know, in terms of  
2 dealing with the standard have a number of additional  
3 input requirements that would need to be addressed  
4 sufficiently and we have current defaults and always  
5 defer to case-by-case local or source specific or area  
6 specific type of information in terms of in-stack  
7 ratios and the background ozone, but those are things  
8 that may also need to be considered as we move forward.  
9 And I believe that we'll hear about an evaluation of  
10 PVMRM this afternoon as well.

11                   In terms of emerging models and  
12 techniques, we've been working with FLMS putting forth  
13 both the statement of program needs which I'll cover  
14 this afternoon, as well as a new evaluation paradigm  
15 for the long-range transport models and the chemistry  
16 models which we feel is appropriate and more in line  
17 with how they're used in the regulatory arena. The fit  
18 for purpose type of paradigm in terms of we need to  
19 demonstrate the models can do the things that they're  
20 required to do under the regulations and make sure that  
21 we and you have confidence in their ability to do that.

22                   We also have been undertaking a number  
23 of model inter-comparisons and evaluations to inform  
24 that process of what models are viable and what  
25 techniques are viable for assessing single source

1 impacts on ozone and secondary PM2.5. I'd also say for  
2 visibility and deposition purposes, in terms of AQRVs,  
3 so we look forward to working with the various model  
4 developers in the future as part of this phase three  
5 effort as we both provide you the information, as will  
6 be discussed in detail this afternoon on our  
7 evaluations, and what models and techniques we have  
8 been looking at and putting forth to the community for  
9 consideration.

10           As we go through the process as was done  
11 in the original IWAQM phase one and phase two efforts,  
12 starting with that broader landscape and then narrowing  
13 it down to those models that are viable and, if  
14 necessary, determine what areas or aspects of those  
15 models will need further develop, research and  
16 development improvement, such that they can meet the  
17 needs that we have both at the EPA and for the Federal  
18 Land Managers.

19           So, in terms of process, as I introduced  
20 yesterday at the first modeling conference that I was  
21 part of, the 8th Modeling Conference, that was a month  
22 before we actually promulgated AERMOD and that was the  
23 last time we updated Appendix W. The focus was to  
24 incorporate AERMOD into Appendix W. There are a number  
25 of other changes, perhaps housekeeping type of items,

1 that were taken care of, but that is the last time  
2 Appendix W was formally updated through notice and  
3 comment rulemaking.

4           So, you're all on notice that the next  
5 update officially starts now with this 10th Modeling  
6 Conference. As I've mentioned, we've committed to  
7 doing that in a grant of the petition to Sierra Club  
8 and in that, we explicitly stated that we would expect  
9 that at the next conference in three years, the 11th  
10 Modeling Conference, that we'd be discussing proposed  
11 rulemaking and changes that either the EPA is  
12 considering in an upcoming proposal or have already  
13 proposed and getting feedback in that context.

14           So, I imagine that most people in the  
15 room and elsewhere have the question, okay, so what  
16 happens between now and then? That's a good question.  
17 Hopefully, I have a good answer.

18           So, between now and then, there is no  
19 engineering ABC formula for this. Obviously, at the  
20 tail end of a promulgation process to get a proposal  
21 out, we're going to have to go through our bureaucratic  
22 and administrative procedures of review both within our  
23 agency -- we'll determine whether or not this  
24 rulemaking is significant or not to go through review  
25 by OMB. Previously, they have not gone through that



1 time to look at those things. That said, that doesn't  
2 preclude any consideration after that fact, but we  
3 really do need your input so that we can then go  
4 through a process of identifying those critical or  
5 priority items from our standpoint, summarize those  
6 public comments and priorities later in 2012, and get  
7 that out back to the community and engage with you  
8 through the appropriate venues, either through  
9 individual trade associations or other types of venues  
10 to vet that to make sure that we've both heard you and  
11 are, you know, in line intersection in terms of some of  
12 the priorities that we have and that you have in the  
13 community.

14           And then we'll continue our efforts to  
15 inform the process and provide information. We will  
16 issue public reports, EPA reports, and the like, either  
17 solely by the agency or in collaboration with the FLMS.  
18 We'll be submitting journal articles to promote peer  
19 review of the evaluations, the models that we may be  
20 tweaking, if you will, or updating. And then we'll  
21 participate actively in workshops and conferences that  
22 are upcoming.

23           At the tail end here, I mentioned  
24 suggesting a specialty conference perhaps late in 2012  
25 or early 2013. I believe AWMA or other organizations

1 have regularly or periodically had such conferences and  
2 we've actively participated in those and we would  
3 welcome that type of venue to have much more detailed  
4 discussion and focused discussion on specific items so  
5 that we can make progress.

6           And then, as George mentioned, this year  
7 we're having a week-long -- our annual workshop with  
8 the regional, state, local modelers, is going to be a  
9 week-long workshop that involves both the permitting  
10 side as well as the SIP side, so we won't be able to  
11 facilitate a public session as we did last year, but I  
12 would imagine or I would anticipate that in 2013, in  
13 the late April, May, early June time frame, we would  
14 have our annual workshop and we would, again, extend an  
15 extra day or two to have discussion about the items  
16 that we're focusing on and working on.

17           Again, we're trying to provide as many  
18 avenues as we can to allow for the type of interactions  
19 and more full disclosure and transparency in those  
20 interactions. And so, the other aspect to help us  
21 coordinate that, would be the third bullet there, is  
22 George mentioned that we had established a technical  
23 coordination workgroup that was really born from the  
24 fact that here we would get various meetings with  
25 different trade organizations and the like on a

1 periodic basis and we would meet with certain subsets  
2 of the community. In most cases, we're hearing the  
3 same thing across the community, but we learn of  
4 different efforts that are going on across different  
5 parts of the community and one aspect of that was the  
6 cross-fertilization across the community of those  
7 efforts to make sure that people are aware of what is  
8 going on and connecting the dots there and so it makes  
9 it easier on us to work with you all, but also to make  
10 sure that if there are collaborative efforts that we  
11 can take advantage of, that we're aware of those. We  
12 can inform that committee of the things that we're  
13 doing by meeting on a periodic basis and have those  
14 representatives be able to disseminate information and  
15 feed that information throughout the community.

16                   So, we've established a technical  
17 coordination workgroup. They helped and were a  
18 tremendous help in getting the agenda solidified, the  
19 invited speakers, and the like. So, we greatly  
20 appreciate that effort and we really feel that that is  
21 a good way to continue coordination as we go through  
22 this process. So, we can talk more about that and get  
23 your thoughts and ideas. Again, it's one of those  
24 things where everybody probably wants to be part of the  
25 workgroup. What we stressed in initially forming it is

1 that we needed people who were going to be active  
2 participants and had been, kind of, deemed  
3 representatives for a broader group and the like, so  
4 they did have a responsibility and an obligation to  
5 take that information back to their host organization  
6 and so we can make sure that everybody in the community  
7 is represented in that fashion, but it's a very  
8 effective and efficient way to coordinate, in addition  
9 to the other aspects that I mentioned here.

10                   So, obviously there's a lot of time and  
11 effort that will be taken to try and coordinate and  
12 communicate, but we also need to take the time to get  
13 the job done in terms of the work that we're doing.

14                   Hopefully today, as you see the  
15 information that we're providing, you'll gain a better  
16 understanding and appreciation of the time and effort  
17 that folks here have put forth to put these things in  
18 place in addition to dealing with case-by-case  
19 situations on permits and the like and dealing with  
20 other aspects of the EPA workload.

21                   I should mention that this is one aspect  
22 of what my group deals with and so we're also dealing  
23 with federal rules and other types of things doing the  
24 assessments and the work, writing guidance for other  
25 purposes, and applying these models in other -- for

1 other purposes. So, these folks are doing a wonderful  
2 job, but they do have quite a bit on their plate. So,  
3 what we'd ask is that we try and find an appropriate  
4 process that respects both the community and our time  
5 and resources so that we can move forward in the best  
6 way -- most effective and efficient way possible.

7                   So, before I turn it over to George, I  
8 guess, what I'd like to do is open it up and make sure  
9 that, in terms of the process and the scope,  
10 everybody's understanding. If there's any questions, I  
11 would welcome them now because I want to make sure as  
12 we go into today and go through all the details and  
13 more substantive things, that we have an understanding  
14 of that process and scope and you all know what we're  
15 expecting of you all in that process and if there's any  
16 questions or clarification, please let me know now.

17                   No questions?

18                   **AUDIENCE MEMBER:**       Bob Paine, AECOM.  
19 Just a question on the length of time to comment on the  
20 PM2.5 guidances becoming smaller and smaller, we were  
21 hoping for I would think 60 days, but it looks like it  
22 would be less than 30 days, perhaps.

23                   **MR. FOX:**       Well, so, in terms of the  
24 guidance, I mean, what we really need and want is  
25 comments through this formal process, but that doesn't

1 preclude comments after this formal process. So, I  
2 wouldn't think of it as that the door is slamming and  
3 then we're going to move on. I would think of it --  
4 that, it's to everybody's advantage to get comments in  
5 sooner rather than later so that we can take those into  
6 account and then, as we modify and update that guidance  
7 throughout the year and then finalize it near the end  
8 of the year, we can take those considerations and  
9 comments into account.

10                   So, you know, same thing with those  
11 other two reports in terms of the evaluations. They're  
12 kind of seeing it as an evolving process and the like.  
13 Again, it's to all of our advantage to get comments  
14 sooner. If they're put together in this, you know,  
15 context, we can deal with them in aggregate and then  
16 work through them. If they come in afterwards, that's  
17 fine, in terms of the PM2.5 guidance and those reports  
18 we'll deal with those, but what we're trying to  
19 emphasize is that people use the current process. But  
20 by no means do I mean that that shuts the door and then  
21 we're not going to consider anybody's thoughts or  
22 comments. In fact, you know, we would welcome  
23 additional analyses or other type of work that people  
24 may do as you hear more on the guidance and as you hear  
25 about potential techniques this afternoon, they may

1 spark some ideas that you could do that could then  
2 inform that guidance.

3           And that's very similar to the way in  
4 which we have updated the SIP modeling guidance. We  
5 put something out there for review and we've gotten,  
6 you know, a huge amount of input from the states and  
7 others and assessment by the states that were very  
8 valuable in coming up with that final guidance.

9           **AUDIENCE MEMBER:**       Is there a schedule  
10 for that guidance to come out final?

11           **MR. FOX:**       We, at this point, we'll be  
12 talking about that in Chicago in late April with the  
13 regional, state, and local modelers. Obviously, we  
14 have a new old ozone standard and may have a new PM  
15 standard at some point in time. We're trying to align  
16 and update to that guidance -- that SIP modeling  
17 guidance, with those types of requirements and it's not  
18 clear, given the existing level of the ozone standard,  
19 whether or not the current guidance is sufficient or  
20 not. We're addressing those types of issues and we'll  
21 let people know. I wouldn't anticipate any update to  
22 that guidance before the end of the year.

23           **AUDIENCE MEMBER:**   That was -- no update  
24 to the SO2 guidance before the end of the year?

25           **MR. FOX:**       No -- okay, I thought you were

1 talking about ozone, PM, regional haze, SIP modeling  
2 guidance.

3                   **AUDIENCE MEMBER:** Yeah, I wanted to  
4 bring up the issue of the SO2 guidance that came out  
5 last fall, I think it was. Is there a schedule for  
6 that to become final?

7                   **MR. FOX:** The agency got comments on  
8 that overall guidance and right now, we and senior  
9 management, and others are determining how to move  
10 forward, so I can't give you any answer on that. Any  
11 other comments?

12                   Welcome, Raj. Raj Rao, everybody.  
13 There were a number of people looking for you  
14 yesterday, Raj, so I figured that I would.

15                   **MR. BRIDGERS:** As we transition here, I  
16 wanted to thank everybody. The creatures of habit in  
17 the room that everybody sat almost exactly where you  
18 sat yesterday, so I feel very comfortable as I look out  
19 and I see the various people in the room.

20                   I'm going to go ahead and say please  
21 accept my pardons. The presentation you're about to  
22 see, there was a lot of midnight oil -- later than  
23 midnight oil, later than that midnight oil that was  
24 burnt last night. So I had a request in the audience  
25 to dim the lights. If I fall asleep while giving the

1 presentation, just nudge me. So, here we go.

2                   So, George Bridgers, U.S. EPA, so we got  
3 that on the Record. The topic of my talk today, if I'm  
4 not doing spell check which makes no difference to the  
5 room, is The Lochness Monster, Sasquatch, my Insta-  
6 Blade Brackets, things that everybody's heard about,  
7 but nobody has quite seen.

8                   So, as was already asked in the question  
9 if this will move forward, we had intended to have PM  
10 two and half -- the draft PM2.5 permit modeling  
11 guidance out last fall in advance of the 10th Modeling  
12 Conference that was originally scheduled for October.  
13 We intended to have this out in a timely fashion for  
14 the review and comment by the state and local agencies  
15 and then also by the permit modeling community.

16                   One of many aspects as to why we delayed  
17 the conferences, obviously, this was not the only one,  
18 but it did provide us some more time to work on it.  
19 As, like everything else, best laid plans, good  
20 intentions, whatever you want to say, we didn't get it  
21 out before October and it's not on the website today.

22                   Part of the reason for that is, Tyler's  
23 already gone through, that we have had a multitude of  
24 things that have been ongoing. There's a lot of  
25 complexities here with the guidance document that we're

1 talking about and, to that end, there's been a lot of  
2 coordination that has been needed between senior  
3 management, the policy division, and OGC. We had  
4 actually had hopes -- we were burning some of the oil  
5 this last weekend trying to get this document in a  
6 final form that we could put out there, but there just  
7 wasn't time for the review internally that happened  
8 before we could then put it out. As Tyler said, our  
9 plans now are to have it out in the very near future,  
10 but I did want to make the comment, and this comes back  
11 to what Bob asked, is the comments for the PM2.5  
12 guidance are in no way tied to this conference. And  
13 that we welcome the comments after the docket and we've  
14 already mentioned this morning it's going to be  
15 extended to April 30th.

16           The thought is that when we release this  
17 draft guidance, the states and locals are going to make  
18 comments. The modeling community as a whole is going  
19 to make comments. There may, in fact, need to be a  
20 second version of the draft document that's put out  
21 sometime later in the year for more comments. Tyler  
22 had mentioned the fact that we may be soliciting other  
23 ideas or work from all of you. This is a collaborative  
24 approach and it's something that, working together, I  
25 think that we can put together a quality document when

1 it's finalized.

2           The regional, state, and local modelers  
3 workshop will be our next opportunity to sit down with  
4 the states and have an informed discussion. Keeping to  
5 the timeline that Tyler mentioned that we would have it  
6 out sometime in April, there probably won't be a  
7 tremendous amount of review time by the states and  
8 locals by the time they come to the conference, but we  
9 will have that as a part of our workshop and we'll also  
10 summarize at least what we've heard today, tomorrow,  
11 and over the course of the docket with the state,  
12 local, and tribal agencies in Chicago. And then, as I  
13 said, we're going to put the goal of finalizing this  
14 only a year late at the end of 2012.

15           So, for the rest of this presentation, I  
16 have to put this disclaimer out there, one that I'm  
17 very tired, but two, the slides throughout the  
18 remainder of this presentation -- they're glimpses as  
19 to what we're doing. They're by no means the final  
20 document and that they have not gone through all of the  
21 formal internal review processes. So please, we  
22 shouldn't take these as sort of the EPA's formal  
23 recommendations or particular endorsements. So,  
24 caveats as they are.

25           I thought it would be appropriate, most

1 of the people in the room this is going to be old hat  
2 and so, pardon the next five minutes or maybe a little  
3 bit less, but I wanted to kind of set the stage for  
4 everyone, build a little bit of background so we can  
5 understand where we came from to where we've arrived to  
6 today.

7                   Actually, this kind of dates my history  
8 with air quality as well because it was about 1997 when  
9 I joined the state agency but, nonetheless, the daily  
10 and annual PM2.5 NAAQS was set back in 1997. At that  
11 time, there was no monitoring network and there hadn't  
12 been any significant modeling done. There really  
13 wasn't the techniques or tools in place. So, when this  
14 standard was set, just within a few months after it was  
15 set -- promulgated, a PM10 surrogate policy was put  
16 into effect. And this, for the most part, allowed the  
17 status quo to continue with respect to the permit  
18 applicants using their PM10 requirements to satisfy  
19 that for the PM2.5.

20                   Not a lot happened through the early  
21 part of the 2000s. We got past the 2000, you know, the  
22 bug with the computers and that wasn't an issue, and  
23 2011 or 9/11 and what not. We got to 2006 and we  
24 decided to revise the standard. We only revised the  
25 daily standard, moving it from 65 to 35, but we

1 retained the annual standard of 15.

2                   Things were going along pretty good.  
3 2008, though, was the first real nugget that helps us  
4 with this guidance document and, subsequently, with the  
5 work that we all have to do in showing compliance.  
6 It's that we got the PM2.5 NSR implementation rules  
7 promulgated and through this, the first vehicle for  
8 helping us was put into place and that was the SERs --  
9 the significant emission rates. In here, for direct  
10 PM, the ten tons was set as the SER there and then  
11 there was also a precursor of PM2.5's SERs set for  
12 NAAQS and SO2. Both of those were set at 42 tons per  
13 year which happened to be equivalent to their SERs for  
14 them as major pollutants by themselves. There was also  
15 this little quirk put in there about this  
16 grandfathering provision that allowed the federal  
17 permits to continue relying upon this PM10 surrogate  
18 policy. There's a bunch of dates that are involved in  
19 that. I didn't want to bring it up in this context,  
20 but I encourage anybody, if they want to know that  
21 history, to go back and look at this May 16th rule.

22                   On or about February 11th, though, of  
23 2010, EPA published a rule to repeal this  
24 grandfathering provision and also put an early end to  
25 the PM10 surrogate policy. Well, with that action on

1 February 10th of 2011, we came into the world where we  
2 knew that we were going to have to deal with PM2.5 from  
3 a compliance demonstration standpoint of view and to  
4 aid that, there were a couple of actions. I talked to  
5 you yesterday with the Model Clearinghouse update that  
6 there was a Region 6 clearinghouse action in -- it was  
7 in 2010 -- I think it was February 2010, with regards  
8 to a couple of things with background monitor and then  
9 the calculation or what model value to apply to  
10 background compliance demonstration for PM2.5.

11                   On the heels of that clearinghouse  
12 action and based in some degree to the work that had  
13 already been laid down for us by OTAQ, there was a lot  
14 of work that already had been done in that arena for  
15 PM2.5. There was a memo that was released March 23rd,  
16 2010 and it was entitled The Modeling Procedures for  
17 Demonstrating Compliance with PM2.5 NAAQS. That's a  
18 pretty good name.

19                   Somehow, this has affectionately become  
20 the Page memo. Now, Steve Page has signed dozens and  
21 dozens of memos but from the context of this community,  
22 we've just always come back and referred to this as the  
23 Page memo. I imagine the next one that fits in this  
24 community, we'll call it the Page memo two or whatever  
25 we want -- a do-over or whatever. But at any rate,

1 there was a couple of important things here. This memo  
2 really was the foundation -- is the foundation for  
3 where we are today with respect to being able to show  
4 compliance with PM2.5 and it's also the foundation of  
5 the draft guidance that you've yet to see.

6           There's a couple of very important  
7 things that were addressed here and Roger Brode has  
8 showed up and he could probably talk at great length  
9 about the aspects that we're now dealing with the  
10 probabilistic standard. Previously, it was a  
11 deterministic, second high type approach and now we've  
12 moved into the world of probabilistic standards and  
13 that throws a monkey wrench in the way that the -- the  
14 general convention had been for compliance  
15 demonstrations.

16           Another thing is, you know, there was  
17 all the complexities associated with the ability for  
18 existing models to be able to show the secondarily  
19 formed PM2.5. These tools and techniques, there were  
20 some out there, but they were not promulgated into  
21 Appendix W and they are definitely not at this point.

22           And finally, there was the recognition  
23 that you need to pay special attention to your  
24 background monitoring concentrations because now that  
25 takes on a more important role than just characterizing

1 the primary emissions from your surrounding facilities  
2 and the background longer range transport, but you're  
3 also catching a bit of the secondary forms locally and  
4 remotely. So, you just need to understand the context  
5 to which you're doing your compliance demonstration.

6           A few more nuggets that came into place  
7 and this was a rather important one, that in October of  
8 2010, there was the PM2.5 increment, the significant  
9 impact level, and the significant monitoring  
10 concentrations were promulgated and so we moved from  
11 the world of some interim SILs and SMCs to a world  
12 where we had a defined set of tools that we could use  
13 in the compliance demonstrations. I put the table in  
14 here. It's worth pointing out the annual SIL for PM2.5  
15 and class two areas .3 and 1.2 with respect to the 24-  
16 hour standard. So, that was for reference.

17           And then that kind of brings us to the  
18 modern era. This last year on May 16th, the surrogate  
19 policy ended and so, at this point, without question,  
20 all the PM2.5 -- or all the PSD compliance  
21 demonstrations with respect to PM2.5 had to consider  
22 primary and, if applicable, the secondarily formed  
23 PM2.5. I said here from precursors but, nonetheless,  
24 it's something that needed to be done. It was no  
25 longer just an optional thing where you had a policy to

1 which you could rely upon.

2           And then one more nugget that actually  
3 plays into moving forward is that on the 21st of July,  
4 Gina McCarthy signed a memo that effectively ended this  
5 interpolluting trading ratios that had been set as  
6 presumptive ratios in the preamble to the 2008 rule  
7 that we talked about on May 16th.

8           I think it's worth pointing out that  
9 although we removed the presumptions for applicability  
10 across the country, it didn't remove the position of  
11 the agency that we felt that these ratios could be set  
12 on a specific non-attainment area or a regional basis,  
13 but that would require local agencies, state agencies,  
14 and the like to work very closely with the regional  
15 office, develop a technical justification for those  
16 ratios that are set.

17           The memo actually went further and had  
18 four different steps as to how one might go through  
19 that process and even offered up, I guess, in nine  
20 cities around the country that there was at least some  
21 data already available to which agencies in those areas  
22 may be able to glean information upon. But there is a  
23 wealth of regional modeling and other things that are  
24 already in place that agencies may be able to rely  
25 upon.

1                   While all this was going on, I guess  
2 Tyler Fox made the request, but there was a request  
3 from EPA made to NACAA. It was basically a plea for  
4 help with the states to let's work together in a  
5 collaborative fashion to tackle some of the issue with  
6 regards to modeling PM2.5, especially from a single  
7 source perspective.

8                   So, early in 2010, a NACAA workgroup was  
9 formed. There are others in this room that probably  
10 can speak a lot more knowledgeably of this workgroup,  
11 but I'll give it my bit of a try here.

12                   The objective was to come up with a set  
13 of technical recommendations back to the agency with  
14 respect to the guidance. It comprised obviously with  
15 NACAA you're talking about state modelers, permit  
16 engineers, staff that worked with the mission's  
17 inventories, and we had also some regional office  
18 representation and some representation from here from  
19 OAQPS. They worked together. I think initially there  
20 was probably 20 or more different items that were put  
21 on the table and that coalesced into three main focus  
22 areas that are listed here below.

23                   Each of the workgroups that were formed  
24 had a specific charge or they formed a specific charge  
25 and then they worked across the year 2010 to come up

1 with a set of recommendations.

2                   Let's see -- one, two, three, four days  
3 after I started with the agency here, a report was  
4 delivered to my desk which I appreciated greatly. It  
5 was nice reading along with all of the training that I  
6 had to go through. That was the culmination -- the  
7 compilation of all the recommendations from the three  
8 subcommittees. That report is available through NACAA  
9 but for the interest of this conference, we have posted  
10 it on the SCRAM website specific to the 10th Modeling  
11 Conference.

12                   I'm not going to read all the names but  
13 since this is going into the Record, I thought it was  
14 appropriate to have some recognition for all those that  
15 worked diligently and provided information back to us.  
16 So, I'm going to show each of the workgroups. Briefly,  
17 you can read your names and, again, many of the people  
18 that helped with these recommendations are sitting in  
19 this room. And then I'm going to show kind of the  
20 bullet points of what the recommendations were from the  
21 workgroup.

22                   So, with the Emissions Inventory Sub-  
23 Workgroup, there was a request or a recommendation that  
24 there needs to be a new emphasis on the development of  
25 reliable PM2.5 emission factors. Until such factors

1 could be developed, quality assured, and are available,  
2 the workgroup recommended to kind of leverage against  
3 existing state programmatic work. An example that was  
4 given was with CARB.

5                   There was also a request or a  
6 recommendation that we provide guidance as to what  
7 types of emissions sources are required to include with  
8 respect to secondary formation in their modeling  
9 analysis. The example that was given in their bullet  
10 points was for combustion sources.

11                   The secondary formation from the project  
12 source, this workgroup was made up of a large number of  
13 people that I've worked with through the number of  
14 years with SIP related modeling and a lot of the  
15 recommendations that came out of this workgroup are  
16 mimicked in some of the slides that I'll give later  
17 that are directly found in our draft guidance. So,  
18 I'll give everybody just a second to read all those  
19 names.

20                   And with respect to the recommendations,  
21 at the top level, they had recommended a four-tiered  
22 approach to modeling PM2.5 conducting the air quality  
23 analysis. They wanted us to reconsider the use of the  
24 maximum modeled value for comparison to the NAAQS and  
25 that's something that was established in that Model

1 Clearinghouse memo and reinforced in the March 23rd  
2 Page memo.

3                   They requested or recommended the  
4 development of offset ratios which reflected the  
5 geographic and seasonal variations with respect to the  
6 single source permitting, that fits in somewhat the  
7 context of what was discussed with the McCarthy memo,  
8 and then to complete an evaluation of plume models and,  
9 if necessary, clarify the guidance for tier three  
10 modeling approach. I have a slide of their tiers here  
11 in a second.

12                   They also said that we should consider  
13 adding comprehensive chemistry to AERMOD and if it were  
14 to be done, then we would have to look at the tier four  
15 and their level and also require an update to Appendix  
16 W.

17                   I look to Roger Brode, he's typing on  
18 his computer. How's that chemistry coming? It's  
19 coming. I say that in jest, I apologize for putting  
20 Roger on the spot there.

21 And then with respect to the tier four, the  
22 photochemical grid models, there were a whole bunch of  
23 issues that were brought up and I'll go ahead and say  
24 that these issues have been brought forth from the  
25 recommendations they sent to us and that we're also

1 continuing to solicit comment in our draft guidance  
2 document when you see it. Such as: what's the best  
3 way to apply the models? There's a varying number of  
4 sources whether there's DDM or source apportionment or  
5 the like. Should we use plume and grid or some type of  
6 sub-grid characterization? Absolute or relative  
7 modeling? You know, we got into the world of relative  
8 modeling with regards to your state implementation  
9 plans, but we still did a very straightforward,  
10 absolute type modeling with dispersion modeling. Now,  
11 we're bridging those communities. What do we do?

12           And then with respect to photochemical model,  
13 now that you've got a photochemical model, especially  
14 if you're using a sub-grid treatment, do we use it for  
15 both the primary and for the secondary form because  
16 we'll have that information. Or does it still make  
17 sense to use AERMOD for your fence line effects and  
18 things that are within the near-field and then somehow  
19 use the secondarily formed impacts from the  
20 photochemical model?

21           And here's this table. I hope it's a little  
22 bit clear. I've tried to make it big so it could be  
23 seen from the back of the room, but they followed a  
24 typical approach that we had with other NAAQS  
25 pollutants where you had a SIL and a cumulative

1 analysis and then there was four different tiers.  
2 Three of the tiers were contained within the cumulative  
3 analysis, but in each one of their steps, there was  
4 some consideration for the secondary formation from  
5 precursor emissions.

6           Then finally, here's the third workgroup or  
7 sub-workgroup and this was with respect to the  
8 representation of background concentrations. So, just  
9 a second to recognize everyone. I see some names and  
10 they're in this room. Mike Kiss. John Glass is here.  
11 Leigh Bacon.

12           With respect to the recommendations that came  
13 out of this workgroup, there was a couple of different  
14 paired sum approaches that were recommended with  
15 respect to whether it was continuous data or whether it  
16 was every one and three day samples. That is a problem  
17 that's unique to PM2.5 is that we don't sample every  
18 day at all locations. Their recommendation here was to  
19 develop an analysis technique to help with whether one  
20 or more monitoring sites could be used whether we're  
21 talking sort of a creeked field approach. What about -  
22 - and that kind of plays into this next one where we  
23 talk about the infusion of model predictions with  
24 observations. And also there was a request to modify  
25 AERMOD to read an hourly background PM2.5

1 concentrations through a file. And then finally,  
2 modify Appendix W to accommodate the recommendations.

3           So, now that we've got the background, how we  
4 got to where we are. We've got the Page memo. We've  
5 got some other pieces in place. We've got the NACAA  
6 recommendations, the charges. Okay EPA, go out and  
7 let's get this thing done.

8           I should mention up front, and this was  
9 stated in great detail in the Page memo, that there's a  
10 screening nature to everything that we've talked about  
11 because we don't have an explicit model that is  
12 promulgated in Appendix W to do a one for all, for  
13 example. So, I can read the bullets word for word,  
14 but, you know, given the potential contribution, the  
15 secondary formation, it's not explicitly accounted for,  
16 the prominent role of background, certain aspects of  
17 the standard. There are things that are with this  
18 particular criteria pollutant that aren't with others.

19           PSD modeling should be viewed as the  
20 screening level analysis and that's analogous with what  
21 had been done for NO2 and that's in Section 5, 2, 4 of  
22 Appendix W. Do a little more RegText quoting with  
23 respect to Section 5, 2, 2, 1 (c). The choice of  
24 methods to be used to assess the impacts of individual  
25 source depends upon the nature of the source and its

1 emissions and, therefore, with respect to everything  
2 that we've talked about, there's this need, a  
3 significant need for consultation with your state and  
4 local authorities and with the regional office.

5 I know that the words case-by-case become the  
6 most dreaded terms ever, but we're in an arena now that  
7 we don't have a wealth of information and so we are  
8 going to glean things from every case-by-case  
9 situation. What's paramount to this is the modeling  
10 protocol. That's the avenue to which the consultation  
11 can start and there should be a well-developed modeling  
12 protocol that's then been approved by the state and  
13 local agency and the regional office before a lot of  
14 work gets done because we've seen in several cases that  
15 I've actually gone through with PM2.5. I won't say  
16 that there were some simpler ways. Simpler makes it  
17 sound lesser than it was, but there was probably some  
18 more efficient ways that the application could have  
19 been done. People kind of get worked up in a frenzy  
20 and lose sight of the ultimate goal.

21 I threw the flowchart in here. This is very  
22 typical for NSR PSD. I'm not going to spend much time  
23 here. The important point of this is that once you  
24 fall into the PSD side of the house and you're above  
25 the SERs, we're still recommending in our guidance

1 document that you're going to go through, at a  
2 screening level, the significant impact analysis and  
3 also a cumulative analysis. The significant impact  
4 analysis being one which you're not including  
5 background. You're only looking at the emissions and  
6 the secondary formation from your project source. And  
7 then the cumulative impact analysis is where you're  
8 going to look at sources that cause a significant  
9 concentration gradient on or about your source and also  
10 you're going to take into consideration aspects of your  
11 background concentrations.

12           Within that framework, we're proposing four  
13 different scenarios and these four different cases, if  
14 you will, will help further define how you would step  
15 through the SIL or the cumulative analysis. And it may  
16 be that in one of the cases or a couple of the cases,  
17 you may not step through the SIL or the cumulative  
18 analysis.

19           So, really quickly, the first case is -- I  
20 won't say it's a no-brainer. We put it in here just  
21 for completeness. And this is one where your facility  
22 doesn't trigger the SERs. You've got a maybe major  
23 facility for CO or what have you, but your net  
24 emissions increase or proposed emissions increase from  
25 PM2.5 is less than ten tons and with respect to your

1 precursor pollutants are less than 40 tons. You're  
2 done. You don't have to do anything with PM2.5.  
3 Celebrate. We can all go have a drink.

4           Case two, and this one is going to be fairly  
5 typical, is where you have a facility that is major.  
6 It's a major facility -- a PSD facility. And you've  
7 triggered for your primary or direct PM2.5 emissions.  
8 They're above ten tons per year. And your precursor  
9 emissions from NOx and SO2 are less than 40. And here,  
10 this should be the easiest case because we've already  
11 got the Page memo that's in place. The groundwork has  
12 been done. You're going to do a very typical  
13 compliance demonstration using AERMOD. And with  
14 respect to here, we're saying that you do not have to  
15 make any assessment of secondary formation.

16           The third case, and this one is the one, this  
17 is the big one. This is going to be the meat of the  
18 draft guidance when it's out. And this is one where  
19 you've triggered for both PM2.5 and one or both of your  
20 precursor emissions. And here, you've got to make  
21 compliance demonstration that takes into consideration  
22 the direct impacts of primary PM2.5 and also the  
23 secondary formation. That being said, this sum  
24 assessment that has to be done does not necessarily  
25 mean that you have to go all the way to a photochemical

1 model, meaning that everyone's got to run CAMx or CMAQ  
2 or the like or some new model that's yet to be formed.

3           There may be a completely qualitative way  
4 that you can go about demonstrating your compliance  
5 demonstration, at least from the secondary formation.  
6 You're still going to have to go through AERMOD for  
7 your primary. But in most cases, there's probably some  
8 hybrid qualitative quantitative approach that can be  
9 done. And this is where we don't have a wealth of  
10 cases and the case-by-case is going to help us. And we  
11 really only anticipate in a handful of situations that  
12 one would go all the way to the step that a single  
13 source itself would be running a photochemical model  
14 run. It's not out of the realm of possibilities, but  
15 we think it's going to be a rare exception, not the  
16 rule.

17           And then the fourth case, and this one may  
18 end up being the most controversial, maybe not to the  
19 community, but within the legal world, it may. And  
20 this is one where you are not triggering for your  
21 primary PM2.5, but you are triggering for one of your  
22 precursor emissions SERs, so NOx or SO2 have gone above  
23 40 tons with respect to the net emissions increase.  
24 Here, we're saying, well, sort of like case one, maybe  
25 no analysis is needed. Maybe you need to make a few

1 statements, but the pollutants NO2 and SO2, they're  
2 already -- their SERs for their major is already 40  
3 tons, so you've already triggered compliance with the  
4 1-hour NO2 and or SO2 standard. They're very stringent  
5 when, you know -- well, they're adequately stringent.  
6 Maybe I should say it that way.

7           Nonetheless, what we are trying to get  
8 confirmation from within the agency is saying that  
9 compliance -- that facilities compliance with the 1-  
10 hour NO2 or SO2 standards is adequately protective of  
11 that of the secondary formation for PM2.5. We hope we  
12 can get this through. This would be something that  
13 would be good for the community. All that being said,  
14 let's talk about how the devils are in the details.  
15 Let's actually go through a couple of the bullets about  
16 how we actually go through the modeling process.

17           I've already said case one we're not doing  
18 anything. Case four, we hope we're not doing anything.  
19 Maybe there's some discussion there, but at the end of  
20 the day we're hoping there is no modeling involved.  
21 So, both cases two and three require at least the  
22 compliance demonstration for the primary PM2.5. I  
23 already said it's your standard fair AERMOD type of  
24 exercise. It's the preferred near-field model. You're  
25 going to have all your normal considerations. You're

1 going to have your modeling domain considerations.  
2 You're going to have your source impact considerations.  
3 You're going to have to think about your meteorological  
4 inputs. I could go on and on. We've seen talks  
5 yesterday that went into length about the different  
6 things that we need to consider.

7           And then when you get to the cumulative  
8 impact, that's where we have to start thinking about  
9 the inclusion of background and that could be directly  
10 from the monitor and you also have to think about how  
11 you're going to model explicitly from the other  
12 sources. I could spend a week here and still, thanks  
13 to James for providing this, but I wanted to put it in  
14 the Record. It's just a review, obviously, of the  
15 AERMOD system.

16           Some things to think about and since our  
17 friends from OTAQ are in the room, we do have some  
18 considerations to think about with the receptor grid  
19 placement. It's unique. You have to think about it.  
20 It's unique to your modeling domain depending upon  
21 things such as terrain, sources modeled, various other  
22 aspects. They should be placed in areas that are  
23 considered an ambient air. There's nothing new there.  
24 There are some current provisions, though, that say  
25 that PSD source impact analysis with respect to the

1 NAAQS is required only in areas that have an existing  
2 PM2.5 monitoring locations as well as locations that  
3 are appropriate for comparing predicted PM2.5  
4 considerations to the NAAQS based on the PM2.5  
5 monitoring siting requirements and recommendations.  
6 That's a mouthful. I'm not going to -- there's a lot  
7 of nuances here. There's some caveats at the bottom  
8 that this is -- that PSD modeling is not required to  
9 include receptors that are located at sites that are  
10 not "population oriented" and also it's not required to  
11 consider effects, at least from the annual standard  
12 perspective, of receptors that are considered micro and  
13 middle scale.

14           There's a lot of nuances here and I would say  
15 that we can engaged in another venue to talk about some  
16 of those nuances, but there's some issues here just to  
17 be mindful of specific to PM2.5.

18           Emissions and source characterization, at  
19 least from respect of the primary direct PM2.5  
20 modeling, you're going to follow Appendix W with  
21 respect to Section 8-1. You have to look at Table 8-2  
22 with respect to the maximum allowable emissions. With  
23 your source characterization, you know, you have to  
24 make sure you have all of the source release  
25 parameters. I understand that the characterization

1 actually goes back to the NACAA recommendations. There  
2 are a bunch of issues here because this is an area  
3 where we don't have as much information, but it's  
4 growing with time. In, obviously, things like building  
5 locations, urban rule, what have you. Five years of  
6 meteorology. I'll just go past that one. For one year  
7 on site data. I didn't actually put in this slide --  
8 let me back up in all fairness. The one thing that's  
9 not on here is that we talked about the MMIF tool  
10 yesterday and so that's something that we need to  
11 further think about incorporating possibly down the  
12 road.

13           Just a few comments on the -- once you've  
14 moved to the cumulative impact in case two still where  
15 we're just looking at the primary direct PM only. Just  
16 a few things to think about with respect to monitored  
17 background. You have to consider a few things, you  
18 know, should -- the monitoring concentrations should  
19 account for the contributions of the secondary  
20 formation associated with your existing facility and  
21 also those throughout your domain. Consideration  
22 should be given to make sure that you're not double  
23 counting in your background monitor for sources that  
24 you're explicitly modeling.

25           It's likely not going to be quite as

1 important for secondary contributions -- secondary  
2 formation, just because of the lack of spatial and  
3 temporal location of that formation and also the  
4 uniformity of the background concentrations from the  
5 secondary perspective, but you could have some issues  
6 if you have a site that's located fairly close to a  
7 larger source.

8           You also may have to take into account  
9 seasonal variation and this is one, I think I have the  
10 caveat here that you may have a facility with fugitive  
11 or low level emissions that, at least from the primary  
12 perspective, your worst situations are probably going  
13 to be in the winter time when you have a lot of stable  
14 conditions or longer stable conditions than you would  
15 in the summer. Whereas, the maximum levels of the  
16 secondary contributions, especially say in the  
17 southeast that are sulfate driven, are going to be in  
18 the spring and summer. So, in that type of case, you  
19 may have to take into consideration the seasonal  
20 variation. And then I put a caveat in here also that  
21 the relative composition of PM2.5 also might need to be  
22 something that needs to be considered, especially in  
23 the western part of the country.

24           Now, let's talk about comparison to the  
25 NAAQS. We're still in case two. Somewhat, we can

1 think about case three on, at least on the direct side.  
2 We haven't got to the secondary formation aspect yet.  
3 At least with respect to the primary PM2.5, it's going  
4 to be pretty a straightforward approach. Remember that  
5 I said we have to take into consideration the  
6 probabilistic form of the standard. To that end, when  
7 you combine the monitored and modeled concentration,  
8 just because the standard is a 98th percentile and this  
9 is what was addressed in that February 2010 Model  
10 Clearinghouse action, you don't take the 98th  
11 percentile model and add it to the 98th percentile  
12 background because that would result in something that  
13 is less conservative than that of the NAAQS.

14           So, for the annual, the actual background or  
15 the design value concentration that you're going to use  
16 is going to be the design value. It's a three-year  
17 average of the annual average PM2.5 concentrations.  
18 And then for the daily, it's the three-year average of  
19 the 98th percentile of the 24-hour average  
20 concentrations. It just so happens that it's the  
21 eighth highest if you actually had an everyday sampler  
22 that had 365 samples, but please reference Appendix N  
23 to 40 CFR Part 50. If you had like every three day  
24 monitor or a monitor that had a lot of missing data to  
25 understand the rank for this specific design value

1 calculation.

2           With respect to combining the modeled and  
3 monitored, though, with respect to the annual PM2.5  
4 NAAQS at the SIL level. We're just at the SIL level.  
5 We're not combining it with the background. You're  
6 going to take the modeled annual average of the highest  
7 concentrations from each year that's modeled and  
8 average that. Or, if you're only modeling one year  
9 based on site specific, it would be the highest annual  
10 average from that year and you can compare it against  
11 the 15 data.

12           Did I say that right, Roger? Did I read it  
13 right, Roger? This is Roger's.

14           **MR. BRODE:** Well, it's the annual  
15 average -- average across the number of years at each  
16 receptor to the highest --

17           **MR. BRIDGERS:** Right, at every receptor  
18 and the highest -- so, you would average the highest at  
19 each receptor across the five years and you would pick  
20 the highest of those, right?

21           **MR. BRODE:** Right.

22           **MR. BRIDGERS:** And then when we look  
23 at the cumulative analysis, this is where we bring in  
24 the background concentrations. So, once again, you're  
25 going to use the same step where you're going to look

1 at the highest annual average at each receptor averaged  
2 over five years and pick the maximum of that and then  
3 add it to the design value. So, I'll make the  
4 corrections there. Again, midnight oil, with respect  
5 to NAAQS and SIL.

6           And then when we talk about the daily,  
7 here we're going to do the same type thing only we're  
8 going to look at it from the model 24-hour average.  
9 So, again you're going to have your receptor grid.  
10 You're going to find the highest daily PM2.5  
11 concentration at a receptor averaged over five years.  
12 Pick the maximum out of the entire receptor grid. Then  
13 that's what you're going to then compare against the  
14 SIL and then, not the NAAQS, sorry. And then with the  
15 cumulative, then we add in the background  
16 concentrations. The background concentrations here,  
17 though, we have a first and second tier. This is also  
18 outlined in the Page memo. So, there's already  
19 information out there that you could run and look at  
20 later this afternoon.

21           So, let me talk about the first tier  
22 here. For applications where the impact of the primary  
23 emissions aren't really temporally correlated, fairly  
24 steady state throughout the year, the first tier  
25 modeling analysis would be exactly as advertised. It's

1 that highest at a receptor for the year, averaged over  
2 five years, the highest receptor point then compared to  
3 the SIL. But when you have cases that are a little  
4 more challenging, where you have seasonal variability,  
5 then we have to look at something that's quite  
6 different where you might take into consideration a  
7 seasonal or quarterly basis. And that would be  
8 considered a second tier.

9           It's probably going to be more of an  
10 issue with the daily standard than it's going to be  
11 with the annual standard, but that doesn't exclude that  
12 there may be one or two cases where there is some  
13 impact on the annual standard.

14           And then I put down some bullets here  
15 with respect to that second tier where you would go  
16 through and determine four seasonal background values  
17 that then would be combined with the modeled  
18 concentrations. Then that would then be compared  
19 respectively to the SIL. So, I've got a few edits here  
20 to make in the slide.

21           Important thing is the AERMOD now has  
22 the capabilities to track all this. So, Roger has done  
23 all the dirty work. And there may be some future  
24 updates and some post-processing that would need to be  
25 done to help a little more inform the PM<sub>2.5</sub> analysis.

1           Is that a fair assessment? Okay. Let's  
2 switch gears. We talked a lot about case two where we  
3 were talking primarily about the direct PM2.5 analysis  
4 which was already somewhat straightforward, but now  
5 let's talk about the assessment of the secondarily  
6 formed PM2.5 and this puts us in case three where we  
7 were both triggered the SER for the primary PM2.5 and  
8 also for the precursors.

9           Here, some level assessment has to be  
10 done. And we've already talked about that. That it  
11 could be a completely qualitative, it could be some  
12 hybrid quantitative qualitative, or it could be full  
13 blown modeling. I can't stress enough the consultation  
14 is paramount here. And one of the things I didn't  
15 mention about the modeling protocol earlier in the  
16 presentation is one of the most paramount things in  
17 that modeling protocol is the conceptual description.  
18 You really need to understand the nature of PM2.5 and  
19 the nature of the environment around your source to be  
20 able to effectively develop your strategy for modeling.

21           So, what's a qualitative only approach?  
22 There are situations and this is one example. This  
23 isn't the only example. One example where your  
24 precursor emissions are only marginally higher than the  
25 SER, so maybe you've got, I don't know, 100 tons, just

1 an example. Maybe that's a bad - maybe 85. Let me  
2 just throw a number -- 83. That's when the Wolfpack  
3 won the last National Championship.

4 **AUDIENCE MEMBER:** 40. Precursor in  
5 terms of 40.

6 **MR. BRIDGERS:** They are, but I mean,  
7 they could be 41. They could be 162, but nonetheless,  
8 it's not 10,000. Your background levels are also very  
9 low. So that when you look at your -- back in case  
10 two, when you look at your direct PM2.5 concentrations,  
11 their modeled impact compared in the cumulative sense  
12 with background concentrations, you're still halfway to  
13 the standard. And so now, you know, the statement is,  
14 okay, in reality is 83 tons of NOx going to create in  
15 my environment 20 micrograms of PM? And I challenge  
16 anybody to go find in any documentation where that's  
17 happened. I imagine it has but, nonetheless, that's  
18 what we're talking about. You kind of look at things  
19 objectively. You see if it even fits a real case and  
20 then you make a technical justification for not going  
21 further into a full blown photochemical modeling  
22 exercise.

23 We have recently dealt with this in  
24 Region 10. Now granted, the OCS off in the Arctic  
25 Ocean and Beaufort and the Chukchi Sea is unique to the

1 whole country. But, nonetheless, they put together  
2 what effectively was a weight of evidence type of  
3 discussion that their background was, I forget, it was  
4 like 15 and with their model it was, you know, whatever  
5 it ended up being, like in the low 20s, and so they  
6 were so far removed from the NAAQS. It was ammonia  
7 limited, so there wasn't the right chemistry to make a  
8 lot of ammonium nitrate and it just wasn't reasonable.  
9 And that was the end of the story.

10                   That's not going to be the case for most  
11 of the country and this is where we get back into this  
12 hybrid qualitative quantitative approach and this is  
13 probably going to be most situations where we've got  
14 higher background concentrations. I'm thinking the  
15 industrial midwest. I'm thinking the southeast. Your  
16 primary impacts are fairly high. You're pretty close  
17 to NAAQS to start off already and so this is where the  
18 consultation process really kicks in. It's trying to  
19 understand how far are you removed from the standard  
20 and what type of analysis would be most appropriate  
21 moving forward and what tools do you already have in  
22 the war chest? Has the state just recently done a SIP  
23 demonstration or was there regional modeling that you  
24 could leverage upon to show? Maybe there was some  
25 sensitivity modeling that was done that could be

1 brought into the fray.

2           One of the recommendations that came out  
3 of the NACAA workgroup and that we -- although the  
4 McCarthy memo said that we removed the presumptive  
5 offset ratios, that didn't in any way exclude states  
6 from going through and making that type of  
7 justification and it may very well be that that's a  
8 good policy for states to go through, at least on non-  
9 attainment basis areas or on regional areas that have  
10 similar types of emission density and traffic patterns  
11 and the like to create offset ratios that then could be  
12 applied by the various applicants.

13           So, the modeling demonstration would be  
14 your direct PM2.5 with AERMOD. You apply the offset  
15 ratios. If everything is below the SIL or, if you have  
16 a violation and that combination shows that you don't  
17 cause or contribute to that violation, you're done.

18           And then there's going to be a talk  
19 later this afternoon that Ralph Morris is going to  
20 give. There's something that was -- that was actually  
21 a Greg Yarwood presentation that was given at CMAS last  
22 year. Now, the presentation specific to ozone, but we  
23 really feel that something like that screening tool  
24 approach could be done for PM2.5. It does require some  
25 agency, some body, to do some level of PM2.5

1 photochemical modeling, but once the tool is in place,  
2 then it can be applied across the region.

3           And then we get to the chemical  
4 transport modeling. The middle bullet is probably the  
5 most important one. We hope that this is the rare  
6 case, especially in light of the compliance  
7 requirements with the 1-hour and NO2 and SO2 standards.  
8 The NACAA recommendations have this basically as their  
9 tier three and tier four cumulative impact assessments.  
10 We're, I guess, tier three with them you have  
11 Lagrangian models and tier four had the Eulerian  
12 models. We think that there's a lot of promise.  
13 SCICHEM, for example, may be another solution and  
14 that's something that will be discussed this afternoon  
15 in the emerging models and techniques session. And  
16 also there will be some discussions on the Eulerian  
17 models. CAMx, CMAQ, they've been widely used for years  
18 for SIP attainment purposes, but now we're starting to  
19 look at them from single source specific. Now, they're  
20 resource intensive. We fully understand that. But I  
21 did want to provide and I think Kirk Baker -- I don't  
22 know if Kirk's in the room, but he provided some of the  
23 information here as we were putting together this  
24 document. He's been helpful here.

25           So, just a few things with respect to

1 single source. There's various different applications  
2 of brute forth method which is the old tried and true  
3 zero out. You've got source apportionment techniques  
4 that have taken on a more prominent role in recent  
5 years, especially with some of the rulemakings that  
6 have come past.

7           You've got DDM and there's, somewhere on  
8 the horizon, higher water DDM. And then, we talked  
9 about a little bit earlier about the sub-grid treatment  
10 and if we go down the path of sub-grid treatment, do we  
11 get into the realm where we're also thinking about the  
12 photochemical model applying to both the primary and  
13 the secondarily formed PM2.5.

14           As NACAA did in the sub-workgroup two  
15 readout, we also continue to be soliciting from the  
16 community various issues. With respect to  
17 photochemical models, do we model five years? Is there  
18 some episodic type of meteorology that we would use in  
19 this criteria? What would be appropriate with respect  
20 to secondary formation?

21           Emissions input. Now, earlier I said  
22 follow Table 8-2 -- maximum allowables. It makes a lot  
23 of sense when you're talking about direct, primary,  
24 AERMOD run concentrations, but now we're trying to get  
25 a realistic look at the world with the photochemical



1 evaluation. With the SIP world, we spend quite a bit  
2 of time on MET performance evaluation and looking at  
3 the emissions and recirculating through the  
4 photochemical modeling and performance evaluation there  
5 and, you know, what's going to be expected and  
6 representative for this community? And we're still --  
7 probably more questions than answers.

8           As I mentioned, we have this existing  
9 guidance document for photochemicals. It may and  
10 probably is not totally appropriate in this context.  
11 We want to make sure that we don't develop something in  
12 this guidance document that goes in difference to that  
13 document and we also have aspects of this document that  
14 we don't want to do -- that's going to be difference to  
15 the qualitative hot spot analysis that OTAQ has formed  
16 that we've used many pieces of in this document.

17           There's also these other applications --  
18 NEPA, DOJ, and what not that are ongoing. We want to  
19 make sure that everything is consistent there as well.  
20 So, I put a couple of links up here. That's obviously  
21 not -- I didn't actually have the link for the  
22 qualitative hot spot analysis, but that is linked  
23 through the 10th Modeling Conference website because,  
24 like I said, at least with respect to calculating your  
25 impact with respect to the NAAQS -- the design value,

1 that's more thoroughly explained, I think, in Section 9  
2 of that guidance.

3           And so that ends my talk and I think I'm  
4 pretty close to the time that we had set. I should  
5 also mention that we, on the schedule, had set aside  
6 some time for a panel discussion. Presentations by a  
7 state and local representative, a regional office  
8 representative, and an industrial representative. All  
9 three of the people had agreed to do so with the  
10 understanding that we were going to release the PM2.5  
11 guidance document so they could make a presentation on  
12 it. To that end, two of the speakers respectfully  
13 said, well, no guidance document, no presentation.  
14 But, they have also graciously offered, at least in the  
15 case of Jim Boyle, that he can answer specific  
16 questions to the NACAA workgroup recommendations. He  
17 was spearheading that. And Randy Robinson was going to  
18 be our regional and local -- our regional office  
19 representative and he also can answer some questions  
20 specific to things that they've dealt with in Region 5.

21           But before we do so, and respect to Ryan  
22 Gesser, he had prepared a presentation and it was sort  
23 of indifferent whether I got his document or not. So,  
24 my appreciation to you Ryan for agreeing to talk.  
25 We'll definitely have time for questions and answers

1 after Ryan. So, it's all you.

2 **MR. GESSER:** As you're about to see and  
3 hear, I can barely get through my opening monologue in  
4 ten minutes, so I'm happy to take up a little more time  
5 that's been yielded from the other panelists and,  
6 hopefully, wrap this up still in about 20 minutes to  
7 where we can get back to the schedule and the time for  
8 those questions and answers.

9 My name is Ryan Gesser and I'm speaking  
10 on behalf of the American Forest and Paper Association  
11 which is the AF&PA, the National Trade Association of  
12 the Forest Products Industry and the manufacturing  
13 operations for those products. And I'm happy to speak  
14 on behalf of that group. As a group we're very  
15 grateful to be acknowledged and recognized as an  
16 important stakeholder in this process in recognition of  
17 all that we have at stake and on the line through this  
18 process as well as the size of our footprint, not just  
19 in terms of the importance of our industry to the  
20 American economy, but also in terms of our footprint in  
21 being located and operating nationwide and virtually  
22 all 50 states and ten EPA regions. This means we're  
23 getting a lot of experience very quickly and  
24 identifying a number of concerns which is what I'm  
25 wanting to share in this forum.

1           As George mentioned, our comments or our  
2 participation, I don't remember if we were invited or  
3 volunteered, but whichever the case, we did hope to be  
4 sharing comments based on what we've seen of the draft  
5 guidance and obviously I just saw what everybody just  
6 saw for the first time. So, the flavor of my  
7 presentation is really based on our experience and what  
8 we hope will be addressed and obviously working through  
9 a lot of details in that guidance. And so my  
10 presentation is very much a user's perspective and so I  
11 think it'll be something of a change of pace from a lot  
12 of the discussions that we had yesterday which were  
13 very technically and detail oriented. This certainly  
14 comes from a higher level and reflects real world  
15 applications where we have to deal with the constraints  
16 that are in the real world which is making the best out  
17 of meteorological data, background data, all those  
18 things that are available and have issues to work  
19 through and constraints to overcome.

20           So, naturally, this talk and the things  
21 I'll discuss are a mix of both technical issues, but  
22 also policy issues and I know that that can quickly get  
23 across the lines of sometimes the narrow scope of what  
24 this group and Appendix W is meant to capture. But I  
25 think it's important to address those policy issues to

1 the extent that they reflect challenges in the  
2 technical formulation of the models and the way we  
3 apply them. So, I am going to address some policy  
4 issues and I hope that that's okay and everyone  
5 appreciates that perspective.

6           As I shared the content of my  
7 presentation today with peers and colleagues and  
8 counterparts from the member companies, more than a  
9 couple of people said, you're just really going there  
10 to complain, aren't you? I said no, no, no. I'm not  
11 complaining. I'm articulating our specific concerns.  
12 I think that's a very subtle distinction, but one that  
13 I hope you appreciate, especially in light of the  
14 discussions that we've heard about limitations on  
15 budget and needing to set priorities. So, if nothing  
16 else, consider this talk my vote for where the  
17 priorities go and, you know, where I hope those  
18 priorities are set and we can move forward on a  
19 relatively quick time frame. So, I'm offering those  
20 comments in that context and with that spirit. I hope  
21 you accept them that way and we look forward to  
22 continuing the dialogue there.

23           To frame up our industry perspective,  
24 we're focusing on integrated pulp and paper mills here  
25 which are generally a major source in the regulatory

1 sense of the word and that we're on the PSD list of 28  
2 major sources. We are title five major sources in  
3 virtually all cases. But as far as an industrial  
4 operation goes, we're actually pretty well controlled.  
5 We're already subject to a number of regulatory  
6 programs that end up having standards to control PM not  
7 limited to just the new source performance standards  
8 that would apply to a number of our industrial boilers  
9 and eventually we'll be subject to Boiler MACT.

10 But also our chemical recovery  
11 operations which are sort of the heart of a pulping  
12 operation. They're already subject to an existing MACT  
13 standard which happens to regulate and set standards  
14 for PM as the surrogate for a number of HAPs and beyond  
15 that, at the front end and back end of our operations  
16 we have wood yards, haul roads, finishing converting  
17 operations, all of which can be sources of fugitive  
18 dust that are generally subject, at a minimum, to state  
19 level requirements for fugitive dust management of some  
20 type or another. So, I think we are a relatively well  
21 controlled source of PM, albeit being a major source  
22 category.

23 And then more generally, beyond PM, you  
24 know, we've been a heavily regulated sector. We're  
25 still a heavily regulated sector. And we're going to

1 continue to be a heavily regulated sector. In addition  
2 to the NSPS and MACT standards that apply, not just to  
3 our combustion sources, but our process sources and,  
4 again, we're going to be subject to Boiler MACT. We  
5 are a targeted source category under the various  
6 regional haze rules, whether it's BART and/or  
7 reasonable progress. A number of facilities will be  
8 having reductions come about because of that.

9           And also, we're in the process of going  
10 through the residual risk and technology review  
11 process, so we see a lot of reasons or a lot of things  
12 that are going to be coming down the pipeline in the  
13 next six years or so that are going to be reducing  
14 emissions from our operations even further.

15           So, especially with that in mind of all  
16 the changes that are going to be happening in the next  
17 six years, you know, we feel like we have a lot of  
18 stake, a big stake, in this process.

19           Like many industrial sectors, our  
20 industry finds it difficult to demonstrate compliance  
21 with the applicable NAAQS following the current EPA  
22 guidance. And I'm going to qualify, any time I say  
23 demonstrated compliance, I'm going to qualify it with  
24 that same statement. If I wanted to be hyperbolic, I  
25 would say it's impossible. You just can't demonstrate

1 compliance under this guidance, but we are on the  
2 Record, so I want to be precise and say, let it suffice  
3 to say that it's challenging to demonstrate compliance  
4 following the guidance. This, obviously, has a number  
5 of consequences.

6           New projects can't move forward until  
7 these modeling issues are resolved. George alluded to  
8 the significant emission rates that trigger this PSD  
9 permitting process and the significant emission levels  
10 that we test and, you know, the numbers, you know, you  
11 should that they're very small, so it's virtually any  
12 project ends up in the cumulative analysis process and  
13 even -- we find that there are sources that you have to  
14 resolve the modeling issues before you can even worry  
15 about what the project is.

16           But that's not the only case. There's  
17 plenty of situations. A number of states have  
18 requirements that require modeling even if you're not  
19 worried about PSD. This can come about from minor  
20 source permit modifications or operating permit  
21 renewals. So, just under the status quo we have a  
22 number of facilities in our industry that end up having  
23 to do modeling reveals issues that have to be  
24 addressed. And the result is ending up with better  
25 than BACT or better than MACT levels of control that

1 might be necessary to resolve a modeling issue and, in  
2 some cases, that would require a significant capital  
3 investment in new or upgraded controls, but at a  
4 minimum, it's probably going to require at least some  
5 on paper reductions to permit limits because remember,  
6 in this context, we're always modeling maximum  
7 allowable emission rates from all the sources and that  
8 often corresponds to a reduction in operating  
9 flexibility, whether it's just in terms of the  
10 operating scenario, alternative fuels, those sorts of  
11 considerations. So, there's a lot of this going on.

12           And I had to come up with a way to  
13 explain all this with the magnitude of the challenge to  
14 our non-modeling staff that have environmental  
15 concerns, but don't do modeling or just in operational  
16 and management staff that don't, obviously, do  
17 modeling. And I found it most convenient to boil it  
18 down this way, just what I call the order magnitude  
19 axiom where, you know, under the old PM10 24-hour  
20 standard of 150 generally was a controlling standard  
21 for types of sources like ours that are -- have a lot  
22 of PM emissions. And under that standard of 150, it  
23 wouldn't be unusual to find a background level of about  
24 50, meaning we had 100 micrograms to work with and fit  
25 our operations into the model. Now, of course, back in

1 the PM10 surrogacy days, we were only considering  
2 filterable PM in that analysis and that's what the  
3 permits most often reflected.

4           So, we know that the PM2.5 24-hour  
5 standard is substantially more stringent at the level  
6 of 35 and we find typical background concentrations  
7 more like 25. So, now we only have ten micrograms of  
8 margin to fit our operations into the model. The  
9 additional complication, of course, is the PM10  
10 surrogacy policy is gone and we are now including  
11 condensable PM in our analyses.

12           And so we find ourselves modeling  
13 emission rates that are about equal. We rely heavily  
14 on emission factor data. Filterable PM2.5 might be, on  
15 average, range varies from different sources, maybe  
16 about 70 percent of the filterable PM10, but then we  
17 add back in the condensable PM which varies wider.  
18 Sometimes, it's as little as 25 percent, but could even  
19 be 100 percent or more of the filterable PM rate. So,  
20 at the end of the day, boiling it all down, when I have  
21 to explain why we're having such a hard time to our  
22 management, we're modeling an equal or greater emission  
23 rate. But what was previously defined in terms as  
24 stack layouts, stack heights, et cetera -- what was  
25 previously defined to fit within 100 micrograms, now

1 has to fit within ten. I don't think any of us need a  
2 model to actually tell us that this is going to be a  
3 challenge and we're left with this question of saying  
4 can these emissions fit in this new standard?

5           If we look at the monitoring data, I  
6 think we'd be encouraged and we'd say, yeah, I think we  
7 could be okay. This -- I have a couple of examples  
8 here, no doubt there's other cases around the country  
9 that you might be familiar with or have thought of or  
10 be aware of, but there's one case we know of with a  
11 member company where there's a federal reference to  
12 PM2.5 monitor that's located less than two kilometers  
13 away from a large integrated tissue mill and wood  
14 products operation. And if you look at the state's  
15 summary report, what they quantified as the design  
16 value, three year average with the 98th percentile,  
17 it's 20.8 compared to the standard of 35. That's a  
18 good result.

19           There's another case where a state has  
20 deployed a special purpose, high concentration PM2.5  
21 monitor within 25 kilometers of not just a big tissue  
22 mill, but also a refinery, chemical plant, power plant,  
23 coal and coke handling operation. You look at that  
24 data, you get a design value 98th percentile of 20.7.  
25 A -- it's not too different. B -- it's pretty far

1 under the standard. That case is interesting because  
2 you go 120 kilometers upwind to what that state calls a  
3 regional scale general background monitor and the  
4 result is 18.3. It's not that different. It's a  
5 little bit lower. And it's comfortably below the  
6 standards.

7                   So, we consistently see these monitor  
8 design values in a range of about 18 to 26, which is  
9 just, roughly, 50 to 75 percent of the NAAQS standard  
10 and so we think, great. That's an ample margin  
11 relative to the standard. But, it leaves very little  
12 room if we take that design value and add it to a  
13 conservative model result to show compliance under the  
14 standard. So, can the emissions fit? We go back to  
15 the modeling and we see the answer is usually no  
16 following the current guidance. So, the examples I  
17 want to talk about are some PM<sub>2.5</sub> modeling analyses  
18 following the current guidance, limited to the  
19 characteristic sources at an integrated pulp and paper  
20 mills which are utility boilers making power and steam  
21 and the chemical recovery units which are, again, the  
22 sort of unique characteristic source of our industry  
23 and a very important part of the process.

24                   So, we can look at modeling results for  
25 a different -- for the different scenarios of emissions

1 control. So, we're going to look at some results where  
2 a source has already implemented the existing source  
3 recovery MACT standards that apply for our industry and  
4 assume that they are going to meet or they have their  
5 plan to meet the existing Boiler MACT standards that  
6 would apply.

7                   And then we can also look at a case  
8 where -- take the controls a step further and assume  
9 that that facility could just put on or achieve the new  
10 source MACT levels of control which are about 40 to 85  
11 percent lower than the existing and compare the results  
12 in those cases. And when we formulate this, you know,  
13 we're doing this by applying a typical PM2.5 size  
14 distribution, adding back in the condensable PM to make  
15 sure all those are accounted for.

16                   I would note I've left out the fugitive  
17 sources here, which isn't to say they're not important.  
18 Obviously, they are and we definitely appreciate the  
19 work that we heard about yesterday in getting best  
20 practices because that is important, but I'm leaving  
21 them out so as not to confound the analyses or distract  
22 from, sort of, the fundamental issues here. I'm not  
23 including the regional sources. We'll get to them once  
24 we've solved our own problems. And secondary impacts  
25 aren't included. Under the current guidance they

1 haven't been yet. We'll obviously come back and think  
2 about what that is.

3                   So, we'll do this and we'll show the  
4 results under the current guidance using the maximum  
5 model result added to a 98th percentile background and  
6 then go into the other extreme where we hope some  
7 guidance might lead us is the more -- the more --  
8 approach what we call the paired sums or tier three  
9 where we simulate an hourly background concentration in  
10 the model. Use that capability in the model to give us  
11 the overall 98th percentile or highest eighth high,  
12 matching the form of the standard.

13                   So, there's a ton of information on this  
14 slide. This was a slide designed for a ten-minute  
15 presentation. I don't have much more time than that so  
16 I'm going to hit some highlights here. What I'll do is  
17 focus on what we've just termed Mill A here. We've got  
18 three different mills here. I'll just focus on the one  
19 because the results are consistent as you look at the  
20 different scenarios. What you find in Mill A this is -  
21 - this would have emissions of about 100 pounds per  
22 hour total from the chemical recovery process. Maybe  
23 another 50 pounds an hour of boiler emissions in there  
24 once you've got Boiler MACT installed. And this would  
25 be the existing technology case and if we use the

1 existing guidance for the maximum model result plus the  
2 98th percentile, the result we would get is 82.6.  
3 Obviously, that's over the standard. So, if we go to  
4 the other extreme and look at the highest eighth high  
5 and a paired sums approach, the result we get would be  
6 48.5.

7                   So, I'll stop right there and address a  
8 couple things with that difference. We see substantial  
9 differences in the magnitude of impacts at the highest  
10 first high and the highest eighth high levels. Of  
11 course, accounting for the background and using these  
12 different approaches. We suspect and we can, in our  
13 comments, look into greater detail that we'll submit.  
14 We suspect that what we're seeing is some sensitivity  
15 of these very maximum results to the model performance  
16 of low wind speeds and that we heard about yesterday  
17 and that those low wind speed conditions are more  
18 frequent when you have AERMINUTE that is generating  
19 these data at a very low wind speed threshold. So, we  
20 suspect that's what's going on.

21                   The other thing I would note is that,  
22 you know, that's a big difference in the high first  
23 high and the highest eighth high however you look at  
24 it. Just by the magnitude of that case, it's 34  
25 micrograms. Another way to look at it would be to say

1 the highest eighth high is 59 percent of the highest  
2 first high. Maybe I should have inverted that to say  
3 that the highest first high is 70 percent higher than  
4 the highest eighth high. But whichever way you look at  
5 that difference, when I look at that number, what we  
6 would wonder is is that what EPA intended or expected  
7 when saying this is a screening technique. We're  
8 concerned we're not accounting for the secondary  
9 transformation so, you know, that's the difference we  
10 see and that's how much that guidance means in a real  
11 world application. And again, I'm focusing on the one,  
12 but I think we find those results pretty consistently  
13 in the different scenarios we look at.

14                   So, if that guidance or if that  
15 recommendation comes about because of concerns about  
16 secondary -- accounting for the secondary formation  
17 impact, then we're left with questions like is it  
18 reasonable because we don't necessarily expect those  
19 impacts to be at the same time and the same place?

20                   George had alluded to the NACAA study  
21 which looked at different ways of characterizing that  
22 secondary formation impact and someone will correct me,  
23 I'm sure in the Q and A if I'm wrong in how I  
24 interpreted it, but I saw it in a number of places.  
25 So, I felt like I read it right where it said that in

1 all cases where they looked at secondary formation  
2 using photochemical models or various offset  
3 approaches, in all cases secondary formation accounts  
4 for less than or equal to one microgram of PM2.5. So,  
5 if we're trying to protect ourselves for one microgram,  
6 you know, here's cases where we're doing it by adding  
7 34 micrograms or a substantial amount higher than that  
8 amount. So, that's a concern.

9           The second part of this slide that I  
10 would highlight is on the bottom where we move to the  
11 second scenario of assuming a better level of control  
12 and running that through the model and, if we follow  
13 the current guidance, we get an impact of 46.8. If we  
14 run it through the paired sums and take the eighth high  
15 approach, we would get a value of about 31.

16           So, we're doing better, but here we get  
17 to the conclusion that's very alarming which is that no  
18 scenario we looked at, even with state of the art  
19 control, would show attainment following the current  
20 guidance. And that is a very significant philosophical  
21 milestone to say that at state-of-the-art levels of  
22 control, we're following the guidance and, frankly,  
23 we're not that close to complying with the standard.

24           So, in the light of all this, we'd ask,  
25 you know, is there room to then back -- add back in the

1 fugitive source impacts? We look forward to applying  
2 those best practice techniques and, you know, I think  
3 we can. Can we fit in regional source impacts if we're  
4 located in a dense industrial area? I don't know. Is  
5 there room for secondary formation in these impacts  
6 once we add them? You know, maybe, maybe not.  
7 Obviously, we're going to exercise this new draft  
8 guidance and see if it could work using the qualitative  
9 or semi-qualitative approaches.

10 I would note that sort of working off of  
11 the NACAA recommendations and the offset approaches,  
12 what we saw was that we typically expect to add  
13 somewhere between, I think it's about 4 to 15 percent  
14 to a modeled direct PM2.5 impact based on the  
15 characteristic emission rates of PM2.5 and the  
16 precursors from these kind of operations. So, at the  
17 level of the standard, 15 percent is more than three  
18 micrograms. You know, that's a substantial amount if  
19 you only have ten to work with, so it's hard to say.  
20 And, of course, behind all this is looming a revised  
21 PM2.5 standard. So, if it were to happen to go down as  
22 30 which is perhaps the lowest we've heard might be the  
23 proposal, you know, we see some cases where we would be  
24 encouraged that, yeah, it might work. But once you add  
25 everything back in, it's still going to be a challenge.

1                   How am I doing on time? Can I take  
2 another minute or two?

3                   I have this slide, it's under the  
4 heading of AERMINUTE, but it probably speaks more  
5 generally to the concept of model stability. And this  
6 example, I'll try to go through it very quickly.

7                   In those states that I mentioned where  
8 modeling is done frequently for minor permit  
9 applications or operating permit renewals creates a  
10 really rich history of model results in a regulatory  
11 context and all of the data, of course, that went into  
12 those models. So, we looked at an experiment where we  
13 took a source, assumed it was static, no changes, no  
14 growth, which obviously is not what we hope. We want  
15 to find opportunities for growth, but let's keep all  
16 the model inputs equal and look at the model results  
17 over the past 11 years when we've had various versions  
18 of the model and certainly various versions of the  
19 inputs that go into it in terms of the MET data and the  
20 processors that go into it.

21                   So, this is a little bit concerning and  
22 again, this is obviously just one case. Maybe other  
23 people have looked at this sort of thing, maybe not.  
24 But a couple of alarming things jumped out here and I'm  
25 not saying the answers or this is completely right or

1 wrong, but I think it is important. The key findings  
2 are summarized here looking at the various model tests  
3 over time. Starting back in 2001, if we were using the  
4 tools available at that time, you get a model result.  
5 We normalize that to 100 and did the various exercises  
6 with model versions and meteorological data over the  
7 years up and to the current day version of AERMOD 12060  
8 with AERMET 11059 and AERMINUTE 11325. And the couple  
9 of things that stand out here in the results column is  
10 there can be significant run to run variability. And  
11 obviously, we don't have to go through why that it is,  
12 but it really seems to be due to the meteorological  
13 data. When you change the meteorological data sets,  
14 you're picking up periods of time or episodes that lead  
15 to high concentrations in the model and, you know,  
16 these pop out in the results.

17                   Focus really on just the recent history,  
18 we found that introducing AERMINUTE to the results did  
19 cause a pretty significant jump of about 25 percent to  
20 this 24-hour average model result. And, just in  
21 summary, we're at a point now where we've run this  
22 model, inputs being equal except for the model version,  
23 meteorology, et cetera, and we find our model result is  
24 38 percent higher than it was 11 years ago around the  
25 vintage of the 7th Modeling Conference and the tools we

1 had available at that time.

2                   Is this right? Is this wrong? I don't  
3 know. There's no monitoring data to go along with  
4 this. We wouldn't expect a correlation if there was  
5 because of the way we run the models in a regulatory  
6 context. But again, you know, I think it's important  
7 and it speaks to the necessity of having good notice  
8 and comment and opportunities to consider consequence  
9 analyses of changing, not just model versions and  
10 guidance, but even the inputs to the models themselves.  
11 So, with that, it's obviously premature to call  
12 anything here today a conclusion. But in terms of  
13 observations and comments, let that be my summary that  
14 AF&PA is concerned about the current EPA guidance being  
15 overly conservative in situations where it just can't  
16 practically be implemented.

17                   So, we appreciate the efforts that we've  
18 heard about to develop best practices for fugitive  
19 source modeling. That's very important to us. And  
20 also identify and correct systematic deficiencies in  
21 model performance for things like the low wind speeds  
22 that we heard about yesterday. Obviously, we eagerly  
23 anticipate getting the draft guidance and working  
24 through it. We appreciate the opportunity to comment  
25 on it and certainly plan to take advantage of that.

1                   We're going to be focused on how the  
2 guidance can be applied to develop sound, unbiased  
3 estimates of our impacts, including background and  
4 secondary formation, emphasizing the consistency on  
5 temporal and spatial scales of the background  
6 concentrations and secondary impacts. And obviously,  
7 we're in favor of reasonable and practical  
8 implementation of new standards in modeling guidance.  
9 We think it's very important as we've heard many times  
10 to critically apply this guidance in practice and  
11 promote stability of the modeling, especially during  
12 these times of regulatory implementation.

13                   So, where we're looking forward over the  
14 next decade of having to implement a number of control  
15 programs, the prospect of this extrapolating out in our  
16 model results continue to change -- is very  
17 challenging. It makes our decision making process very  
18 difficult. And we suspect that there will be  
19 opportunities or we'll need to look at opportunities to  
20 revisit some of the traditional approaches that are  
21 reflected in the guidance such as the way ambient air  
22 is modeled as well as variable emissions which we'll  
23 hear about more.

24                   So, I'll stop my remarks there. Again,  
25 thanks for the time and turn it back over to George for

1 Q and A.

2 **MR. BRIDGERS:** I just checked with Jim  
3 and he can be a resource if there's some questions  
4 specific to the NACAA comments, but -- and Randy, I  
5 imagine you're the same, wherever Randy is. He can be  
6 a resource for questions, but probably not wanting to  
7 say any other remarks. So, at this time, we'll have a  
8 real quick Q and A session, unless there's a lot of  
9 comments and we can kind of structure the schedule.  
10 So, it's open mic time. And in case there aren't any  
11 questions or while people are thinking about questions,  
12 I want to apologize for the slides on the NAAQS  
13 comparison that had it with the NAAQS versus the SIL.  
14 We'll have that corrected and uploaded to the web  
15 probably later this afternoon.

16 **AUDIENCE MEMBER:** Bob Paine, AECOM.  
17 Just wanted to understand when I heard about adding  
18 model monitors to the background. As I recall for NO2  
19 and SO2, it's adding the 99th models to the 99th or  
20 98th monitor and is it not -- would it be consistent to  
21 do that for PM2.5 as well? And why not go to the tier  
22 -- three tier approach?

23 **MR. BRIDGERS:** In all fairness, Bob, I'm  
24 going to absolutely defer this to the expert that is  
25 not sitting at the table which is Roger Brode. I could

1 try to answer it, but I know that Roger would have to  
2 clean up my mess.

3 **MR. BRODE:** Well, I think one point is  
4 that what's been provided in the guidance is sort of a  
5 starting point. This is something that we feel is  
6 appropriate for these reasons. There's always the  
7 opportunity to propose alternative approaches with  
8 adequate justification that can be considered in  
9 specific cases.

10 I think it's a legitimate question and I  
11 think part of it is the complication introduced for  
12 PM2.5 of the secondary component. So, I think as we  
13 gain a better understanding of that, it's certainly  
14 possible that our guidance may evolve and examples like  
15 this will help inform us as to what the issues are and,  
16 you know, how to move forward if we can to improve the  
17 guidance.

18 I did have a couple of questions  
19 specifically about this and I appreciate you  
20 articulating your specific concerns for us and  
21 actually, I don't mind complaining. It's the whining,  
22 maybe, that's more of a problem.

23 **MR. GESSER:** I hope I didn't do that.

24 **MR. BRODE:** I'm wondering if you could  
25 explain in more detail, in terms of the paired sums,

1 how you actually implemented that for the daily  
2 standard? You know, it's a monitor -- a continuous  
3 monitor or?

4 **MR. GESSER:** Yeah. In those cases, I  
5 believe in every case, they were continuous monitors.  
6 We're mindful and obviously didn't go into details  
7 about the difference in the quality of the monitors and  
8 we recognize that that's part of a protocol process  
9 that would fully evaluate the appropriateness of the  
10 models, the quality of the data filling, et cetera. In  
11 those cases, what we found in the real world and, of  
12 course, it's not every case, is there's usually some  
13 continuous monitors upwind and downwind within about  
14 100 or so kilometers and that's the data that we have  
15 to work with so, we worked with it.

16 We would look at the information  
17 compiled by states in terms of their network  
18 assessments and monitoring plans. Those usually have  
19 indicators of quality, purpose of the monitors,  
20 settings, and if we can make a comparison, for example,  
21 of the county level emissions of where our source is  
22 and is the monitor exposed in a similar way. We would  
23 make those types of considerations.

24 Looking at those kind of summaries that  
25 the states provide, they often show correlations

1 between the different areas and we try to take  
2 advantage of that as well. So, it was continuous  
3 monitors implemented in the model with the hourly  
4 background files that we knew about.

5 **MR. BRODE:** I was actually more asking  
6 about just mechanically. So, you did generate an  
7 hourly background file input to the model that had a  
8 constant value for a given day and then --

9 **MR. GESSER:** Hour. Continuous hourly  
10 values.

11 **MR. BRODE:** They were continuous hourly  
12 values. Okay. I just wanted to clarify that. I guess  
13 the other question I was going to have is if you had  
14 actually looked at how the results you showed there  
15 would compare if you had combined the 98th percentile  
16 monitored with 98th percentile monitored results.

17 **MR. GESSER:** Yeah, so, I obviously  
18 didn't show that. I guess that would fall in between,  
19 sort of, the two extremes I showed.

20 **MR. BRODE:** Well, that's kind of in  
21 response to Bob's question as well.

22 **MR. GESSER:** I think maybe the way I  
23 would answer it is to say when we've looked at the  
24 seasonal variability, for example, you know, of course  
25 with seasonal variability you can sometimes end up with

1 seasonal 98th percentiles that are higher than your  
2 overall 98th percentile. And wouldn't you know it, the  
3 model result always ends up there. So, it ends up  
4 being higher or, in many cases, it does. So, I think  
5 it seems like going to the extreme of the paired sums,  
6 hourly, whether that's implemented with hourly  
7 continuous data or the one and three type data which, I  
8 think, we've yet to see some details about how to do  
9 that. I see us heading toward that approach.

10 **MR. BRODE:** Did you ever -- did you look  
11 at just adding the 98th percentile monitored to a  
12 single 98th percentile modeled?

13 **MR. GESSER:** Yeah. It would still be  
14 levels that comparable to what I showed since that 20 -  
15 - that 98th percentile background is still usually  
16 about 20 to 25. So, adding that to a model result that  
17 may be still in the 20s even is going to be above the  
18 standard.

19 **MR. BRODE:** So, that was somewhere  
20 between the two?

21 **MR. GESSER:** It would be somewhere  
22 between.

23 **MR. BRODE:** Okay. Thank you.

24 **AUDIENCE MEMBER:** I guess I just wanted  
25 to add, there we go. Usually I don't have a problem

1 with talking loud. Meg Patulski, OTAQ. I just wanted  
2 to add since so much of your guidance relies on what we  
3 worked with you on for a hot spot guidance that we've  
4 gotten similar questions about why did you pick 98th  
5 percentile? Why not in the 99th percentile? And  
6 things like that. And obviously, without -- I guess  
7 I'll just say what's unsaid is we had to be consistent  
8 with the NAAQS and so a lot of this was something that  
9 we, you know, had to develop these tools to be  
10 consistent with how the NAAQS itself was created. So,  
11 that's why it's the 98th percentile and there are all  
12 these hoops that we're walking through. If the NAAQS  
13 was different, we would have different calculations.  
14 And I was also interested in what the tier two results  
15 would have been, so.

16 **MR. BRODE:** I appreciate you clarifying  
17 for the Record that it's OTAQ's fault.

18 **MS. PATULSKI:** Well, just, you know, it  
19 was a several month effort to create Section 9 of our  
20 guidance and also the tool that we've created in our  
21 training to calculate the tier two -- NAAQS tier two  
22 results. So, it was definitely an undertaking, so.

23 **MR. BRODE:** Well, on a more serious  
24 note, I think it's good to acknowledge that interaction  
25 that we had with OTAQ was very helpful for us and

1 timely for us to prepare for what we're dealing with  
2 now.

3                   **MR. FOX:** That experience let us know  
4 earlier rather than later how complicated this is and  
5 how difficult it is, but the bottom line is that we  
6 want to have a realistic and representative  
7 characterization as if there were a monitor there in  
8 terms of these receptors and the like. Not double  
9 count, but appropriately account for the contributions  
10 of the project source. That project source is the  
11 primary emissions. If necessary, that project source  
12 is contributions to secondary formation through its  
13 precursor emissions as well as the representative  
14 background which may be composed of, you know, PM2.5,  
15 but also there's an urban increment, so each area is  
16 very unique and different, you know, adding up  
17 different parts of the distribution can be quite  
18 complicated and so we're trying to work through and is  
19 evidenced by Roger's questions and we try to do some  
20 different simulations.

21                   The more information we can have in  
22 terms of looking at real situations and seeing how well  
23 the different approaches mimic reality I think would  
24 help us in terms of coming up with an approach that we  
25 feel and you all feel comfortable with.

1                   **AUDIENCE MEMBER:** Mike Kiss, Virginia  
2 DEQ. This question is for George. I saw no reference  
3 in the guidance with respect to increment consumption  
4 and expansion. And what we're seeing in some of our  
5 analyses already is that the class one increment, in  
6 particular, has already been consumed by direct PM2.5  
7 emissions. And we're expecting to see a lot of  
8 increment expansion through the transport rule and  
9 secondary or precursor reductions sulfates and  
10 nitrates. And I think there's going to be some  
11 difficulty in class one modeling in pairing the  
12 secondary reductions in time and space with the direct  
13 PM emissions. For example, from a combined cycle plan.  
14 Is there any thought to adding that to your guidance  
15 document?

16                   **MR. BRIDGERS:** Since the question was  
17 specifically addressed to me, is Ryan Corrales still in  
18 the room?

19                   In all seriousness, at this time the  
20 guidance does not include anything with respect to  
21 modeling for increment. Obviously, moving forward,  
22 it's a draft document. It's a living document. Even  
23 when it goes final, it's a living document just like  
24 the other what we affectionately have called for years  
25 Brian's guidance, but the photochemical regional haze

1 PM2.5 modeling guidance. And consideration for  
2 increment could very well be added to it. I don't know  
3 that there's any plans at the immediate time. Right  
4 now, the immediate plan is to get what we've got out,  
5 but it would be taken under advisement.

6 **AUDIENCE MEMBER:** Okay. Thank you.

7 **MR. FOX:** I think we're, right now,  
8 focusing on the NAAQS compliance demonstration and  
9 getting that in a firm foundation there, but you're  
10 point is well taken in that we need to address  
11 increment. There's some nuances there and you  
12 mentioned them in terms of increment expansion and  
13 other types of things that get into other types of  
14 issues in terms of how best to account for that and I  
15 think, as George indicated, we're going to have to work  
16 with our policy division and both from a policy, legal,  
17 and technical standpoint, be able to do things that  
18 allow for an appropriate analysis. In that context,  
19 it's not something that we're ignoring. It's kind of  
20 first things first and we would welcome comments along  
21 those lines in terms of specific experiences with  
22 details about problems that you're encountering or  
23 issues that you foresee. That would allow us then, you  
24 know, as we work throughout this year to address that  
25 and maybe bring that in - hopefully, bring that in

1 later on in the year. Once we've got a firmer  
2 foundation of how we're doing it -- how we're  
3 addressing issues from a NAAQS compliance standpoint  
4 because that will give us a foundation to then view  
5 increment.

6 **AUDIENCE MEMBER:** Yeah. I think we  
7 expect to see increment expansion with these -- the  
8 transport rule, for example. I think the key is going  
9 to be trying to pair those reductions in time and space  
10 on the secondary side with the direct consumption from  
11 natural gas type facilities. Thank you.

12 **MR. BRIDGERS:** And Mike, your comments,  
13 thank you. Actually, Dan Deroeck just walked into the  
14 room, so it's good that there are other people within  
15 our policy division that are hearing these requests.

16 **AUDIENCE MEMBER:** Jim Boylan, Georgia  
17 EPD. I wanted to follow up on the NACAA  
18 recommendations for PM secondary formation. I know  
19 George joked with Roger about putting chemistry into  
20 AERMOD, but my question is does EPA have any plans to  
21 put chemistry into AERMOD?

22 **MR. BRIDGERS:** Fair question.

23 **MR. FOX:** No. No, we're, at this point,  
24 and you'll see more this afternoon in terms of the  
25 emerging models and techniques, there are existing

1 models that are out there that address secondary  
2 formation and are more suitable and have advanced in  
3 terms of the science and the like. At this point, we  
4 would like to look at and evaluate the existing  
5 capabilities and capacity for those models to meet  
6 those needs. And hoping, expecting that we'll be able  
7 to find in those existing models or modifications to  
8 those existing models that capacity or capability so  
9 that we're not thinking of adding PM2.5 chemistry or  
10 ozone chemistry to AERMOD. And that seems like the  
11 best approach for now.

12 **AUDIENCE MEMBER:** I guess, is it fair to  
13 say that it's not completely out of the realm of  
14 possibility, but it's unlikely?

15 **MR. FOX:** Well I -- it just changed. It  
16 would be EPA engaging in developing its own new model  
17 to account for chemistry that would go through the  
18 promulgation and it would probably be more challenging  
19 and difficult to take the current construct in AERMOD  
20 and add chemistry than to just embrace those more  
21 complete, full, elegant characterizations of that in  
22 existing models.

23 Now, as George noted, and I think we all  
24 understand and appreciate, those types of models then  
25 have resource constraints in terms of their ability to

1 be used in this context. And so, as indicated in the  
2 McCarthy petition grant and George reiterated, the  
3 pursuit of updating Appendix W to account for ozone  
4 impacts and secondary PM<sub>2.5</sub> will not necessarily lead  
5 us to a model and a model would be used in every and  
6 all cases.

7                   We, in some ways, see the use of a full  
8 scale model as an exception rather than rule in that  
9 the vast majority of cases where we're dealing with  
10 precursor emissions and the secondary impacts from the  
11 project source could be handled through other  
12 techniques if they could be developed with a credible  
13 basis. Either using photochemical models, or as was  
14 eluded to, both in the NACAA guidance and what we'll  
15 put forth shortly, credible techniques to base on an  
16 area-by-area basis representation of the impacts  
17 through offset ratios, you know, sensitivities through,  
18 you know, techniques in photochemical models like DDM,  
19 and those are things that we're looking at. And as  
20 referenced in George's presentation, this afternoon  
21 there'll be a presentation on how a similar situation  
22 was dealt with in Sydney, Australia for ozone and if  
23 the techniques can get there for secondary PM, maybe  
24 that's a viable option to be able to pursue to be able  
25 to come up with those types of characterization in a

1 screening tool standpoint, short of full scale  
2 modeling. But I think all those things are on the  
3 table and we welcome everybody's thoughts and comments  
4 on existing capabilities that you're aware of or  
5 experiences in dealing with those models. And from an  
6 operations standpoint, thinking in the context of their  
7 suitability for operation and use in a permit  
8 environment as well as any scientific or technical  
9 aspects of those models.

10 **AUDIENCE MEMBER:** George Schewe of  
11 Trinity. I've got a question for Ryan. Ryan, the last  
12 table there AERMET and AERMOD and all that good stuff.  
13 Did you see any differences in any of your results  
14 between the different mills or anything? Flat versus  
15 complex terrain?

16 **MR. GESSER:** That's a good point. I  
17 probably, if I had more time, would have done a better  
18 job of setting the stage of those examples. These  
19 really were, I think, exclusively flat terrain  
20 situations. It was a pretty simple analysis insofar as  
21 just point sources that are unambiguous. Everybody  
22 knows how to model them in a flat terrain without any  
23 complex situation.

24 **MR. FOX:** And I would just add that  
25 those types of examples are very useful to look at the

1 sensitivity. As you noted, the meteorological data  
2 seemed to be driving quite a bit. Actually, if you  
3 look at the results, in some ways the models showed  
4 some, you know, some stability in terms of use over  
5 time which was good. It seemed like some of the inputs  
6 and the like were driving those things and so the more  
7 that we could, you know, engage and investigate those  
8 types of sensitivities would be useful. And,  
9 hopefully, as an illustration of that for NO2 and SO2,  
10 James Thurman and Erik Snyder will be providing the  
11 AIWG results that tried to get at those types of issues  
12 and perhaps we should consider something similar for  
13 PM2.5 down the road.

14 **AUDIENCE MEMBER:** John Gill, EnviroMet.  
15 As a follow-up to George's question with regard to the  
16 same table. As a fellow modeler, you mentioned that  
17 you kept the MET data the same. Did that include how  
18 you were more concerned about your sectoring,  
19 especially with the implementation changes to the  
20 sector guidance a few years ago and were you using on-  
21 site data for that as well?

22 **MR. GESSER:** No. If I gave that  
23 impression, I should clarify. The MET data was not the  
24 same. It was -- the sources were constant throughout  
25 that and this was a situation where the state would

1 provide data or suggest the data to be used, arguably  
2 without thoroughly reviewing the consequences or what  
3 might be lurking in that data or just legitimately  
4 explain big differences like that you see in the model  
5 results. And I mean, they could have been legitimate.  
6 There just wasn't any consideration of that.

7 **MR. BRIDGERS:** Maybe one last question  
8 and then we're going to have to break.

9 **AUDIENCE MEMBER:** Hello. This is Julie  
10 Mitchell with URS Corporation and I have a question.  
11 San Joaquin Valley APCD has put out a guidance document  
12 on how to model PM2.5. It's got a couple tiers, but  
13 the tier two approach does talk about secondary  
14 formation and including that in your AERMOD analyses.  
15 Have you reviewed through that and what is your  
16 findings or feelings on the appropriateness of that  
17 analysis?

18 **MR. BRIDGERS:** If I'm not mistaken,  
19 Leland had shared that with us at some point in the  
20 past. I'm going to say that it's something that's not  
21 been a focal point as of now, but it's something that  
22 he, at least, extended our way, but in the myriad of  
23 everything that we -- I haven't specifically reviewed  
24 the document. No.

25 **MR. FOX:** If I recall correctly, I think

1 they were using the same type of approach that the  
2 NACAA recommendations had with offset ratios and the  
3 like and so, again, as was indicated, those types of  
4 things would have to be approved on a case-by-case  
5 basis in terms of their appropriateness for use in that  
6 area representing the type of chemical regime and the  
7 like that exists. So, you know, at this point in time,  
8 we haven't reviewed it in detail, but I believe it's  
9 following something similar to what was recommended in  
10 the NACAA. Run AERMOD for the primary and then have  
11 some offset ratio account for the secondary  
12 contribution from the project source.

13 **MS. MITCHELL:** Right. And he was  
14 advising to run AERMOD for the SO2 and NO2 and then do  
15 a post-processing with taking your -- an offset ratio  
16 that was appropriate so that you could determine what  
17 the impacts of the secondary SO2 and NO2 could be and  
18 then combine that with the PM2.5. Thanks.

19 **MR. BRIDGERS:** Thanks. With that, I  
20 think we need to move on to our break. Since we're a  
21 little bit over, let's go ahead and take till 10:40 --  
22 to 10:40. And as everybody is leaving, I also want to  
23 thank again the volunteer effort by Jim Boylan and  
24 Randy Robinson and also Ryan Gesser for the panel this  
25 morning.

1 (WHEREUPON, a brief recess was taken.)

2 **MR. BRIDGERS:** Okay, if we could have  
3 everybody start taking their seats it would be greatly  
4 appreciated. Thank you.

5 I feel like I'm standing in front of the  
6 television camera and they're doing this, you know,  
7 extend it out and it's that cross talk across the  
8 banker desk that is just gibberish. So, hopefully,  
9 Tyler will be back in here soon because he had some  
10 points he wanted to make here as we kick off the 1-hour  
11 NO<sub>2</sub> and SO<sub>2</sub> and speaking of the devil, here's the  
12 Michigan man right here.

13 **MR. FOX:** And for the Record, this is  
14 water, not coffee so when you see me gulping it I'm not  
15 drinking coffee. I already had my dose. All right.  
16 So, I'm going to go through what we've been doing to  
17 try and address some of the challenges that we're all  
18 recognizing in modeling compliance under the new 1-hour  
19 NO<sub>2</sub> and SO<sub>2</sub> NAAQS. I'll also try and get us back on  
20 schedule and try and provide more time for James and  
21 Erik because I think those type of results and the like  
22 are more important and provide more real information  
23 for everybody to chew on.

24 So, we all are very familiar with the  
25 new 1-hour NO<sub>2</sub> standard of 100 ppb based on a 98th

1 percentile annual distribution of daily maximum 1-hour  
2 values and that was effective April 12th, 2010. That  
3 was followed shortly afterwards with a new 1-hour SO2  
4 standard of 75 ppb based on the 99th percentile of that  
5 same distribution and that was effective in August.

6                   As part of those rules, as of the  
7 effective date, PSD requirements came into effect and  
8 so we followed up with clarification memos for the NO2  
9 standard and the SO2 standard and I'll go through those  
10 briefly. But I'll try and focus most of the discussion  
11 on the March 1st guidance memo and aspects there that I  
12 think or at least we thought were very critical to get  
13 out there to the community and allow for flexibility to  
14 address issues that we have become aware of. And I  
15 have to stress the fact that we understand and feel  
16 your pain. We are dealing with these issues as best we  
17 can. That March guidance was issued as fast as we  
18 could to address and to provide much needed flexibility  
19 under these standards and I recognize that some folks  
20 would have liked review of those, but that would have  
21 just dragged that process out. So, we're facing the  
22 trade-off between going through longer review processes  
23 versus getting things out that we think are valuable  
24 and flexible and allow for more appropriate analyses  
25 for compliance.

1           But that said, these are guidance, so  
2 review and follow-up and additional guidance can always  
3 come afterwards to address certain issues and I think  
4 it's very valuable to have real examples as James and  
5 Erik and others, Ryan, provided earlier to inform the  
6 development of that future guidance and that AIWG  
7 effort was intended to evaluate the existing guidance  
8 including flexibilities in the March guidance as well  
9 as give us some understanding of what new guidance may  
10 be necessary. And this just provides the two  
11 clarification notes in terms of the applicability of  
12 Appendix W under those two new 1-hour standards as well  
13 as the additional clarification that we provided in  
14 March of last year.

15           So, as I said, the NAAQS for NO2 was  
16 revised in 2010. The monitoring guidance, design  
17 values, were based on three year averages, but it's  
18 important to note that that does not preempt or alter  
19 the Appendix W requirement for use of one year of site  
20 specific data which is preferred or the use of five  
21 years National Weather Service data.

22           For NO2, the guidance was more  
23 exhaustive, I guess, or detailed than for SO2. We  
24 established that under Appendix W, AERMOD is the  
25 preferred model for estimating NO2 impacts in the near-

1 field and we saw the existing three-tiered screening  
2 approach in Appendix W as applicable to this new 1-hour  
3 standard with some different considerations. And I'll  
4 go through the details in terms of those three tiers.  
5 Thankfully, we had that tiered approach and screening  
6 techniques available as part of the third tier for use  
7 here.

8                   So, in terms of the applicability of  
9 these three tiers, tier one is obviously a conservative  
10 test of full conversion and it can be used without any  
11 justification just as it was before. And under the  
12 annual standard, we understand and acknowledge that  
13 most applicants were able to use either the first tier  
14 or the second tier in demonstrating compliance. And  
15 that we have not had as much experience with the third  
16 tier and these detailed screening methods, but under  
17 the 1-hour standard, we certainly have and will and  
18 need to.

19                   The second tier is applicable in many  
20 cases, but needs to have additional consideration given  
21 the nature of how that ambient ratio method applies and  
22 given the default ratio of .75, at least at the time of  
23 this clarification memo, as being representative of  
24 area wide quasi equilibrium conditions. So, in there  
25 that was designed more specifically to the annual

1 standards so we thought it was applicable but, again,  
2 additional considerations need to be there and we'll  
3 hear later this afternoon about an approach to  
4 potentially modify that -- that has been brought to us.

5           Tier three represents more formal  
6 modeling using the existing techniques of ozone  
7 limiting method or the plume volume molar ratio method  
8 within AERMOD. And it can be used on a case-by-case  
9 basis. These are not refined methods. As I mentioned  
10 at the beginning of the day, perhaps one aspect of  
11 updating Appendix W is doing what we need to to allow  
12 these to be seen and used as refined methods. But with  
13 these techniques come greater requirements to inform  
14 the model appropriately and that gets at the  
15 representativeness of the background ozone data as well  
16 as the in-stack ratios. And those are obviously much  
17 more important as you analyze and assess the 1-hour  
18 NAAQS.

19           So, in the memo we went into detail  
20 about the tier three approaches, recognizing that given  
21 our lack of direct application and use of these  
22 techniques, there wasn't as much understanding across  
23 the full community. We did the best we could to try  
24 and provide information that we thought was very  
25 relevant and will continue to do so.

1 OLM is specifically referenced in  
2 Appendix W and PVMRM is also considered in that  
3 category until more robust evaluations can be done.  
4 Both of them are available as non-regulatory default  
5 options in AERMOD which requires a justification and  
6 approval from the regional office on a case-by-case  
7 basis.

8 One note here is that as part of the  
9 March guidance, we did provide a number of evaluations  
10 of these tools and I believe Roger may go through some  
11 of those in the next discussion. And we did feel as if  
12 some of the work that we did could be used as the  
13 justification to try and reduce the burden or hurdle of  
14 demonstrating their applicability on a case-by-case  
15 basis. That's not to mean that you don't have to work  
16 with the regional authority or the regional office to  
17 get approval, but you can reference the information  
18 that we put together and do maybe a little bit more  
19 work to provide sufficient justification. But we did  
20 do, we think, a good job of providing some information  
21 that can be leveraged in that case.

22 We also noted that applications of OLM  
23 in AERMOD should routinely use the OLMGROUP ALL for  
24 combining plumes. There had been some confusion there  
25 and now that the treatment is within AERMOD rather than

1 outside of AERMOD, some of the past issues have been  
2 resolved and we feel more comfortable using that  
3 OLMGROUP ALL in those circumstances.

4           We have several documents listed there.  
5 As I noted, Roger did some additional evaluations which  
6 we believe showed encouraging results, but we do  
7 recognize that there is a sparsity of information and  
8 data. It's very limited in order to move forward in  
9 the next step but, hopefully, we can work towards that  
10 in terms of considering PVMRM as a refined method in  
11 the future. And in regard to those evaluations, we  
12 extended those and updated them for predicting hourly  
13 NO2 concentrations.

14           For the SO2 NAAQS, again, the same holds  
15 even though we have a three-year averaging time for the  
16 NAAQS design values that does not preempt or alter  
17 Appendix W's requirement for use of one year on site  
18 MET data and the five years of National Weather Service  
19 data.

20           In terms of the clarification, we did  
21 put forth the fact that we believe that the current  
22 guidance in Appendix W that was done in the context of  
23 the previous twenty-four, annual, and the three-hour  
24 secondary SO2 NAAQS were generally applicable to the 1-  
25 hour standard and that AERMOD, just as in the case of

1 NO2, was the preferred model for estimating these  
2 impacts in the near-field.

3           So, then we had heard from a number of  
4 folks through both the state and local tribal agencies,  
5 the regional offices in terms of specific permits and  
6 experiences, and also directly from you all, the  
7 stakeholder community. Either directly through memos  
8 or other information provided to either me or Chet  
9 Wayland or our upper management, there were a number of  
10 concerns. I think it was mentioned earlier, the  
11 impossibility of demonstrating compliance here and  
12 particular issues rose to the top of the list in terms  
13 of priorities for us.

14           So, in March we issued after probably  
15 three or four months of work on these issues, a number  
16 of things that we felt were necessary to assist you all  
17 in demonstrating compliance here. I should say that  
18 even though the memo itself was referenced specifically  
19 for NO2, the options and treatment here that are put  
20 forth are relevant for SO2 except, of course, the  
21 recommendations related to the tiered approach for NO2.

22           So, we clarified the procedures for  
23 analyzing results given the new form of the NAAQS. We  
24 modified the recommendations in terms of the tier two  
25 ambient ratio and the in-stack ratio defaults for the

1 tier three options. Again, we modified those national  
2 defaults that can be used without any further  
3 justification. We always prefer and would look for  
4 more appropriate source area specific information for  
5 use in that situation and so those defaults in no way,  
6 shape, or form preempt folks from informing the model  
7 in a more appropriate way and we encourage you to do  
8 so.

9           Thirdly, we addressed the treatment of  
10 intermittent emissions. A prime example would be  
11 emergency generators. As we were finding that in a  
12 number of situations, more and more the previous way of  
13 treating these sources under the annual NO2 NAAQS and  
14 even under the pre-existing SO2 NAAQS, they were not  
15 the controlling scenarios and now, under the hourly  
16 NAAQS, they were becoming the controlling scenarios in  
17 terms of determining whether or not one would get a  
18 permit or not.

19           Given the nature of the standard and the  
20 nature of those sources, we put forth some flexibility  
21 there in terms of treating those sources under these  
22 two NAAQS. Then we talked about recommendations  
23 regarding combining nearby background sources and the  
24 modeling there with the monitored contributions in the  
25 case of cumulative analyses. So, in terms of the form

1 of the standard, we suggest that or recommend that for  
2 comparison of the SIL that the impact from your source  
3 be based on a multi-year average of the highest 1-hour  
4 concentrations at each receptor. And that's consistent  
5 with the maximum contribution that a source could make  
6 at that receptor. And then, in terms of the cumulative  
7 impact analysis in determining whether or not you're  
8 causing or contributing to a violation, we would ask  
9 that you examine whether the project contributes  
10 significantly to model violations paired in time and  
11 space, including all cases where the cumulative impact  
12 exceeds the NAAQS, at or below the 98th percentile for  
13 NO2 or the 99th percentile for SO2.

14           And to support that, I believe within a  
15 month or so of release of this guidance, after a lot of  
16 work by Roger and James, we modified AERMOD to be able  
17 to post-process that information and support those  
18 analyses. We recognized there was a lot of angst about  
19 the post-processing requirements and the needs in order  
20 to come up with the correct values for comparison to  
21 the SIL and the NAAQS here. And we worked diligently  
22 to try and incorporate those. We considered having a  
23 separate post-processor and air post program, if you  
24 will. In the end, we decided to put these types of  
25 post-processing routines in AERMOD to support these

1 analyses and so we hope that that was helpful to you  
2 all because we know that there was a burden imposed  
3 initially there.

4                   We also addressed treatment of  
5 intermittent emissions. This has come up in a number  
6 of contexts. Given the form of the standard, we  
7 highlight the fact that there is a concern that  
8 assuming continuous operations for these types of  
9 sources would effectively impose an additional level of  
10 stringency beyond what was intended in the level of the  
11 standard itself. And as a result, we recommended that  
12 the compliance demonstrations be based on emissions  
13 scenarios that can be logically assumed to be  
14 relatively continuous or which occur frequently enough  
15 to contribute significantly to the annual distribution  
16 of daily maximum 1-hour concentrations.

17                   And I know Roger said that yesterday and  
18 we didn't expand on that too much. I think one aspect  
19 here is that we need to know the specifics of  
20 situations and cases. We're trying to address  
21 situations where emergency generators or other types of  
22 emissions scenarios that are either -- can't be  
23 projected or can't be controlled, like an emergency  
24 generator coming online and that occur fairly  
25 infrequently in terms of that situation. Those are the

1 types of situations that we intended to address here.

2           If there are planned downtimes or other  
3 types of situations where emissions spike, if those are  
4 planned, that would be an aspect where they may or may  
5 not fall in here. That's something that you would have  
6 to work with the regional office to work with. And, as  
7 noted there, routine testing and operations may be one  
8 of those things that would not be considered an  
9 intermittent source.

10           We've been getting questions, as an  
11 aside, related to this at both right before the  
12 conference and then yesterday as part of the  
13 conference. We -- I wrote a letter of concurrence to  
14 Region 2 based on a request from Region 2 in the  
15 context of a situation involving hydro-fracking in  
16 Region 2. And the specific request was from New York  
17 DC and Region 2 was asking for our concurrence in their  
18 review of that. And what we said was that given the  
19 information that was provided to us, that the sources  
20 in question could not be treated as an intermittent  
21 source and, therefore, could not be eliminated from the  
22 compliance demonstration or not accounted for.

23           There are ways in which you can account  
24 for those types of sources. If they're moving within  
25 an area, I believe that in the work that Region 10 did

1 in the OSC permits, their situation where rigs are  
2 moving and they actually try to account for that  
3 spatial dynamic of moving over the year, but that's a  
4 planned activity and it's known. So, that did not seem  
5 to comply with the spirit of what we were talking about  
6 here in terms of intermittent sources. So, work with  
7 the regional office and others in terms of how best to  
8 treat those types of sources in that situation. But  
9 that letter was just a concurrence and was part of the  
10 public record to submit as a public comment in that  
11 context that we concurred with their assessment in  
12 terms of saying that those sources were not -- could  
13 not be treated under this guidance as intermittent  
14 sources and, therefore, not included at all. So,  
15 hopefully that helps clarify a little bit of that and  
16 if there are questions, we can deal with those  
17 separately.

18 In terms of determining background  
19 concentrations, cumulative analyses will be required,  
20 as you know, if the emissions exceed the interim SIL.  
21 Those were established as part of the memos that went  
22 out soon after the standards were set. What we try to  
23 do is address the components of the cumulative impact  
24 analysis including identification of the nearby sources  
25 to include in the modeling inventory. So, you're

1 explicitly modeling them and then how to combine those  
2 results with the monitored background. And what we  
3 stressed here, as well as in the previous memos in  
4 regards to the NO2 and SO2 standards, is that we  
5 advised and cautioned against the literal and  
6 uncritical application of very prescriptive procedures,  
7 particularly those that one will find in the 1990 draft  
8 NSR workshop manual. In some of those cases, following  
9 that manual will result in overly conservative types of  
10 assessments. And the challenge here is to find a  
11 proper balance between balancing those factors that are  
12 appropriate to account for versus those that, under the  
13 context of this new 1-hour standard, would be  
14 appropriate.

15                   So, for example, the straightforward  
16 application of 50 kilometers and then going out another  
17 50 kilometers in terms of your area of influence and  
18 the sources that you would include in your modeling  
19 analysis, frankly, is not something that we see as  
20 necessary and should be reconsidered. Again,  
21 everything should be viewed in the case or the context  
22 of the situation at hand. But blindly following the  
23 workshop manual in that regard, I believe as Roger said  
24 yesterday and we have said elsewhere, if one wants to  
25 go down that road and do an obviously overly

1 conservative analysis, we won't stop you. But these  
2 guidance -- this guidance was intended to provide  
3 flexibility and, again, caution not to do that.

4           And so, I'll give an example at the end  
5 that we've seen recently that illustrates some of the  
6 pitfalls of that, but we urge you and the community to  
7 take advantage of the flexibilities that we're  
8 providing here. Work with the regional office to  
9 understand the particulars of how to work in that. But  
10 we've got to move away from the very prescriptive  
11 nature of things that were in the workshop that were  
12 done under the previous NAAQS.

13           I guess I shouldn't say this for the  
14 public Record, but I'll go ahead and say it anyway. At  
15 some point, perhaps in the future, we'll have a  
16 bonfire. A well-controlled one. We will have all of  
17 our permits in place before doing that.

18           So, but joking aside, really, we do need  
19 you all in the community to work effectively with us,  
20 with this guidance to take advantage of the  
21 flexibility. If you, you know, hold onto these old  
22 techniques of 20, 30 years ago, we acknowledge and  
23 admit you're going to have problems and you're going to  
24 have issues. So, we hope that we can work together.  
25 As an illustration of that, in Appendix W we have the

1 concept of a significant concentration gradient. And  
2 we identify a significant concentration gradient in the  
3 vicinity of the source as the sole criterion for  
4 identifying which nearby sources to model.

5           Now, there's aspects of that that can be  
6 somewhat complicated, but it's not impossible to define  
7 that. It may be that, as we move forward in updating  
8 Appendix W, we can work towards having a more concrete  
9 understanding and example of how we define that  
10 significant concentration gradient, what it means, and  
11 how best to put in practice an approach to identifying  
12 in a more, I guess, prescriptive way what nearby  
13 sources to model. But right now, we need to work with  
14 what we've got.

15           So, we did not comprehensively define  
16 the term given the uniqueness of each modeling  
17 situation, but if we can get an understanding of these  
18 situations in the context of these standards,  
19 hopefully, we can provide more information and refine  
20 the guidance and ultimately perhaps update Appendix W.

21           So, these gradients in the vicinity of  
22 the source imply that nearby sources' potential  
23 interaction with the proposed source impacts will not  
24 be represented well by monitored concentrations at a  
25 specific location. So, there's a feedback mechanism

1 between the monitored background that you're going to  
2 use and the nearby sources and that requires some best  
3 professional judgment and assessment in terms of making  
4 sure you're not double counting and making sure that  
5 you're properly accounting for the concentrations  
6 gradients in and about the project source.

7           We hear about the nominal 50 kilometer  
8 distance and other things. I know in the workshop last  
9 year there were questions that, well now EPA, you're  
10 suggesting that the focus on nearby sources is within  
11 about 10 kilometers. We're trying to provide  
12 information that's helpful to you all, but there is no  
13 bright line. Obviously, with a 1-hour standard, we  
14 want to make sure that you're focusing on sources in  
15 closer proximity to the project source or those that  
16 are, you know, going to be important to account for in  
17 terms of potential violations and contribution of the  
18 new project source to those violations. And it does  
19 suggest that you need to look in a tighter domain.  
20 What specifically that domain is, you need to work with  
21 your regional office and the like to design that on a  
22 case-by-case basis and as we do more modeling and  
23 understand better the nature of NO<sub>2</sub> and SO<sub>2</sub> in that  
24 context, we can provide more concrete examples. And  
25 then, perhaps, refine that type of information.

1                   And then, one of the more popular topics  
2 is how we combined the monitored to modeled  
3 concentrations. In the interest of time, I'm going to  
4 move down to the next slide where in the March 1st memo  
5 -- well, in June, we identified the overall highest 1-  
6 hour monitored background as a first tier. So, in a  
7 tiered approach, that's a conservative approach. In  
8 the March memo, we suggested a new first tier and that  
9 being the monitored design value and expressed that  
10 that should be acceptable as a less conservative first  
11 tier. And then given the form of the standards both  
12 for NO2 and SO2, we suggested then looking at the  
13 diurnal and seasonal patterns of those concentrations  
14 to then look and see whether or not more refined  
15 combination of those monitored concentrations is  
16 appropriate.

17                   And so, again, I don't want to read this  
18 stuff but, basically, based on the guidance and  
19 Appendix W, again, all the things that we're putting  
20 forth are rooted in Appendix W. That we suggested that  
21 the use of the multi-year averages of the 98th  
22 percentile of the available background concentrations  
23 by season and hour of day is an appropriate methodology  
24 for the 1-hour standard.

25                   So, we've provided three tiers here. A

1 first tier, admittedly conservative. A second tier  
2 that is fairly easy to implement, but still may have  
3 some nature of conservatism to it. But then a third  
4 tier, here, that allows one to take advantage in an  
5 appropriate way the combination of those data on a  
6 seasonal basis.

7                   And here for Salt Lake City, you can  
8 see, I believe this was the same example provided in  
9 the guidance. You've got the 1-hour design value  
10 there. You've got the standard level up here. And  
11 each of the different colors are the 98th percentile  
12 for winter, spring, summer, and fall. And by hour of  
13 day. So, that information can be provided by the  
14 background monitor and we've suggested a more refined  
15 approach to combining those that we feel both provides  
16 more appropriateness and reality to a particular  
17 situation and it's firmly rooted in the data that are  
18 available. And appropriate for combining in a way  
19 that, at least at this point in time, we feel  
20 comfortable with people using.

21                   So, that really covers the guidance that  
22 we put out in March. Again, we've gotten comments in  
23 terms of the sufficiency of that guidance and  
24 additional issues. Maybe not going far enough in  
25 certain areas and the like and we welcome those types

1 of comments to push us to better address your issues.

2 I guess two things that I want to  
3 mention before I get to this slide and finish up. When  
4 we first started this process and these NAAQS came out,  
5 the first call was, you know, hey it's impossible. It  
6 can't be done. Not, you know, Dana Carvey, not going  
7 to do it. It's just -- it can't be done. Well, at the  
8 end of last year, our policy division polled the  
9 regional offices and I will get the firm numbers and  
10 we'll submit it to the docket for everybody to see, but  
11 based on that polling of the regions, we had, I  
12 believe, 27 final permits that had demonstrated  
13 compliance with the NO2 standard. Ten of those permits  
14 had used either the tier one or tier two approach to  
15 demonstrate compliance. Seventeen used the tier three  
16 approach -- either OLM or PVMRM. From what we  
17 understand, out of those 17, three used OLM and 14 used  
18 PVMRM. So, we understand and hear what you're saying  
19 in terms of the difficulty and challenges here. But we  
20 do see -- and in certain situations and this was across  
21 the entire regions. You know, there were some regions  
22 that may have had more, but every region had a final  
23 permit that had successfully demonstrated compliance  
24 with the NO2 standard. And I didn't pull the SO2  
25 results. That doesn't seem to be as much of an issue,

1 but it was, and I believe the number was closer to the  
2 -- in the handful.

3                   But I did want to stress, and again,  
4 we'll compile this information and put it in the docket  
5 for you to see, that people are applying the guidance.  
6 People are successfully completing their compliance  
7 demonstration. And we appreciate and kudos to those  
8 who are moving forward and using these tools and  
9 techniques and guidance successfully.

10                   With that said, as you all know through  
11 the Clearinghouse process and other venues or avenues,  
12 we get pulled into situations where there are issues in  
13 terms of demonstrating compliance. So, I don't want to  
14 discount or diminish the fact that there are serious  
15 challenges here. But I want to provide an example and  
16 I don't want to say any names and I'll try to be very  
17 generic in characterizing this which, I think from our  
18 standpoint, puts a burden and obligation on you all in  
19 terms of applying the guidance appropriately and taking  
20 advantage of the things that we're providing and  
21 working hard to provide to you.

22                   So, we had a situation -- a source -- a  
23 combustion source was demonstrating compliance with the  
24 SO2 NAAQS under PSD. The timing of it was right around  
25 the issuance of the March guidance and then the

1 subsequent release of AERMOD. So, when we first heard  
2 of this application, our understanding is that they  
3 were having difficulty demonstrating compliance. In  
4 fact, they had modeled the fact that they exceeded the  
5 SIL, that they were going through the cumulative impact  
6 analysis and that they were significantly contributing  
7 to violations. And so, what was put forth was a novel  
8 approach, acknowledging that there were violations, but  
9 they were small in number. A probabilistic approach,  
10 so to speak.

11           Appreciate the creativity there and the  
12 like, but under the current guidance, those types of  
13 approaches you've demonstrated that there is a  
14 violation. You've got to address those types of  
15 things. We engaged through the regional office and  
16 others and early on in that process, pointed to the  
17 fact that we had March guidance. We had a new version  
18 of AERMOD. Perhaps one could run that through. They  
19 had previously post-process without the benefit of the  
20 tools that we had provided in AERMOD and so, we didn't  
21 hear anything for a little bit. Then, we -- probably  
22 in late summer or so, start hearing back about this  
23 issue and then get more details about what's going on.  
24 Still having an issue in terms of demonstrating  
25 compliance. We understood that the individuals

1 involved pushed back on re-running through AERMOD which  
2 we understand would have taken hours, days perhaps to  
3 do and to take advantage of the new capabilities in  
4 AERMOD. We also then got more details on the modeling  
5 and found out that they were going out 90 kilometers  
6 away and modeling an SO2 source -- 90 kilometers away  
7 and they were following the puzzle book. They were  
8 going out and modeling all of these sources.

9           We looked to our guidance and sent the  
10 message back that, well, it looks like the domain is  
11 much more expansive than we would suggest. To make  
12 matters even worse, we then looked and saw that they're  
13 between the project source and the source 90 kilometers  
14 away. It was a large SO2 source. I'll give them that.  
15 But there was a monitor between those two sources. And  
16 so why one wouldn't use that monitor as --

17           **MR. BRODE:** They did use the monitor.

18           **MR. FOX:** Oh? They double counted.

19           **MR. BRODE:** That was the monitor they  
20 used.

21           **MR. FOX:** Oh. Thank you.

22           So, to make matters even worse, you  
23 know. So then, what we did or what Roger and James and  
24 others did, is that we took the -- we got the input  
25 files and ran it through the new version of AERMOD and

1 found that, yes, they were above the SIL, but when you  
2 looked at the violations that they were modeling at the  
3 nearby sources -- the explicit sources that they had  
4 modeled, yes there were violations above the NAAQS  
5 level, but this source was contributing nothing.  
6 Nothing to those sources. Way -- I mean, it wasn't  
7 even close to the SIL. It was, literally, nothing.

8 So, long story short, you know, we provided the  
9 information. I hope that the information found its way  
10 to the right places and that ultimately gets resolved.

11 But, you know, we need you to work with  
12 us in this context. We need you to apply the guidance.  
13 We need you to apply the tools. We need you to engage  
14 with the regional offices. This is a totally avoidable  
15 situation. And before those types of situations get to  
16 a point where they're political or other types of  
17 things where that's not the most constructive way to  
18 work these things out, we really need to, you know,  
19 engage and work better together as a community.

20 I'm not saying that this is what we see  
21 most often. It isn't. It's an exception to the rule  
22 and it's becoming more of an exception to the rule.  
23 But I use it as an example just to say let's critically  
24 evaluate the way in which we did things in the past.  
25 Let's embrace the fact that we do have to demonstrate

1 compliance under these, you know, 1-hour standards and  
2 the PM standards and the like. And let's work together  
3 to find credible, technically credible, legally  
4 defensible ways to demonstrate compliance such that you  
5 can get your permits and that we can move forward with  
6 the types of environmental protection that we need to.

7           So, with that -- there's again these  
8 outreach efforts that we've been engaging in to try and  
9 provide information and answer questions. As a lead-  
10 in, we've got the AERMOD Implementation Workgroup that  
11 James and Erik will cover and provide more examples.  
12 And that was a key thing in dealing with the types of  
13 issues that were being brought to us, you know, I know  
14 I said yesterday that the devil is in the details and  
15 I'll repeat it. The devil is in the details in a lot  
16 of these situations. So, the more information we have  
17 in terms of the particulars of what you're challenged  
18 with or facing, the better we can help diagnose and  
19 understand and either provide a case-by-case solution  
20 to that problem and through that build better guidance  
21 or address a real issue in our guidance and provide  
22 that in timely fashion so that not only that project  
23 source but other sources facing that same type of  
24 challenge can benefit from that.

25           So, I'll end now and turn it over, I

1 believe, to Roger to go through.

2                   **MR. BRODE:** So, I'll try to do this  
3 fast. I guess a number of concerns that have been  
4 raised about the ability of the model to predict  
5 impacts, ambient impacts, and its accuracy. You hear  
6 over and over again that the AERMOD is overly  
7 conservative. We acknowledge that in some respects how  
8 the model is applied has conservatism built into it in  
9 terms of modeling with maximum allowable emissions, for  
10 example. But the model itself is not designed to be  
11 conservative. It's designed to be unbiased. And even  
12 within OAQPS people are asking, well, can AERMOD even  
13 calculate 1-hour averages -- failing to understand that  
14 that's the basic time step in the model.

15                   So, I'm just going to try to go through  
16 briefly a lot of this stuff you've probably seen  
17 before. AERMOD was very extensively evaluated before  
18 it was promulgated. A total of 17 databases for use  
19 which is far more than any other model had gone through  
20 before. It was in two phases. A developmental phase  
21 where you're actually changing the model as you  
22 evaluate it and then independent evaluations covered a  
23 range of scenarios. It looked at short term intensive  
24 field studies. Long term studies from operating plants  
25 and so on.

1                   They're very different. The one on the  
2 left, Prairie Grass that's sort of intensive field  
3 Tracer study where you had a large number of receptors  
4 oriented in arcs like that. So, removing the  
5 uncertainty due to wind direction which can be  
6 important. Here's the Lovett power plant example.  
7 Operating a power plant and far fewer monitors, but  
8 located on a critical impact area - a hill nearby.

9                   A number of methods were used in that  
10 process. We were comparing AERMOD performance to the  
11 then preferred models that AERMOD would replace. For  
12 example, for ISC, for non-downwash, non-complex drain  
13 cases CTDM Plus was a preferred model for complex  
14 drain. And ISC-PRIME came along sort of in the middle  
15 of that process for downwashes. So, overall, AERMOD,  
16 you know, did pretty well against the models that it  
17 was sort of competing against or replacing.

18                   So, I'm just going to go through these.  
19 QQ Plots, a number of people raised concerns. Well, a  
20 QQ Plot, you know, there's a lot more to it, but at  
21 least it gives you some sort of a quick visual  
22 understanding of how well the model works and I think  
23 what we're interested in in the model, especially for  
24 these hourly standards, is how well is the model going  
25 to predict the peak of the concentration distribution

1 because that's what's going to be compared to the  
2 NAAQS. We don't necessarily care did it get this value  
3 right for that hour at that receptor. We'd like it to  
4 but, you know, the level of skill involved to do that  
5 is much greater than we're expecting.

6                   So, this is complex drain -- Lovett.  
7 AERMOD is the red curve so that line that it's almost  
8 right on is the one-to-one line. So, the unpaired  
9 distribution observed in AERMOD agreed very well. And  
10 also, to put it in perspective with these new  
11 standards, the model that it was replacing was CTDM  
12 Plus which was about a factor of two higher in that  
13 case and it actually required very robust, site  
14 specific MET monitoring in order just to run CTDM Plus.  
15 We haven't imposed that high level of standard in terms  
16 of collecting site specific data to apply AERMOD even  
17 in complex terrain situations. So, we've made a  
18 significant step forward, I think, in terms of the  
19 ability of the modeling to handle these challenges.  
20 ISC was about a factor of ten higher so, yes, it was  
21 clearly conservative for that, but it was also not a  
22 refined model for complex terrain.

23                   This is another complex terrain. Again,  
24 AERMOD did quite well against the other models. This  
25 is a downwash case in Alaska, where a prime downwash

1 was involved so we had AERMOD versus ISC-PRIME and then  
2 ISC before PRIME. And even with PRIME in there, AERMOD  
3 actually did better than ISC-PRIME and performed very  
4 well.

5 Another downwash case and, let's see,  
6 there's an urban case, tall stack in Indianapolis,  
7 comparing AERMOD versus ISC. ISC has some biased over-  
8 predict it looks like, but AERMOD is pretty much  
9 unbiased.

10 One thing to point out is that there's  
11 some caveats here. These performance evaluations  
12 typically involved some fairly robust site specific MET  
13 data that was collected as part of the field study.  
14 You typically have hourly actual emissions or at least  
15 pretty good estimates of the emissions in order to  
16 remove as much uncertainty or bias associated with  
17 those key model inputs as possible.

18 So, you know, we're not -- this doesn't  
19 necessarily translate into the, sort of, practical  
20 world where I'm modeling my maximum allowable  
21 emissions. Maybe I'm using the nearest representative  
22 airport. It's representative enough, but it's  
23 certainly not necessarily going to achieve comparable  
24 results as you see here for those various reasons.

25 And also, you know, even -- well, I've

1 seen this case yesterday where we had one monitor, but  
2 even in the long-term field studies, there was  
3 typically about eight or ten or maybe more monitors  
4 that were being compared to, not a single monitor, to  
5 remove some of the uncertainty associated with the  
6 wind. The direction's a little bit off and then you  
7 either miss the monitor or you don't and that can  
8 result in significant differences.

9           So, just to caution that comparing PSD  
10 permit modeling results to observed concentrations at a  
11 single monitor or some monitor nearby is subject to  
12 possible misinterpretation and not necessarily a good  
13 indicator of the performance of the model. I mean, it  
14 may be useful information. We're interested in seeing  
15 that. We shared an example yesterday for the Portland  
16 Plant where there was one monitor downwind of the  
17 source. It was actually reasonably well sited. In  
18 that case, it actually did match up reasonably well,  
19 but if we looked hour by hour, it certainly wouldn't  
20 have looked as good.

21           So, now I'm going to talk about NO<sub>2</sub>.  
22 So, that kind of was a general evaluation of AERMOD  
23 dispersion. No chemistry involved. NO<sub>2</sub> adds a new  
24 dimension. I do think, you know, we need to  
25 acknowledge you said that not many people needed the

1 tier three options in the past. At least maybe we were  
2 thankful that at least Region 10 did. And the State of  
3 Alaska because I think we're very fortunate that they  
4 basically sponsored the implementation of the OLM and  
5 PVMRM options within AERMOD several years ago due to  
6 that. And I think we're in better shape now that they  
7 did that than if they hadn't. So, I just want to  
8 acknowledge, Herman Wong and the State of Alaska for  
9 those efforts.

10                   So, a lot of this has been documented in  
11 the documents that are referenced on SCRAM and in, you  
12 know, one of the clarification memos. So, this was  
13 probably the evaluation that was done for ISC, PVMRM,  
14 and basically these are power plant plumes showing --  
15 comparing the ratios, you know, with distance from the  
16 source and overall, it's not perfect, but it actually  
17 for a convective case, it picks up the fact that it  
18 converts to NO2 pretty quickly. In stable cases, it  
19 recognizes that there's not much conversion because  
20 there's a very narrow, small plume. Not much  
21 entrainment of ozone.

22                   We only had two longer term field  
23 studies and I think that that's still the case that  
24 we've looked at for NO2 to evaluate these options. One  
25 in Hawaii -- Palau, Hawaii where there's one monitor.

1 And then New Mexico. Empire Abo, where there's two  
2 monitors. And this just sort of summarizes the ratio  
3 of the robust highest concentrations and the average  
4 ratio of predicted observed for AERMOD with PVMRM --  
5 PVMRM is about 1.5. There's some bias to over-predict  
6 it looks like, mostly for that case. OLM with OLMGROUP  
7 ALL actually does much better in terms of the average  
8 bias. OLM without OLMGROUP ALL certainly shows over-  
9 prediction as well as full conversion. We expect that.

10                   And that is, just again, to make the  
11 point that we have not stated anywhere that PVMRM is a  
12 better algorithm or approach than OLM in any given  
13 situation. We don't know. I mean it may depend on the  
14 circumstances. There are aspects of PVMRM that are  
15 more refined. That might make it more appropriate in  
16 some cases than others but, you know, OLM certainly  
17 does much better in a few cases here. So, we hope to  
18 learn more about that and provide better guidance.  
19 We've provided some ideas. Some indicated some cases  
20 where PVMRM may not be as appropriate for low level  
21 sources, for example.

22                   These are -- but that was, yeah, that  
23 was 1-hour. The previous evaluations that have been  
24 done for this were just focused on the annual  
25 standards, so this is what we updated more recently.

1 These are the QQ plots. That again shows the OLMGROUP  
2 ALL working pretty good. You know, it's not perfect,  
3 but it matches pretty well with observations. PVMRM at  
4 least, kind of near, but not quite as well, but  
5 certainly highlights the conservatism of the full  
6 conversion and OLM without OLMGROUP ALL.

7                   That was the one monitor at New Mexico.  
8 This is another monitor where AERMOD does show with  
9 PVMRM more tendency to over-predict. That was  
10 highlighted on the table whereas OLMGROUP ALL was  
11 looking better. Palau is where AERMOD PVMRM actually  
12 does pretty well in matching. Again, these are the NO2  
13 concentrations -- hourly NO2 concentrations. So,  
14 OLMGROUP ALL certainly much better than the other  
15 cases.

16                   We had AERMOD -- a question came up  
17 about mobile sources and can the model -- how much  
18 confidence do we have in the model to predict  
19 concentrations for mobile sources. AERMOD was actually  
20 applied as part of the risk and exposure assessment for  
21 the Atlanta area as part of the most recent NO2 NAAQS  
22 review that resulted in the new hourly standard. And  
23 it was certainly focused on hourly impacts. A majority  
24 of the impacts were attributable to mobile sources and  
25 there's a longer story there which I'll kind of skip

1 over. But when it came to us, that's the kind of  
2 monitor to monitor comparisons we were seeing that  
3 AERMOD was, you know, grossly over-predicting the  
4 monitors. There were a number of factors there -- the  
5 MET data. They were using OLM. The roadways as area  
6 sources with OLM but without OLMGROUP ALL, so that was  
7 where we actually looked at that and realized that  
8 OLMGROUP ALL may actually be a pretty good idea.

9           But there are other issues, so that was  
10 kind of the before slide. This is actually a time  
11 series of NO2 concentration model versus monitored at a  
12 particular monitor for, I think, about a month. This  
13 is sort of after. So, much better agreement. It's not  
14 perfect, but in this case there's actually quite a bit  
15 of under-prediction of the observed. Well, that's  
16 because the wind is calm, so there actually are high  
17 concentrations under light wind conditions. In this  
18 case, the model grossly under-predicted those  
19 concentrations because it thought the wind was calm and  
20 so missing.

21           But given the level of detail and  
22 uncertainties in the emissions for the mobile sources,  
23 I think that's pretty good agreement. This is another  
24 monitor -- sort of a very similar picture there. So,  
25 that's -- and this is just overall looking at the

1 ranked distribution. One of the things we realized is  
2 that the emissions input to the model were defined by  
3 season and hour of day, but did not account for any  
4 kind of day of week component. And that showed up  
5 clearly here. If you compare during the weekday, the  
6 model actually agreed much better with predictions than  
7 on the weekends. So, some of that over-prediction  
8 actually was due -- occurred on the weekends. But more  
9 recently, we've had some interaction I want to sort of  
10 preempt later talks, but maybe feed into later talks on  
11 the NOx options and NO2 options in AERMOD, but sort of  
12 revisited this and had a range of conversation.

13           At New Mexico, there were two monitors.  
14 Kind of one north and one south that had NO2, NOx, and  
15 so forth, and ozone. And the original modeling  
16 evaluation had been done before we got involved. Just  
17 paired the north monitor -- ozone monitor and evaluated  
18 the north NO2 monitor which may be not the best idea.  
19 So, we looked at reversing them. So, we used the south  
20 monitor for ozone to predict impacts at the north  
21 monitor and actually did maybe improve the results a  
22 little bit in some cases.

23           But we also -- some concerns were  
24 raised. You'll hear more about it later. And wish we  
25 could have coordinated the timing on this a little bit

1 better, but about -- one aspect of PVMRM in AERMOD in  
2 terms of using relative dispersion coefficients may  
3 tend to over-estimate the volume of the plume under  
4 stable conditions because the relative dispersion  
5 coefficients really aren't applicable. The way they  
6 were formulated weren't necessarily applicable to  
7 stable conditions.

8                   So, I actually started looking at what  
9 if we implemented PVMRM in AERMOD like it was for ISC  
10 originally by Pat Hanrahan using just total dispersion,  
11 but using a smaller portion of the plume predicted by  
12 total dispersion. And so I've done some tests with  
13 this which actually are kind of encouraging. And,  
14 yeah, so this is the new PVMRM results for the south  
15 monitor. Again, there was some sensitivity on whether  
16 you used the same monitor for the ozone or the other  
17 monitor. But it actually performs much better than  
18 with the current implementation. And this is the other  
19 monitor, and I can't even see what I'm looking at, of  
20 the same sort of thing. I don't have time to go  
21 through details because I want to leave time.

22                   And then the other comment had been made  
23 is there's some, you know, disagreement on whether the  
24 way it's implemented now should actually use four  
25 sigmas to define the volume of the plume versus what

1 Pat Hanrahan has used with total dispersion which was  
2 1.28. And this is just showing the difference. If I  
3 run the model as it's currently designed for one of the  
4 monitors, that's what PVMRM gives. And this is what it  
5 would give if you used the 1.282 to define the plume  
6 volume. It actually agrees much better in that case.  
7 But if you go to the other monitor, again, that's not  
8 perfect, but at least you're in the ballpark for the  
9 peak values. Now, you're seeing -- introducing some  
10 under-prediction by reducing the volume of the plume.

11                   And for Palau where we actually did  
12 pretty good with the current implementation. If we  
13 just change the sigma -- the number of sigma Zs from  
14 what's in the model now, four, which gives you pretty  
15 good agreement, to the 1.282, clearly a biased under-  
16 predict, which is kind of what we would expect. And  
17 this is total -- using total dispersion, again, as a  
18 something to investigate for Palau and it worked pretty  
19 well before that and it still works pretty good. So,  
20 at least it didn't compromise the performance there.

21                   Just to put it in perspective, finally,  
22 I thought I would throw in for Palau, where AERMOD with  
23 PVMRM does pretty well. ISC PVMRM actually gave you  
24 that. So, you know, same chemistry, same approach,  
25 except for the total. I think this is actually both

1 using total dispersion and the same number of sigmas,  
2 so the only difference is the dispersion model. And  
3 it's interesting to see how much improvement we get  
4 using AERMOD versus ISC with the same chemistry option.  
5 So, that was kind of an interesting point.

6 And that's where I'll stop.

7 **MR. BRIDGERS:** After a very on schedule  
8 day yesterday, we have slipped. And so, in the  
9 interest of time, I think what we'll do is we'll go  
10 ahead now and let's break for lunch and then when we  
11 come back from lunch, we'll pick back up on the  
12 schedule that we were going to keep. But to be fair to  
13 Erik and James, I don't want them to try to launch into  
14 a 45-minute presentation that a lot of people have come  
15 to see in less than 20 minutes. So, let's break for  
16 lunch and that means be back at 12:40 and we'll kick it  
17 back off.

18 So, thank you and see you after lunch.  
19 (WHEREUPON, a lunch break was taken.)

20 **MR. BRIDGERS:** Okay, if we could take  
21 our seats. I see a lot already have. They're  
22 watching the clock better than I am. We're already  
23 four minutes over the schedule I had set.

24 So, as we start the afternoon session,  
25 obviously we've still got leftovers from the morning

1 session. Just a little bit of logistics and making  
2 sure that we can stay somewhat on time with the  
3 afternoon session and still get our question and answer  
4 sessions in because that's an important aspect of this  
5 conference is the dialogue between all of us.

6                   What we're going to do, as I had  
7 mentioned before lunch, is we're going to have the  
8 AIWG, the AERMOD Implementation Workgroup talk by Erik  
9 Snyder and James Thurman now, but the talk that was  
10 originally schedule for one to one-fifteen that Roger  
11 Brode was going to deliver, we're going to scratch that  
12 from the agenda.

13                   But that being said, a lot of the  
14 information that is included in that presentation can  
15 be found on the SCRAM website at the 10th Modeling  
16 Conference under the TSD for the New Jersey 126 and  
17 Roger and I are in conversations that we most likely  
18 will still go ahead and post the presentation under the  
19 conference presentations on the SCRAM website. I don't  
20 know that we would actually formally submit it to the  
21 docket, but nonetheless, it will be in there and there  
22 is additional information in the TSD.

23                   Just in the interests of time, we want  
24 to hear from all of our invited speakers, so without  
25 further ado, let me turn the agenda or the podium over

1 to, I guess, James Thurman and Erik Snyder.

2 **MR. SNYDER:** Hopefully, everybody's not  
3 too full and I'll try to go through the 200 slides  
4 pretty quickly. I think we've got 50 or thereabouts.

5 I'm at Region 6 in Dallas and we formed  
6 the AIWG group to focus on NO2 and SO2 modeling.  
7 Anyway, we formed this last February, I think it was,  
8 or so. And we did some work last year and some follow-  
9 up work this year. Doing some cumulative.

10 Mainly, we formed the workgroup  
11 initially with these new standards and at the Region 6  
12 we had a fair amount of experience already with some of  
13 the new standards and issues with modeling with some  
14 permits and so really, it's just focused on some one  
15 hour NO2 and SO2 as the workgroup and analyzing and  
16 trying out different things and trying to build up some  
17 community knowledge level in modeling.

18 It's comprised, I think, there's about  
19 27 or 28 states that have members. I think we have six  
20 or seven regional offices and OAQPS involvement, so  
21 it's a good crowd of people.

22 The stage one of it was basically to --  
23 we worked with our members that we had and we came up  
24 with specific facilities and then we kind of made them  
25 generic so that we wouldn't be modeling a specific

1 source so to speak. But we based these generic  
2 facilities on real facilities and just modified stack  
3 parameters and locations somewhat, but well within the  
4 tolerances of what we would see.

5           We completed this with all the single  
6 facility modeling. It was a non-cumulative last June  
7 at the regional state local workshop in Atlanta. And  
8 then we continued the AIWG process and we did some  
9 source grouping analysis, individual source  
10 culpability, and some cumulative analysis as well. We  
11 still have some additional work we'll be working on on  
12 these issues and then other issues as far as adding  
13 background and some of the other things as we work on  
14 the NO2 modeling and the future SO2 as well.

15           I'll kind of give an overview. We  
16 started with 12 typical industrial facilities that  
17 required the modeling and then we kind of expanded  
18 based on the workgroup. We had four more that we added  
19 to it and so overall, I mean, we worked to review it  
20 and, like I said, because of the concerns, especially  
21 with SO2 modeling that nobody wanted to have SO2  
22 modeling at their own facility. We figured ahead of  
23 time before the actual modeling for the maintenance  
24 SIPS or whatever.

25           So, we did take these generic scenarios

1 to try to give that and it also had some generic  
2 property boundaries in lot of cases. We created base  
3 scenarios and then we also did a combination of stack  
4 heights and emission control combinations to see, when  
5 we modeled exceedances, what in the base level if we  
6 could fix it with additional, feasible things that you  
7 could do.

8           The way we kind of divided up the work  
9 in the regions and the states was, basically, the  
10 people that worked with that industry a lot did the  
11 work and the modeling so they were most familiar with  
12 it as well. And, of course, we did the normal five  
13 years met data and building downwash when we had the  
14 downwash data.

15           The caveats on the initial modeling we  
16 did and even on this modeling -- it's not in  
17 cumulative, I mean, even for the cumulative runs that  
18 we've done, we only put some sources in there. It's  
19 not the full level of what it might within the modeling  
20 domain of a 10, 20, 30 kilometers whatever you were  
21 looking at for your area of concern.

22           We didn't include the background  
23 monitoring values because that's going to vary a lot  
24 over -- so we know that there's also background  
25 monitoring to add in on these things.

1           As again, this was done not necessarily  
2 for one specific task other than to really get some  
3 experience doing this in the states and initially these  
4 standards were really being talked about in really  
5 difficult to attain and stuff and so we thought we'd  
6 form this group to really get some basic knowledge of  
7 is it plausible to work it out and show attainment or  
8 not.

9           I guess I'll turn it over to James for  
10 this part here.

11           **MR. THURMAN:** This is just a summary  
12 table of NO2 results. I'm not going to go very more in  
13 detail. This is also in the draft summary that we put  
14 out on SCRAM last week and that's going to be updated  
15 in the next couple of weeks as we finish adding maps.

16           Basically, what we have here is each  
17 facility we modeled base emissions or uncontrolled  
18 emissions the sales in yellow are where we had  
19 violations and it gives the maximum design value in  
20 micrograms and ppb. And also a percent of the  
21 receptors in the grid that violate. The ones in green  
22 are those where we passed -- didn't have any problems  
23 with the NAAQS.

24           So, these are all the NO2 facilities  
25 like the steel mill, for example, in the base case

1 there were violations of OLM and PVMRM, but when you go  
2 to a controlled scenario, the OLM case passes, but the  
3 PVMRM still had exceedances with one receptor. So, I  
4 mean that shows some sensitivity OLM or PVMRM.

5           Again, these are just summaries of NO2  
6 and continuing with the summaries of NO2 on the  
7 refineries are actually very borderline. It could be  
8 depending upon how you convert from micrograms ppb.

9           So, you can look at this on your own in  
10 the report or the presentation was posted on SCRAM.

11           SO2, same thing. We had some similar  
12 facilities. One thing I'd like to point out about the  
13 ethanol plant is initially you see a violation of 296  
14 and then control strategy is still 296. It wasn't the  
15 stack that you would -- the main-stack wasn't the  
16 problem, but actually what the modelers also did it.  
17 This is with a 50 meter fence line. They actually  
18 modeled with a 300 meter fence line and that receptor  
19 was inside the facility property so then you didn't  
20 have to have an exceedance. So this was a good case of  
21 showing how the distance to ambient air is important.

22           And then we have some more scenarios  
23 down more in the table and a few more. And like I  
24 said, more details can be found in this draft summary.  
25 We've got all the inputs in the summary right now. Bar

1 charts for all the facilities and maps for all the  
2 facilities that had exceedances and next week, I'll  
3 fill in the rest of the facilities. I thought we'd put  
4 in maps even for those that didn't have exceedances  
5 just so you could see the spatial profiles.

6                   So, we're just going to go through a  
7 couple single source examples. If you were at the  
8 workshop last year, you'll remember we did all of them,  
9 but we don't have that much time today so we're just  
10 going to do a couple.

11                   And I also want to acknowledge we have a  
12 few people in here that are a part of AIWG. I just  
13 want to thank them for all their efforts. It's been a  
14 lot of work. They had, you know, busy schedules, but  
15 they still took time out to help us with this so we  
16 really appreciate it and they did all the work here.

17                   The first example for NO<sub>2</sub> is the ethanol  
18 plant, actually. This was Dawn Froning from Missouri  
19 and Jen Krzak from Iowa. They were the modelers. So,  
20 we actually had states working together.

21                   They evaluated four scenarios. These  
22 four scenarios with four different meteorological data  
23 states. All I'm going to cover are results for one  
24 today. But the four scenarios were our base case, you  
25 know, starting out with 1100 tons. Then, scenarios two

1 and three changed stack heights to 65 meters for this  
2 one point C004 and also for scenario three we added --  
3 they added controls to get the emissions down to 381  
4 tons. And in scenario four they added more controls to  
5 get down to 172 and, just to let you know, volume  
6 source remained unchanged in all of these.

7           They also had descriptions of what these  
8 sources are. C01 and two are flares. The third one is  
9 an emergency fire pump. And the fourth one is the  
10 source you would think of in an ethanol plant, the  
11 regenerative thermal oxidizer. I don't what that does,  
12 but it sounds important. That's probably a fancy word  
13 for a moonshine still, I don't know.

14           So, these are the emissions in grams per  
15 second down here. We highlighted the one source that  
16 we changed in yellow. So, we start out with a 32 grams  
17 per second, 43 meters stack height. Then, we changed  
18 stack height up to 65 meters and reduced emissions down  
19 to nine grams per second and then three grams per  
20 second.

21           They also modeled the, like I said,  
22 distance to ambient air. They modeled a 300 meter  
23 versus 50 meter fence line and then they also modeled  
24 stack ratios. First, they did .1 for all sources and  
25 then one -- .05 for the main source. They were looking

1 at C4 and then .1 for all others. And then a .25 for  
2 all sources.

3 And this is just an outline of the  
4 facility, how the 50 meter versus 300 meter fence lines  
5 and the spatial relationship of all the sources.  
6 Here's that main source that will be controlled. The  
7 red line is 300 meters. The blue line is 50 meters  
8 fence line.

9 These are bar charts of the maximum  
10 design value for each scenario in micrograms per meter  
11 cubed. Solid black line is the 188, 189 microgram  
12 level which is the NAAQS. These are all scenarios  
13 based on increasing the stack height and then with  
14 controls and more controls. And then different color  
15 bars are those NO2 stack ratio sensitivities and fence  
16 line.

17 Now, one thing you'll see is you don't  
18 see a lot of difference between the different scenarios  
19 when you control that one stack. And actually you  
20 don't really see any difference in when you change the  
21 NO2 stack ratio for that one source, the red and blue  
22 bars and the green and -- for the 300 meter you don't  
23 see a lot of difference. For the 50 meter fence line,  
24 you do see when you change that ratio for that one  
25 source, you get a difference because it's outside the

1 facility so its impacts are probably, you can see them  
2 better.

3                   So, there's some spatial plots. This is  
4 where we're going to show the base case. The first one  
5 is for the .1 ratio at 300 meter fence line and the  
6 star represents the maximum design value. It's right  
7 on the fence line. You see the exceedances are  
8 basically kind of the orangy colors.

9                   Or is this SO2? Okay. This is NO2, but  
10 I think I used a different -- it should have been  
11 stopped at 188. It should have had a break there, but  
12 anyway, the kind of orangy colors are the violations.  
13 50 meter fence line, you get a max of 810. Still on  
14 the property line. And then changing the stack ratios  
15 for 300 meter fence line, you don't see any difference  
16 for max values. For 50 meters it goes up to 930  
17 micrograms, but the overall spatial doesn't change a  
18 whole lot.

19                   At .25, obviously you're changing that  
20 ratio a lot. It goes up to 1,000. And then .5, the  
21 default that's talked about in the NO2 guidance gives  
22 you a lot higher.

23                   So, we had some findings initially. Our  
24 results are sensitive to distance and ambient air, and  
25 the stack ratios. The maximum design values did not

1 change based on changing that stack height or applying  
2 controls to that stack of interest. And we actually  
3 went back and did a few reruns to get a source  
4 contribution and it looks like the maximum design  
5 values were driven by the emergency fire pump. Now, we  
6 modeled that at continuous emissions so there may be --  
7 in the permit you may want to take permit limits or  
8 something to help with that.

9           This shows is that problematic emissions  
10 may not always due to the stacks thought to be causing  
11 the problem. You know, you think I'm going to control  
12 that big stack and we find, well, not necessarily.

13           The next one we're going to talk about  
14 is for SO<sub>2</sub>. This is a coal-fired EGU. I did some runs  
15 myself and Erik Milligan from Oklahoma did some runs.  
16 I modeled with Charleston, South Carolina met data and  
17 he modeled with Springfield, Missouri met data.

18           We modeled six scenarios of a baseline,  
19 increasing stack height and controls. A combination of  
20 stack height increasing controls and you can see how  
21 the emissions change. More stack height increases and  
22 then another stack height increase with controls and a  
23 higher exit velocity and the actual inputs we'll show  
24 in a second.

25           And also, I did a run for two of the

1 stacks where we modeled a 65 meter stack height. Their  
2 original stack heights are 150 meters. So we thought  
3 what if you had the model at 65 for some reason. Also,  
4 I modeled with uncontrolled emissions at 10,000 tons.  
5 I believe this was based on a proposed EGU with  
6 controls already in place, so it looked like it was  
7 already fairly well controlled maybe.

8                   These are the parameters. C1 and C2 are  
9 the two emission points we'll be adding stack heights  
10 and controls to. C1 is a 780 megawatt boiler. C2 is  
11 an auxiliary boiler. C3 is a diesel generator and four  
12 and five are fire pumps.

13                   The uncontrolled emissions I modeled  
14 with for C1 are 290 grams per second. Controlled, I  
15 modeled 57 grams per second. Oklahoma modeled 112  
16 grams per second.

17                   Now, these are the bar charts broken  
18 out. Springfield -- so these are the Oklahoma runs  
19 here. These are the runs that I did here. As you can  
20 see, this red bar and this blue bar -- this white blue  
21 bar are the uncontrolled emissions and the base  
22 emissions using a 65 meter stack height. When their  
23 initial stack heights are 150 and 100, so I modeled  
24 them at 65 each. So you can see that makes a huge  
25 difference in the concentrations. We did model with

1 downwash. But except for those two cases, there's no  
2 NAAQS exceedances. So, if you were to model as-is,  
3 they would have passed.

4           Just some spatial plots for the  
5 uncontrolled case with the base parameters, but at 65  
6 meter stack height, we get a 905 microgram. Right off  
7 the facility property, less than 500 meters. If we  
8 model with the base emissions and a 65 meter stack  
9 height, we go down to 445 micrograms and you still have  
10 a maximum design value of just off the property. But  
11 then once you raise the stack height to, you know,  
12 original stack height, it goes down to 65 micrograms  
13 and the max is actually farther out, but you have no  
14 exceedances. And eventually -- this is with  
15 uncontrolled emissions and this is with the base  
16 emissions and base stack parameters. Nice green  
17 background. So 33 micrograms.

18           So, our findings from the EGU are we  
19 didn't have any NAAQS exceedances unless we changed  
20 stack heights to 65 meters. For the base case and the  
21 controlled cases where we didn't change stack height,  
22 the maximum design value was driven by the diesel  
23 generator.

24           For the uncontrolled cases and for all  
25 the 65 meter stack height cases base or uncontrolled,

1 the maximum design value was driven by that big boiler  
2 which makes sense.

3           The Springfield case that Oklahoma ran  
4 seemed to be more sensitive to changes in-stack height  
5 than the Charleston case and that could be a  
6 combination of the meteorology and terrain.

7           These results may not be indicative of  
8 all EGUs, especially older ones that may not be as well  
9 controlled or have different stack combinations and  
10 terrain combinations.

11           So, those are our single source. We  
12 have three cumulative scenarios that I'll talk about.  
13 I'll talk about the first two for NO2 and SO2 and then  
14 Erik will come in with the natural gas compressors.

15           The first one is an ethanol plant, fuel  
16 or asphalt plant based on AIWG facilities we ran. So,  
17 we put them together. It didn't have any NAAQS  
18 exceedances.

19           The second one was an NO2. This was  
20 from a PSD scenario in Minnesota. They told me it was  
21 okay to use it. One receptor exceeded the NAAQS for  
22 NO2, but was located on facility property. And the  
23 design value was driven by that facility, so -- and it  
24 was not the facility of interest. And then, like I  
25 said, Erik will talk about natural gas compressors.

1                   The first one, the ethanol plant, the  
2 turbine and asphalt plant, the receptor grid is  
3 centered over the ethanol plant. Here's the fuel  
4 turbine and the asphalt plant is out here. I can't  
5 remember the exact distances we put these at, so this  
6 is probably about -- this should be about 5 kilometers.  
7 I think this might be 15 from here to here.

8                   Here are the results. No violations.  
9 The maximum is somewhere around the ethanol plant.  
10 What's interesting here is that here's a fuel turbine.  
11 When we ran this in single source mode for the initial  
12 AIWG stuff, Hadar from Tennessee modeled it and he  
13 modeled in complex terrain and he had violations. You  
14 can see those in the summary report, but they were less  
15 -- they were maybe about 500 to a kilometer away and  
16 you could tell it was driving by terrain. This is  
17 relatively flat terrain and the fuel turbine doesn't  
18 really cause any issues here. It's kind of an  
19 interesting thing to see that the terrain for the fuel  
20 turbine did have an effect, but here there's really no  
21 problem.

22                   This is the one from Minnesota. This is  
23 the facility they were modeling for. Their facility of  
24 interest. You can see, you know, the dense network of  
25 receptors. You know, the fence line receptors around

1 the different facilities. These arcs down here are  
2 part of a polar grid, but then you have a Cartesian  
3 grid.

4 Now, the maximum design value is 189 and  
5 it was somewhere in here, but it was driven by this  
6 facility. So, technically, you wouldn't consider this  
7 facility's effect on itself, so I don't think there was  
8 a problem there.

9 I'm going to let Erik take over now and  
10 talk about natural gas compressors.

11 **MR. SNYDER:** Okay. This is, we  
12 presented this material last summer, but it's one of  
13 the first cumulative runs and I think it's kind of  
14 pertinent because there's a lot of oil, gas, shale clay  
15 stuff going on. That was one of the reasons we looked  
16 into this originally.

17 We did a scenario that's basically four  
18 compressor stations, assimilating in the DFW area. In  
19 the non-attainment area, we've got some rules on NOx,  
20 but Texas has put them in most of East Texas for their  
21 engines -- put these rules in place to control NOx.  
22 And so even outside the non-attainment area to help  
23 with the ozone levels.

24 But we've had a large shale clay. One  
25 of the first ones in the country was in the Dallas-Fort

1 Worth area west of Fort Worth and into Fort Worth and  
2 Arlington area. So, we're pretty familiar with this  
3 type of set-up.

4           We had facilities -- we had four  
5 facilities. We had scenario one that was a baseline.  
6 We had a small compressor at 28 tons per year. Another  
7 facility was 230 tons per year. 165 tons per year.  
8 And 135 tons per year. And these were in -- I'll show  
9 a map in a minute.

10           In the second scenario we raised, on the  
11 engines, we raised the height up to about 17 meters  
12 which, from the research we had done and the  
13 experience, that was kind of the upper limit of maybe  
14 stacks without too much back pressure on the engines.

15           In the third scenario was going to,  
16 would incorporate a 35 meters stack height on the  
17 engines from a standpoint of you'd actually have to do  
18 some induced fan probably to do that.

19           In scenario four was to look at, okay,  
20 what if you had one of these facilities that was maybe  
21 built in the 80s or something. There are a number of  
22 facilities close together like this that was built in  
23 the 80s and maybe they had an air field ratio controls  
24 was all they really had on the unit. And so you might  
25 have a 6 gram per horsepower hour type emission rate.

1                   We modeled all four facilities. We  
2 looked at 100 percent, 80 percent conversion. So, tier  
3 one, tier two, looked at OLM and PVMRM and looked at  
4 different in-stack ratios of .1, .25, .5 and used a .9  
5 equilibrium ratio.

6                   We also did model a lesser controlled  
7 facility just using the same thing other than we didn't  
8 do the OLM on it, I guess. And short stacks on that  
9 unit. So, it's basically any existing facility you  
10 might come across initially. This was done with a  
11 couple other modelers; Chu Phong and Ashley Moore  
12 at Region 6.

13                   This is a bar graph and, again, this  
14 scenario one is the -- this first scenario here and I  
15 do note the scale and nobody's jaw dropped, at least  
16 not too far anyway. But this is in micrograms per  
17 meter cubed, so this is definitely showing a problem  
18 here, especially this last scenario, this SC5, is for  
19 maybe one of the existing 80s type facilities that  
20 you've run into. Or 70s or something like that.

21                   Okay, looking at this from the  
22 standpoint of existing facilities that you might run  
23 into and if they have to do a project or another  
24 facility comes in nearby and constructs and they show  
25 we got this other facility that's doing this type or a

1 combination of facilities are generating this.

2           Can we solve this problem is one of  
3 those open questions. So, that's kind of the construct  
4 of this scenario set-up.

5           So, we have the baseline scenario and  
6 we're still up over 1,000 micrograms with a lot of  
7 these scenarios and, just left to right, the blue is  
8 100 percent so that's full conversion tier one. Tier  
9 two, 80 percent ARM is red. And the yellowish, dirty  
10 yellow, is using the .1 PVMRM. .25 is next. .5 and  
11 then OLM .1, .25, and .5.

12           And so, but you can see that as we go,  
13 even SC2 gets us, I mean, this black line is the NAAQS  
14 down here. It gets us below the NAAQS even just  
15 increasing the stack heights without doing anything  
16 else on controls if you have a well-controlled facility  
17 already.

18           As far as if you back off on the  
19 controls, it does cause a problem, even if you have the  
20 increased stack height. This is scenario four.

21           This is just to bring a scale now. I  
22 pulled SC5 out so the historical non-controlled  
23 facility or not very well-controlled facility, low  
24 stacks, is out of the picture. So, this gives a little  
25 bit more context. Okay, with baseline, 100 percent,

1 you know, you run the AERMOD, get the outputs and don't  
2 do any slicing of it at all. 1,800 plus micrograms.  
3 Using 80 percent, we drop it some. Then looking at  
4 PVMRMs, we had three cases, and it's still up over  
5 1,000 for the baseline. OLM in this case was quite a  
6 bit lower.

7 Roger, you spoke earlier about the  
8 differences between OLM and PVMRM and the way they  
9 react with low level facilities and so, in some cases,  
10 PVMRM might not be the best scenario to go at. It  
11 should be -- consider looking at both. We haven't  
12 really developed an opinion on which one is the best  
13 under each situation. So, we're open to looking at  
14 both of them.

15 **MR. BRODE:** The best one is the one that  
16 gives you the best answer.

17 **MR. SNYDER:** Yes, whatever the best  
18 answer is. That may be user-defined.

19 But, again, the increased stack height,  
20 the only one that -- 100 percent was a little bit above  
21 here, but looking at this, even going to any of the  
22 three tier threes we had here you show, and this is  
23 just PVMRM runs on the stack height one with 17 meters  
24 increases, all these are showing fine as far as you can  
25 add the background monitoring and still be in

1 compliance or most likely. And again, if you add, it  
2 shows you can get it done further on the impact levels.

3           Here's some spatial plots. Okay, this  
4 is the 100 percent conversion so straight out of the  
5 box for scenario one baseline. No stack height  
6 increases and the 1838. And, as you would expect, the  
7 concentrations are really targeted right around the  
8 facilities. And this is -- kind of give you the  
9 spatial plot of the facilities. We had one here. We  
10 had another one right here on the edge. That was the  
11 small one. Another here and then another one down  
12 here. And these distances are a couple of kilometers -  
13 - zero to two kilometers, so the spacing on these  
14 facilities is a little over two kilometers here in  
15 direction. So, fairly close knit package of sources.

16           So, we see a fair amount of sources like  
17 this with the shale clay where you get a lot of these  
18 units fairly close potentially. So, it may be  
19 conservative compared to what you run into in a lot of  
20 cases, but it may be realistic in some cases. I mean,  
21 we know it's realistic in some cases from the stuff  
22 we've seen in Texas.

23           This is the cumulative using the PVMRM,  
24 so again and I didn't point out on this, but even the  
25 scale over here on the right, really, once in the

1 yellows, you have to get up in the mid-yellows to be  
2 above the exceedance level, almost into the oranges.  
3 Really, it drops off really quick around these  
4 facilities. If you had a lot larger footprint on the  
5 facility than what we modeled, again, the distance to  
6 ambient air, you may not have a problem at all.

7           And this is doing a stage three PVMRM  
8 .1. In the analysis and the data sets that we've  
9 collected, I mean, .1 may be on the low side for  
10 natural gas units. We've seen them lower than .1 and  
11 we've seen them higher. .2 levels. .25 on some of the  
12 data that I've gotten through the region and some  
13 protocols and stuff. So, but again, I mean getting in-  
14 stack ratios, doing that test, to me, is not difficult  
15 if you've got existing facilities to do that and then  
16 use that data to help drive the modeling. Again, the  
17 max is still over 1,000, but your non-attainment zone  
18 where your actual modeling exceedance is really small.

19           This is the stage two or scenario two,  
20 excuse me. So this is with increasing the stack height  
21 to 17 meters and 100 percent conversion. So this is,  
22 you know, you almost get there with doing 100 percent  
23 conversion, not even doing a tier two, and I don't have  
24 that plot, but you would get there depending upon what  
25 your background is. But if your background NOx levels

1 are high enough, you might have to go to tier three,  
2 but it looks doable on these short stack, fairly, I  
3 mean, these facilities -- if they're fairly well-  
4 controlled, it seems they can pass in a lot of cases.

5           This is, again, this was increases in-  
6 stacks. 17, less controls and, of course, the spatial  
7 plot grows a little bit, but still you have everything  
8 is in attainment with the 17 meters and using PVMRM,  
9 even with the less controlled level than the range of  
10 emissions rates we had. I think we backed that one  
11 off, though. I think it was in the two to three grams  
12 per horsepower hour emissions rate. I'd have to  
13 double-check on that exact number.

14           And then this is the cumulative 100  
15 percent ratio with the higher stacks, so you can, with  
16 dispersion and raising the stacks on these units, it's  
17 not a huge tonnage of emissions so it drops it off real  
18 quick.

19           And this is the scenario four. This is  
20 the stacks with less controls and 35 meters stacks.  
21 So, raising stacks along may not solve the situation.  
22 From the analysis on this type of industry anyway, it  
23 looked like controls were the first thing, but if you  
24 had a lot of sources around, but you just have to model  
25 and see what works best for the facility.

1                   And just for grins, this is what the  
2 facility looks like without, you know, a 1980s vintage  
3 facility and it does show a huge area of non-  
4 attainment, but the non-attainment levels are basically  
5 the dark yellows and you can see the contour line here  
6 of the standard and a distance of six kilometers, six  
7 and eight kilometers on the bottom.

8                   So, you know, we know there's going to  
9 be situations where some of these might model this way  
10 with PVMRM, but the question is can they be solved or  
11 is it not a doable situation? In general, the NOx  
12 controls for this industry are fairly reasonable cost  
13 compared to some of the other point source controls.

14                   Lessons learned, James, jump it at any  
15 time. Again, you need to evaluate both controls and  
16 stack heights within GEP. Evaluate for low stacks.  
17 Small property footprints are still the main problem  
18 and so it's not surprising. And I think out of this,  
19 again, the stacks that drive it aren't the starch  
20 dryers or the ethanol plant or the boilers. It was the  
21 emergency unit, but that's fixable with permit  
22 restrictions and stuff.

23                   Another thing is this is one of those  
24 things that it really helps to spend some time getting  
25 the facility information together as far as the

1 emissions rates and any information on in-stack ratios,  
2 downwash, and getting your property lines. Make sure  
3 you've got good property definition for the facility as  
4 far as what's ambient air or the start point is.

5           We know a number of states have started  
6 working on collecting this as part of the AIWG process  
7 as well. And also for the SO2. People are pulling  
8 information together out of permits and stuff. Again,  
9 emergency units are solvable. And again, NAAQS  
10 exceedance is not just tied to emissions levels, but  
11 that is an important thing.

12           This last bullet, from the perspective  
13 of Region 6 and some of the feedback, I haven't heard  
14 from the region other than one facility that they were  
15 facing new controls to go forward with and they decided  
16 to pull the plug on a project. Other than that, I  
17 haven't heard of any SO2 projects being pulled. We  
18 have had successful demonstrations in the region and  
19 the state. It is a tight standard. We all realize  
20 that, but it seems that in our case it's workable. I  
21 guess we would support any information and if there's  
22 examples and work through those things. Work with the  
23 regions.

24           With NO2, again, not necessarily tied to  
25 the emissions levels or the predominant sources, but

1 again, in-stack ratios, getting it for other facilities  
2 may be problematic. I've run into that on one project  
3 already, but it's important to work with the other  
4 facilities and try to get that information and also do  
5 the research necessary.

6                   The NO2 modeling is sensitive to the in-  
7 stack ratios and, of course, there's differences  
8 between the two tier three options and the background  
9 data has an impact as well.

10                   I just emphasize the importance of this  
11 as we move forward as a group, a community. We really  
12 need to work together on pulling as much information on  
13 NO2 and in-stack ratio data for all types of  
14 facilities. Parameters and controls.

15                   As far as AIWG, we're continuing the  
16 process and we'll be looking more on the cumulative and  
17 looking at some other scenarios and stuff as we move  
18 forward. Of course, the workgroup is also involved in  
19 local permitting, so it depends on their workloads as  
20 well. We look to loop in additional experiences in the  
21 RSL workshop coming up in another month, month and a  
22 half, but that's not that far away. So I'm not sure  
23 how much extra it will -- we may have some extra  
24 anyway.

25                   I think we've got the draft report

1 created, but it's kind of rough right now, but I think  
2 we'll be working on that to really populate it further  
3 than what we've done so far in document what we've done  
4 so far and I guess that's kind of how I'll wrap it up.

5 I appreciate any input from people on  
6 scenarios when they have problems demonstrating. Work  
7 with the regions, work with us, and it will get to AIWG  
8 as well and we're interested in trying to help tackle  
9 those things and work forward.

10 **MR. BRIDGERS:** What I will say is, you  
11 know, James said that there would be some updates made  
12 as more maps and more charts are made for the AIWG  
13 report. I'm the one who actually uploads the stuff to  
14 SCRAM, so as that goes up, we'll make sure that under  
15 the recent addition, there will be some note that the  
16 report had been updated. Otherwise, it would not.

17 So, somewhat getting this train back on  
18 the right schedule, if there is a right schedule, we're  
19 going to shift gears a little bit and head into a  
20 couple of invited or a slew of invited talks and the  
21 first up is something that a lot of us have heard quite  
22 a bit about over the last year.

23 So Bob, if I can find your presentation  
24 here, we can --

25 **MR. PAINE:** Hopefully, you have it.

1                   **MR. BRIDGERS:** -- yeah, it should be on  
2 here.

3                   All yours.

4                   **MR. PAINE:** Okay, this was first  
5 introduced last June at the regional workshop and we've  
6 made a lot of progress. Unfortunately, the version I  
7 have has fellow authors and I would like to acknowledge  
8 the contributions of AECOM authors and staff members  
9 Dave Heidle and Rich Hamel and EPRI members in the  
10 back of the room there. Eladio Nipping and Naresh  
11 Kumar. And, of course, they'll answer all your  
12 questions.

13                   I'm going to talk about the guideline  
14 procedures that effect what emission rates you have to  
15 use in modeling and how we would deal with variable  
16 emission distributions. And a description of a  
17 procedure for a Monte Carlo type of approach, which  
18 we're calling EMVAP which stands for the Emissions  
19 Variability Processor.

20                   We've got the code working and have  
21 evaluated three of the AERMOD evaluation databases with  
22 this procedure and I'm going to report those results.  
23 I'll talk a little bit about how the results are  
24 sensitive to the number of simulated years going from  
25 50 to maybe 5,000 simulated years and conclusions.

1                   This is a famous table in Appendix W  
2 which says for short term averages you have to model  
3 your maximum emission rate, design capacity, and assume  
4 continuous operation. And obviously, some sources  
5 don't operate at their maximum emissions limit  
6 continuously and that's definitely a problem.

7                   Some sources may be able to accommodate  
8 more than one emission rate which they could assign a  
9 probability to and this procedure is designed to try to  
10 give a source credit for being able to do that. Some  
11 intermittent sources would be, for example, emergency  
12 backup engines, but sometimes bypass stacks which  
13 operate infrequently but have much higher emission  
14 rates during those operations. They present modeling  
15 challenges and so assuming a fixed peak one hour  
16 emission rate continuously will certainly result in  
17 unrealistic model results when compared to a monitor.

18                   So, this approach would be to assume a  
19 prescribed distribution of emission rates and so this  
20 processor which I'm going to describe uses this  
21 information to develop alternative ways to come up with  
22 a compliance rather than just using one emission value.

23                   Here's an example of a time surge over  
24 8,760 hours and this is emission rate on the y-axis.  
25 You can see that the peak hourly emission rate is about

1 133 grams per second, but the average is more like  
2 about a third of that.

3                   So, how do we use this information? Say  
4 this was a typical operation for a source. One way to  
5 do this is to put this into a cumulative frequency  
6 distribution and you can see that about a quarter of  
7 the time the source is off. And maybe two percent of  
8 the time it's pretty high and to model this, if a  
9 source wanted to permit this type of emission rate,  
10 they would have to say well, I'm going to model it at  
11 maybe 140 grams per second to be safe. Well, that's  
12 clearly going to overstate the emission rate for most  
13 of the time.

14                   One way to do this in our emission  
15 variability processor is to come up with a few cases  
16 and to put boxes around those cases. As long as we can  
17 envelope this cumulative distribution with these sets  
18 of boxes and this is just an example. In this case we  
19 say well, we'll never operate more than 140 grams per  
20 second emission rate, but 98 percent of the time we'll  
21 be no more than 100 grams per second and 89 percent of  
22 the time no more than 65 grams per second and so on.

23                   The average emission rate, the weight  
24 average, would be a third of the peak emission rate.  
25 In some cases I'm going to describe later, we can

1 divide this probability distribution in maybe five,  
2 ten, or even 20 divisions. Or another way is you can  
3 divide this range of emissions by emission rate into  
4 five, ten, or 20 divisions. Obviously, the more  
5 divisions you have, the closer you come to fitting this  
6 curve and therefore, the more closely you will come to  
7 actual emissions. And we're going to show how the  
8 procedure is sensitive to that type of set-up.

9           So, this approach would be to create an  
10 emissions frequency distribution I just showed you an  
11 example of. And then model the source with unit  
12 emissions for each case. In this past slide I had six  
13 different cases, but you could have up to 20 cases in  
14 the way the procedure is set up now.

15           Each case is modeled with unit emissions  
16 with its own exhaust parameters and even if you add a  
17 bypass stack that we even at a different location, you  
18 can model that because that's a separate AERMOD run.

19           And then you would create hundreds,  
20 thousands of simulated annual realizations of the  
21 concentrations distribution by basically rolling the  
22 dice, taking the probability, and then applying the  
23 emission rate that corresponds to the percentage that  
24 comes up.

25           Then we, basically, as a post-processor,

1 there is no change in AERMOD. We compile many, many  
2 simulated years of concentrations and then post-process  
3 these with a look alike to the AERMOD post-processor.  
4 We have basically replicated the AERMOD software to  
5 create the right design concentrations.

6           So, how do we do this random selection?  
7 Well, in one case -- in some cases, that is, peak  
8 emissions might occur in groups of hours, but since the  
9 form of the standards of the one hour NO2 and SO2  
10 involve only the highest concentrations an hour in any  
11 given day, a group of hours in a day only count as one,  
12 you know, basically one day's maximum concentrations.  
13 So, it's conservative to basically spread these high  
14 concentrations out among as many days as possible.  
15 That makes the process simpler, but somewhat  
16 conservative, so that's what we do.

17           But we also have a procedure where if  
18 two different sources operate together, we can use the  
19 same sequence of random numbers to make high emissions  
20 occur in the same time and if they're not in tandem, we  
21 give them different initial random numbers.

22           So, the purpose and definition of this  
23 system is to do a probabilistic post-processor for a  
24 range of emission rates. We have three different  
25 modules in addition to, of course, AERMOD itself.

1 EMDIST is used to look at hourly emissions and decide  
2 how to set-up your cases for running AERMOD. Then you  
3 run AERMOD with unit emissions. Then you use the EMVAP  
4 probabilistic emissions simulator to take the  
5 probabilities you've set up, select an emission rate  
6 for each hour, apply it to your output concentration  
7 for each receptor for each hour of the year up to five  
8 years of normal AERMOD runs, and come up with output  
9 files which are then fed into the EMPOST post-processor  
10 which gives you the output design concentration  
11 predictions.

12 I'm not going to dwell much on EMDIST  
13 except that it can take into its -- input the, let's  
14 say, several years of hourly emissions data, come up  
15 with very useful statistics. You also want to do for  
16 each case a realistic hourly stack exit velocity  
17 emission and exhaust velocity.

18 Let's go to EMVAP. EMVAP is an  
19 interesting part of this whole procedure because it  
20 takes the number and lists of the years included in the  
21 analysis and the number of Monte Carlo simulated years  
22 to perform. Obviously, each run would use the same  
23 receptors. Each of the cases would be run with AERMOD  
24 with identical receptors, but the stacks can actually  
25 move. If you're using a bypass stack in some cases.

1           You then use a random, sort of a non-  
2 random random number file, but you can start with  
3 different starting points in that file to get sources  
4 that are uncorrelated. But sources that are linked can  
5 use the common sequences of random numbers for up to  
6 ten source data sets, one of which can be -- by the  
7 way, you can run AERMOD for a group of sources the  
8 traditional way. Combine them with running AERMOD with  
9 sources that have variable emissions and have a hybrid  
10 approach and even have a concentration file of just  
11 background. So, you can add in sources run the old  
12 fashioned way and sources run the EMVAP way.

13           Okay, EMPOST will then take the results  
14 of EMVAP and give you the required output. You'll want  
15 to know how many years you're using, file names, et  
16 cetera. The number of modeling iterations that were  
17 performed and it will give you the statistics to  
18 report.

19           Now, let's go into the evaluation of  
20 EMVAP. We developed a working code. We decided to,  
21 besides trying it out on prototype examples to see if  
22 our own staff could figure out how to run it, we  
23 actually tried it on three AERMOD databases that were  
24 previously evaluated with actual emissions.

25           But we ran AERMOD with both actual and

1 peak emissions for those data sets just to see how the  
2 evaluation might change if you were required to use  
3 what Appendix W says you have to do to compare a model  
4 to a monitor. And then we ran EMVAP to see if we got a  
5 more realistic result from running the peak emissions.  
6 And we ran it over 1,000 simulated years and we would  
7 expect that the EMVAP result would be more conservative  
8 than the actual emissions because we have this buffer.  
9 We're covering the cumulative distribution with a set  
10 of cases, but certainly less conservative than using  
11 peak allowable emissions.

12                   We used the Lovett Generating Station.  
13 We've seen that mentioned before. Clifty Creek and  
14 Kincaid. So, these are all electric generating  
15 stations, all of which had hourly emissions very well  
16 documented, and different terrain settings from complex  
17 to rolling to flat.

18                   Here's Lovett showing the stack here and  
19 the hill with the monitors. And this is the frequency  
20 distribution of those emissions. Pretty steep. And  
21 you would expect that EMVAP might do something about  
22 this because obviously modeling this emission rate all  
23 year has a lot of conservatism.

24                   If you chose, for example, six cases.  
25 We chose five, ten, and 20 in different slices, but you

1 can see that the exit velocity as a function of  
2 emission rate will, as you might expect, go up as you  
3 get from minimum load to full load and that is  
4 reflected in the inputs to various discreet cases.

5           Now, I'm going to explain what this is  
6 all about. These are the results of the -- this is the  
7 design concentration and these are concentration bar  
8 charts here. These are the observed at the controlling  
9 monitor. This is the AERMOD with the actual emissions,  
10 so this is slightly under-predicting actually. AERMOD  
11 with the maximum emissions we're probably over-  
12 predicting by a factor of two. As you can imagine with  
13 this emission distribution, the average emission is  
14 about half the peak, so no surprise that the peak  
15 emission rate run through AERMOD would be something on  
16 the order of twice what you got for the actual  
17 emissions.

18           Now, here's EMVAP with five, ten, and 20  
19 cases with the vertical slices that go along the  
20 probability x-axis and then five, ten, and 20 slices  
21 doing the emission rates, cutting the emission rates  
22 into various sections. As you can imagine, as you go  
23 into more and more cases, you get more toward the  
24 actual emission condition. In all cases, we are more  
25 conservative than the observed and more conservative

1 than modeling with actual emissions, but much less  
2 conservative than with maximum emissions. So, this  
3 procedure is giving us tremendous benefit in this case  
4 and performing as expected.

5 The next one, Clifty Creek, with six  
6 monitors in various directions between Kentucky and  
7 Ohio--

8 **AUDIENCE MEMBER:** Indiana.

9 **MR. PAINE:** Sorry. Thank you. My  
10 geography -- but it's close to Ohio.

11 Okay. We have here a fairly shallow  
12 drop off of emissions. So, you might expect in this  
13 case, EMVAP might be less helpful and will still see  
14 that it is, indeed, the case.

15 We again did five, ten, and 20 slices  
16 with vertical slices here and then five, ten, and 20  
17 divisions of the emission rate from the peak emissions  
18 down here. And this is, by the way, there's three  
19 units so I'm just going to show you that they're all  
20 similar, sort of flat drop off of emission rates. And  
21 then we see, as expected, similar set up here observed  
22 design concentration over those six monitors.

23 AERMOD actually over-predicted somewhat  
24 with actual emissions and with peak emissions. Over-  
25 predicted some more and you can see that with EMVAP we

1 got the expected -- not a huge benefit because of the  
2 flat drop off, but with more and more slices we got a  
3 little bit lower over-prediction here and always higher  
4 than AERMOD with actual emissions. Lower with AERMOD  
5 with peak emissions.

6                   The last case would be Kincaid. Flat  
7 terrain. 28 monitors. Lots to choose from here. In  
8 this case, sort of a peak, a few percentage pretty high  
9 up, so obviously if you modeled with this one you would  
10 maybe over-predict by a factor of two and, indeed, we  
11 are seeing that is the case. Actual versus maximum, a  
12 factor of two difference in just running AERMOD.  
13 Actual emissions actually under-predicted slightly.

14                   We're seeing again a similar trend.  
15 EMVAP again always greater than AERMOD with actual  
16 emissions. So, we're getting expected and beneficial  
17 results with EMVAP.

18                   Sensitivity analysis. You can get not  
19 only -- we're using the 50 percentile statistic out of  
20 EMVAP. That is, you take 1,000 simulations and you  
21 rank them. You take the 50th percentile, but you can  
22 take other percentiles and we decided to say okay,  
23 depending upon how many iterations I run EMVAP through,  
24 how fast does this solution converge? The 50th  
25 percentile convergence is pretty fast. After 500

1 iterations it's pretty flat. In fact, after 50 it's  
2 close to converging.

3           Obviously, as you go higher and higher  
4 you get more extremes and this keeps going up as you  
5 add more iterations because you can get more different  
6 selections of random numbers because each iteration  
7 starts with a different random number. Although,  
8 sources in tandem will start with the same random  
9 number. But you can see, even the 90th converges  
10 pretty fast and it turns out that for these evaluations  
11 we used the 50th and the 50th works out well.

12           Current limits in this code. There's no  
13 really effective limit to the number of receptors. We  
14 have tested it with 10,000 receptors and the computer  
15 hasn't exploded.

16           Source groups to be combined. You can  
17 combine ten different source groups currently. Some of  
18 those can be groups with constant emissions run the  
19 current way or background. Low cases per source group  
20 up to 20 with 5,000 simulated years up to five years of  
21 real modeling and the typical run time was surprisingly  
22 fast. You might think you have to have, well, it used  
23 to be a Cray but Crays are old fashioned. Let's say  
24 a Linux cluster, but you don't need a Linux cluster.  
25 You can do it on your laptop. A few minutes to an hour

1 maybe. Maybe the time it takes to run AERMOD or maybe  
2 five years of AERMOD. Not too bad.

3 And so, conclusions and status.

4 Currently operational. EPRI is beta testing this.

5 Considering implementation approaches.

6 We have found against field data that we like the  
7 results. As predicted, we are between actual emission  
8 results and especially for peaky types of emission  
9 distributions, we are much better using peak emissions.  
10 And you can imagine for sources that have very rare,  
11 but very high emissions, that could be a much bigger  
12 benefit, so if the source can see their way to  
13 accepting different emission limits for different  
14 probabilities, this may be a way to go. EPRI is still  
15 testing this procedure.

16 And I think that concludes my talk.

17 **MR. BRIDGERS:** Moving right along. That  
18 is much easier this time. I turn the floor over to  
19 Mark.

20 **MR. PODREZ:** Thank you.

21 Hello, I'm Mark Podrez from RTP  
22 Environmental Associates and I'd like to thank George  
23 and Tyler for making time today for this presentation  
24 which is on an update ambient ratio method or ARM for  
25 performing one hour NAAQS analyses.

1                   In EPA's March 2011 guidance, they make  
2 the statement that given the stringency of the new one  
3 hour NO2 standard, many permit applicants may find it  
4 necessary to use the less conservative tier two or  
5 three approach for their analyses.

6                   Usually, it's the PVMRM or OLM tier  
7 three methods that must be used because the current one  
8 hour ARM guidance is very conservative. I think as  
9 Tyler noted this morning that out of the 26 PSD permits  
10 that were issued that had to deal with perform analyses  
11 for the one hour NO2 NAAQS, 17 ended up having to use  
12 one of the tier three methods.

13                   EPA has also stated that at this point  
14 there's no preference for any of these methodologies at  
15 this time. The test evaluations conducted to date  
16 have been somewhat limited and have shown that under  
17 different circumstances, one method or the other may  
18 indicate better performance or shall I say give the  
19 best answer.

20                   Now, ARM was originally developed by Chu  
21 and Meyers in 1991 and in the report they noted that  
22 the plume mixing and near-field NOx chemistry processes  
23 can be accounted for through the empirical use of  
24 ambient monitoring data. They compile annual average  
25 NO2 concentration divided by total NOx concentration

1 ratios, the ambient ratios, from a large number of  
2 ambient monitors and they recommended looking at the  
3 90th percentile value of 0.75 as a reasonable upper  
4 bound estimate for the annual ambient ratio. And in  
5 this ARM method, you simply take the modeled total NOx  
6 concentration and multiply it by the ambient ratio to  
7 determine the final NO2 concentration.

8           Now, in the more current one hour AMR  
9 guidance, the EPA has cited two more recent studies to  
10 support the current recommendation of a fixed ratio of  
11 .8 for one hour analyses. However, both of these  
12 studies as well as monitoring data evaluations  
13 demonstrate that the ratios are really variable as a  
14 function of time or distance from the emission source  
15 and the current fixed value method may be overly  
16 conservative, especially when your monitoring very  
17 near-field fence line concentrations.

18           One of the studies was the Wang Study of  
19 NOx near roadways for short-term monitoring tests.  
20 You'll see that the background concentrations for NOx  
21 and ozone were very low. Even the maximum measured NO2  
22 impacts were really quite low, less than the ambient  
23 ozone concentration. So in this case, there is no  
24 ozone limiting occurring. In effect, this study is  
25 based on such low measured impacts, it may not be

1 indicative of the processes that may be occurring from  
2 higher impacts from point sources where the entrainment  
3 of ambient ozone into coherent plumes may be more  
4 important as compared to well-mixed roadway emission  
5 sources and where ambient ozone concentrations may  
6 limit the conversion.

7                   Some of the study results. Certainly,  
8 some of the ambient ratios measured were variable and  
9 EPA, you know, focused on using the highest measured  
10 ambient ratio as a conservative fixed ratio for their  
11 one hour ARM recommendation.

12                   I'd like to present a couple plots that  
13 show the variation of the measured ambient ratios.  
14 This is first as a function of the inverse of distance.  
15 So these are closer in. These are farther data points.  
16 Note that the closer in points generally have the lower  
17 ratio. Again, this is consistent with the simple  
18 conceptual mechanism of ozone being entrained and then  
19 subsequently oxidizing to NO<sub>2</sub> which really dominates  
20 the near-field plume chemistry and as there is more  
21 time for dispersion, more time for entrainment, there  
22 is more conversion occurring.

23                   You may ask why the inverse of distance  
24 is plotted here. Here is another plot where the ratio  
25 is plotted as a function of NO<sub>x</sub>, total NO<sub>x</sub>

1 concentration. You can see that these have very  
2 similar looking graphs and this really kind of  
3 illustrates how the NOx concentration can somewhat be  
4 thought of as maybe a bit of a surrogate for the amount  
5 of time, distance, dilution, reaction that has been  
6 occurring.

7                   So, a variable ratio ARM method, calling  
8 it ARM-2, could be less conservative than the current  
9 fixed ratio, more conservative than refined tier three  
10 methods, it could fill gap, and if it's based on a  
11 large enough set of one hour ambient monitoring data,  
12 again it implicitly or empirically addresses a wide  
13 range of the processes occurring in the near-field.

14                   What would the benefits be? Well, these  
15 are really the same benefits that the original ARM  
16 technique afforded. It's a simplified screening  
17 approach that's easy to implement either in spreadsheet  
18 templates or it could be coded rather easily into  
19 AERMOD or a post-processor. It does not require  
20 detailed in-stack ratio data. It does not require  
21 representative ozone data which also avoids having to  
22 look further and make decisions about issues of  
23 potential ozone scavenging in the data sets. It  
24 doesn't really introduce complex offsetting errors  
25 between complicated modules in the model. And, you

1 know, ultimately it would reduce both applicant time  
2 for preparing these analyses and agency for reviewing  
3 them.

4                   So, we looked at a large data set of  
5 ambient one hour NOx data. We looked at the AQS  
6 database from the last decade of all NOx sites in the  
7 U.S. We looked at various subsets of that AQS  
8 database. We also looked at some of these data sets  
9 that have been used in tier three testing of PVMRM and  
10 OLM. The Empire Abo. The Wainwright data set, a new  
11 data set that Steve Hanna will talk about more in the  
12 next presentation. New Mexico Environmental Department  
13 had a big database. And then we got one from the  
14 Canadian Oil Sands monitoring network.

15                   We have plotted all of these data sets  
16 by the observed ambient ratio as a function of NOx  
17 concentration. They all show very similar  
18 relationships. I'm going to go through them quickly in  
19 the interests of time.

20                   Empire Abo and the Wainwright data sets,  
21 the New Mexico State data set, the Canadian Oil Sands  
22 data set, this is a network of six monitors. Numerous  
23 IC engines all around them. You will notice that the  
24 x-axis on here is larger. There are higher impacts  
25 being measured here. Anybody who is looking at this

1 little tail here, that tail is most likely an artifact  
2 of the NOx analyzer over-ranging on the NOx channel and  
3 therefore, that is not real world data. And then here  
4 are the plot for all rural and AQS monitoring  
5 stations.

6                   So, in all these plots you see the same  
7 trend of lower ratios being observed at higher NOx  
8 concentrations. Certainly, there is a wide spread of  
9 ratios at the lower NOx concentrations. Well, that's  
10 because a low NOx concentration could indicate either a  
11 smaller nearby source that has less time for  
12 entrainment and conversion and therefore, a lower  
13 ratio. Or, a larger, more distant source that has more  
14 dilution and more time for entrainment and conversion.

15                   So, we try to take some of these data  
16 plots and develop a variable ratio curve that could be  
17 used for ARM-2. Because of the large number of data  
18 points, we took the data and sorted them into bins. We  
19 tried to get a reasonable upper bound for each bin. We  
20 selected the 98th percentile not because it's related  
21 to the form or the standard, it's just a good indicator  
22 of upper level ratios in that bin. And this is what  
23 such a graph would look like. This is, again, that  
24 same kind of rural and suburban data. Each of the  
25 diamond points is the 98th percentile for that bin

1 fitted to a curve. You'll notice that the curve does  
2 start dropping off at the highest NOx levels. We did  
3 limit these curves then to .15, somewhat arbitrary, but  
4 a .15 ratio to kind of represent an in-stack ratio  
5 average and so that does agree well with what we end up  
6 seeing here at the tail end of the distribution.

7                   These are some of the actual ratios then  
8 calculated both for the rural suburban data subset.  
9 Here's the urban city center subset. You'll see that  
10 they're really quite consistent. The urban city center  
11 are a little higher, but for example, at 300 ppb total  
12 NOx, the two ratios would be .21 and .23.

13                   We also looked at various geographical  
14 subsets. Northeast, southeast, midwest, mountain  
15 states. Southwest. And with the exception of the  
16 mountain states which had a much lower number of data  
17 points, things are very consistent. I think for the  
18 mountain states, when you start getting to bins that  
19 have less than 100 or 50 data points, you're basically  
20 taking the highest observed ratio. But again, for  
21 example, 300 ppb total NOx, the ratios vary from about  
22 .2 to .23. This is all sites compiled together and  
23 that ratio would be .24.

24                   So, we took this curve, we developed the  
25 curve for all data sites in the AQS database and we

1 wanted to do some performance testing in comparison to  
2 PVMRM and OLM using the available data sets. The  
3 Empire Abo North we looked at. Palaau and the New  
4 Wainwright data sets. Basically ran AERMOD to  
5 calculate the total NOx and applied the ARM to variable  
6 curve ratio. And we ran AERMOD with PVMRM and OLM.

7           One note used on our assumptions from  
8 Empire Abu North Site. As Roger was talking about  
9 today, we also wanted to address ozone scavenging at  
10 the North Site. It's not appropriate to use that ozone  
11 data because when you're having impacts, there's less  
12 ozone because it's being used to convert to NO2 and so  
13 that artificially lowers the ozone values. So, we used  
14 the higher of the north and south monitors. And we  
15 also used an in-stack ratio of 0.2 instead of the 0.1  
16 used in EPA's original modeling.

17           You know, most of these sources at  
18 Empire Abo are IC engines and .2 is closer to the  
19 current typical guidance. You know, just those two  
20 little changes resulted in the highest PVMRM modeled  
21 NO2 concentrations being about 30 ppb higher. Almost  
22 30 percent higher than the results originally presented  
23 by EPA in 2011. So, you know, again, obviously PVMRM  
24 is very sensitive to the ozone and in-stack ratio  
25 assumptions being used.

1                   So, we plotted the performance in Q-Q  
2 plots for these different data sets. First Empire Abo,  
3 a monitoring station about 1.6 kilometers from the  
4 source. I averaged the ten highest monitored  
5 concentrations to give you a feel for the impacts. 375  
6 for NOx. 91 for NO2. About half of the NAAQS.

7                   This is the original reported  
8 performance by the EPA in their March 2011 memo and,  
9 again, you can see that both PVMRM and OLM Group are  
10 clustering pretty close to the one-one line at the high  
11 concentrations. OLM is a little low and PVMRM is a  
12 little high.

13                   This is an updated one. And here, total  
14 NOx is blue. 100 percent conversion. The PVMRM is  
15 green. OLM Group ALL is yellow. And ARM two is red.

16                   So, you can again see that with these  
17 updated assumptions that PVMRM and OLM now are about a  
18 factor of 1.5 higher, but you will notice that ARM-2 is  
19 performing roughly the same for this data set.

20                   The Palaau data set. Here the  
21 monitoring site is only located 200 meters away from  
22 the source. You know, very little time for  
23 entrainment, mixing, and reaction to be taking place.  
24 This actually might be a better site for assessing in-  
25 stack ratios than for determining how well these

1 methods address the atmospheric conversion processes.  
2 We do see some very high monitored NOx impacts. But  
3 not very high NO2. You know, the average ratios for  
4 the high concentrations is only about .12.

5           Here's the Q-Q plot for this source.  
6 Again, in this case we see PVMRM, OLM, and ARM-2 all  
7 performing about the same. They're all over-  
8 predicting, whereas full conversion drastically over-  
9 predicts the highest concentrations.

10           The Wainwright data set is 500 meters  
11 from the source. Similar maximum concentrations as  
12 Palaau. Similar Q-Q plot.

13           So, I think the conclusions is that,  
14 well, a couple conclusions. First of all, the relative  
15 performance between PVMRM and OLM, you know, it can  
16 vary depending upon the data set.

17           Again, the tier three results can be  
18 very sensitive to ozone data and in-stack ratio and  
19 really any continued performance tests really should be  
20 using the same assumptions as the current guidance for  
21 permit modeling.

22           The ARM-2 method is more conservative at  
23 lower concentrations. It's assuming very high  
24 conversion because it's based on that upper bound of  
25 observed conversion at low concentrations. But at the

1 higher concentrations, it really performs comparable to  
2 the tier three methods.

3           Finally, we just wanted to do a little  
4 sensitivity testing to compare the methods. Again, we  
5 used the same data sets that were in the MACTEC PVMRM  
6 sensitivity analysis. We did not use the data sets  
7 that had downwash because we did not have building  
8 structures in the downwash parameters and, in addition,  
9 we did a couple of hypothetical source configurations.

10           Really, the conclusions are kind of  
11 similar depending upon the data set in one source or  
12 one method or the other might give you the best answer.

13           For the EPA original data sets, PVMRM  
14 generally predicts the lowest NO2 concentration,  
15 although them ARM-2 are similar, except for that last  
16 case. The gas turbine and complex terrain where here,  
17 ARM-2 is predicting the lowest concentration.

18           Here are some project examples. Again,  
19 there is variability which one of these methods ends up  
20 predicting the lowest NO2 concentration.

21           So, in summary, ARM-2 is a simple method  
22 that's easy to implement. It's straightforward to  
23 review. It is more conservative than PVMRM and OLM at  
24 low concentration ranges, but at the higher  
25 concentration ranges it performs comparably. It could

1 fill a gap in between the current, more conservative  
2 and not as useful one hour ARM and the refined tier  
3 three methods. And we believe that the ARM method for  
4 one hour modeling should be revised. I think, also,  
5 that this points out that additional data sets with  
6 higher NO2 impacts at or above the level of the NAAQS  
7 are still really needed along with concurrent source  
8 data, emission data, are needed to better evaluate  
9 these various conversion options.

10 So, I would just ask you to please  
11 provide your comments or suggestions as part of the  
12 record of these hearings.

13 Thank you very much.

14 **MR. BRIDGERS:** Outstanding job there,  
15 Mark.

16 Humming right along, I turn the floor  
17 over to Steve.

18 **MR. HANNA:** Okay, thank you.

19 The previous talk by Mark Podrez and  
20 this talk are both sponsored by the American Petroleum  
21 Institute and we've been working -- Mark and I have  
22 been working in tandem on this and we -- most of the  
23 work that I'll be describing here on this very specific  
24 evaluation of PVMRM and OLM was actually carried out by  
25 Liz Hendrick and Vin Tino of Epsilon and they were the

1 project managers actually. So, Bruce Egan and I were  
2 more of the science people and planning the evaluations  
3 and interpreting them. And I also wanted to note that  
4 we've been really pleased with the collaboration with  
5 the EPA OAQPS that has taken place over the course of  
6 this study. We've had, you know, several information  
7 exchanges. A couple of face-to-face meetings. And  
8 some of the technical suggestions we've made, Roger  
9 Brode tested with some of the runs that he reported  
10 earlier today. So, we think this is a good example of  
11 a collaborative exercise between industry and the  
12 agency.

13                   Well, there's already been a lot of talk  
14 about PVMRM and OLM and Mark just talked about the  
15 ambient ratio method. This morning, Roger showed many  
16 examples of the evaluations and there's this tier one,  
17 tier two, and tier three and so on. And the PVMRM, you  
18 might say, is an intermediate it, I would consider it  
19 an intermediate approach. It's a very simplified  
20 chemistry approach that just looks at the amount of  
21 entrained ozone into the plume and then figures out how  
22 much NO<sub>2</sub> is going to be produced as a result of that.  
23 And there are more detailed plume models available like  
24 SCICHEM and RPM that include a little more detailed  
25 chemistry. So, there are several categories that are

1 available.

2                   And OLM, I guess you might say, is in  
3 between the ambient ratio method and PVMRM in terms of  
4 complexity. It does what it says it does. It limits  
5 the amount of ozone that can be mixed in. So, if  
6 there's not enough ozone to thoroughly react the  
7 available NO, then it recognizes that and doesn't  
8 proceed.

9                   Well, what we were trying to do with  
10 this specific study is find a new data set. As we say  
11 from Mark's presentation and Roger's presentation,  
12 there is just a few databases. They only have one or  
13 two monitors. There's the power plant plume study in  
14 the Netherlands that's included.

15                   So, we looked around first trying to  
16 identify a better data set and the API is more  
17 interested in low level sources and not so much in the  
18 power plant plume and the aircrafts flying through  
19 them. So, we ended up identifying a particular area in  
20 Alaska and it's, as you all in this room recognize,  
21 it's often hard to get people to give up their data  
22 because it's not too good in some cases to be  
23 identified here as a source and plastered across a  
24 screen. So, we were very fortunate to have these data.

25                   It's what we call the Wainwright data

1 set, Alaska, and Mark already described most of this.  
2 There's a picture of the site. It's just a little town  
3 and the power plant is on the edge of town. One  
4 monitoring station 500 meters away and then there's a  
5 local ASOS met station. But the monitoring station has  
6 meteorological data that it's measuring also.

7                   There's these five diesel fired  
8 generators and stacks. And the picture of the building  
9 is here, so you can count five stacks and there were  
10 logs, operating logs, of which unit was operating when.  
11 Then for the emissions, temperatures, and so on, we  
12 just used the manufacturers design criteria for those  
13 generators.

14                   We tested a few versions of AERMOD and I  
15 should stress that OLM and PVMRM have one missions  
16 here; to calculate the ratio of NO<sub>2</sub> to NO<sub>x</sub>. So, AERMOD  
17 is calculating the NO<sub>x</sub> concentration and then you just  
18 multiply by whatever OLM or PVMRM gets.

19                   Roger reviewed this morning some of the  
20 scientific considerations that are being considered,  
21 like the relative dispersion parameters and whether  
22 they should be larger than the continuing dispersion  
23 parameters. The use of this N sub Z which is how wide  
24 you assume the plume to be when it entrains ozone.  
25 Some other things like downwash and whether the model,

1 the multiple plumes, how they're combined. If you have  
2 several plumes that combine, they are now, actually,  
3 have a smaller total size so there's less ozone  
4 entrained into the combine plumes than there would be  
5 if they stayed the same.

6           So, we did a few of these model runs.  
7 The downwash was done assuming, what you see here,  
8 there's the building itself on the upper with a peaked  
9 roof and then a couple of storage tanks and a shop  
10 building were included in the downwash considerations.

11           There's the local monitoring station  
12 that we used about a year's worth of data. Because of  
13 the land, air, surface data not being available, we  
14 just assumed it was desert shrub land in one direction  
15 and water in the other.

16           And in order to narrow things down a  
17 little more, we only considered hours in which the wind  
18 direction was in a 60 degree sector containing the  
19 monitor and we applied about boot software.

20           It was a little difficult to do an  
21 apples-to-apples comparison here and defining the  
22 thresholds and how the background was going to be added  
23 and the minimum value that we would consider. So that  
24 was all carefully worked out.

25           So here's the first example, just of the

1 prediction of NO2 to NOx ratio. And we thought we'd  
2 see what would happen with stable versus unstable  
3 conditions and for different monitored concentrations  
4 and none of them seemed to make much difference. And  
5 the key thing here, you'll notice, is that most of the  
6 observed and predicted numbers are between 0.2 and 0.4.  
7 Incidentally, we assumed an initial in-stack 0.2 ratio.  
8 So, there's not really much happening here in  
9 Wainwright, Alaska. It's only a little bit of the NOx  
10 is converted to NO2 in that plume in this location.

11 OLM, on the other hand, because it  
12 converts more to the NO2, somewhat over-predicted the  
13 ratios. And just looking at the statistics, the  
14 highest NO2 value once you link it with AERMOD was  
15 over-predicted by about a factor of two, perhaps a  
16 little bit more, by OLM. PVMRM, the mean was better  
17 predicted by PVMRM than by OLM. And then we have the  
18 fractional mean bias and I included a little asterisk  
19 there about not significantly different from zero with  
20 a 95 percent confidence limit for PVMRM.

21 Now, just doing a couple of Q-Q plots,  
22 as I said, AERMOD calculates NOx concentration as if it  
23 was an inert substance, so here's what we got and  
24 there's just a few of the highest values that are  
25 predicted high, so even though this is, yeah, this is

1 just the straight NO<sub>x</sub>, so we're predicting maybe a  
2 factor or two high, but once you get down to the lower  
3 values, it's under-predicting.

4                   Now, when you combine it with PVMRM and  
5 OLM, and now you're looking at NO<sub>2</sub> Q-Q plot and Roger  
6 showed these for other places and Mark showed them  
7 also. You're a little bit closer with PVMRM than with  
8 OLM. The blue curve is full conversion, so that's  
9 obviously way, way over-predicting, but as we showed,  
10 there's really not that much conversion at this site.

11                   These two, this slide is for the  
12 original AERMOD assumption of this N sub Z equal to  
13 four. And then we change it to 1.28 as Roger described  
14 in some of his tests and that didn't make all that much  
15 difference here because of the lack of much conversion.

16                   So, the limitations, just to summarize  
17 now, is just that we don't really have the emissions,  
18 we're just sort of estimating them from operating logs  
19 and performance data.

20                   There's only one monitoring location, so  
21 we don't really know what the upwind ozone is and we're  
22 selecting only the hours when the wind is blowing  
23 towards the monitor, so the ozone that we're using may  
24 have been affected. Although, we did do a test of that  
25 on one of the sensitivity runs and because it's out in

1 the middle of nowhere, the ambient NOx and NO2  
2 concentrations are low anyway. So, it's not like you're  
3 in a big industrialized area.

4           So, just at this site, PVMRM is doing  
5 well. OLM is over-predicting. Both of them, sort of,  
6 over-predict the high end concentration, but to be  
7 really fair, when you're doing a comparison or trying  
8 to evaluate a model, you should look at the entire  
9 set of data sets in different locations. Because as  
10 we've seen from Roger's presentation and this one,  
11 sometimes PVMRM is better. Sometimes OLM is better.  
12 It may be due to just AERMOD itself under-predicting,  
13 so this is just one piece of information.

14           And finally, what we've been saying all  
15 along is why don't we do a real field experiment and  
16 get to the bottom of this instead of just dealing with  
17 all these data sets with one monitor and listing  
18 caveats?

19           Thank you.

20           **MR. BRIDGERS:** Right on time. All  
21 right. Thank you, Steve.

22           We have one more talk before we launch  
23 into our Q and A. I will yield the podium to Dan.

24           **MR. DIX:** Thank you, Roger.

25           We've heard a lot of information today

1 about how important the OLM method is becoming now that  
2 we have a new one hour NO2 NAAQS in place.

3 I'm going to go through a case study  
4 that kind of shows how easy it might be to collect this  
5 NO2 NOx ratio information.

6 You know, we're collecting this NO2 NOx  
7 information for PVMRM and OLM for the one hour NOx  
8 modeling and many facilities out there are already  
9 collecting NOx data using continuous emission  
10 monitoring systems for a variety of either state of  
11 Federal programs. These monitors out there, a lot of  
12 them are the same and they're collecting the NOx data  
13 through the chemiluminescence process. And that's also  
14 measuring NO and NO2 information.

15 So, kind of a brief agenda. What I'm  
16 going to go over is I'm going to talk a little bit  
17 about the project that I brought this up. I'll talk  
18 about the current set-up of what the facility had  
19 there. Then, I'll also talk about the equipment in  
20 place, the equipment that I used to collect this  
21 information. Then, some conclusions and additional  
22 considerations that came out of the project.

23 You know, we were conducting some  
24 exploratory one hour NO2 and SO2 NAAQS modeling for a  
25 cement facility. It wasn't for any PSD project. This

1 particular client was being proactive and wanted to  
2 assess their status with the new hour NO2 and SO2  
3 NAAQS, you know, for future planning. So, they wanted  
4 to see where they fell out.

5           When we did the NO2 NAAQS modeling, we  
6 went straight to the tier three and we used the OLM  
7 method and we used the default .5 ratio for the NO2 NOx  
8 in-stack ratio. You know, this was a cement kiln and  
9 what we knew from other studies out there was the ratio  
10 was probably more in the ten percent range. So, we  
11 decided that we would use their existing NOx monitors  
12 to collect some of this information so that we had some  
13 site specific NO2 NOx ratio information.

14           So, the current set-up of the facility  
15 is that they had a Thermo Scientific 42y  
16 chemiluminescence NO NO2 NOx monitor, which is a fairly  
17 common monitor set-up to collect NOx readings. The  
18 system currently collected just NOx data on their data  
19 acquisition handling system and their project logic  
20 controllers.

21           Just a little brief background on the  
22 chemiluminescence process. You know, what's taking  
23 place is that NO is being introduced to O3 and when  
24 it's converted, it gives off a luminescence and the  
25 luminescence is linearly proportional to the NO

1 concentrations. So, that's kind of how the monitor is  
2 working.

3                   A little bit more in detail of the  
4 monitor. This is a 42y, flow schematic and what we  
5 have is a sample coming in here and there's basically a  
6 solenoid here and it goes into two different modes.  
7 Basically, you have your NO mode here which is just a  
8 pass through. Essentially, all of the sample gas is  
9 coming through and going into the reaction chamber  
10 here. An O3 converter is introducing ozone into this  
11 reaction and then when the NO converts to NO2, that  
12 luminescence is then the NO concentration.

13                   This solenoid then switches back and  
14 forth, usually every ten seconds, and it goes into this  
15 other mode known as the NOx mode and this is where the  
16 NO2 is converted to NO and now that is sent to the  
17 reaction chamber and the ozone is introduced. And now  
18 when that NO is converted to NO2 and luminescence is  
19 given off, that measured amount is now my NOx amount.  
20 And when I take my delta between the NOx and the NO,  
21 now I'm getting our NO2 reading. So, this particular  
22 type of monitor is measuring NO, NO2, and NOx.

23                   So, what we decided was it was  
24 definitely easier and more cost effective to install a  
25 temporary data logger than it was to set-up NO2

1 readings in their current data system for a couple of  
2 reasons. They were collecting this NOx data, you know,  
3 as a permit requirement so they didn't really want us  
4 tinkering with that monitor at all. Also, if they were  
5 to set-up NO2 readings on our PLC system, it would have  
6 required the purchase of new cards as well.

7           So, we decided it would be simple to  
8 install our Campbell Scientific SEAR-1000 data logger  
9 and we hooked it up to the unused ports on the 42y and  
10 we programmed the SEAR-1000 to take one minute average  
11 readings of the NO, the NO2, and NOx.

12           This is just some pictures of the set-  
13 up. This is SEAR-1000 here. In this particular  
14 picture there's a lot of wires because I set-up to a  
15 met tower. I had only three wires coming out of the  
16 SEAR-1000 and we hooked them up to these empty slots  
17 here on the back of the 42y and the wire that is  
18 existing here goes to their data system, so we didn't  
19 have to mess with any of these wires or anything. We  
20 simply were able to hook up to some existing ports  
21 here. One was reading NO, NOx, and NO2 and we were  
22 lucky in that the analyzer -- usually these analyzers  
23 come set-up to export to these particular ports here,  
24 but it's easy to set-up. You can see how many empty  
25 slots are on the back of these analyzers.

1                   So, here are the results. This is  
2 basically a snapshot of the one minute averages. We  
3 have the NO NOx readings on top here and then the NO2  
4 and I've scaled this logarithmically so we could see  
5 the NO2 NOx ratio. Basically, we found what we thought  
6 we would see. We weren't above 50 which was good. We  
7 were in that six to ten percent range for the in-stack  
8 NO2 NOx ratio. So, we felt confident that we could go  
9 forward with using ten percent in the OLM method.

10                   When we did ten percent and we modeled  
11 it for this facility, that was enough to get us below  
12 the NO2 one hour NAAQS.

13                   So, just some conclusions and  
14 considerations that came out of the project. You know,  
15 we really found this to be a, you know, cost effective  
16 and simple way to collect this information, you know,  
17 for use in NO2 modeling for AERMOD's OLM and PVMRM  
18 options.

19                   You know, a lot facilities operate these  
20 exact type of NOXCEMS under a variety of different  
21 programs. There's a lot of them out there that could  
22 be potentially collecting this info.

23                   You know, it was easy for us to set up a  
24 data logger. We set it up. We left it there for a  
25 three month period and while it was there, we had the

1 facility run the kiln through all the different  
2 operating conditions so we could get a good, robust  
3 asset.

4           That being said, there's no reason why  
5 they couldn't have hooked up their data system to  
6 collect this data as well, but for this particular  
7 case, it was just easier to come in and put in an  
8 external data logger.

9           What we're recommending to our clients  
10 for facilities that may not have any NOXCEMS in place  
11 is a lot of facilities are also required to do NOx  
12 testing every year. So, we're recommending that they  
13 talk to their stack testing company and request that  
14 they also do NO2 testing during that. I mean, you're  
15 only going to get a three hour data set there, so if  
16 it's a fairly continuous type of operation, it might be  
17 useful. If you're doing RATA testing, you know, it  
18 could be a 12 hour period, but you're not going to get  
19 as much as if you had NOXCEMS in place.

20           Like I said before, this was a purely  
21 exploratory type modeling we were doing. It wasn't for  
22 a PSD, but our thinkings are that, you know, if this  
23 were to go to a PSD modeling project, that we would  
24 include the set-up of all this in a protocol, outline  
25 exactly what we did, how we collected the data, what we

1 used in the protocol so it's out there in front of the  
2 stage to see how we collected it.

3           You know, I just took one minute average  
4 concentration values from the data logger. I'd be  
5 curious if anybody had any other opinions on other  
6 different statistical approaches to take for that in-  
7 stack ratio information.

8           As far as QA QC considerations on this,  
9 you know, the NOx monitor is being calibrated per  
10 requirements. There's a couple of other things you  
11 could do. You could send a known amount of NO2  
12 cylinder gas to the analyzer to see how efficiently the  
13 NO2 converter is working.

14           So, that's pretty much it. You know,  
15 this was just a very cost effective, easy way to  
16 collect this information and I feel like a lot of  
17 facilities could potentially benefit from this so we  
18 could collect this information and get it in some type  
19 of database so that we have a place to go to to get the  
20 in-stack NO2 information.

21           With that, I'll turn it back over to  
22 George.

23           **MR. BRIDGERS:** That's a great talk, Dan,  
24 absolutely.

25           Actually, I should have told you don't

1 run away because we're going to do our Q and A and this  
2 will actually span, let's see, Erik and James and Bob  
3 and Steve and Mark, so everybody who's talked since our  
4 last Q and A, the hot seats are up here in front.

5 The floor is open.

6 **MR. PAINE:** I have a question of Erik,  
7 actually.

8 You did a lot of stack ratio. Now, did  
9 you use the version of AERMOD where it extends the  
10 downwash above the formula height?

11 **MR. SNYDER:** We used the standard  
12 version, so most of the work -- I think some of the  
13 cumulative work, and James you could answer on them  
14 other runs you did, but a lot of the oil and gas work  
15 we did last summer which is when we did it.

16 **MR. PAINE:** So you have to raise the  
17 stack higher?

18 **MR. SNYDER:** Yes.

19 **MR. THURMAN:** Yeah, I think everybody's  
20 runs used version 11059.

21 **MR. PAINE:** You may have to update your  
22 conclusions.

23 **MR. BRODE:** They used the version that  
24 does extend it above that.

25 **MR. PAINE:** Oh, okay. They used the

1 current version. Okay. You're sure?

2 **MR. THURMAN:** We used the 11059 which  
3 introduced that.

4 **MR. PAINE:** Okay.

5 **MR. THURMAN:** That change was introduced  
6 in version 11059 and 11059 is the version that they  
7 used.

8 **MR. PAINE:** Okay.

9 **MR. THURMAN:** But it's not the most  
10 recent version because that was recently updated.

11 **MR. PAINE:** What would that do?

12 **MR. THURMAN:** That would have no effect  
13 on these results.

14 **MR. PAINE:** Good. Okay.

15 **AUDIENCE MEMBER:** This is Dana Wood with  
16 BP.

17 I just wanted to make one clarifying  
18 statement, particularly about the Empire Abo data set.  
19 It was collected by Doug Bluett with Amoco at the time.  
20 It's a BP data set. And during that data collection,  
21 there was no actual emissions data that was collected.  
22 What was used in the New Mexico evaluation was the  
23 potential to emit emissions and so, really, to add to  
24 the statement that Steve Hanna made, we really need to  
25 get out there and do a field study where we collect

1 actual, you know, actual emissions data at the same  
2 time we're collecting the monitoring data to truly  
3 evaluate these models. And I know that's going to be  
4 an expensive undertaking and I hope that the EPA would  
5 be willing to collaborate with industry and other  
6 groups in order to do that.

7 **MR. FOX:** I think we would agree and  
8 echo that same sentiment as follow-up to the conference  
9 as to how we might be able to set those things up.  
10 Again, as I mentioned earlier in terms of the budget  
11 constraints and the like, but I think working together  
12 in terms of developing the protocol for the field study  
13 and the like and if there are funding sources that  
14 could get it done, it would certainly serve a valuable  
15 -- it would be of great value to the community in  
16 getting that done.

17 **AUDIENCE MEMBER:** Mike Anderson, TRC.

18 This is a question for Roger.

19 Roger, did the model performance  
20 evaluation results that you presented this morning take  
21 into account the calculations of downwash from stacks  
22 higher than GEP formula height or the use of the  
23 AERMINUTE low wind speed data?

24 **MR. BRODE:** I think downwash was  
25 present. I don't know that there were any stacks that

1 were above formula height, but I'd have to think about  
2 the most recent version I ran for those, but both of  
3 those cases did have site specific data, so airport  
4 data were not relied upon.

5 I mean, that might be a good question to  
6 look at if there's a nearby -- near enough by airport  
7 that would be more or less adequately representative,  
8 but I guess, yeah. The one man data would not be  
9 available for those time periods.

10 **MR. ANDERSON:** Okay. So, the point I  
11 was making is that the issue of the effect of the  
12 calculation of downwash for stacks above the formula  
13 height wasn't addressed there and the low wind speed  
14 case hasn't specifically been addressed in those  
15 studies?

16 **MR. BRODE:** Those questions were not  
17 paramount in doing those evaluations. I don't know  
18 that either of those questions really played a very  
19 significant role, but it's something that maybe I'll  
20 take a look at.

21 **AUDIENCE MEMBER:** This question is for  
22 Bob Paine.

23 In your EMVAP paper, in a permitting  
24 environment, any permit must be enforceable. How would  
25 you enforce a distribution of emissions in a way that

1 the plant managers would be happy with?

2                   **MR. PAINE:** Okay. I'm not going to  
3 speak for EPRI because EPRI is developing the tool and  
4 not the policy, but I'll put on my consultant's hat and  
5 I would say that this would be averaged over a five  
6 year period. Let's say. Because the modeling would be  
7 over a five year period and you would make sure that  
8 your distribution of emissions was within the envelope  
9 of what you modeled.

10                   So, it could be -- if you had an  
11 exceptionally odd year, you could average it with the  
12 four other years you're using in your distribution.  
13 That's the best possible approach.

14                   I don't know if EPA is going to think  
15 about that, but that -- okay.

16                   **MR. BRODE:** That was actually my  
17 question to Bob the last time he presented it to us.

18                   **MR. PAINE:** I'd like to give you an  
19 answer.

20                   **MR. BRODE:** I mean, if you have an  
21 operating plant, I could see where you could base it on  
22 existing data, but you know, we're open to some ideas  
23 on how that might be done. I think that's one of the  
24 key questions in being able to move forward with  
25 implementing an approach like that.

1           One thing is, the form of the standard,  
2 the fact that it's a multi-year average is something  
3 that should be taken into consideration. It may give a  
4 little bit more flexibility such that if you determine  
5 what the, you know, you take a permit condition on a  
6 particular emission distribution, you can track it over  
7 time and if you tend to overshoot, at least you can  
8 maybe make plans to come back into compliance over the  
9 multi-year period. That's something that could be  
10 considered as part of that.

11           **MR. FOX:** This is Tyler. I had the same  
12 question and it is something for EPA, not the modeling  
13 folks, to consider because that would be an important  
14 aspect in how you actually put it in a permit limit and  
15 monitor it and manage it as such.

16           **AUDIENCE MEMBER:** Eladio Knipping, EPRI.  
17           Actually, Tyler, you're sort of  
18 expressing the same type of comment that I was going to  
19 make that this is something that is going to require,  
20 first, an understanding of the emissions distributions  
21 of existing units and understanding how different units  
22 of different named clay capacities, capacity factors,  
23 control technologies, how they operate, and what are,  
24 you know, what types of emission distributions would be  
25 acceptable to include in such an exercise.

1                   And this is really a discussion that EPA  
2 will really have to take the lead on, but we will be  
3 providing information and analysis of that type of  
4 information so that people can understand how different  
5 power plants and the different operating environments  
6 and under different operating conditions what their  
7 emissions distributions are and what their stack  
8 parameters relevant to those emissions distributions  
9 are as well.

10                   **MR. FOX:** This is Tyler Fox, OAQPS.

11                   That would be very helpful. I think, in  
12 addition, to understanding the operating conditions  
13 and, I guess, the value or usefulness of that approach  
14 in those different conditions. That would be useful  
15 for others in the community who have maybe an  
16 understanding absent the same type of continuous  
17 emissions monitoring information of the nature of the  
18 distribution of their emissions or operating cycles to  
19 then understand whether or not it would be a valuable  
20 approach for them.

21                   I guess, along those lines, I'd have a  
22 question that -- two fronts. One is, how do you take  
23 an approach that is designed for a certain type of  
24 source and has data that may not be readily available  
25 to other sources and use it across the different

1 situations for permitting and how do you, you know, tie  
2 a new source's distribution that doesn't yet exist to  
3 an existing source or a set of existing sources'  
4 profiles?

5 I think those are questions that we  
6 would like and something to consider in comments from  
7 the community on as they review the report and  
8 understand this method. As Eladio said, and then try  
9 to translate it to what it would mean to them in terms  
10 of how they operate.

11 **MR. KNIPPING:** I just want to say that  
12 first the -- with respect to your first comment on how  
13 industries or other sources may implement this tool  
14 without the appropriate knowledge, well I can't really  
15 speak to that, but that should not preclude the use of  
16 the tool for this particular application of power  
17 plants where we do have that information.

18 Second, as to how an emissions  
19 distribution is assigned to a new source based upon the  
20 amount of data that we're gathering over many years for  
21 1,000 plus units, that is a discussion that we're  
22 really going to have to have with the information  
23 available. Without that information available, we're  
24 really just speculating at this moment and speculating  
25 is dangerous.

1                   So, let's first wait for the data to  
2 tell us what and inform us how we move forward.

3                   **MR. FOX:** Thank you. I appreciate that.

4                   I guess my first comment was really to  
5 the community at large, for them to think about this  
6 approach and relate it to their experience in terms of  
7 understanding their operations so that they can then  
8 have an understanding and express an opinion through  
9 the public comment period for this conference to EPA in  
10 terms of the value that they see in this approach.

11                   **AUDIENCE MEMBER:** John Glass, South  
12 Carolina DHEC.

13                   I think this question is probably either  
14 for Roger or Tyler. I wanted to go back to that March  
15 memo of last year. The Clarification Memo. We  
16 discussed the screening of background sources and I  
17 wanted to make sure that I was interpreting that  
18 correctly. Some others might be interpreting it the  
19 same was as I am and I want to clarify that.

20                   You cautioned against the prescriptive  
21 application of the old 1990 guidance, you know, causing  
22 overly conservative results. Part of that prescriptive  
23 guidance would be, you know, you form a significant  
24 impact area. You would include all of the sources  
25 within that significant impact area. And then you

1 would screen from 50 kilometers there out.

2 I think the intent of your memo would be  
3 certainly that you could apply that significant  
4 concentration gradient on the screening area, 50  
5 kilometers out from the significant impact area, but I  
6 think your memo also implies that you could apply that  
7 within the significant impact area.

8 Is that a correct interpretation?

9 **MR. BRODE:** I think that's consistent  
10 with my understanding of Appendix W and that's kind of  
11 the main point. It was to focus what Appendix W  
12 actually says regarding nearby sources should be  
13 considered for inclusion and the significant  
14 concentration gradient is the only criterion that it  
15 provides. And it goes on to say something like except  
16 in rare cases there will be relatively few sources. I  
17 forget the exact wording, but yeah, I don't -- I think  
18 it's for the whole domain and certainly the closer the  
19 source, a background source, is to your source, the  
20 more likely it would be causing significant  
21 concentration gradients.

22 But also it tried to make a point in  
23 that memo that that question, should that source be  
24 included or not, is not an isolated question. It has  
25 to be looked at from the perspective of what ambient

1 background concentrations I'm also going to be  
2 including and the cumulative impact analysis and make  
3 sure that all the different pieces fit together in a  
4 way that makes sense for that application.

5           So, that's something I hope people will  
6 keep in mind is look at each of those pieces, not  
7 independently, but as a whole. Make sure they make  
8 sense together.

9           **MR. GLASS:** Right. And I think that  
10 memo also talks about there are certain situations  
11 where you would not include any background sources and  
12 probably the only way you're going to get at that is  
13 using that significant concentration gradient. I  
14 think.

15           There may be another way to exclude  
16 those within the significant impact area, but I'm  
17 thinking that's the only way you're probably going to  
18 get at that.

19           **MR. BRODE:** Well, every case is  
20 different and I think that question then gets to, not  
21 just where the monitor is, but what metric you take  
22 from the monitor to represent background.

23           So, if you take the first highest value  
24 across three years or five years of monitoring, that  
25 might allow you to justify eliminating more sources

1 from the inventory than if you used something -- a  
2 metric that provided a lower background.

3 **MR. GLASS:** Right. Thank you.

4 **AUDIENCE MEMBER:** This is Steve Hanna.  
5 I hear the words significant concentration gradient.  
6 There's always concentration gradients. How do you  
7 know or define when they're significant?

8 **MR. BRODE:** Appendix W does not define  
9 significant in any more detail than that. So, I think  
10 that's a good question and that's part of it.

11 **MR. HANNA:** You'll know it when you see  
12 it.

13 **MR. BRODE:** Well, exactly. I mean, we  
14 actually -- one thing is people, we actually provided  
15 some examples in, I think, our webinar. I don't know  
16 if they've shown it here.

17 We took a source, actually a taller  
18 stack and a shorter stack and calculated the  
19 concentrations and actually calculated gradients. And  
20 one of the things that our March memo points out is  
21 that Appendix W just says significant concentration  
22 gradient. It doesn't say a gradient in which  
23 direction, so there's a longitudinal gradient. Along  
24 the path of the plume, there's a lateral gradient and,  
25 in my view, maybe the lateral gradient should be given

1 more weight, in fact, especially for an hourly  
2 standard. Because one of the issues is if there is a  
3 strong lateral gradient, it means that that plume's  
4 impacts may not be adequately captured by a monitor.

5 I think that's, I mean, Appendix W  
6 doesn't go on to say why that's the one criterion, but  
7 if you think about it, I think that makes sense. If  
8 there is significant concentration gradient, then an  
9 ambient monitor may not adequately capture that  
10 source's contribution.

11 But, you know, we actually did some  
12 plots and it was kind of interesting. We might try to  
13 do some more. We actually talked about maybe modifying  
14 AERSCREEN to output the concentration gradient versus  
15 distance or something.

16 There's lots of idea, but there's just  
17 too many of them and not enough time to do them, but I  
18 think it's a fair question. I don't think that there's  
19 a clear answer for it, but we're welcome to hear other  
20 feedback or comments or suggestions along those lines.

21 **MR. BRIDGERS:** And Roger I was just  
22 going to add the fact that in addition to SCRAM being  
23 the place for MCHISRS and the Clearinghouse actions and  
24 Clarification Memorandums and everything else. The two  
25 webinars are actually posted on SCRAM. They're linked

1 under the recent additions, so there's a webinar that  
2 was given back a couple of months after the March memo  
3 came out for NO2 and then one for SO2 that was given  
4 later in the summer.

5 So, if you didn't have a chance to  
6 participate, you can go review the slides by going to  
7 SCRAM under recent additions.

8 **MR. BRODE:** I think they actually have  
9 the audio with that, too.

10 **MR. BRIDGERS:** I don't have that link,  
11 but it's posted.

12 **MR. BRODE:** I think it was June 2011 NO2  
13 webinar where we included those gradient plots.

14 **MR. BRIDGERS:** We do have time for more  
15 questions.

16 **AUDIENCE MEMBER:** Hi. My name is Sam  
17 Sampieri, Department of Energy and Environmental  
18 Protection in Connecticut and, of course, our old  
19 Commissioner is Gina McCarthy.

20 My question to you guys -- by the way,  
21 Bob, that was a great analysis you did. It would be  
22 great for one of our EGUs in Connecticut to use.

23 However, we have a problem with all  
24 that, with our SO2 SIP modeling. And the question I  
25 have basically for EPA is we have a year and a few

1 months to submit modeling for our SO2 SIP. We're not  
2 going to submit non-attainment. Well, of course,  
3 without any further ado to it, we could have some non-  
4 attainment issues.

5 My question is, you would have to change  
6 Appendix W to use your type of analysis to put in our  
7 emission rates for these big EGU coal plants. That  
8 could work to be in attainment, but you would have to  
9 change Appendix W and 8.1 or 8.2 table where you would  
10 have to use the maximum allowable emission rate and  
11 we're going to be looking at pound per hour maximum  
12 hourly emission rate for the hourly standard to be in  
13 compliance by 2017.

14 So, you would have lean this process to  
15 change Appendix W in time so all the SIP modeling can  
16 be submitted.

17 Am I off base?

18 Plus, are we going to open up a can of  
19 worms if we start letting EGUs doing that kind of  
20 analyses and, you know, we're going to start talking  
21 about we're getting away from the maximum allowables  
22 and we're going to start modeling with actuals or your  
23 Monte Carlo analysis.

24 **MR. FOX:** Tyler Fox, OAQPS.

25 I think, as we asked before, the

1 critical question is whether or not you could actually  
2 implement permit limits based on that approach. I  
3 think a lot of the questions that we asked in terms of  
4 that approach from a technical standpoint as well as  
5 actually how you would implement that would have to be  
6 resolved.

7                   To the point of modifying Appendix W,  
8 right now I would say yes. In order to use that type  
9 of approach, it's conceivable that it would require a  
10 modification to Appendix W and yes, in terms of  
11 updating Appendix W in that time frame, that would be  
12 an extremely difficult task.

13                   That being said, we issued guidance in  
14 March that provided some flexibility. So again,  
15 internally we would have to work with our management  
16 and also the folks in the policy division and the OGC  
17 to see whether or not there's existing flexibility to  
18 interpret things in a way that would allow that to be  
19 done without Appendix W.

20                   But again, that would have to be  
21 something that we have both the information that Bob  
22 and Eladio referred to, have an understanding of how it  
23 would actually be implemented in a permit limit, and  
24 then work the chain within EPA to see whether or not  
25 that's a feasible approach.

1                   We're understanding and trying to be as  
2 flexible as possible, you know, working through  
3 guidance rather than through rulemaking. You guys know  
4 very much, as you've indicated, the rulemaking process  
5 sometimes does not work with the existing time frames  
6 for other compliance purposes.

7                   **MR. SAMPIERI:** It's one thing to talk  
8 about new source permitting, but it's another thing now  
9 with the SIP modeling that's going to come due fairly  
10 shortly and, you know, do we have the time to do all  
11 that and so, is that one of these things where we'd be  
12 doing a case-by-case basis? But that's going to be in  
13 a SIP, you know, and each state, of course, has its own  
14 issues.

15                   Thank you.

16                   **MR. FOX:** Thank you for that question.

17                   **AUDIENCE MEMBER:** Dick Perry, Stinger.

18                   I was interested to see Monte Carlo  
19 raising its head again because about , oh, eight or ten  
20 years ago, John Chadwick and I did a study of running  
21 of looking at heavy metal variability running through a  
22 kiln, a cement kiln processor and in that Monte Carlo  
23 analysis and something you may want to look at, we did  
24 one further thing after we had run this. I got the  
25 statistics. We looked at the likelihood of that

1 maximum potential to emit ever occurring and found that  
2 it was out at 33 standard deviations from the center  
3 line which, you do the math, and it's an unimaginable  
4 number of years.

5                   So, the point there is that between 33  
6 standard deviations and what you're likely to see,  
7 you've got a lot of room for maneuver to make things  
8 more reasonable and still give yourself a comfortable  
9 margin of conservatism on how you structure the  
10 emission variability.

11                   **MR. FOX:** I have one more question for  
12 Bob. This is Tyler.

13                   In terms of the distribution that you  
14 showed, do you understand or know what's causing that  
15 high end of the distribution? Are those peaking units  
16 or, you know, start-up shut-down emergency generator  
17 type of use that may actually be remedied through the  
18 treatment of intermittent sources or are those, you  
19 know, base units operating at their allowable levels  
20 just in an -- infrequently?

21                   **MR. PAINE:** Well, for the AERMOD  
22 evaluation data sets and Roger, you may have as much  
23 understanding as I do, these were back intersection he  
24 1970s and 80s. It could be just a slug of coal with  
25 high sulfur emissions. I don't think it was a bypass

1 stack operation or anything like that. It was just a  
2 delivery of coal or maybe -- because I don't think that  
3 they had any controls at these sources. So, it was the  
4 old fashioned sulfur variability.

5 **MR. FOX:** Okay.

6 **MR. BRIDGERS:** I know we're running just  
7 a few minutes long on the session, but we'll entertain  
8 a few more questions. We had a lot packed into this  
9 session and with the remainder of the conference, we  
10 only have one more Q and A time before we get to the  
11 public presentations tomorrow.

12 **MR. HANNA:** This is Steve Hanna. I have  
13 another question about this Monte Carlo.

14 If you have to model multiple sources in  
15 the domain, do you account for correlations between the  
16 emissions of the different sources?

17 **MR. PAINE:** Well, you can by having the  
18 same random number starting point for sources that  
19 would be correlated and if they're not, you can add  
20 different random numbers starting point. So, you can  
21 accommodate that.

22 And of course if sources are not to be  
23 run with variable emission distribution, you can run  
24 them normally, save those concentration files and just  
25 add them into the EMPOST processor. So, you can

1 accommodate variable sources and constant sources in  
2 the whole process.

3 **MR. FOX:** This is Tyler.

4 That actually is a very good question,  
5 especially in the context of a SIP situation where it  
6 may be a multi-source area. So, how to handle that  
7 would be a useful thing to maybe put some information  
8 out there on. Or thoughts.

9 **MR. BRIDGERS:** Okay, we'll do this like  
10 the auctioneer.

11 Questions going once? Ah, we'll just  
12 cut to the chase. Sold.

13 I appreciate everybody being patient  
14 through the session, if we could give our speakers  
15 another round of applause.

16 Let's go ahead and take until five  
17 minutes after three. That's just a few minutes under  
18 15, but that will hopefully keep us on schedule to get  
19 out of here.

20 So, thank you.

21 (WHEREUPON, a brief recess was taken.)

22 **MR. BRIDGERS:** I guess I will call Tyler  
23 Fox to the microphone. Paging Tyler Fox.

24 **MR. FOX:** All right. The room doesn't  
25 seem as full. I guess everybody is still taking their

1 break.

2                   We're going to go ahead and start  
3 introducing this last session for the day. Very much  
4 appreciate the presentations that we've had up to this  
5 point. They've been very valuable and very productive  
6 in terms of informing us and hopefully the community  
7 and we look forward to further engagement on those new  
8 methods, techniques, and the like.

9                   Similarly, we're going to be introducing  
10 some of the work that EPA has done jointly with the  
11 FLMs and try and engage similarly with the community  
12 and get your thoughts and comments on this work and how  
13 we're approaching handling the issues that we see in  
14 terms of potentially updating Appendix W to meet  
15 ongoing emerging needs.

16                   So, over the past years, at least three  
17 or four, we've been engaging with the FLMs and we've  
18 had various meetings in terms of the issues related to  
19 the long range transport applications and issues  
20 related to chemistry.

21                   It's clear, over time and particularly  
22 now, that our interests and needs are overlapping  
23 across a number of multiple programs and regulatory  
24 responsibilities that we have.

25                   Examples include the NEPA air quality

1 analyses for energy development on Federal lands. We  
2 went through a process with EPA, Department of  
3 Interior, and the Department of Agriculture to sign an  
4 MOU on going forward with consistent and credible  
5 analyses under NEPA and that took a huge step forward  
6 in terms of a number of issues related to long range  
7 transport and chemistry and it shows the commitment of  
8 the Federal partners to work together and try and make  
9 things both more technically credible, but also respect  
10 the resources that are required to conduct these types  
11 of analyses.

12                   And most recently, I've mentioned in  
13 previous talks EPA has granted the Sierra Club petition  
14 on ozone and secondary PM2.5 models and we are  
15 considering in engaging in a process starting with this  
16 conference and potentially updated Appendix W to bring  
17 those types of models in.

18                   I will say that we will be following the  
19 IWAQM process for conducting the necessary evaluations  
20 and reporting of those evaluations and engage with the  
21 community in the same manner in which we did previously  
22 and that resulted in the 2003 promulgation of CALPUFF.

23                   In addition to the Federal partners  
24 viewing, you know, the needs and the like, we have  
25 comments from the most recent modeling conference from

1 the ALMA AB-3 committee that also provide information  
2 and support for moving in this direction.

3           The comment areas included the need for  
4 regional models, Eulerian models, best uses for  
5 Lagrangian and Eulerian models, and where does EPA go  
6 from here.

7           So, I just wanted to pull some of these  
8 comments. In terms of needs for regional models, they  
9 identified the fact that ozone and PM are pollutants  
10 involving precursors and trans-chemistry in transport  
11 and that our current Appendix W do not address these  
12 needs.

13           Just for everybody's clarification, we  
14 addressed the use of photochemical models in a separate  
15 guidance document. The SIP modeling guidance for  
16 ozone, PM, and regional haze SIPS and attainment  
17 demonstrations which does link to Appendix W and  
18 follows the same type of approach in terms of an  
19 alternative model and applies that and, as you all  
20 know, models such as CAMX and CMAQ are the workhorse  
21 models in the SIP context. And that EPA needs to  
22 provide procedures for modeling PM2.5 and I think that  
23 we recognize that. We're working on draft guidance in  
24 the permitting context that gets at single source  
25 issues and so we certainly would agree with those

1 comments.

2                   In terms of the Lagrangian models, they  
3 are suitable for individual sources, but there could be  
4 a resource penalty in terms of running them. And the  
5 chemistry, at that point, was limited. Ozone is not  
6 modeled and PM2.5 can be modeled in certain degrees of  
7 sophistication.

8                   In terms of Eulerian models, there's  
9 issues in terms of, you know, conserving mass and the  
10 like with respect to these models. I think a number of  
11 the analyses that we have done or are doing understand  
12 those points and are trying to address those points.  
13 And obviously we're dealing with situations where we  
14 have complex, non-linear chemical conversions and at  
15 sometimes long distances for regulatory purposes.

16                   And in terms of approved use of these  
17 models, there have been evaluation studies, but EPA  
18 should have system to determine acceptable criteria for  
19 approving these models. And the models accuracy is  
20 good in some areas and poor in others. Continue to  
21 work on consistent evaluation approaches recommended,  
22 similar to short range models.

23                   Obviously, looking at those comments and  
24 looking at the direction that we're moving. We believe  
25 that we're responding in line with those comments and

1 our needs, as I mentioned, we've been discussing with  
2 the Federal Land Managers and other Federal partners.

3 We -- this is a slide from a previous,  
4 earlier presentation. As I mentioned, we'll follow the  
5 same type of IWAQM effort. We've defined it as phase  
6 three and we're focusing in on that next generation of  
7 model to meet those needs such as single source ozone  
8 and secondary PM2.5 and AQRVs.

9 And our program needs and commitments,  
10 again, have made it clear that we need to address the  
11 long range transport and chemistry issues and have made  
12 that a high priority for us.

13 In terms of meeting with the FLMs, we  
14 initially talked about the needs and attributes for  
15 models as part of the process and previously under  
16 IWAQM, the group put out a models attribute study or  
17 report. We would feel as if we would follow suit and  
18 provide that type of document in the near future.  
19 These are some of the needs and attributes that were  
20 discussed as part of those interactions with the  
21 Federal Land Managers.

22 As we move forward, as has been pointed  
23 out throughout the conference thus far, evaluation is  
24 at the heart of our ability to move forward and have  
25 the confidence necessary to use and, in this case,

1 promulgate new models and techniques.

2           There are a number of historical efforts  
3 that looked at these things. EPA's 1986 eight model  
4 study based on the Savannah River and Oklahoma  
5 mesoscale experiments and then the use of those  
6 throughout these different efforts that ultimately led  
7 to the promulgation of CALPUFF were critical in that  
8 process.

9           However, there was some lessons learned  
10 in terms of these evaluation efforts. There is no EPA  
11 recommended methodology for evaluation of long range  
12 transport models and there's no consistent approach  
13 between the efforts in the 80s and 90s.

14           The evaluation methodology used all  
15 published AMS metrics and data organization strategies.  
16 This did not take into consideration the regulatory use  
17 of the long range transport models and the schemes for  
18 weighting those may not have been appropriate.

19           We observed high sensitivity of these  
20 models to meteorological inputs. And we see the need  
21 for more objective meteorological performance  
22 evaluation measures as part of moving in the future.

23           And there were no data sets available to  
24 evaluate chemical transformation mechanisms with the  
25 long range transport models.

1           So, in terms of working forward and, as  
2 mentioned previously, a fit for purpose type of  
3 paradigm, we feel compelled to define our performance  
4 objectives by starting with the regulatory use of the  
5 models. And our current use of these models include  
6 PSD class one NAAQS and increment analyses. The AQRV  
7 analyses. A visibility and deposition going on. And,  
8 in terms of potential future uses, the single source  
9 ozone and single source PM2.5 analyses.

10           So, in terms of an evaluation framework  
11 moving on, we believe that the evaluation of these long  
12 range transport models within their defined regulatory  
13 niche requires an evaluation of these three independent  
14 components of the system; the meteorological  
15 component, the advection and diffusion component, as  
16 well as the chemical transformation.

17           In terms of the inter-comparisons, the  
18 modeling comparisons, the long range transport models  
19 performance is going to inherently be linked to the  
20 suitability of the meteorological inputs, so you get  
21 out what you put in and so we need to make sure that we  
22 address those and that we use a common source of  
23 meteorological data across these modeling systems when  
24 we evaluate them to reduce potential contribution of  
25 the differences put into those analyses by the

1 meteorology. And that was one of the motivating  
2 factors for the beta release of MMIF, the Mesoscale  
3 Model and Interface tool. Program. Sorry.

4 At least I didn't say BARF, right Bret?

5 And, you know, the meteorological model  
6 performance is necessary and is integral to any part of  
7 an evaluation framework and, as we talked about, we put  
8 forth the MMIFSTAT tool to facilitate those types of  
9 evaluations and the visualization tools to facilitate  
10 the use of that information for visual inspection of  
11 these data in a number of different frameworks that  
12 exist in different parts of the community.

13 In terms of the single source chemistry  
14 evaluations, application of these models for chemistry  
15 usually only involved in individual or a small set of  
16 sources and traditionally, photochemical model  
17 evaluation techniques the chemistry evaluation are  
18 combined with the inert Tracer evaluation to evaluate  
19 the suitability of a model. The best performing  
20 chemistry model will only be as good as its ability to  
21 treat advection and diffusion appropriately.

22 So, we are taking these things into  
23 account and trying our best, as you'll see in the  
24 following presentations, to put forth an evaluation  
25 paradigm and put the models that are currently

1 available to the community through their paces  
2 consistent with the regulatory applications that we see  
3 these fulfilling under the guideline and then letting  
4 that information go to you in the community and getting  
5 your feedback on that.

6                   So, with that, I'll turn it over to Kirk  
7 Baker.

8                   **MR. BAKER:** Thanks, guys. Thanks,  
9 Tyler.

10                   I'm here, basically, to provide an  
11 additional layer of overview to Tyler's overview and to  
12 fill in some of the gaps between Roger's talks.

13                   So, I'm going to talk a little bit today  
14 about some of the work that we've been doing to get a  
15 better idea for what types of tools we have and how  
16 well they work and in terms of looking at the secondary  
17 impacts from single sources, so a lot of this is a work  
18 in progress. So, as we go through this talk I'm going  
19 to show and the talks after this, just keep in mind  
20 that this is a work in progress. All of this is  
21 evolving. So, if you see something that looks really  
22 cool, I wouldn't get too excited or I wouldn't get too  
23 upset about stuff you're seeing because it's likely to  
24 change as we go through this process of understanding  
25 these things better.

1                   So, what I've got here that's probably  
2 kind of hard to see in the back, I just got a chart  
3 showing some of the different scales of modeling and  
4 types of modeling we do. We do single source modeling  
5 assessments at fence lines, urban scales. We do all  
6 sources, types of assessments for the purposes of  
7 projecting design values for model attainment  
8 demonstrations of the NAAQS.

9                   And where I've got some of the yellow  
10 areas that we're trying to focus on learning more about  
11 single source impacts of secondary PM2.5 and ozone near  
12 the fence line for permit applications, urban scale  
13 types of impacts, and long range transport assessments  
14 for things like ozone.

15                   So, I'm going to talk first a little bit  
16 about some of the work that we're doing for looking at  
17 long range transport of ozone, PM2.5, and deposition at  
18 class one areas and then talk a little bit more in-  
19 depth about some of the single source modeling we're  
20 doing looking at fence line and urban scale types of  
21 evaluations.

22                   So, for the long range transport, this  
23 is important to do primarily for NEPA type of  
24 assessments and we're looking at a lot of existing and  
25 alternative types of modeling systems for PM and ozone

1 in combination. A big step for this was Brett having  
2 the foresight to develop the MMIF tool that he talked  
3 about yesterday, so now we've got a program that can  
4 translate prognostic meteorological model output into a  
5 common platform for a variety of dispersion,  
6 Lagrangian, and photochemical models. So, when we  
7 start comparing all these types of modeling systems,  
8 we're starting from as consistent a place as possible  
9 with the meteorology and that's very helpful.

10           So, with that tool in this beta form is  
11 currently available on SCRAM and we're actively  
12 supporting that internally in our group and with  
13 Environ.

14           So, a lot of the work that has been done  
15 is currently being done through contract with Environ  
16 and this is going to be talked in more detail in  
17 subsequent presentations.

18           So, one thing that Tyler touched on was  
19 how well do these modeling systems just transport mass  
20 around a large domain between source and receptor? So,  
21 one useful way of trying to evaluate that is comparing  
22 modeled -- the modeling system predictions for Tracer  
23 release experiments.

24           So, we have a big report where we've  
25 compared a variety of different Lagrangian and

1 photochemical modeling systems to several different  
2 Tracer release experiments like ETEX in Europe. The  
3 Great Plains Tracer experiment and CAPTEX in 1983 that  
4 people are pretty familiar with. And as part of that  
5 evaluation we looked at SCIPUFF, CAMX, HYSPLIT,  
6 FLEXPART and CALPUFF in different combinations for  
7 different field experiments.

8           In addition to that, there's a second  
9 report that Environ is working on which is more of a  
10 consequence analysis and Bret's going to talk more  
11 about that later.

12           Notwithstanding how they compare with  
13 Tracer experiments, it's just how consistently do these  
14 models predict air quality and air quality related  
15 values like deposition at class one areas?

16           So, what the plot is on the bottom is  
17 some results from that report that show CAMX as the two  
18 bars on the left for total nitrogen deposition at one  
19 particular -- at a few different class one areas and  
20 CALPUFF total deposition at a few areas on the right  
21 and we can see that they're different. We're not  
22 trying to say that one is better than the other, but we  
23 just want to understand what these differences are.  
24 And I think in the end, when we apply models as  
25 consistently as possible and against each other, we're

1 probably going to learn things about both of them and  
2 make both of these types of systems better and have a  
3 better comfort level when we try to apply them for  
4 these types of purposes.

5           So, switching gears back to the urban  
6 scale, we're looking at the single source impacts of  
7 PM2.5 and ozone for PSD NSR purposes. Tyler talked  
8 about the Sierra Club petition, so now we've made an  
9 agreement to come up with some modeling guidance to put  
10 some information out there to provide some steps for  
11 people on how to do these types of assessments.

12           So, we're going to build off things that  
13 are already out there like the NACAA recommendations  
14 for doing single source assessments for PM2.5 for the  
15 purposes of PSD NSR. Evaluate some of those approaches  
16 and see how well we think that's going to work for  
17 these purposes.

18           In addition to that, we think a lot of  
19 the work as we go through this process is going to  
20 inform and help improve technical basis for  
21 establishing inter-pollutant trading ratios for PM2.5.

22           So, NACAA recommended a multi-tier  
23 approach and, in general, the approach just kind of  
24 goes from a more simple approach to a more complex.  
25 So, they start off with just applying AERMOD and taking

1 the primary PM2.5 estimates and adding offset ratios to  
2 estimate secondary impacts at receptors near the  
3 source. One issue with that is it can be kind of  
4 complicated to come up with really good offset ratios  
5 that are location and site specific.

6           So, moving forward from that, there are  
7 more complicated approaches like using Lagrangian puff  
8 or particle models that have secondary chemistry or  
9 using a photochemical modeling system. They  
10 recommended all three of these things as a possibility.

11           And so when we get to something like a  
12 photochemical model simulation, there are a lot of  
13 different ways to track the single source contribution.  
14 We need to do a lot of work and we're just starting to  
15 do that work to try and understand which approach is  
16 going to be the best or are there a bunch of comparable  
17 approaches that are going to be equally appropriate for  
18 these types of purposes.

19           So, we're working with contractors,  
20 other Federal agencies to try and figure these things  
21 out.

22           One thing that we're thinking about is  
23 the feasibility and utility of a screening level tool  
24 that would provide quick, reasonable, and credible  
25 single source secondary impacts before you got to more

1 complicated modeling systems. And just thinking along  
2 those lines, where do you draw the line between using a  
3 screening level tool and more complicated tools like  
4 Lagrangian puff models and photochemical models?

5           And then when we get to these places  
6 like a photochemical model, like I said before, how do  
7 you apply it in a way that's going to be appropriate  
8 for these purposes?

9           Ralph's going to talk a little bit later  
10 about a possible screening level tool. At CMAS last  
11 October, Environ presented a reduced form single source  
12 screening model that estimates ozone impacts from VOC  
13 and or NOx emissions based on CAMX hired order DDM  
14 modeling that was done for the City of Sydney. So,  
15 they wanted to come up with a screening level approach  
16 for their permitting purposes before they required  
17 sources to do a full scale photochemical model  
18 assessment.

19           So, we think this approach may  
20 potentially fill a need for a technically sound  
21 screening tool to allow us to efficiently evaluate what  
22 sources would be required to do more rigorous types of  
23 assessments and hopefully this type of tool could also  
24 help improve or give us a better inter-pollutant  
25 trading ratios as we go forward.

1                   For single source modeling, we've  
2 currently got three reports being compiled by Environ.  
3 I've touched on the top two already. We're hoping  
4 that, even though they're geared more towards long  
5 range transport assessments, but I think a lot of the  
6 lessons we've learned and the information there is  
7 going to be helpful on an urban scale, too.

8                   The third bullet on the top, the  
9 evaluation of chemical dispersion models using  
10 atmospheric plume measurements from field experiments,  
11 that's the one I have not touched on.

12                   So, for an urban scale in the near-  
13 field, how well do these models perform and one way to  
14 try to assess that is to compare the model estimates  
15 from a particular source to field measurements that are  
16 made.

17                   There have been many different field  
18 campaigns over recent years where helicopters or  
19 airplanes have flown through the plume of a particular  
20 source, so we're hoping to use some of those  
21 experiments as an approach to try to get an idea of how  
22 well some of these models are performing for these  
23 purposes.

24                   The report is focused on two different  
25 field campaigns. Tennessee Valley Authority

1 measurements in 1999 from Cumberland and measurements  
2 made as part of TEXAX 2006 around Oakley Union Plant.  
3 So, those are the two field experiments that are being  
4 evaluated at and the models that we're evaluating there  
5 are SCICHEM, CAMX, and CALPUFF. Both the regulatory  
6 version of CALPUFF and the newer version six series of  
7 CALPUFF.

8                   So, we expect that report to be  
9 available in early April and that's going to be talked  
10 about in a little more detail later.

11                   Jim Kelly is going to talk a little bit  
12 about some of the SCICHEM work we're doing in-house.  
13 We've evaluated against the 1999 TVA field experiment.  
14 We're learning a lot about the application of SCICHEM  
15 and we're hoping that work is going to lead us towards  
16 better understanding the model and finding the best  
17 approach to ramping it up to use it in a regulatory  
18 fashion where we would apply the model for multiple  
19 years.

20                   The other thing that we're doing is  
21 we're comparing a variety of different photochemical  
22 modeling systems, single source approaches, to the 1999  
23 TVA field experiment. And this is just a plot of SO<sub>2</sub>  
24 on the top and NO<sub>2</sub> at the bottom that Jim put together  
25 for the TVA case from SCICHEM.

1           The photochemical modeling that I just  
2 mentioned, there's a variety of different approaches  
3 that we're using in the photochemical models and a  
4 variety of photochemical models. We're starting off  
5 simple using CAMX and CMAQ and a brute force approach  
6 where we just zero out the facility.

7           And we've also got an additional  
8 sensitivity approach where we're using higher order DDM  
9 where available, DDM to track the emission sensitivity  
10 from that particular source to see what its  
11 contributions are. Just -- all of these techniques are  
12 just a way to isolate the contributions of a particular  
13 source and we're comparing these to the field campaign  
14 measurements.

15           In addition, we're looking at CAMX  
16 source apportionment. When it becomes available, we're  
17 going to be adding in CMAQ source apportionment.

18           When we've got issues with proximity, a  
19 lot of times the fence line and the source are a lot  
20 closer to each other than the grid resolution that  
21 we're using in the photochemical model.

22           So what do we do in those situations?

23           So, we want to look into using ultra-  
24 high resolution fine grid nests around the source  
25 looking at sub-grid and plume treatment and sub-grid

1 and plume sampling to see how well that's going to work  
2 for these types of purposes.

3           And, as we move forward, we're hoping to  
4 fold into that the new CMAQ sub-grid plume treatment,  
5 APT, that's being developed by EPRI.

6           The modeling set-up that we're using for  
7 this evaluation, it looked pretty good on my screen up  
8 in my office, but not so good here. So, on the right  
9 is the photochemical modeling domains. We've got a 36  
10 kilometers continental U.S. domain and we're nesting  
11 down with a 12 kilometers domain which is about the  
12 size of the big box. And then it's kind of hard to  
13 see, but around this green dot we've got a smaller,  
14 four kilometers domain, and that's what I'll be showing  
15 results from the four kilometers domain today.  
16 Preliminary results.

17           So, for the TVA case in 1999, we're  
18 using 1999 CEM emissions for NOx and SO2 from  
19 Cumberland. In addition to that, we're using 1999  
20 biogenics and the other anthropogenic emissions are  
21 based on the 2001 NEI.

22           WRF 3.3 was used to feed met inputs to  
23 CMAQ 4.7.1 and CAMX 5.40.

24           So, just to kind of show comparability  
25 in estimates in a photochemical model from a single

1 source, there's kind of a lot of things going on here,  
2 so I'll walk you through what each of these tiles are.  
3 What you're looking at, in each tile is the two week  
4 episode maximum of NOx from this particular source.

5                   So, on the top row we've got CMAQ  
6 estimates and on the bottom row are CAMX estimates.

7                   On the top left is the CMAQ brute force  
8 simulation, so just from zeroing out emissions from the  
9 facility, this is the two week maximum contribution  
10 that we're seeing.

11                   In the top center is the contribution  
12 based on DDM where we did not do any brute force  
13 sensitivities. We just used DDM, the approach, to  
14 track the contribution from that source through the  
15 photochemical model and you can see that those two  
16 approaches come up with pretty consistent answers.

17                   On the bottom we've got the same types  
18 of things with CAMX.

19                   On the far left is the brute force zero  
20 out run.

21                   In the center, using higher order DDM.

22                   On the right is source apportionment.

23                   Again, they're pretty consistent, but  
24 there are differences and as we move forward, we want  
25 to better understand these differences and figure out

1 what the reasons are, if they're important differences  
2 or not when we start using this modeling for permits.

3           On the top right, we're continuing to  
4 work with ORD to implement source apportionment into  
5 CMAQ and once we have that, we'll have the sixth tile  
6 on this plot.

7           Looking at the same thing, but this time  
8 this is the two week episode maximum impact from  
9 primary elemental carbon from this source. So, the  
10 tiles are the same thing here on the top. You see the  
11 CMAQ brute force zero out of elemental carbon compared  
12 to DDM and they're pretty comparable in their  
13 estimates.

14           On the bottom, you've got CAMXs results.  
15 We don't have -- the most recent version of CAMX does  
16 not have DDM for PM2.5 species, so we don't have any  
17 information on that, but the source apportionment on  
18 the right and the brute force on the far left are  
19 pretty comparable. The differences you see in some of  
20 the spatial extent of the plumes are due to differences  
21 in the horizontal and vertical advection schemes in  
22 these two models and it's also a function of the color  
23 scheme that we're using. That tail to the right of the  
24 plume is there in CMAQ, too. It's just not quite as  
25 pronounced to show up as different colors on this plot,

1 the lighter blue.

2                   As I mentioned before, there's going to  
3 be times we've got a source receptor proximity issue  
4 and this just shows an example of that. If you're in  
5 the front couple of rows and can see it. The yellow  
6 boxes are one kilometer grid cells and the source in  
7 question is outlined in green. At the monitor -- the  
8 impacts are being assessed at is the letter A. The B  
9 monitor is a meteorological monitor. You can see  
10 they're all in pretty close proximity to each other and  
11 the one kilometer modeling cells do not really  
12 adequately represent this proximity relationship.

13                   So, we want to look at a variety of  
14 different approaches and this is kind of the next step.  
15 We have been able -- we don't have a whole lot of  
16 results for you yet, but we're going to evaluate the  
17 sub-grid and plume treatment and looking at finer  
18 nesting to look at and see how we can resolve these  
19 relationships when we've come into these types of  
20 problems.

21                   So, in the end, our goal is to have a  
22 really sound and useful modeling guidance for people to  
23 go out with when we start doing single source  
24 assessments for PM2.5 and ozone and so I think that all  
25 this work that you're going to be hearing about after

1 me is going to feed into that, including the things  
2 that I just showed you.

3 **MR. BRIDGERS:** All right, Ralph.

4 **MR. MORRIS:** Thanks, George. I'm Ralph  
5 Morris with Environ. I think I've heard my name  
6 several times here, so it's good to be up here  
7 defending myself.

8           Anyway, I'm going to talk about the long  
9 range transport evaluation using the Tracer test. This  
10 report has been up in SCRAM for over a month. It's  
11 only 260 pages, so I'm sure you've all read it by now.  
12 I did provide a summary. The 35 pages is actually the  
13 summary, so if you want to read that. Anyway, it's  
14 been up there for a while. It documents dispersion  
15 modeling that EPA and mainly Bret Anderson has been  
16 doing over the last three or four years. It's hard to  
17 say. Anyway, it's a lot of work. We got all the  
18 results and QAed them and documented them and did some  
19 interpretations, but we didn't do any of the runs. I  
20 usually don't like to do this, because it's hard enough  
21 to explain the stuff that I do and also I probably  
22 would have done things a little differently. But we  
23 did QA the results and document them in this tome.

24           So, in their Tracer tests, and with this  
25 crowd I probably don't need to do this, but you release

1 a known amount of inert material that has a zero  
2 background or as close to zero background as possible  
3 from the source and then you measure it downwind. So,  
4 we're measuring the transport and dispersion. There's  
5 no chemistry. There's no deposition. So, you're  
6 actually evaluating the long range transport model's  
7 ability to treat this transport dispersion.

8           In the early 60s and 70s, we had lots of  
9 great dispersion tests using radioactive materials and  
10 that's how we did all of our -- a lot of our dispersion  
11 curves. That's frowned upon these days. It was good  
12 while it lasted.

13           So, an example of the past Tracer  
14 experiments are as the 1986 eight model study. I think  
15 Tyler mentioned that and that's a study Argonne  
16 National Lab did. I was one of the reviewers of that  
17 study. I was only 12 at the time, but I was very into  
18 reviewing.

19           Rocky Mountain was one I worked on and  
20 then this 1988 EPA evaluation was the CALPUFF using two  
21 of the experiments and that actually fed into the IWAQM  
22 recommendation of CALPUFF as long range transport  
23 model.

24           1994 European Tracer experiment is the  
25 one that I'll be talking about. That was, they had a

1 real time experiment where they used Tracers and people  
2 got forecast deals and tried to simulate and then they  
3 had a retrospective ATMES two where they went back and  
4 did it again and that experiment was actually spawned  
5 by another experiment called Chernobyl which they  
6 weren't ready for.

7                   So, CALMET using the 1988 experiment  
8 because part of the objective here was to see how  
9 CALPUFF had changed from the 1998 Tracer test  
10 evaluation. They used the Oklahoma Great Plains 1980  
11 database that had ARCs at 100 kilometers and 600  
12 kilometers and the Savannah River Lab SO6 database that  
13 had an ARC at 100 kilometers. So, these are ARCs or  
14 receptors. And at that time, the 1998 study and this  
15 study using the new version of CALPUFF used a fitted  
16 Gaussian plume evaluation technique where you take the  
17 observations along the ARC of receptors. They'd be  
18 like 20 observations and fit a Gaussian plume on there  
19 and you look at things like the maximum ops on the ARC  
20 or the maximum fitted plume center line because the  
21 receptor may not have picked up the maximum  
22 concentration. And you can look at plume widths and  
23 cross wind integrated. And then you can do the same  
24 thing with the model predictions where you may have 100  
25 receptors. And you can also look at timing statistics

1 of how long is the Tracer on the ARC and when did it  
2 get there and when did it leave.

3           One of the findings that we had here was  
4 that for this long wind distance, like a 600 kilometers  
5 ARC, assuming that the Tracer has a Gaussian plume  
6 along the ARC may not be true because there's wind  
7 shear and stuff and so we found out, at least in the  
8 Savannah River Lab that that was a poor fit and it  
9 could be misleading.

10           So, I think you need to look at this.  
11 Look at how the fit and the observations occur and then  
12 see whether it's working because this is not -- it  
13 doesn't always work.

14           So, we revised the Tracer test  
15 evaluations that we documented. It was for the two  
16 historical Savannah River Lab, a GP 80 that had ARC  
17 receptors experiments, but also the 1983 Cross  
18 Appalachian Tracer experiment. They had five releases  
19 and I'll talk more and then the 1994 European Tracer  
20 experiment. That had more, lots of receptors out  
21 there.

22           And the idea, at least for the Savannah  
23 River Lab GP 80 was to compare the current version of  
24 CALPUFF, which was 5.8, with the older version, CALPUFF  
25 four and what's changed and whether some new techniques

1 like puff splitting has improved CALPUFF's performance.

2                   And then for some experiments, maybe the  
3 CAPTEX and the ETEX compared multiple model  
4 configurations like I have on the right.

5                   Originally, my talk was going to try to  
6 talk about everything, but people want to leave here  
7 before eight, so I'm just going to talk about CTEX3 and  
8 everything is in the report. So, it's been up there  
9 for a while.

10                   So, the CAPTEX experiment had five  
11 releases during 1983 and they were released from either  
12 Dayton, Ohio and Sudbury. Actually, EPA modeled two of  
13 them. CTEX3, October 2nd, 1983 from Dayton, Ohio. And  
14 then CTEX5 from Sudbury. And Dayton, Ohio is where my  
15 Cal Bears play tonight in the play-in game for the  
16 NCAA, so that brings a little relevance.

17                   So, in doing this we did some met or a  
18 met model was evaluated first like we talked about  
19 yesterday and so there are multiple CALMET  
20 configurations. We'll talk about that.

21                   And one of the things, EPA's objective  
22 for doing multiple model evaluation is identify the  
23 best performing CALMET configurations that kind of fed  
24 into their EPA OFM recommendations. And then CTEX5  
25 also had the MM5 evaluated in there. And then for

1 CAPTEX, we also evaluated multiple models and I'll talk  
2 about that at the end.

3           Okay. For CTEX3, there are 31 CALMET  
4 sensitivity tests and what was varied were things like  
5 the MM5 model that was put into CALMET where there was  
6 80 kilometers. Actually, it was MM4 for CTEX3. 36  
7 kilometers MM5 or 12 kilometers MM5. That was put in.  
8 And then how the MM5 was used by CALMET because you  
9 could use it different ways. As a first guess field  
10 which is the usual way of using it. As a step one wind  
11 fields which means you skip the diagnostic effects and  
12 feed into the CALMET step two procedures that does an  
13 objective analysis of the observations. CALMET was  
14 also ran with no MM5. CALMET was also run with  
15 different grid resolutions; 18, 12, and 4 kilometers.

16           And there was how did the observations  
17 get blended into the step one wind fields and that's  
18 controlled partly by this RMAX R1 procedures where  
19 there a three A, B, and C different values for RMAX R1  
20 would be the 100 kilometers for the surface winds and  
21 200 kilometers winds. That's the distances that are  
22 used to blend into the field being the EPA FLM  
23 recommended settings from their August 2009  
24 Clarification Memo. And then the D is not to use any  
25 observations.



1 MMIF 12 kilometers met which -- MMIF mostly doing a  
2 pass through, for the most part, of MM5 winds. It's  
3 kind of the MM5 performance.

4           And if you look at the top left at the  
5 wind speed bias, you can see that the ones that are  
6 shaded are the ones that are the B series. The RMAX1  
7 RMAX2 which is what the EPA FLM recommended. And you  
8 can see for the wind speed bias there, they also under-  
9 prediction, but the under-prediction for the B series,  
10 quote B series, EPA FLM recommended has the lowest  
11 bias. Yay. Did something right.

12           And then on the wind directions on the  
13 right, the bias, again, the lowest bias, the highest  
14 bias is from the MMIF, i.e. the MM5 data coming in and  
15 then the use of CALMET actually reduced the bias in the  
16 wind direction with the lowest wind direction bias  
17 being the A and the B series.

18           And then on the bottom is the error. I  
19 know it's hard to see, I was sitting in the back. It's  
20 hard to see and you've got all these smart people  
21 sitting up front and they got big heads and it's hard  
22 to see through them.

23           You can't see the bottom, but the B  
24 series is performing the best and if you look at the  
25 wind direction bias, the MMIF or rather the MM5 model

1 actually exceeds the benchmark at 30 degrees. It's not  
2 a pass-fail grade, but it's, you know, the CALPUFF is  
3 doing it's intended thing of making the winds match at  
4 the observation sites better than what it got from MM5.

5           So, conclusions from the CTEX CALMET  
6 model performance, I skipped a lot of runs here, but  
7 the recommended settings that EPA Federal Land Managers  
8 came up with in the May 2009 Clarification Memo  
9 produced the best wind model performance. And then  
10 using a four kilometers grid resolution, CALMET tended  
11 to produce better wind performance than using the 12 or  
12 18 kilometers. I can't say anything about less than  
13 four kilometers because we didn't run anything, a  
14 model, on that.

15           And then using MM5 data with higher  
16 resolution, we didn't see a huge difference between 12  
17 and 36, but that is definitely better than the 80  
18 kilometers MM4 data.

19           And then this is CTEX4. CTEX5 also  
20 found that the EPA recommended RMAX1 RMAX2 settings did  
21 produce the best wind performance.

22           But I do want to caveat in a way at the  
23 bottom which no one can see, but this is not an  
24 independent evaluation. The same wind data that goes  
25 in the evaluation database is also used as input to

1 CALPUFF. Excuse me, CALMET. So, it's not an  
2 independent evaluation.

3                   Moving onto the CALPUFF CALMET  
4 sensitivity tests. In this case, CALPUFF was evaluated  
5 using 25 CALMET sensitivity tests and it was evaluated  
6 using these ATMES II Sysco performance metrics and the  
7 question is which CALMET -- CALPUFF CALMET  
8 configuration gave you the best Tracer performance?

9                   CALPUFF was also run using three MMIF  
10 configurations corresponding to MM5 grid resolution of  
11 36, 12, and four. These ATMES Sysco performance  
12 measures, there's 12 of them. They look at the spatial  
13 performance, temporal performance, the global  
14 performance and they conclude measures of bias and  
15 error, scatter, correlation, cumulative distribution  
16 and a couple of the ones down the bottom I just gave  
17 four of them that I'm going to show here.

18                   There are four of those spatial ones  
19 that count as, like, forecast measures. Like if you  
20 configured a mirror up in space that looks at the  
21 overlap of the predicted cloud with the observed cloud  
22 divided by the union of those two clouds. So, what  
23 percent of the overlap -- things like, normalized meets  
24 squared error, you know, the error, people are familiar  
25 with that. Correlation coefficient, again, people are

1 familiar with that where a perfect correlation is one.  
2 A fractional bias, again, it's a bias. You want to get  
3 zero. And then Kolmogorov-Smirnov parameter which is  
4 looking at the cumulative frequency distributions of  
5 the two prediction's observations and how their maximum  
6 difference.

7                   We also looked at these composite cisco  
8 ranking models. One is a parameter called rank that  
9 Roland Draxler came up with that combines four  
10 parameters of correlations, bias, the figure mirror,  
11 the spatial parameter, and then the cumulative  
12 distribution and he normalizes them so they each get  
13 ranked one, so a perfect model will get a four.

14                   One of the things we found is that the  
15 fractional bias is probably not a very good metric to  
16 have in this composite because you can have a model  
17 that creates 100 or a minus 100 and have a zero bias,  
18 but it's not performing very well. You know, it's off.  
19 So it could have compensating errors and so I think  
20 we're looking to revise this and maybe put an error  
21 statistic in there that more -- and you don't have this  
22 compensating error. We used rank in the report.

23                   The other thing that we did was we  
24 looked at all of the statistics and averaged across the  
25 11 statistics as 12 -- it ranked as a 12 and see how

1 that changes because the models will perform  
2 differently for different statistics.

3                   And this is the CALPUFF model  
4 performance for the statistics. I guess the same test  
5 I showed before using the 12 kilometers MM5 and CALMET.  
6 12 and four kilometers CALMET resolution and those A,  
7 B, C, D version of RMAX1 RMAX2 and for the figure merit  
8 and space, higher metrics are better and it looks like  
9 the experiment four A pro forma MMIF is performing  
10 best.

11                   If you look at the mean squared error on  
12 the right, you want to get lower numbers and experiment  
13 four C is the lowest, they're all pretty close, but I'm  
14 going to go to the fractional bias. There again, you  
15 want zero. And they're all fairly close. And you  
16 finally get to the rank metric where we want a perfect  
17 -- higher score is better and one of the things we  
18 noticed is that the B series is not performing as well  
19 it was given to be for the -- as we thought for the met  
20 model comparison.

21                   So the evaluation conclusions and this  
22 includes -- one of the things I found was that the  
23 CALPUFF MMIF with CTEX3 was the best performance  
24 configuration, outperforming all the other CALPUFF  
25 CALMET configurations, but then you go to the CTEX5 and

1 it was the worst performance configuration. So, it  
2 depends on your application and, but consistently  
3 across the CTEX3 and CTEX5 we found out that the B  
4 series the EPA FLM recommendations appear to be the  
5 worst performing values for RMAX1 RMAX2 and that's in  
6 contrast to what we saw in the met model. And then the  
7 difference RMAX1 and RMAX2 configurations, the A  
8 series, seemed to perform best, followed by C and not  
9 using any ops performed worse. And then the, as I  
10 mentioned, CALPUFF using CALMET with a higher than five  
11 resolution performed better than generally CALPUFF.  
12 Using CALMET with a four kilometers grid performed  
13 better using the higher resolution.

14                   So, one of the things we came up with  
15 here is that you can't just go by met model evaluation  
16 when you incorporate met observations into the met  
17 model.

18                   Also for CAPTEX3 experiment, there were  
19 six long range transport models that were then compared  
20 and these were evaluated using, again, the ATMES II  
21 statistical metrics. There were two Lagrangian models.  
22 It would be CALPUFF with MMIF, not CALMET. Two  
23 Lagrangian models. CALMET and SCIPUFF. And then  
24 CALMET was run with MMIF. In this case it was the best  
25 performing CALPUFF configuration.

1                   Two Lagrangian particle models, FLEXPART  
2 and HYSPLIT and then two Eulerian grid models, CAMX and  
3 CALGRID. They're photochemical grid models, but they  
4 run no photochemistry and no deposition.

5                   These are performance statistics where  
6 the best performing model has the lowest value. And  
7 you look at false alarm rate and that's how many times  
8 the model said you had Tracer at a monitor that was  
9 none. So, how many false alarms, these are kind of  
10 forecast statistics. In that case, FLEXPART was  
11 performing best and maybe CAMX second best.

12                   Go to fractional bias and again,  
13 FLEXPART is performing best and HYSPLIT is performing  
14 worse. Kolmogorov-Smirnov test, the frequency  
15 distribution, well HYSPLIT is performing best and  
16 FLEXPART and CALGRID are performing worst. It depends  
17 on which statistic you look at and normalized mean  
18 squared error, by far, HYSPLIT is performing the worst  
19 and FLEXPART is performing best. So, it depends on  
20 which stat you're looking at.

21                   And then looking at performance  
22 statistics where the best performing model -- well, you  
23 want to get the highest. You want to 100 percent. For  
24 figure, mirror, and space, the spatial statistics, CAMX  
25 is performing best and then CALGRID is performing

1 worst. And then on the right, it looks like SCIPUFF  
2 and CAMX.

3 And then on the correlation coefficient,  
4 lower left, HYSPLIT actually is negative correlated  
5 with the Tracer concentrations and CAMX and SCIPUFF are  
6 the highest positive correlated.

7 And then for the composite rank  
8 statistics, it's clear that CAMX and SCIPUFF are the  
9 highest models, followed by it looks like CALPUFF and  
10 FLEXPART with HYSPLIT and CALGRID being the lowest.

11 So, in conclusions, try to get us back  
12 on track here -- I know it's late. The GP80 Tracer  
13 field experiments, we're using this different valid or  
14 reasonable CALMET configurations. The maximum CALPUFF  
15 concentrations vary by a factor of three, so you can  
16 get a factor of three variation just by varying your  
17 inputs to CALMET. And since you have less options in  
18 MMIF, meaning the pass through options, it varied by, I  
19 think it's plus or minus 20 to 30 percent.

20 One of the things that we found is that  
21 in order to reproduce the, quote, good performance of  
22 the 1998 EPA study on the 600 kilometers ARC of the  
23 GP80, we need to use the slug near-field option which  
24 they used in that 1998 study. Slug is a way to  
25 represent a continuous source near the plume and why it

1 was used for a 600 kilometers ARC which I guess may be  
2 near the source on a global model, but is unclear to  
3 me, but that's the way they ran it. We ran it without  
4 the slug and we couldn't reproduce the time of the  
5 Tracer on the 600 kilometers ARC, but when it was  
6 turned on, it was able to. So that was kind of a head  
7 scratcher.

8                   As I mentioned earlier, the Savannah  
9 River test. 75 Tracer. The fitted Gaussian plume  
10 observations were very poor and thus we couldn't say  
11 anything about modeled evaluation because the model  
12 evaluation paradigm was broken for that experiment.

13                   And the CAPTEX field -- brute force  
14 CTEX3 and CTEX5, we found that RMAX1 equal 100, 200  
15 kilometers, i.e. the FLM recommendation from the 2009  
16 Clarification Memo -- it produced the best CALMET wind  
17 speed wind direction performance but the worst CALPUFF  
18 Tracer performance.

19                   So, keeping all of the CAPTEX experiment  
20 with MMIF as a driver to CALPUFF, it performed better  
21 than CALPUFF CALMET for the CTEX3, but was worse in  
22 CTEX5. You know, as usual, it's the atmosphere. You  
23 can't say anything with certainty.

24                   And then for CTEX3, you look at the  
25 multi-model. You know, SCIPUFF and CAMX were the best

1 performing with CTEX3, followed by CALPUFF and FLEXPART  
2 with HYSPLIT and CALGRID the worst.

3 Then CTEX5 is CAMX and HYSPLIT were the  
4 best performing, followed by SCIPUFF FLEXPART and  
5 CALPUFF CALGRID the worst, so there wasn't always  
6 consistency.

7 The ETEX Tracer experiment which I  
8 think, from looking at these three years ago at this  
9 meeting, the CAMX, the HYSPLIT, and the SCIPUFF were  
10 performing the best and FLEXPART and CALPUFF were  
11 performing the worst. I think we'll hear more about  
12 the ETEX tomorrow.

13 So, with that, I'll open up for  
14 questions.

15 Or I don't. We've got questions at the  
16 end of the thing. Nevermind.

17 **MR. BRIDGERS:** Ralph gets the gold star  
18 award for getting us absolutely back on track.

19 While Bret is coming up to the podium,  
20 I'll make a request for all of the presenters on  
21 tomorrow's public session, at the present I have 50  
22 percent of the presentations for tomorrow, so it would  
23 be very helpful if at least the ones that are in the  
24 morning first thing, if I could get those before  
25 sometime this evening.

1 Thank you.

2 **MR. ANDERSON:** Thank you. Bret  
3 Anderson. U.S.D.A. Forest Service.

4 The outline of my talk this afternoon  
5 will be another element of this project that Tyler and  
6 Kirk outlined and before we begin with that, I'd like  
7 to discuss the use of air quality models, you know, for  
8 both NAAQS and air quality values under NEPA which is a  
9 major driver in this project. Then we'll discuss the  
10 design elements of the EPA FLM single source model  
11 evaluation project as it relates to the consequence  
12 analysis that Kirk referred to. And then to examine  
13 some of the initial results of that evaluation. Also,  
14 a part of this is, as we move forward into the future  
15 is kind of an evaluation of the practical  
16 considerations of the use of some of these your  
17 learning models more routinely in the regulatory  
18 framework because part of this project is also to look  
19 at the comparison of the resource requirements  
20 associated with that to kind of inform the public.

21 So, as I had mentioned, the NEPA  
22 requirements and the FLMS, we have a very distinct  
23 motivation here in this. And because prior to about  
24 2005, 2006 time frame, air quality modeling for NEPA  
25 projects was fairly well-defined. So, basically, you

1 had to do your standard near-field analysis and also  
2 your far-field analysis so you had to deal with local  
3 scale NAAQS and you had to deal with the air quality  
4 related values and you had analyze, you know, each  
5 option -- each resource management option relative to  
6 each of those. And then, thanks to our buddies in the  
7 State of Wyoming and their deployment of monitors we  
8 started to find some problems. And in particular, what  
9 we found was we found, you know, I'm sure you've seen  
10 many articles about these, but basically we found  
11 winter ozone in the Upper Green River Basin in Wyoming  
12 and the Uintah Basin in Utah. And now we have to deal  
13 with addressing ozone air quality modeling for  
14 pollutants that occurred in times of the year and in  
15 remote locations that were once considered to be urban  
16 scale and summertime problems.

17                   So the paradigm in NEPA modeling shifted  
18 and so I speak somewhat on the behalf of the both the  
19 Bureau of Land Management and the U.S. Forest Service  
20 because we are unique among the land management  
21 agencies that we are multi-use agencies and that we're  
22 responsible for developing environmental impact  
23 statements for any resource management decisions that  
24 are made on Federal lands and so, typically, when you  
25 see the BLM doing an EIS for a resource development,

1 you'll see a companion document coming out from the  
2 Forest Service because many of our lands are adjacent  
3 to one another.

4                   So for air quality, this means that we  
5 now have to analyze potential impacts to local -0- to  
6 both local and regional air quality for each resource  
7 management option that is considered. This was  
8 translated into running AERMOD, CALPUFF, and CAMX. And  
9 so the complexity and the cost associated with meeting  
10 these needs and air quality analyses under NEPA have  
11 grown considerably in the last five years.

12                   In response to this, and this is what  
13 Tyler highlighted in his presentation is that the  
14 Department of Agriculture, the Department of Interior,  
15 and EPA entered into a memorandum of understanding  
16 outlining generally agreed upon principles for  
17 conducting air quality related analyses under NEPA for  
18 energy development projects.

19                   And so the general principles are to  
20 establish an agreed upon procedure for conducting air  
21 quality analyses. Having a development of a formal  
22 stakeholder process for input and how the modeling  
23 analyses area done. And then also dispute resolution  
24 procedures.

25                   And one of the major themes of this is

1 to reduce the cost to both the development agencies,  
2 the agencies that are responsible for the development  
3 of these NEPA documents as well as the project  
4 proponents through the promotion of modeling techniques  
5 which allow for the leveraging of existing analyses to  
6 the extent that they're practical.

7           This means that we're trying to reduce  
8 the burden in the modeling requirements and this occurs  
9 through two approaches.

10           The first approach is to establish what  
11 we refer to as a reusable modeling framework which are  
12 regional scale air quality analyses that can bracket,  
13 you know, development potential in a given air shed  
14 that can be leveraged to help describe, you know, the  
15 potential impacts from any individual development  
16 project and; two is to promote the use of a single  
17 modeling platform where practical to deal with issues  
18 of both ozone, PM2.5 and then the subsequent issues  
19 related to air quality values which are visibility and  
20 deposition for this NEPA.

21           And so you can see, we have quite a bit  
22 of a resource burden here in terms of the modeling  
23 requirements and so we have a very strong interest in  
24 the evaluation of these various platforms.

25           So, where do the EPA and the FLMs go

1 from here? So, the NEPA requirements in the Sierra  
2 Club petition necessitated that both the EPA and the  
3 FLMS reassess the suitability of the existing modeling  
4 paradigm in order to address these issues. In order to  
5 address these needs, the EPA and the FLMS undertook  
6 this project to compare the model predictions of  
7 existing models and emerging models to understand both  
8 the predicted impacts for resource management decisions  
9 and to better understand the resource requirements and  
10 challenges to implementing these.

11           So the EPA had a work order, a multi-  
12 task work order, with Environ and under task order six  
13 there was the single source LRT demonstration project.  
14 And so the first element would be to apply a long range  
15 transport chemical dispersion models, for example; test  
16 sources as one would for both a PSD far-field class one  
17 assessment which is essentially the same thing that you  
18 would have to do for NEPA in describing each resource  
19 management option impact. And so for this, they used a  
20 2005 and 2006 annual simulation and this configuration,  
21 what you see here, is that CALPUFF and CALMET and  
22 CALPUFF and MMIF were examined and then also using CAMX  
23 for source apportionment capabilities.

24           The other thing was to compare the air  
25 quality and air quality related value metrics for class

1 one areas across all of these different ones. And so  
2 this is essentially -- this is not a performance  
3 analysis. This is simply a consequence analysis to  
4 look at what the predictions are looking like for each  
5 one of these types of things.

6 And so thank you, Ralph, for outing me  
7 so I'm outing him here. This presentation just  
8 documents the transport dispersion model simulations  
9 that were performed and done by Environ. So, turnabout  
10 is fair play. It's like in 2011.

11 So, basically, what you see is that  
12 Environ used two separate modeling domains here and so  
13 they used it -- for 2005 they used what we call the  
14 four corners air quality task force project and that  
15 had a 12, you can see it's a region 12 and a sub-region  
16 4 kilometers domain that's focused over the four  
17 corners area in the southwestern United States.

18 And then you'll see here, you'll see the  
19 12 kilometers domain and, I don't know, is this for  
20 Peyonce Basin or is this just a -- Uintah  
21 Ralph?

22 **MR. MORRIS:** Uintah.

23 **MR. ANDERSON:** Uintah. So anyway, this  
24 is the 2006 domain. You know, this is purely just 12  
25 kilometers domain here.

1                   So, for this evaluation, for the 2005  
2 four corners air quality task force modeling database  
3 that was used, they looked at five EGU sources which  
4 are identified in the top figure and nine oil and gas  
5 point sources -- or point and area sources that are  
6 identified in the bottom figure.

7                   For the 2006 study, they identified --  
8 they modeled 13 EGUs and then 11 oil and gas, you know,  
9 corresponding the same figures as in the previous  
10 slide. And this is going to be and I'm going to talk a  
11 little bit about this, but there is a lot more to  
12 explain in terms of, you know, going into the report  
13 and actually looking at this because there is just an  
14 awful lot here and these images are going to be pretty  
15 difficult in the back. But basically, what you see  
16 here is -- all this is is a head-to-head consequence  
17 analysis looking at the concentration predictions or  
18 the deposition value or the visibility analysis  
19 predictions of each modeling system compared to each  
20 other modeling system.

21                   So, in the left figure for top and  
22 bottom which is annual NO2 at the top and sulphur  
23 dioxide on the bottom is that on the left you see  
24 CALPUFF and CALMET configured with CALMET according to  
25 the EPA FLM recommended settings and what you --

1 compared to CAMX. So, CAMX is on the left axis and  
2 CALPUFF CALMET is on the right axis and so you can see  
3 that CAMX has slightly higher predictions than CAMX for  
4 nitrogen dioxide for the annual standard.

5           And then when you compare in the center  
6 one where you have CALPUFF MMIF on the left axis and  
7 CALPUFF CALMET configuration on the right axis, you see  
8 that the CALMET is slightly predicting higher relative  
9 to CALPUFF MMIF and you see a similar behavior for both  
10 SO2 on the bottom, you know, in this and the fact that  
11 you see CAMX has slightly grading or slightly higher  
12 predictions for SO2 compared to CALPUFF CALMET.

13           And when you compare CALPUFF MMIF to  
14 CALPUFF CALMET in that, on the bottom here, what you  
15 see is there is a slight edge towards over, you know,  
16 CALMET predicting, you know, the CALPUFF CALMET  
17 configuration predicting higher.

18           And then likewise for, you know, here on  
19 the left when you're looking at CAMX on the left and  
20 CALPUFF MMIF. CAMX has that same tendency to predict  
21 higher than the CALPUFF MMIF configuration.

22           So, here, and I'm going to quit rambling  
23 through these here, but I just encourage you to go look  
24 at the report. Basically, what you see is, again, just  
25 a consequence analysis and it's informative to look at

1 each one. How these stack up against one another here.

2                   So, I'm going to slide through this and,  
3 now, the one thing you see here is in the PM10, where  
4 you're looking at it, because we have different issues  
5 with species mapping from the secondaries that are  
6 coming out of CAMX compared to what is in CALPUFF, the  
7 values are going to be significantly different as a  
8 result of that and so that, you know, that's the  
9 important take-home message when you're examining the  
10 results of the PM10 analysis.

11                   And then for annual SO2 in the 2006, you  
12 can see here -- you'll see some very high CALPUFF  
13 CALMET and MMIF outliers here that we'll get into  
14 examining that just a little bit closer. You can see,  
15 for the most part, at the lower concentrations they do  
16 -- there is fairly strong parity and -- but when you  
17 see them in the center image here, you'll see that  
18 there's a significant outlier here that was with  
19 CALPUFF and CALMET.

20                   And then, again, you'll see this.  
21 You'll see something similar with this as far as the  
22 outliers go with the CALPUFF CALMET and the CALPUFF  
23 MMIF.

24                   So, basically Environ did take the  
25 opportunity to go back and take a look at the outlier

1 in a little bit greater detail and so basically what  
2 they found was the maximum annual NO2 and SO2 by  
3 CALPUFF CALMET occurs only for the smallest of the 12  
4 EGUs and in that 13 EGU scenario for the 2006 study.  
5 And this occurred within the Holy Cross Wilderness  
6 which is a class two area. So, it's likely that they  
7 were co-located with receptors.

8                   The maximum CALMET, MMIF, and CAMX  
9 annual NO2 concentrations were 3.1, .6, and .02  
10 respectively and so the -- we understand why CALMET was  
11 much higher than CAMX because CAMX was configured for  
12 LRT application with a 12 kilometers grid, but why are  
13 MMIF and CALMET so different?

14                   And so they were looking at the wind  
15 fields here and this is just a snapshot using the  
16 CALDESK software to look at the MM5 winds at 12  
17 kilometers overlaid with the CALMET vectors here and so  
18 you can see that with CALMET, which I believe is the  
19 blue, you can see that at the surface, both the surface  
20 and aloft, CALMET is showing that there is much more  
21 response to the terrain in the CALMET wind field as  
22 compared to what the MM5 shows which you would hope to  
23 expect running CALMET at a higher resolution there.

24                   And then likewise, when you run it aloft  
25 and you look at aloft, you'll see that CALMET still

1 shows significantly more response to the terrain than  
2 the MM5 data does at that resolution. So, you can see  
3 that there are, especially in this area of the domain  
4 over here, you can see significant variation because  
5 you can start to see more of a transition to more of a  
6 zonal flow which is more indicative of synoptic scale  
7 flow and so it's not -- the course of resolution and  
8 prognostic data is not responding as much to the  
9 terrain as what the finer scale CALMET winds would do.

10                   So, looking at that outlier again.  
11 CALMET was modifying and slowing the MM5 winds and it  
12 occurs both at the surface and aloft. And their  
13 conjecture -- they are unsure as to whether or not it's  
14 the diagnostic effects or the objective analysis  
15 procedure doing this. It occurs throughout the year  
16 and it results in very high concentrations for the  
17 CALPUFF CALMET configuration and, but as they indicate  
18 here, you get much better agreement between the CAMX  
19 and the CALPUFF CALMET configuration at all of these  
20 other sites.

21                   So, then we get into visibility which is  
22 where we're very interested in here. And as you can  
23 see, the visibility has a very similar thing here where  
24 you see, basically, the CALPUFF and CALMET  
25 configuration and CALPUFF and MMIF are yielding higher

1 results than CAMX, you know, in terms of the visibility  
2 impacts.

3                   Now, there is an explanation -- a  
4 partial explanation for this and it's because when  
5 Environ ran CALPUFF initially, they used the old IWAQM  
6 default of ten parts per billion background ammonia, so  
7 it's going to affect both the particulate nitrate  
8 estimates you get and then also the total nitrogen  
9 deposition that you get because one model will carry  
10 the species around more as nitric acid which is, you  
11 know, probably much more susceptible to wet deposition  
12 in that as opposed to particulate nitrate. So, again,  
13 but you can see that there are significant differences  
14 in the visibility configuration there -- the visibility  
15 predictions as a result of the various configurations.

16                   And so one other thing that we had  
17 Environ look at was to look at the spatial variability  
18 across the receptors because one of the primary  
19 concerns that the Federal Land Managers have is that,  
20 you know, if you understand how visibility modeling is  
21 conducted, we deploy discreet receptors within the  
22 boundaries of the class one areas at a routine interval  
23 of about 1 kilometer. And the reason why we do that is  
24 we're interested in picking up the inhomogeneity of the  
25 wind field for lack of a better term. Basically, what

1 we're looking at is we're looking to see -- we're  
2 concerned about the spatial gradient of the  
3 concentrations and also the spatial gradient of the  
4 deposition and visibility and so one of the concerns  
5 that there is is how applicable is a grid model to  
6 visibility estimates or deposition estimates? Do we  
7 see a high degree of variability across the predictions  
8 in distant class one areas?

9                   And so we asked Environ to go in and  
10 look at the distribution of the visibility impacts.  
11 And what you see is that four far-field receptors, so  
12 when you look at each one of these class one areas and  
13 I think this is the 2005 Four Corners, right? But  
14 basically what you see is is that there is very little,  
15 much tighter distribution across the receptors within  
16 the class one areas or these further ones except for  
17 the nearest class one area which is the Mesa Verde one.

18                   And so this is a very important piece of  
19 information that you see here. The Eulerian models in  
20 close proximity to the class one areas account for much  
21 less spatial variability as compared to either the  
22 CALPUFF or the CALMET or the MMIF configurations for  
23 that and that's what the information that we were  
24 trying to drive at was is that for -- when you're doing  
25 LRT assessments and you're looking at source receptor

1 distances that, you know, are not 200, 300 kilometers  
2 beyond but are within 50 to 75 to 100 kilometers is  
3 that is there a spatial gradient in those  
4 concentrations and the answer from this is yes, there  
5 is very much a spatial gradient there. And that was  
6 information that we were very concerned about and has  
7 some considerations as we move forward is the  
8 suitability of these types of models for different  
9 source receptor distances.

10           So, looking a nitrogen deposition here  
11 and this is what I was talking about earlier was is  
12 that and this is what you see is that CAMX has higher,  
13 a factor of two higher, estimate of deposition than  
14 CALPUFF. And the CALPUFF MMIF nitrogen deposition is  
15 just slightly greater than that off CALPUFF CALMET.  
16 And then you'll see something similar, but to a lesser  
17 degree with sulphur deposition. Basically, what you  
18 see is CAMX predicts slightly higher sulphur deposition  
19 relative to CALPUFF and, again, MMIF has slightly  
20 higher sulphur deposition predictions relative to  
21 CALPUFF CALMET except for one point. And the results  
22 from this are similar to what they were from the 2006.

23           And so Environ went in to look and see  
24 why is CAMX estimating much higher deposition than  
25 CALPUFF? And one of the first reasons is that because

1 they used different species mapping with CAMX, so  
2 there's more nitrogen species and only ammonium from  
3 the source and CALPUFF included ammonia assuming both  
4 the full sulfate and the nitrate are neutralized.

5           So, they performed CAMX species mapping  
6 according to CALPUFF rules. And, Ralph, would you care  
7 to explain this a little bit further?

8           **MR. MORRIS:** I guess using the CALPUFF  
9 species mapping where you assume nitrate and sulfate  
10 would be completely neutralized by ammonium, it kind of  
11 went the wrong direction.

12           I mean, it gave you more nitrogen than  
13 CAMX and so maybe it will over-estimate a lot worse  
14 higher nitrogen deposition in CAMX greater. And so it  
15 didn't explain it. The species mappings and the extra  
16 species did not, in itself, explain it.

17           **MR. ANDERSON:** So they basically look at  
18 the fact that -- what they concluded was that CAMX was  
19 carrying much more nitric acid in the model as compared  
20 to CALPUFF. CALPUFF is carrying much more nitrogen in  
21 the form of particulate nitrate.

22           Again, bear in mind that this analysis  
23 will be redone because they initially did this  
24 evaluation looking at CALPUFF configured with the old  
25 IWAQM ten part per billion recommendation. So, they

1 were going to be redoing it with, I believe we said it  
2 was one part per billion. It was, I think that was  
3 what the FLMs recommended is one part per billion here  
4 and that's much more in line with what you see from  
5 monitoring studies in high terrain out in the west like  
6 at Dinosaur National Monument and stuff. So, there  
7 will be another revised set of CALPUFF runs with more  
8 realistic background ammonia values and so this will be  
9 part of it, but you'll also see additional CALPUFF runs  
10 with much more realistic ammonia background.

11                   So, I did want to take a little bit of  
12 time to talk about some of the practical considerations  
13 associated with this and these are kind of, as you can  
14 tell, we are interested in looking at our Eulerian  
15 models or a higher order Lagrangian chemical model such  
16 as SCICHEM or if they're reactive particle models. If  
17 those are -- what type of challenges would they impose  
18 on the modeling community? Like if, for example, as  
19 Tyler was talking about from the FLM side, we try to --  
20 we're relying on the EPA to provide a guideline model  
21 for us, even though applications of the guideline model  
22 for air quality related values technically don't fall  
23 under EPA's regulations. We try to stay in concert  
24 with EPA as much as possibly can and so we're very  
25 sensitive to shifts in modeling technology that would

1 be adopted by EPA because we try to adopt a more  
2 uniform approach to things with EPA.

3           And so there are some practical barriers  
4 to implementation when you look at the use of these  
5 higher order models. And one of these things is that  
6 the dispersion modeling community that is represented  
7 here, most of your work is done on Windows platforms.  
8 And especially for state agencies. And, unfortunately,  
9 for most of the agencies, that means when you have to  
10 do these large, annual simulations for photochemical  
11 models, the Windows systems are typically designed in  
12 such a way that you can only do serial applications of  
13 runs which would be if you're doing the standard way  
14 for doing an annual PM2.5 run for photochemical models  
15 is typically to break it up by quarter. And run them  
16 across multiple machines.

17           Well, on a Windows environment, that's  
18 not possible. So, as you can see is the disconnect is  
19 both meteorological and photochemical models are  
20 largely Unix and Linux based platforms. And also we  
21 take a look at the time that's involved with running  
22 photochemical grid model simulations compared to the  
23 current models that are used under the AQRV analyses.

24           So the computational considerations here  
25 is is that if the community moves to these higher order

1 models is that -- is it necessary to adapt these  
2 platforms to adapt to a Windows based environment which  
3 may sound for the SIP modelers and the meteorological  
4 modelers, that may sound like a very strange concept,  
5 but bear in mind the fact that the vast majority of the  
6 community that uses these models -- will be using these  
7 models in the permitting arena are Windows based  
8 people.

9                   So that creates two problems. One is  
10 that the level of fluency for Unix and Linux operating  
11 systems in the dispersion modeling community is  
12 typically much less and they typically aren't as fluent  
13 in programming skills as they are in the Linux and the  
14 Unix environment with the SIP model because we have to  
15 do much more data manipulation and a lot more custom  
16 programming that way.

17                   And then the other issue that we run  
18 into is the fact that the IT authorities within the  
19 states and local permitting agencies often lack the  
20 familiarity with and the resources to dedicate to  
21 systems administration for Unix and Linux based  
22 systems. And thus, they actively present -- in my  
23 case, when I was a state modeler, they absolutely  
24 refused to allow us to acquire any Linux equipment.  
25 And if you were given the privilege of buying Linux

1 equipment, it was a stand-alone machine. It would not  
2 sit on the network. They absolutely forbade it to be  
3 on the network.

4                   So, from a barrier to implementation  
5 from a regulatory perspective, basically what you have  
6 now is this is the clash of the worlds that George  
7 talked about here. And this is where the clash really  
8 begins. It's that for permit modeling, the operational  
9 construct for permit modeling is a highly rigid set and  
10 it's based upon a series of regulations and guidelines  
11 that generally restrict operational flexibility in  
12 order to promote more general consistency in the  
13 application of models.

14                   The operational construct for  
15 meteorological and photochemical modeling is vastly  
16 different. Because those are based upon a more loosely  
17 binding set of EPA recommendations which typically  
18 encourage the adaptation of both the science and the  
19 modeling techniques to produce the most scientifically  
20 feasible answer given the constraints of the state of  
21 the science.

22                   So, from the regulatory considerations,  
23 these two differences in the operational paradigms  
24 between the two communities will require both the EPA  
25 and the FLMS to develop a more rigid set of operational

1 procedures similar to both the current permit modeling  
2 paradigm in order to ensure that a scientifically sound  
3 and consistent set of procedures prevents an anything  
4 goes process which would likely develop without such  
5 procedures.

6                   Additionally, like what you see in the  
7 NEPA context, we typically only do one year's worth of  
8 evaluations, but when you see the AQRV requirements  
9 under PSD or with the near-field analysis, it's three  
10 and five.

11                   So, if you go down this route of doing  
12 this, the length of meteorological record for the  
13 photochemical models will likely have to be expanded to  
14 be consistent with the requirements with the guideline  
15 on air quality models.

16                   And then finally the -- and this is EPA  
17 policy here so I won't get into this, but you know the  
18 old issue of significance thresholds for single sources  
19 which is a hornet's nest that I'm not going to touch  
20 here.

21                   And so in conclusion, basically, what we  
22 have found from this study is that photochemical grid  
23 models are capable of assessing single source impacts  
24 for both AQRVs and ozone requirements if there would be  
25 any for PSD. The source apportionment techniques that

1 Kirk talked about earlier eliminate the need for  
2 multiple zero out runs or the brute force techniques.  
3 However, there are, as the community thinks about this  
4 and moving forward, is there are significant barriers  
5 that remain to implementation of these and these come  
6 in terms of both training requirements for staff,  
7 computational requirements, and then also the creation  
8 of a suitable regulatory framework that can accommodate  
9 the requirements of permitting but respect the fact  
10 that you're dealing with a much more scientifically  
11 robust system.

12 **MR. BRIDGERS:** Jim Kelly.

13 **MR. KELLY:** Okay. So some of the  
14 previous speakers have pointed out that a need exists  
15 for a single source models that can accurately simulate  
16 secondary PM2.5 and ozone formation.

17 The SCICHEM reactive plume model is one  
18 that could potentially be used in single source  
19 applications where consideration of secondary  
20 pollutants is required. However, before the model can  
21 really be applied widely in regulatory applications,  
22 it's important that we can thoroughly test the model  
23 under conditions relevant to those regulatory  
24 applications. It's important that we can thoroughly  
25 test the model under conditions relative to those

1 regulatory applications.

2                   So, today I'll talk about a very  
3 preliminary study which is our first implementation  
4 here at EPA of the SCICHEM modeling. Basically, we'll  
5 simulate the plume from the TVA Cumberland Power Plant  
6 for a day in July of 1999 and then compare predictions  
7 with simulations from CMAQ and some observations to  
8 kind of get ourselves familiar with the performance of  
9 this model.

10                   So SCICHEM stands for the Second Order  
11 Closure Integrated Puff Model with Chemistry. The  
12 plume is represented by numerous puffs that are  
13 advected and dispersed independently according to the  
14 local meteorology. The name comes, in part, from its  
15 use of the second order closure parameterization for  
16 integrating the turbulent diffusion equation. So, the  
17 dispersion rate is related to turbulent concentration  
18 fluxes which are saw through that parameterization.

19                   The model has some puff merging and  
20 splitting capabilities which can be important under  
21 inhomogeneous meteorological conditions. And what's  
22 important to us is that it holds the promise of  
23 potentially being able to give us comprehensive  
24 simulations of chemical process as well as gas aerosol  
25 as well as aqueous phases.

1                   So, as I mentioned, we've just started  
2 to implement this model here and we started by  
3 simulating the Tennessee Valley Cumberland Power Plant  
4 for a day in July of 1999. Now, the reason that we  
5 picked this up to begin with is that it's a well-  
6 studied episode and so as we start to learn about the  
7 behavior of this model which is new to us, we wanted to  
8 benchmark our results against some simulations that had  
9 come prior to us.

10                   Also, this is a pretty data rich period  
11 because there was a helicopter that flew transects  
12 through the plume downwind of this power plant and  
13 measured some suite of chemical species and so we can  
14 use those measurements to help us evaluate and  
15 understand the performance of the model.

16                   This gives an overview of the model  
17 configuration that we used in the study. And  
18 basically, I'll talk about the results of two  
19 simulations with SCICHEM that we've named SCICHEM-WRF  
20 and SCICHEM DIAG.

21                   In the SCICHEM-WRF case, the  
22 meteorological used to drive the SCICHEM model is based  
23 on WRF version 3.3 output that's been converted to  
24 MEDOC format using the MMIF tool that Bret talked  
25 about.

1                   For this simulation, the background  
2 concentrations that we're using are time varying three  
3 dimensional hourly varying concentrations that we took  
4 from CMAQ photochemical grid model simulations which  
5 were converted into a format that SCICHEM could read  
6 using a tool developed in-house.

7                   The SCICHEM DIAG simulation is based on  
8 meteorology that uses observations from four met  
9 stations and this met was provided to us as part of a  
10 test case that we received with a pre-released version  
11 of SCICHEM that EPRI was gracious to allow us to use.  
12 The background concentrations for this case are set to  
13 constant values and we're using, pretty much, the  
14 default values associated with this test case, although  
15 we adjusted ozone by a few ppb and SO2 as well to be  
16 more in line with the background measurements. We're  
17 using hourly emissions that were based on CEM data in  
18 this simulations.

19                   We also conducted some CMAQ simulations  
20 for this period and so CMAQ is a three dimensional  
21 photochemical Eulerian grid model. And the reason we  
22 applied CMAQ is that this is something that we're very  
23 comfortable and familiar with in our group. And so, as  
24 we learn about the behavior of this SCICHEM model,  
25 which is new to us, it helps us to understand the

1 performance of that model if we can look at it through  
2 this lens of CMAQ which we know pretty well.

3           So, we did some simulations with CMAQ  
4 version 4.7.1. And these simulations were done at four  
5 kilometers resolution shown in this inner domain down  
6 here. Two points to mention is that the WRF  
7 meteorology that drove the CMAQ model was the same  
8 meteorology that was used in the SCICHEM-WRF case that  
9 we simulated. And the emissions from the TVA power  
10 plant for the SCICHEM simulation -- or for the CMAQ  
11 simulation was the same as that used in the SCICHEM  
12 simulations.

13           So, we'll get started by I'll show you  
14 some figures comparing absolute concentration  
15 predictions of CMAQ and the SCICHEM-WRF case. And  
16 basically what we'll do is we'll overlay SCICHEM-WRF  
17 predictions at receptor rings onto CMAQ concentration  
18 fields.

19           So, this shows a plot for SO<sub>2</sub>  
20 concentration. Just to orient you here, what we have  
21 is this point in the center is the TVA power plant.  
22 And this is basically, these three rings that you see  
23 around the power plant correspond to our receptor rings  
24 that we placed in the SCICHEM simulation. So, the  
25 colors inside those rings correspond to SCICHEM

1 predictions and the colors outside those rings  
2 correspond to concentrations from the CMAQs. We're  
3 overlaying SCICHEM and these rings overtop of the CMAQ  
4 field.

5           And there's three plots here which are  
6 at layer one of the CMAQ model at hours of ten in the  
7 morning, one p.m., and six p.m. later in the afternoon.  
8 Now, if we look at this quickly and just qualitatively,  
9 we see that the plume direction for the SCICHEM  
10 simulation overlaps the plume for CMAQ pretty well here  
11 and later into the afternoon. And so, this is kind of  
12 reassuring because both models were driven by the same  
13 meteorology, so it's nice to see that they put the  
14 plume roughly in the same location. That wasn't  
15 guaranteed necessarily.

16           Another thing we see is that possibly  
17 near the source, SCICHEM is predicting high  
18 concentrations of SO<sub>2</sub> than CMAQ. That's something that  
19 we'll look into in terms of dilution rates and, you  
20 know, puff versus grid based averaging. We need to  
21 look into some of those differences.

22           One of the things that's kind of  
23 puzzling us right now, as I mentioned, is this is our  
24 first implementation. Away from the plume, you see  
25 these grey colors in the SCICHEM simulation. And as I

1 mentioned earlier, in this simulation, we fed the  
2 SCICHEM model three D, time varying ambient background  
3 concentrations from the CMAQ simulation. So, we  
4 expected that, away from the plume, down here in these  
5 rings, we would get back the same values that we had in  
6 our CMAQ simulation, but we don't see that and so it's  
7 something we'll look into.

8           We had similar behavior for NOx. These  
9 are NOx concentration plots and we see kind of a  
10 similar thing where the direction of the plume is the  
11 same largely between SCICHEM and CMAQ and that  
12 transition from the morning to afternoon happens in the  
13 same way, but it looks like SCICHEM is predicting  
14 higher concentration of NOx near the source at layer  
15 one and, again, we'll look into this further.

16           Now, the second set of figures I'll show  
17 you will attempt to just compare plume concentrations  
18 for the different simulations. So, what we did was we  
19 did a set of simulations where we set the emission from  
20 the TVA plant to zero and then we got predictions from  
21 that simulation and subtracted them from the  
22 simulations where the TVA emissions were accounted for.  
23 And then sort of the difference between the zero out  
24 and the base case simulation should help us isolate the  
25 impact of the plume. And I'll show you some figures

1 for that now.

2                   So this shows the SO2 concentration  
3 difference between the base case and our zero out run.  
4 And up top, these are the same scenarios that we've  
5 just seen. So this is comparing CMAQ predictions and  
6 the SCICHEM-WRF case that we simulated. Again, the  
7 plume directions are pretty similar.

8                   Down on the bottom row, I'm not sure  
9 everyone can see it, but this is comparing the CMAQ and  
10 the SCICHEM DIAG case which, just to remind you, just  
11 used the observation based meteorology. So, especially  
12 in the morning hours, if we look at the direction of  
13 the plume when we use the observation based  
14 meteorology, it differs from the case with the WRF  
15 prognostic model meteorology.

16                   As the afternoon wears on, then the  
17 directions kind of align a little bit better, but you  
18 still see here's some red down -- pointing that there  
19 is some southward trajectory of this plume in this case  
20 that we're not seeing up here with the WRF case. And  
21 so, not surprisingly, if you use different met fields,  
22 it has some consequence.

23                   These are similar results for NOx.  
24 Because of the time, I won't through a lot of the  
25 details, but the same differences apply here.

1                   And finally, this is a plot of ozone.

2 And so, we mentioned at the beginning that we're  
3 interested in SCICHEM because we're interested in  
4 photochemistry and secondary pollutants and so this is  
5 the first example I've show you we're really starting  
6 to look at that.

7                   And so, just to orient you, the blue  
8 colors in this figure represent cases where when you  
9 add TVA emissions into the simulation, it results in  
10 reductions of ozone concentrations. Those are the blue  
11 colors. Whereas the red colors show when you introduce  
12 the plume emissions to the simulation, it leads to a  
13 net production of ozone.

14                   So, if you think over here these blue  
15 colors very close to the source, that represents a  
16 situation where the plume is very concentrated in NO  
17 and that NON will react with the ozone molecule and  
18 kind of destroy ozone. But as we move further  
19 downwind, some background ambient air mixes in and that  
20 contains radicals and VOCs and so, under those  
21 conditions, NOx is a net producer of ozone. And so we  
22 see, moving from the source where we have titration of  
23 ozone downwind, there's some production, we're  
24 capturing these qualitative features that we'd expect.  
25 Although we see for the CMAQ simulation, the reds are a

1 lot more prominent. I don't know how well you can see.  
2 Within the ring of the SCICHEM simulation, the ozone  
3 production downwind was a little bit less and we're  
4 going to look into that.

5           This shows just a surface concentration  
6 Tracer plot that compares on it -- the left, the  
7 SCICHEM-WRF simulation and on the right the SCICHEM  
8 DIAG simulation which used the observation based  
9 meteorology. And as I've already pointed out, in the  
10 morning hour, this is nine local standard time, there's  
11 a pretty big difference in the direction of the plume,  
12 but then later in the afternoon, the plume directions  
13 are a little bit more in line.

14           Okay, so as I mentioned, one of the  
15 purposes of simulating this episode is some helicopter  
16 observations were available for this time period. So  
17 this Google map shown here shows the TVA Cumberland  
18 Power Plant and then these black transects at distances  
19 downwind of the power plant is where that helicopter  
20 flew through and sampled the plume coming from the  
21 power plant. And the average altitude of these  
22 aircraft transects was 500 meters. And so now we'll  
23 compare some of our predictions with these helicopter  
24 observations.

25           So this shows the SO2 measurements for

1 the plume transects. So the plot on the left is the  
2 observed SO<sub>2</sub>. The plot in the middle is the CMAQ model  
3 predicted SO<sub>2</sub> concentration. And on the right is the  
4 results of this SCICHEM-WRF simulation.

5                   So, we see in the observations you have,  
6 near the source, these bright red colors which indicate  
7 that we have a fairly narrow plume of concentrated SO<sub>2</sub>.  
8 And if we move downwind, the concentrations are going  
9 down, presumably because of some dilution and this  
10 plume broadens a bit.

11                   For the CMAQ case, we have similar  
12 qualitative behavior where you see the red colors for  
13 the plume near the source and then the concentrations  
14 just diminished a bit as we move downwind. We would  
15 want to look into this a little bit more quantitatively  
16 to give a full assessments, but those patterns are  
17 there.

18                   And we see a similar trend with the  
19 SCICHEM-WRF case, but for the SCICHEM and CMAQ, it  
20 appears that maybe the plume is moving a little bit to  
21 the south compared to the observations in the  
22 beginning.

23                   This shows some similar results of NO<sub>x</sub>  
24 which I don't want to dwell on because the patterns are  
25 pretty similar to the case I just showed you for SO<sub>2</sub>

1 and then finally we have ozone.

2                   So you see in the aircraft observations  
3 that near the source there's some blues in here  
4 indicating that within the plume, we're having a net  
5 destruction of ozone. So ozone is falling below its  
6 background value in the plume, but then downwind, now  
7 we really start to see these deep reds where the NOx  
8 from this power plant is leading to some net ozone  
9 production.

10                   Similar trends that you see here with  
11 CMAQ again. There's some blues near the source and  
12 then there's some transitions to these redder colors  
13 down here which might indicate some ozone production.  
14 But again, we want to look at this more quantitatively.

15                   SCICHEM has similar behavior where you  
16 have some ozone titration near the source and downwind  
17 we saw less ozone production with SCICHEM, but we saw  
18 some.

19                   Now the final set of plots I'll show has  
20 to do with comparing what I'll call centered profiles  
21 for the observations to the model and I'll explain that  
22 now.

23                   So, what we did is we searched along  
24 these receptor ARCs that we used for the SCICHEM  
25 simulation and we find the maximum -- the location of

1 the maximum. And similarly, we search along the  
2 aircraft transects and find the maximum. And then we  
3 sort of look at the profiles and we center them all to  
4 zero at the maximum.

5           So, we're saying here, okay, if there is  
6 some angular displacement from the models that doesn't  
7 exactly track the plume, let's try to eliminate that  
8 from our evaluation by matching up the peaks and  
9 centering them at zero. That's what we've done here.  
10 And we have the radius of 11 kilometers, 31 kilometers,  
11 and 65 downwind of the power plant and this is all an  
12 elevation of 500 meters.

13           So, what we see with the black points is  
14 the observations and, you know, they're pretty narrow  
15 with a sharp spike near the source, but then as we move  
16 downwind, this peak comes down a little bit and the  
17 distribution broadens.

18           The curves that you see for the two  
19 SCICHEM simulations similarly follow this trend. They  
20 start out with a narrow plume with a large peak and  
21 then this diminishes a bit as we go downwind and  
22 there's some dilution of background air mixing in. But  
23 really the striking thing about the figure is that  
24 there's a pretty big difference in concentrations  
25 predictions between the SCICHEM WARM case and the

1 SCICHEM DIAG case. This is likely related to some  
2 differences in dilution and mixing or maybe plume  
3 placement and it's something that we plan to look into  
4 further. Right now we don't have a full explanation.

5           Similar behavior for the NOx  
6 concentration where we see similar trends. In this  
7 case, actually, the SCICHEM DIAG has actually over-  
8 predicted the observations of NOx at this far away  
9 distance which is one of the cases where that happens.

10           And then finally, ozone. So, if you  
11 look at ozone and for the black points and the  
12 observations, again, you see this titration near the  
13 source and you see this minimum in ozone. Then, as  
14 you move a little bit downwind to this radius of 31  
15 kilometers, you still see this minimum here, but now  
16 you start to see ozone production near the edges. So,  
17 what's going on is that the edge of the plume, some  
18 background air is mixing in and that might have some  
19 proxy radicals and VOCs that allows the NOx in the  
20 plume to then become a net producer of ozone and you  
21 start to get some ozone production around the edges.

22           And then when you move all the way  
23 downwind, these two wings that they call them, ozone  
24 wings, start to approach each other from both sides and  
25 you still have a minimum here in the middle.

1                   Now the model simulations, they capture  
2 the -- we can be critical of this, but this is just a  
3 preliminary application. But we capture this trend.  
4 We get ozone titration near the source and then as we  
5 move downwind, the models aren't getting these ozone  
6 wings, but I think there are certain configurations in  
7 SCICHEM where you can try to capture these features  
8 that we haven't really implemented here.

9                   But then we move to the final distance.  
10 We kind of flat line with our ozone in both SCICHEM  
11 simulations. Part of that might be related to that we  
12 didn't resolve these ozone wings here, so we moved  
13 downwind, maybe we don't get that. It could also be  
14 related to our background ambient concentrations.  
15 Perhaps they're low in VOCs and radicals. We haven't  
16 really looked into this because a lot of the work has  
17 just gone into setting up the model and conducting the  
18 runs.

19                   So, just to summarize, we developed some  
20 preliminary tools for using SCICHEM in terms of  
21 processing model inputs and outputs. And so much of  
22 the work that we've done today has focused really on  
23 getting the model inputs set-up, running the model, and  
24 extracting outputs so we can make the figures that we  
25 saw today. We haven't focused too much on the

1 chemistry and the details just yet.

2                   So, as I mentioned, we simulated this  
3 TVA Cumberland Power Plant with SCICHEM and CMAQ  
4 version 4.7 and considering that we haven't spent much  
5 time on the model configuration or gotten into the  
6 details, we think we have some reasonable model  
7 behavior in the sense that within the plume, we have  
8 high SO<sub>2</sub> and NO<sub>x</sub> concentrations. These profiles  
9 broaden and go down further from the source due to  
10 dilution. We see ozone titration in our plume for the  
11 SCICHEM simulations which is what we'd expect. And  
12 some qualitative similarities between SCICHEM and CMAQ  
13 predictions we found. But clearly there is some next  
14 steps.

15                   The next thing we're going to look at is  
16 exploring the impact of different treatments of ambient  
17 background concentrations. They might play a role in  
18 this ozone production issue I just mentioned. And then  
19 once we get that issue addressed, we'd like to look at  
20 NO<sub>x</sub> oxidation products, NO<sub>z</sub> in particular. So, there's  
21 measurements of that which I haven't talked about. And  
22 also we'd like to look at vertical profiles. So, some  
23 of the difference between those models may have been  
24 related to the different models putting the plume in  
25 different vertical regions which I haven't really

1 accounted for in the comparisons. So, we'd like to  
2 look into that.

3 Another thing is we'd like to consider  
4 additional plume observation studies. In particular,  
5 we might look at a nighttime case where we have very  
6 stable meteorological conditions and see how well the  
7 models perform under these stable nighttime conditions  
8 compared to this daytime case here.

9 As Kirk mentioned earlier, we waiting  
10 for this CMAQ advanced plume treatment model that's  
11 planned to be delivered sometime in the future and when  
12 we get that model, it has a sub-grid scale reactive  
13 plume treatment and we're eager to see how that  
14 performs for these types of simulations.

15 And then finally, we want to move away  
16 once we can test and get some familiarity with the  
17 models, we'd like to simulate longer time periods in  
18 larger domains and start moving to more regulatory  
19 relevant applications and testing the models under  
20 those conditions.

21 And so we're just getting up to speed  
22 here, I'd like to acknowledge the people who have  
23 helped us out getting set-up and providing the SCICHEM  
24 model to us.

25 Thanks.

1                   **MR. BRIDGERS:** Home stretch.

2                   Ralph?

3                   **MR. MORRIS:** I'm glad everybody is  
4 sticking around for the ozone presentation. There  
5 will be a test on the chemistry afterwards.

6                   Anyway, this is something completely  
7 different. We talked about a screening methodology for  
8 single source ozone and it was developed for Sydney,  
9 Australia. I'm going to present it, but the work was  
10 done at Environ. It was headed up by Greg Yarwood,  
11 Edward Tai, Prakash Karamchandani and sponsored by the  
12 New South Wales Office of Environment and Heritage. We  
13 also had our folks at Environ Australia participate and  
14 since this was a screening model and you have to come  
15 up with some screening thresholds as to what's  
16 significant or not, the New South Wales Office of  
17 Environment and Heritage was also involved in that  
18 because we don't set significance thresholds.

19                   I'm going to talk about the motivation.  
20 Why they wanted to do this. 3D modeling of new source  
21 ozone impacts. The development of the screen tool.  
22 That's technical work there. The framework for  
23 evaluation ozone impacts. So, that involves technical  
24 and policy considerations. What is a significant ozone  
25 threshold? I don't decide that. That's for EPA and

1 these folks and I'll summarize it.

2                   Okay, so the city greater metropolitan  
3 area region, GMR, exceeds the applicable ozone  
4 standards which in Australia is one hour average of 100  
5 ppb. Our old one hour was 120. And a four hour  
6 average of 80. Our current eight hour is 75. So, they  
7 do things a little differently down there.

8                   They decide attainment, areas of  
9 attainment is less than 82 percent of the standard.  
10 Not 80. Not 84. 82 percent of the standard. So, if  
11 your one hour ozone above 82 ppb, then that's  
12 attainment. I don't know what the reasons are for it,  
13 but it's to protect the most sensitive kangaroo with a  
14 margin of safety.

15                   Anyway, they define things differently,  
16 but they need a method to quantify ozone impacts from  
17 ozone sources. We talked about photochemical models  
18 for ozone is preferred approach across the world. But  
19 it's very resource intensive. Bret talked about that.  
20 They need a technically sound screening tool to  
21 evaluate which new sources require -- are likely too  
22 small to require a more comprehensive photochemical  
23 model application. So, that's where it started.

24                   When the Australian office got the RFP  
25 and sent it to us, the guys in the bottle that do this

1 stuff that they don't understand, and they talked about  
2 well, we need to develop something like the Scheffe  
3 Tables. I think people in this group know what the  
4 Scheffe Tables are. They were developed by Dr. Scheffe  
5 in 1988 using your active plume model to come up with  
6 the VOC NOx screening for ozone increments. Six months  
7 later, he completely disavowed ever developing them and  
8 it was only years later that people came back to say,  
9 you know, Rich, they're using -- can you explain these  
10 Scheffe Tables. And he immediately started writing  
11 letters saying, don't use it -- don't use it -- don't  
12 use it. And so, they mentioned that and now we  
13 actually had some of those letters in our proposal's  
14 appendix saying, don't use this approach.

15                   So the methodology was that we first  
16 reviewed literature, identified defensible methods  
17 since EPA hasn't put ozone in AERMOD yet, picked  
18 photochemical modeling.

19                   Roger, you're supposed to laugh.

20                   We modeled several prototype new sources  
21 using the photochemical grid model. In this case, we  
22 used CAMX for reasons I'll explain in a second. And  
23 then we used social city method which is a higher  
24 order, decoupled direct method and CAMX developed a  
25 parametric model of the prototypical source impacts.

1 The ozone pack of the source was a function of the  
2 source's NOx emissions, VOC emissions, and the source  
3 location.

4           And then we implemented this parametric  
5 equation in a spreadsheet, an Excel spreadsheet. It  
6 can run on Windows. And that's developed a screening  
7 tool. And then with the New South Wales folks, they  
8 developed criteria to evaluate the impacts using a  
9 tiered approach where if you can show the emissions are  
10 too small to cause an impact or that this level one  
11 screening uses parametric approach is less than a  
12 significance threshold. So, they pick -- then you're  
13 presumed not to have a significant impact and you can  
14 build your new source. Whereas, if it goes above their  
15 significance thresholds, then you need to go back, go  
16 and do a full blown photochemical model application  
17 what the ozone impacts of that source will be.

18           Okay, so this is the Sydney Greater  
19 Metropolitan Area. The domain is a three kilometers  
20 domain. 25 verticals up to 8,000 meters. Two episodes  
21 were run. December 2003 and January 2004. That's two  
22 months' episodes. That's Australia so summer is in  
23 winter or however it works. The other episode is  
24 December 2004 and January 2005.

25           I used CAMX version 5.3. You see the 05

1 chemistry. The meteorology comes from the Australian  
2 model. Met model and air pollution model called TAPM.  
3 The air pollution model is what it stands for. That  
4 may be presumptuous of me.

5           The emissions are the anthropogenic  
6 emissions from the Office of Environment and Heritage  
7 and then we ran the MEGAN, the biometric emissions  
8 model, to get the biogenic emissions. The boundary  
9 conditions for that domain was from the Mozart Global  
10 Chemistry Model.

11           To look at these sources, we divided up  
12 the area into these five different locations and since  
13 we had to pick a source location for those five  
14 locations, we used the emissions weighted centroid of  
15 each one of these five locations. The five locations  
16 is Newcastle, I think in the North. Wollongong in the  
17 south. Sydney and for Sydney we had an east, west,  
18 central, and west. And those little blue dots are the  
19 emissions weighted centroids of each of those areas.  
20 And then we looked for the nearest industrial area to  
21 that location because in some case they ended up being  
22 over the water and we figured that wasn't likely.

23           For each one of these prototypical  
24 sources, we had combined VOC NOx emissions of 500  
25 tonnes per annum. Tonnes are metric tons and annum is

1 a year. It's metric tons per year. And we had a VOC  
2 NOx emissions ratio that is 1.24 and then the stack  
3 parameters we picked to essentially release the -- have  
4 minimum plume rise, release these emission source near  
5 the ground to get maximum ozone impact.

6           Okay. So, high order B coupled direct  
7 method is a sensitivity method that's one of the  
8 probing tools in CAMX and it's like the D coupled  
9 direct method only it has higher order terms to  
10 describe the effects of VOC and NOx on ozone. You  
11 think about DDM, you think it's like Taylor's theorem  
12 of linear -- you have a curve of ozone that's linear  
13 approximation, but with these higher order terms we are  
14 able to fit the parameters and so the bottom shows that  
15 the change in ozone is a function of all of these  
16 derivatives of S1 through S2. First order and second  
17 order derivatives and X -- the equations are NOx  
18 emissions and Y is the VOC emissions. So, you run each  
19 DDM on each one of these prototypical sources and you  
20 get this parametric equation to describe it.

21           And the way that's done is we look at  
22 all of the days in those two month periods and pick  
23 high ozone formation days that satisfy certain model  
24 performance requirements and then we pick the highest  
25 sensitivity coefficients from those days for each one

1 of those sources. So, you're getting kind of a worst  
2 case day to get this ozone increment.

3                   So, doing this we evaluated the  
4 parametric equation by doing brute force runs where we  
5 run the model with different sources and we use sources  
6 at the same strength, 500 tonnes per annum, and then we  
7 did ten times that and then 25 times that because with  
8 the sensitivity tests, as you go away from what you  
9 ran, your model may deviate from the brute force and so  
10 one times NOx and VOC, you'll see ten times, and then  
11 25 times.

12                   So, we use that to evaluate it and the  
13 example here is a HDDM using a parametric equation for  
14 a source in one of the domains on the left. And then  
15 the brute force we did zero out run for the Central  
16 Sydney source and you see the location there on the  
17 right. You see the pattern matches fairly well for the  
18 500 tons per year source. Maximum is .23 ppb versus  
19 brute force of .25. Then, even when multiplied by 25,  
20 these parametric equations are developed under a 500  
21 ton per year source, multiply it -- we put in 25 times  
22 the emissions and we get values that are also fairly  
23 close patterns are very close to using the brute force.

24                   So, we're trying to look at what is the  
25 range of this parametric equation? How high of

1 emissions is it still valid? We kind of say that 25  
2 times it still looks valid.

3                   And then here's another way of looking  
4 at the valuation of the parametric equation of the  
5 increment of ozone by HDDM on the left axis and then  
6 the brute force ozone on the right axis. Looking at a  
7 combine VOC NOx sources, this is ten times the initial  
8 500 tons emissions. An only NOx source in the middle.  
9 Then only VOC source. It's not surprising that these  
10 parametric equations work better with VOCs than NOx  
11 since NOx chemistry is much more complicated.

12                   So, we had fairly good agreement and the  
13 differences are within about five percent of what brute  
14 force gives us in parametric equation up to about 25  
15 times the original source that was done.

16                   So, the fact was that -- they're  
17 considering for evaluating ozone impacts is what's the  
18 magnitude of the source impact? Is the source located  
19 in the ozone monitoring attainment area? And then  
20 sources, of course, must satisfy all of the regulatory  
21 requirements which I don't know what they are in  
22 Australia, but I'm sure they're -- they have other  
23 criteria.

24                   So, the preliminary results of the tests  
25 in the New South Wales Office has developed a

1 significant impact level where if they do this level  
2 one screening and the source impact is less than .5  
3 ppb, they figure it's not measurable and so you satisfy  
4 the level one screening analysis and you're done. You  
5 can build your source as long as you satisfy everything  
6 else. And then there is a maximum allowable impact  
7 level. And for non-attainment areas they picked one  
8 ppb. So, if you're above .5 ppb but less than one ppb,  
9 you satisfy your requirement.

10                   And for attainment areas, they looked at  
11 the difference between the maximum ozone is to the  
12 standard and you got, you know, you've got -- you blow  
13 the standard by so much and you get 25 percent of that  
14 to use up by that one source. So, if the standard is  
15 80 ppb and the background ozone is currently 60 ppb,  
16 you've got 20 ppb to go and you get 25 percent of that  
17 and so you get a 5 ppb. So, if your source's level one  
18 screening is less than 5 ppb, then you can build the  
19 source.

20                   So, if the source impact is below the  
21 maximum impact level, you can build. Level one  
22 analysis satisfied and you can do it. If you go above  
23 it, then you need to go to level two which involves  
24 doing a site specific photochemical model application  
25 of that particular source using a model like CAMX or

1 CAFM or CMAQ.

2                   Okay, I'm not sure if you can see this,  
3 but -- so you start up here and there is two pathways.  
4 One is for attainment areas. One is for non-attainment  
5 areas. The first thing you do is look at the emissions  
6 of the source. If the emission is less than certain  
7 thresholds, the NOx emissions plus VOC emissions is  
8 less than a certain threshold, then you're off. If  
9 your attainment area is less than 90 tons per year,  
10 then you just need to go to the best model practice.

11                   The second screening is the level one  
12 screening with your less than .5 ppb deciview. And  
13 then you move it. You keep on moving down and you do  
14 your level one screening. Are you above the maximum  
15 impact level for the attainment area? If you do, then  
16 you keep moving down and then you're eventually do that  
17 and you don't satisfy any of these things, you move on  
18 to the level two screening which is a full blown  
19 photochemical model application. But I don't think you  
20 can see any of that because I can't see it.

21                   The screening tool is in a spreadsheet  
22 and what you do is you input your source inputs as a  
23 fraction of the nominal source prototype and you tell  
24 it whether it's an attainment area or non-attainment  
25 area and you give it the baseline ozone and it tells

1 you what your maximum allowable increment is. This is  
2 a test source that was applied for the original  
3 prototype source because the emissions are the NOx and  
4 VOC are the same as the test source. Then you press  
5 the go button and it gives you your increment. In this  
6 case it's .74 ppb which is less than the maximum  
7 increment back level of 7.8, so this source would pass  
8 the level one screening and therefore you would not  
9 have to go to the level two and do a full blow  
10 photochemical model application.

11 Now, for the -- was also ran HDDM  
12 getting sensitivity coefficients out for each of the  
13 individual VOC species. And the one below I showed had  
14 defaults speciation which is kind of the default  
15 overall sources. Here, you can put in all the species  
16 -- the explicit species of your source and this is the  
17 way they want you to run it. And it calculates the  
18 sensitivity coefficients for VOC individual species  
19 because there is a wide range of reactivity for these  
20 sources and so a lot of alkanes or something is one  
21 thing. If you have a lot of alkenes, it could be  
22 totally different and make a lot of ozone.

23 This is an example on the bottom of the  
24 different reactivity coefficients where you can see the  
25 05 species. You put in all the individual species.

1 You see the 05 species and you can see the actual  
2 things like alkenes; ethane, olefin, isoprene are much  
3 higher than other species like alkanes like paraffin  
4 and some species like toluene have a negative ozone  
5 reactivity. Increasing toluene actually decrease  
6 ozone. These reactivities actually are tailored  
7 towards each one of those five locations that we have.  
8 The Newcastle, Wollongong, and the three Sydneys. So,  
9 the speciation reactivity is different in those areas.  
10 So, you have locational specific reactivity  
11 information.

12                   So, the summary is that we developed a  
13 sufficient screening method for screening tools for  
14 Sydney. It's very location specific. It's using a  
15 location specific photochemical model application. We  
16 divided up into sub-regions based on where we think the  
17 chemistry would be different. We think it's  
18 scientifically defensible and robust. We have, like I  
19 said, location specific speciation VOC sensitivities  
20 and we find the range of applicability. I think I  
21 didn't mention that flowchart because I couldn't read  
22 it, but if your emissions are higher than that 25 times  
23 that source -- test source, then you immediately drop  
24 down to level two to the explicit application of the  
25 photochemical model. So, there's a range of

1 applicability of the screening. So, if the emissions  
2 are really high, you've got to run the model for that  
3 source.

4                   It's suitable for smaller sources.  
5 That's what we're focusing on. And then you use your  
6 resources, your photochemical modeling tool to focus on  
7 the big sources. There's no reason you can't apply  
8 this general technique to other regions. Of course,  
9 other jurisdictions will want to have other screening  
10 and significant impact levels and maximum achievable  
11 impact levels. But you have to redo the photochemical  
12 model run with HDDM specific for that region and come  
13 up with new coefficients.

14                   So, anyway, the framework is there.  
15 It's developed for local standards. It's not yet  
16 finalized. I think if -- the idea of what a  
17 significant ozone impact is something that they're  
18 wrestling with. I think we're doing the same thing  
19 here. But there is no reason why it can't just be  
20 adapted for new locations.

21                   So, I'm done.

22                   **MR. BRIDGERS:** Thanks, Ralph, for that  
23 presentation.

24                   **MR. FOX:** So, I would just like to thank  
25 all the speakers today and yesterday. We've had a lot

1 of information flowing. Hopefully, you all stuck  
2 through the first two days. We have the public session  
3 tomorrow and so I would just say that as a reminder of  
4 the process and the like that I talked about this  
5 morning, all I wanted to do is just reinforce that  
6 given all the information flow and the like that your  
7 comments are critically important in terms of providing  
8 us with information about what you've seen.

9 I'd also like to emphasize that given  
10 the constraints that we all have, if there's any  
11 priority that you see in terms of the items that are of  
12 most concern to you; either your industry, your  
13 particular interests, and the like. That would be very  
14 useful to get comments for us to get in this context of  
15 this conference.

16 As I said, we will be summarizing those  
17 public comments and either providing our internal  
18 priorities or a reflection of the priorities that we  
19 saw in those comments from you all and others.

20 The comment period has been extended or  
21 will be extended until the end of April. So that will  
22 hopefully facilitate a review of a lot of the  
23 information that has been provided. We recognize that  
24 there has been quite a bit and the reports are now up  
25 on SCRAM and the presentations that were provided in

1 these two days as well as the reports that are still  
2 due up on SCRAM by the end of the month or early April.  
3 Hopefully, there is sufficient time to provide those  
4 comments.

5           In the context of the PM2.5 guidance and  
6 even in other situations, that doesn't slam the door,  
7 hopefully, and we do expect to continue to use existing  
8 avenues of communication and coordination with you all  
9 so that there can be a continued evolution of the  
10 digesting and information sharing and further  
11 coordination on activities and the like.

12           I recognize that there may be some  
13 things that you all have seen and hear here that you  
14 may want to be a priority and not just a priority in  
15 the context of updating Appendix W, but also maybe  
16 providing updated guidance and the like. So, to the  
17 extent that there are those types of items that would  
18 be very important to know so that as we engage in the  
19 next steps after this, we're looking at a two-pronged  
20 attack in terms of looking at the feasibility and  
21 suitability of taking some of these things and  
22 improving upon the existing guidance as well as looking  
23 down the road and what we need to do to get where we'll  
24 need to be in time for the 11th Modeling Conference.

25           And I would just also reinforce the

1 suggestion of a specialty conference or other types of  
2 avenues for us to get together either broadly as a  
3 community or in specific sectors or certain interests  
4 in late 2012 or early 2013 so that we can continue to  
5 have the dialogue and actually reserve time for  
6 probably more detailed discussions at those times with  
7 planned activities in the interim such that we can then  
8 deliver results and compare things at those times.

9           So, we're looking forward to engaging  
10 with you all throughout this process. We're committed  
11 to undertaking both in new guidance where appropriate  
12 and looking forward to modifications to Appendix W. I  
13 think in a lot of the evaluations will be critical.  
14 The screening tools and other types of approaches, you  
15 know, just as a reminder, you know, updating Appendix W  
16 to address chemistry and the like. We're going to have  
17 to be pragmatic in looking at that and doing that and  
18 provide techniques or tools, short of full scale  
19 modeling in some cases. That may be a viable option  
20 for use and so please consider those things as well.

21           I think we're going to have a question  
22 and answer session so, I will turn that over.

23           **MR. BRIDGERS:** If we could get the  
24 speakers back up here from the late afternoon session,  
25 not that we need the slide, but it's there. So, Bret

1 and Tom and Kirk and Jim.

2                   And again, if you could announce who you  
3 are.

4                   **AUDIENCE MEMBER:** Mark Bennett with CH2M  
5 HILL.

6                   This is not so much a comment, but a --  
7 or not so much a question as a comment in response to  
8 something that Tyler just said in terms of specialty  
9 conference and to continue cooperation and coordination  
10 between the modeling groups and the regulated community  
11 and the EPA. So, I'm going to represent in this  
12 comment as chair of AB-3, Committee of Air and Wind  
13 Management Association.

14                   We're having a meeting at the Courtyard  
15 Marriott directly after this to talk about specialty  
16 conference and coordination. Any AB-3 members are  
17 welcome to attend. See me if you didn't get the email  
18 and anybody who is really interested in becoming an AB-  
19 3 member, maybe we can do something about it and make  
20 you an honorary one in the meantime.

21                   **AUDIENCE MEMBER:** Are we allowed to  
22 bring beer?

23                   **MR. BENNETT:** I have the liquid  
24 refreshments covered.

25                   **AUDIENCE MEMBER:** I am Biswanath

1 Chowdhury from Sage Management and we are developers of  
2 SCICHEM, so I just wanted to comment on Jim Kelly's on  
3 ozone rings.

4                   So, you can get the ozone rings, but the  
5 default that is a splitting criteria for the puffs, so  
6 if you change the criteria then you'll get a lot more  
7 puffs and then it resolves the ozone wings. I just  
8 wanted to comment on that.

9                   **MR. KELLY:** Would that configuration  
10 cause problems if we wanted to do long annual time  
11 simulations?

12                   **MR. CHOWDHURY:** Yes. If you have more  
13 number of puffs, then it takes longer to run.

14                   **MR. KELLY:** But for these specialized  
15 aircraft campaigns, that would be the way to go?

16                   **MR. CHOWDHURY:** Yes. And Nouri Galani  
17 from Union City, Alabama. He did a study. He did work  
18 on ozone rings using SCICHEM.

19                   **MR. KELLY:** Thanks.

20                   **AUDIENCE MEMBER:** Bob Paine, AECOM. I  
21 have a question for Ralph.

22                   On the long range transport evaluation,  
23 the long range transport models now are typically used  
24 for class one assessments for distances 50 kilometers  
25 and up and I noticed that the models were all compared

1 to much further distances and the Great Plains and  
2 Savannah River Lab were not used for the model inter-  
3 comparisons and I was wondering why those were omitted?

4 **MR. MORRIS:** Well, I was limited to what  
5 runs were done and EPA did plenty of runs. There's no  
6 shortage of runs, but those experiments were limited to  
7 just two ARCs of receptors and they were focusing on  
8 looking at the changes in CALPUFF performance from the  
9 1998 study to current study. The other two studies  
10 have a much higher density of receptors and for the  
11 ETEX, we did look at the -- we were concerned about the  
12 long distance because we were looking at distances of  
13 500 or 1,000 kilometers downwind in addition to close  
14 to the source. When they did look at model performance  
15 close in and the evolution of the statistics, some, and  
16 they didn't change that much. The models didn't  
17 perform better closer to the source.

18 I think the main thing was just resource  
19 restraints.

20 **MR. ANDERSON:** I can probably add since  
21 I was the perpetrator of the problem.

22 There's a number of practical  
23 considerations. The first one is that -- and Joe,  
24 please tell me if you did get all that, I believe there  
25 actually were model inter-comparisons on those other

1 experiments, at least for the Great Plains Tracer  
2 experiment.

3           Ralph will tell you that in the flurry  
4 to try to get report together, we didn't have time to  
5 compile all the results and everything else, but I do  
6 believe that there were comparisons of all of the  
7 various models that were involved in the six study or  
8 the six model comparison.

9           For Great Plains Tracer experiment, the  
10 first problem is that it's my judgment that those two  
11 experiments, there is limitations with each of those.  
12 I think the Great Plains Tracer experiment, I think, is  
13 a very useful one, but the Savannah River one, I really  
14 question the usefulness of it. That's the first thing  
15 there.

16           The second aspect of it is that while  
17 there are results for the Great Plains Tracer  
18 experiment, one of the things is that we have to go  
19 back and do diagnostics on it because the approach that  
20 EPA took in 1998 was to create a 12 hour integrated  
21 average across that six, the 100 -- or in the case of  
22 the 100 kilometers ARC, it was a three hour integrated  
23 average and for the 600 kilometers ARC, it was a 12  
24 hour integrated average. Actually, when you go back  
25 and you look at the performance or you go back and look

1 through the actual observational database, what you'll  
2 find is that there is an unexplained second occurrence  
3 that occurs. Essentially where the Tracer cloud  
4 apparently shows up at somewhere 24 to 36 hours after  
5 the release, shows back up on the 600 kilometers ARC.  
6 So, there is a question there about all of the models  
7 were evaluated against that first transit across the  
8 ARC, but none of the models were including CAMX were  
9 able to pick up that second one. As a result of that,  
10 we needed to go back and look at to see whether or not  
11 the positioning of the 12 because when I did the MM5  
12 modeling for this one, it was initialized within EPRI  
13 analysis data and so those that are familiar with that  
14 it's a two and a half degree by two and a half degree  
15 every six hours.

16           The difficult is that you don't want to  
17 take something that starts at a two and a half degree  
18 and next go right down to a 36 kilometers. So,  
19 standard procedure was to start with a 108, then go to  
20 a 36, then go to a 12.

21           We were concerned about the fact that  
22 when you're using a single nest to represent the  
23 meteorological field, whether or not that 12 kilometers  
24 domain was large enough to capture what apparently  
25 looks like the recirculation on that and so none of the

1 models on the Great Plains Tracer experiment, when you  
2 look at it from the ATMEs framework where you weren't  
3 looking at that 12 hour integrated average, never  
4 picked up that second wave of Tracer. It was like an  
5 ordered magnitude smaller than the first wave that  
6 crossed the ARC, but it raised questions as to whether  
7 or not the 12 kilometers was sufficient, whether it was  
8 sufficiently large to capture if there was  
9 recirculation occurring. So, that was something that  
10 we do need to go back and look at.

11 **MR. PAINE:** One other quick comment.

12 The ratings of the models were like this  
13 model won and this model lost, but the Mississippi  
14 Primary last night, I think the candidates were within  
15 one percent of each other, so were they significantly  
16 different? Were the models significantly different? I  
17 have no idea.

18 **MR. ANDERSON:** And I think you need to  
19 take a step back and look at it -- you know Kirk made a  
20 very good point which is while we have presented  
21 presentations or information at prior conferences, this  
22 is a work in progress.

23 For example, the issue that Ralph  
24 mentioned with respect to use of fractional bias as one  
25 of the indicators in there, you know, where you get

1 that. What is developed -- when we did the evaluation  
2 paradigm, for example. When we tried to look at an  
3 evaluation paradigm, we did look at what tried to make  
4 the most sense given, as Tyler was talking about, the  
5 fit for purpose type of evaluation paradigm, but the  
6 issue becomes is that when you take somebody else's  
7 method off the shelf and you look at it and you try to  
8 use it within the context of a regulatory evaluation,  
9 not everything works out quite the same because the  
10 things that they've placed as an emphasis on those four  
11 broad categories and the metric that they used to  
12 represent each of those four broad categories may not  
13 be sufficient for that purpose. For a regulatory  
14 purpose.

15           Like we were saying, for regulatory  
16 application of a model as an example, the issue of  
17 fractional bias is we are concerned in a regulatory  
18 capacity, you're concerned that the model is -- that  
19 there isn't a systematic bias towards under-prediction  
20 and as a result of that fractional bias, when you look  
21 at the way that it was used within that rank metric, it  
22 takes the -- it takes the one minus the absolute value  
23 of fractional bias divided by two. So, it treats over-  
24 and under-prediction as the same. As a result of that,  
25 it's not a good -- for regulatory purposes, it's not a

1 good fit.

2           We learned about this after the fact.  
3 So, for example, we started going back and looking at a  
4 lot more of the work that, you know, Steve Hanna and  
5 Joe Chang have done with the boot statistics and  
6 looking at fractional bias false-positive, fractional  
7 bias false-negative, and then to start looking at  
8 confidence intervals to look at the statistically  
9 significance between those and so this is a work in  
10 progress.

11           So, you know, I think the point was in  
12 Tyler's presentation was the fact that there were a lot  
13 of lessons learned in the prior evaluations and one of  
14 them was that if you go back and you look at the  
15 results coming out of the Rocky Mountain Acid  
16 Deposition Model Project, basically what they did was  
17 they took all the models that were involved in that  
18 first eight model study that EPA did back in 86 and  
19 then they just weighted -- you've got issues of data  
20 organization. Pairing in time and space. Not pairing  
21 in time and space. They looked across each of the  
22 statistical categories and the data pairing and  
23 weighted them the same.

24           So, in that case, and I think, you know,  
25 Mesopuff and Mesopuff II were the models that were

1 involved. I think Joe probably remembers this because  
2 you were heavily involved in that. Mesopuff II was the  
3 best performing model for purposes of unpaired in space  
4 and time and ARM3, Ralph's model, was the best  
5 performing model for purposes of pairing in time and  
6 space and they were ranking 21 and 20.

7           The problem became then the fit for  
8 purpose which is, okay, and so that question is is that  
9 because you use for long range transport assessments  
10 for AQRVs in class one, you're very concerned about  
11 space time pairing. And so weighting the two the same  
12 in that context for regulatory applications -- when  
13 you're trying to decide which one is best for  
14 regulatory purposes, didn't do that.

15           So, this is a work in progress in trying  
16 to establish a paradigm that makes sense where no  
17 paradigm has existed and so we certainly -- I certainly  
18 hope that through the comment process during this  
19 period that if there are concerns about what was done,  
20 that those be brought forward, but bear in mind that  
21 that is a work in progress.

22           **AUDIENCE MEMBER:** This is Ron Lai from  
23 BOEM. I have a question for Ralph.

24           I looked at the met. It is 20 percent  
25 over the ocean.

1                   **MR. MORRIS:** I didn't understand the  
2 question.

3                   **MR. LAI:** I looked at the Australia  
4 study. The met. 20 percent is across the ocean. Is  
5 there a special approach to modify with respect to the  
6 ocean or no?

7                   **MR. MORRIS:** Well, as part of the sub-  
8 domains do go over the ocean and you might see high  
9 ozone over the ocean because of the reduced mixing.  
10 So, if the plume travels over the ocean, then we do  
11 account for that.

12                   **MR. LAI:** How do you account for that?

13                   **MR. MORRIS:** Well, it's part of the  
14 modeling domain.

15                   **MR. LAI:** The model, the meteorology  
16 accounts for that?

17                   **MR. MORRIS:** The TAPM model? The TAPM  
18 model, the meteorological driver is a fairly  
19 sophisticated prognostic model that incorporates  
20 observations if I remember right. I don't know how  
21 they ran it in this study.

22                   **MR. LAI:** Would you just use the  
23 meteorology model for the driver?

24                   **MR. MORRIS:** Yes. We didn't run the met  
25 model.

1                   **AUDIENCE MEMBER:** My name is Rick Graw  
2 and I'm with the U.S. Forest Service Air Quality  
3 Program.

4                   I have just a few comments to make as we  
5 start thinking about emerging models and techniques  
6 from the view of the U.S. Forest Service.

7                   One has to do with ozone. As we start  
8 thinking about the continued development of ozone  
9 models and how we might apply them perhaps beyond just  
10 a short term period in the urban areas, considering  
11 that a lot of the ozone metrics that the Forest Service  
12 uses are based upon other metrics that might be a  
13 sigmoidal weighted average over time for exposure and  
14 we have a number of additional metrics that aren't  
15 currently being considered in the output of these ozone  
16 models that I think would be really helpful for us and  
17 the regional modelers to help identify areas and see  
18 where the injury to vegetation is occurring as we  
19 continue to develop our understanding of air pollution  
20 effects on the ecosystems.

21                   So, that's a request issue. I'll move  
22 forward with the future development of these tools.

23                   Second has to do with deposition.  
24 Another request is I believe we're at a point and have  
25 been for quite some time where we could at least ARC

1 graphic clouds modeled fairly accurately in these  
2 models and cloud water deposition is of concern to the  
3 Forest Service and again, that's not currently being  
4 considered and I would like to see if or at least plant  
5 the seed so-to-speak in terms of consideration of  
6 including cloud water deposition into the future model  
7 developments.

8 Thank you.

9 **MR. BRIDGERS:** Thanks, Rick.

10 Other questions? This is the last  
11 chance because tomorrow it's all comment.

12 Well, I thank everybody again for  
13 sticking around this afternoon. If you stay around the  
14 campus too long, the gate over at Hobson Road closes at  
15 six, but I don't think that's going to be much of a  
16 problem right now.

17 Thank you again. I think we owe the  
18 speakers another round of applause. We will start at  
19 eight-thirty in the morning.

20 Have a pleasant evening.

21 (WHEREUPON, the conference was concluded.)

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CAPTION

The foregoing matter was taken on the date, and at the time and place set out on the Title page hereof.

It was requested that the matter be taken by the reporter and that the same be reduced to typewritten form.

- 1
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- 8
- 9
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- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25

0		
<b>0</b> 259:5	<b>100</b> 49:25 64:24	262:19 262:24
<b>0.1</b> 179:15	65:19 65:25	266:3 266:12
<b>0.2</b> 179:15	69:21 75:5 80:14	266:16 313:20
188:6 188:7	94:25 143:23	313:23 314:11
<b>0.4</b> 188:6	149:2 150:8	314:20 314:23
<b>0.75</b> 173:3	150:25 151:20	315:3 315:7
<b>02</b> 266:9	152:4 153:21	<b>12:40</b> 131:16
<b>05</b> 139:25	153:22 154:14	<b>120</b> 67:2 295:5
297:25 304:25	161:21 178:19	<b>12060</b> 75:7
305:1	180:14 242:11	<b>126</b> 132:16
	242:13 242:24	<b>12th</b> 95:2
	245:20 250:17	<b>13</b> 263:8 266:4
	250:17 253:23	<b>133</b> 161:1
	255:14 270:2	<b>135</b> 148:8
	295:4 313:21	<b>14</b> 3:3 113:17
	313:22	<b>140</b> 161:11 161:19
1	<b>108</b> 314:19	<b>15</b> 24:1 46:11
<b>1</b> 35:23 40:9	<b>10th</b> 3:2 10:5	51:4 73:13 73:17
100:24 111:5	20:11 25:1 30:10	146:7 178:3
139:24 140:1	56:23 132:15	178:4 217:18
141:5 149:4	<b>11</b> 74:17 75:24	<b>150</b> 64:20 64:22
150:10 150:11	250:25 263:8	143:2 143:23
153:8 153:9	289:10	<b>162</b> 50:7
153:10 268:23	<b>1100</b> 138:25	<b>165</b> 148:7
<b>1,000</b> 141:20	<b>11059</b> 75:8 198:20	<b>16th</b> 24:21
150:6 151:5	199:2 199:6	27:18 28:7
153:17 166:6	199:6	<b>17</b> 113:17
169:20 205:21	<b>112</b> 143:15	119:18 148:11
312:13	<b>11325</b> 75:8	151:23 153:21
<b>1,800</b> 151:2	<b>11th</b> 10:9 24:22	154:6 154:8
<b>1.2</b> 27:15	308:24	172:11
<b>1.24</b> 299:2	<b>12</b> 55:5 134:16	<b>172</b> 139:5
<b>1.28</b> 130:2 189:13	181:4 196:18	<b>18</b> 67:8 245:15
<b>1.282</b> 130:5	236:11 241:17	248:12
130:15	245:7 245:15	<b>18.3</b> 67:4
<b>1.5</b> 125:5 180:18	246:2 246:16	<b>1838</b> 152:6
<b>1.6</b> 180:3	246:18 246:22	<b>188</b> 140:11 141:11
<b>10</b> 50:24 105:25	246:22 247:1	<b>189</b> 140:11 147:4
110:11 124:2	248:11 248:16	
135:20	249:11 249:12	
<b>10,000</b> 50:8 143:4	250:25 250:25	
170:14	251:5 251:6	
<b>10:40</b> 93:21 93:22	262:15 262:15	

<b>1970s</b> 215:24	58:6 82:14 82:16	179:23 180:8
<b>1980</b> 242:10	108:22 131:15	211:12 262:10
<b>1980s</b> 155:2	135:20 162:2	<b>2012</b> 12:6 12:24
<b>1983</b> 229:3 243:17	162:4 162:13	22:14 309:4
244:11 244:13	166:25 167:18	<b>2013</b> 12:25
<b>1986</b> 223:3 241:14	167:20 168:15	13:12 309:4
<b>1988</b> 241:20 242:7	168:16 170:20	<b>2017</b> 212:13
296:5	242:18 254:19	<b>20ish</b> 3:23
<b>1990</b> 107:7 206:21	302:16 318:6	<b>20s</b> 51:5 82:17
<b>1991</b> 172:21	318:24 319:4	<b>21</b> 178:12 318:6
<b>1994</b> 241:24	<b>20.7</b> 66:24	<b>21st</b> 28:3
243:19	<b>20.8</b> 66:17	<b>23</b> 178:12
<b>1997</b> 23:8 23:10	<b>200</b> 133:3	178:22 300:18
<b>1998</b> 242:9 242:14	180:21 245:21	<b>230</b> 148:7
254:22 254:24	255:14 270:1	<b>23rd</b> 25:15 32:1
312:9 313:20	<b>2000</b> 23:21	<b>24</b> 27:15 178:23
<b>1999</b> 234:1 234:13	<b>2000s</b> 23:21	314:4
234:22 236:17	<b>2001</b> 75:3 236:21	<b>24-hour</b> 45:19
236:18 236:19	<b>2003</b> 219:22	47:8 64:19
278:6 279:4	297:21	65:4 75:20
<b>1-hour</b> 5:1 6:24	<b>2004</b> 297:21	<b>25</b> 3:23 65:7
7:13 40:4 53:7	297:24	65:18 66:21
94:10 94:18	<b>2005</b> 257:24	75:19 82:16
94:25 95:1	261:20 262:13	140:1 141:19
95:3 96:12	263:1 269:13	149:4 150:10
97:2 97:17 98:17	297:24	150:11 153:11
103:3 104:16	<b>2006</b> 23:23	249:5 297:20
107:13 110:13	234:2 257:24	300:7 300:11
111:24 112:9	261:20 262:24	300:19 300:19
118:1 119:13	263:7 265:11	300:21 301:1
125:23	266:4 270:22	301:14 302:13
<b>1st</b> 7:8 95:11	<b>2008</b> 24:3 28:6	302:16 305:22
111:4	<b>2009</b> 245:23 248:8	<b>26</b> 67:8 172:9
<hr/>	255:15	<b>260</b> 240:11
2	<b>2010</b> 24:23 25:7	<b>27</b> 113:12 133:19
<hr/>	25:7 25:16	<b>28</b> 61:1 133:19
<b>2</b> 35:21 35:23	27:8 29:8	148:6 169:7
35:23 105:14	29:25 45:9	<b>290</b> 143:14
105:14 105:16	95:2 96:16	<b>296</b> 137:13 137:14
105:17 153:11	<b>2011</b> 3:3 23:23	
178:22 179:18	25:1 172:1	
<b>20</b> 29:20 50:15		

<b>2nd</b> 244:13	262:16	178:19 195:6
<hr/>	<b>4.7</b> 292:4	207:1 207:4
3	<b>4.7.1</b> 236:23	256:21 270:2
<hr/>	281:4	311:24
<b>3</b> 27:15 310:19	<b>40</b> 38:1 38:9	<b>500</b> 144:7
<b>3.1</b> 266:9	39:23 40:2 45:23	146:15 169:25
<b>3.3</b> 236:22 279:23	50:4 50:5 68:10	181:10 186:4
<b>30</b> 3:5 16:22	<b>41</b> 50:7	286:22 289:12
73:22 108:22	<b>42</b> 24:12	298:24 300:6
135:20 179:21	<b>42y</b> 192:15	300:18 300:20
179:22 248:1	193:4 194:9	301:8 312:13
254:19	194:17	<b>50th</b> 169:21
<b>300</b> 137:18 139:22	<b>43</b> 139:17	169:24 170:11
140:4 140:7	<b>445</b> 144:9	170:11
140:22 141:5	<b>45-minute</b> 131:14	<b>57</b> 143:15
141:15 178:11	<b>46.8</b> 72:13	<b>59</b> 71:1
178:21 270:1	<b>48.5</b> 70:6	<hr/>
<b>30th</b> 11:15 21:15	<hr/>	6
<b>31</b> 72:15 245:3	5	<hr/>
246:14 289:10	<b>5</b> 35:21 35:23	<b>6</b> 25:6 133:5
290:14	57:20 141:20	133:11 148:25
<b>32</b> 139:16	146:6 149:4	149:12 156:13
<b>33</b> 144:17 215:2	150:10 150:11	266:9
215:5	192:7 302:2	<b>60</b> 16:21 187:18
<b>34</b> 70:24 72:7	302:8 302:17	302:15
<b>35</b> 23:25 65:6	302:18 303:12	<b>600</b> 242:11
66:17 148:16	<b>5,000</b> 159:25	243:4 254:22
154:20 240:12	170:20	255:1 255:5
<b>36</b> 236:9 245:6	<b>5.3</b> 297:25	313:23 314:5
246:2 248:17	<b>5.40</b> 236:23	<b>60s</b> 241:8
249:11 314:4	<b>5.8</b> 243:24	<b>65</b> 23:25 139:1
314:18 314:20	<b>50</b> 45:23 58:22	139:18 143:1
<b>365</b> 45:22	64:24 67:9 69:23	143:3 143:22
<b>375</b> 180:5	107:16 107:17	143:24 144:5
<b>38</b> 75:24	110:7 133:4	144:8 144:12
<b>381</b> 139:3	137:17 139:23	144:20 144:25
<b>3D</b> 294:20	140:4 140:7	161:22 289:11
<hr/>	140:23 141:13	<hr/>
4	141:16 159:25	7
<hr/>	169:19 170:1	<hr/>
<b>4</b> 35:21 73:13		<b>7.8</b> 304:7
245:15 246:2		<b>70</b> 65:16 71:3
		<b>70s</b> 149:20 241:8
		<b>74</b> 304:6

<b>75</b> 67:9 95:4 97:22 255:9 270:2 295:6	116:13 303:9	202:24 239:15 255:6 278:23 299:14 314:9
<b>780</b> 143:10	<b>905</b> 144:6	<b>Abo</b> 125:1
<b>7th</b> 75:25	<b>90s</b> 223:13	176:10 176:20 179:3 179:18 180:2 199:18
<hr/>	<b>90th</b> 170:9 173:3	<b>absent</b> 204:16
8	<b>91</b> 180:6	<b>absolute</b> 33:6 33:10 55:9 281:14 316:22
<hr/>	<b>930</b> 141:16	<b>absolutely</b> 78:24 197:24 256:18 274:23 275:2
<b>8</b> 173:11	<b>95</b> 188:20	<b>Abu</b> 179:8
<b>8,000</b> 297:20	<b>98</b> 161:20	<b>accept</b> 19:21 60:21
<b>8,760</b> 160:24	<b>98th</b> 45:8 45:10 45:11 45:19 66:16 66:24 69:5 69:11 70:2 78:20 81:15 81:16 82:1 82:2 82:11 82:12 82:15 83:4 83:11 94:25 103:12 111:21 112:11 177:20 177:25	<b>acceptable</b> 111:10 203:25 221:18
<b>8.1</b> 212:9	<b>99th</b> 78:19 78:19 83:5 95:4 103:13	<b>accepting</b> 171:13
<b>8.2</b> 212:9	<b>9th</b> 5:6	<b>accommodate</b> 35:2 160:7 216:21 217:1 277:8
<b>80</b> 149:2 150:9 151:3 243:16 243:23 245:6 248:17 295:6 295:10 302:15	<hr/>	<b>according</b> 263:24 271:6 278:13
<b>80s</b> 148:21 148:23 149:19 215:24 223:13	A	<b>accordingly</b> 5:13
<b>8-1</b> 42:21	<b>AB</b> 310:18	<b>account</b> 5:8 5:13 7:5 11:11 17:6 17:9 43:19 44:8 84:9 86:14 88:17 89:3 93:11 105:23 106:2 107:12 110:16 128:3 200:21 216:15 225:23 269:20 319:11 319:12
<b>810</b> 141:13	<b>AB-3</b> 220:1 310:12 310:16	
<b>82</b> 295:9 295:10 295:11	<b>ABC</b> 10:19	
<b>8-2</b> 42:21 54:22	<b>ability</b> 8:21 26:17 88:25 119:4 121:19 222:24 225:20 241:7	
<b>82.6</b> 70:2	<b>able</b> 13:10 14:14 26:3 26:18 28:22 28:24 49:20 86:17 88:6 89:24 89:24 97:13 103:16 160:7 160:10 194:20 200:9	
<b>83</b> 50:2 50:14		
<b>84</b> 295:10		
<b>85</b> 50:1 68:10		
<b>86</b> 317:18		
<b>89</b> 161:21		
<b>8th</b> 9:21		
<hr/>		
9		
<hr/>		
<b>9</b> 57:1 83:19 149:4		
<b>9/11</b> 23:23		
<b>90</b> 116:5 116:6		

<b>accounted</b> 35:15	269:15 273:16	127:10 127:14
68:15 105:22	295:18 313:21	127:16 128:6
172:23 283:22	314:7 317:21	128:8 128:21
293:1	319:4	129:8 129:13
<b>accounting</b>	<b>action</b> 24:25 25:6	129:17 129:24
70:11 71:8 71:16	25:12 45:10	130:6 130:11
110:5	<b>actions</b> 25:4	130:23 130:25
<b>accounts</b> 72:3	210:23	132:20 137:7
319:16	<b>active</b> 15:1 296:5	137:16 137:17
<b>accuracy</b> 119:5	<b>actively</b> 12:21	138:18 138:20
221:19	13:2 228:11	140:19 142:2
<b>accurately</b> 277:15	274:22	144:13 148:17
321:1	<b>activities</b> 308:11	158:13 164:24
<b>achievable</b> 306:10	309:7	165:23 167:10
<b>achieve</b> 68:9	<b>activity</b> 106:4	168:23 169:13
122:23	<b>actual</b> 45:14	180:24 183:24
<b>acid</b> 268:10	122:14 134:23	184:1 187:2
271:19 317:15	142:23 153:18	197:25 198:2
<b>acknowledge</b> 83:24	162:7 165:24	198:7 202:16
97:12 108:22	165:25 166:8	203:14 203:17
119:7 123:25	167:9 167:16	207:12 209:14
124:8 138:11	167:24 168:1	209:14 209:17
159:7 293:22	168:24 169:4	209:19 210:11
<b>acknowledged</b>	169:11 169:13	210:13 210:25
58:15	169:15 171:7	211:8 213:1
<b>acknowledging</b>	178:7 199:21	213:5 213:23
115:8	200:1 200:1	215:17 217:4
<b>acquire</b> 274:24	305:1 314:1	240:12 241:6
<b>acquisition</b>	<b>actually</b> 4:4 9:22	241:21 242:4
192:19	21:4 23:7 28:2	244:12 245:6
<b>across</b> 3:24	28:17 36:15	247:15 248:1
14:3 14:4 14:6	40:15 40:16 43:1	254:4 263:13
28:10 29:25	43:7 45:21 52:20	290:7 290:7
46:15 46:19 53:2	56:21 61:4	296:13 305:5
59:23 94:7 98:22	66:2 79:21	305:6 309:5
113:20 149:10	80:1 81:5	312:25 313:24
185:23 204:25	81:14 87:13 91:2	<b>actuals</b> 212:22
208:24 218:23	106:2 119:21	<b>adapt</b> 274:1 274:2
224:23 250:24	121:13 122:3	<b>adaptation</b> 275:18
252:3 262:1	123:17 123:18	<b>adapted</b> 306:20
268:18 269:7	124:16 125:7	<b>add</b> 6:12 45:11
	126:11 126:19	47:3 47:15 65:17
	127:7 127:8	67:12 72:25 73:6
		73:12 73:24

82:25 83:2 88:20	70:7 86:10 86:24	293:10
90:24 135:25	88:1 94:17 95:14	<b>advantage</b> 14:11
151:25 152:1	95:18 96:3	17:4 17:13 76:25
162:16 165:11	104:20 105:1	81:2 108:7
170:5 199:23	106:23 113:1	108:20 112:4
210:22 216:19	115:14 118:21	114:20 116:3
216:25 285:9	179:9 181:1	<b>advected</b> 278:13
312:20	220:11 221:12	<b>advection</b>
<b>added</b> 69:5 86:2	222:10 224:22	224:15 225:21
134:18 139:2	261:4 261:5	238:21
139:3 139:4	309:16	<b>advertised</b> 47:25
187:22	<b>addressed</b> 8:3	<b>advised</b> 107:5
<b>adding</b> 32:13	26:7 45:9 59:8	<b>advisement</b> 86:5
68:14 72:6 78:17	63:24 85:17	<b>advising</b> 93:14
78:19 82:11	102:9 104:4	<b>AECOM</b> 16:18 78:16
82:16 84:16	201:13 201:14	159:8 311:20
85:14 88:9	220:14 292:19	<b>AERMET</b> 75:8 90:12
134:12 136:15	<b>addresses</b> 175:12	<b>AERMINUTE</b> 70:18
143:9 231:1	<b>addressing</b>	74:4 75:8
235:17	18:20 87:3	75:18 200:23
<b>addition</b> 15:8	258:13	<b>AERMOD</b> 6:18
15:18 55:19 62:1	<b>adds</b> 123:23	7:18 9:22 9:24
158:15 163:25	<b>adequate</b> 79:8	32:13 33:17
182:8 204:12	<b>adequately</b> 40:5	34:25 38:13 39:6
210:22 219:23	40:10 201:7	40:23 41:15
229:8 230:18	210:4 210:9	48:21 52:14
235:15 236:19	239:12	54:24 75:7 87:20
312:13	<b>adjacent</b> 259:2	87:21 88:10
<b>additional</b> 8:2	<b>adjusted</b> 280:15	88:19 90:12
17:23 55:14 65:9	<b>administration</b>	92:14 93:10
96:2 96:13 97:20	274:21	93:14 96:24 98:8
98:2 100:5 104:9	<b>administrative</b>	99:5 99:23 99:25
112:24 132:22	10:22	100:1 100:25
134:11 135:6	<b>admit</b> 108:23	103:16 103:25
157:20 183:5	<b>admittedly</b> 112:1	115:1 115:18
191:21 226:11	<b>ado</b> 132:25 212:3	115:20 116:1
235:7 272:9	<b>adopt</b> 273:1	116:4 116:25
293:4 320:14	<b>adopted</b> 273:1	118:10 119:6
<b>Additionally</b>	<b>advance</b> 20:11	119:12 119:17
276:6	<b>advanced</b> 88:2	120:10 120:11
<b>additions</b> 211:1		120:15 121:7
211:7		121:9 121:16
<b>address</b> 5:12 6:22		
59:25 60:3		

121:24 122:1	131:24 132:3	127:13 127:23
122:2 122:7	257:4 282:7	130:15 230:9
122:8 123:22	282:11 283:12	267:18 301:12
124:5 125:4	284:16 286:12	<b>Agriculture</b> 219:3
126:8 126:11	309:24 321:13	259:14
126:16 126:19	<b>afterwards</b>	<b>Ah</b> 217:11
127:3 128:11	17:16 95:3	<b>ahead</b> 4:18
129:1 129:9	96:3 294:5	19:20 32:23
130:22 131:4	<b>against</b> 31:2	93:21 108:14
132:8 151:1	46:10 47:13	131:10 132:18
159:21 162:18	107:5 120:16	134:22 217:16
163:1 163:3	120:17 121:24	218:2
163:4 163:25	171:6 206:20	<b>aid</b> 25:4
164:2 164:3	229:25 234:13	<b>air</b> 3:2 23:8
164:8 164:23	265:1 279:8	31:22 41:23
165:7 165:8	314:7	77:21 103:23
165:23 165:25	<b>agencies</b> 20:14	137:21 139:22
167:9 167:10	22:12 28:13	141:24 148:23
167:15 168:23	28:13 28:21	153:6 156:4
169:4 169:4	28:24 101:4	187:13 218:25
169:12 169:15	231:20 258:21	229:14 229:14
171:1 171:2	258:21 260:1	257:7 257:8
175:19 179:4	260:2 273:8	257:24 258:3
179:6 186:14	273:9 274:19	258:13 259:4
186:16 188:14	<b>agency</b> 3:1	259:6 259:10
188:22 189:12	10:23 12:17 19:7	259:17 259:20
190:12 198:9	23:9 28:11 29:13	260:12 260:13
215:21 230:25	30:3 36:13	260:19 261:24
259:8 296:17	40:8 52:25 176:2	261:25 262:14
<b>AERMOD's</b> 195:17	184:12	263:2 272:22
<b>aerosol</b> 278:24	<b>agenda</b> 3:23	276:15 285:19
<b>AERSCREEN</b> 210:14	3:25 4:11	289:22 290:18
<b>AF&amp;PA</b> 58:11 76:14	14:18 132:12	298:2 298:3
<b>affect</b> 268:7	132:25 191:15	310:12 320:2
<b>affected</b> 189:24	<b>aggregate</b> 17:15	320:19
<b>affectionately</b>	<b>ago</b> 75:24 91:20	<b>aircraft</b> 286:22
25:19 85:24	108:22 124:5	288:2 289:2
<b>afforded</b> 175:16	214:20 256:8	311:15
<b>afternoon</b> 8:10	<b>agreed</b> 57:9 121:9	<b>aircrafts</b> 185:18
8:14 9:6 17:25	128:6 259:16	<b>airplanes</b> 233:19
47:20 52:19	259:20	<b>airport</b> 122:22
53:14 78:15	<b>agreeing</b> 57:24	201:3 201:6
87:24 89:20 98:3	<b>agreement</b> 5:11	<b>AIWG</b> 91:11 96:6

132:8 133:6	24:16 310:21	171:24 172:24
134:8 138:12	<b>allows</b> 112:4	173:1 173:2
145:16 146:12	290:19	173:4 173:6
156:6 157:15	<b>alluded</b> 63:7	173:22 174:3
158:7 158:12	71:20	174:5 174:8
<b>Alabama</b> 311:17	<b>ALMA</b> 220:1	174:10 174:13
<b>alarm</b> 253:7	<b>aloft</b> 266:20	175:11 176:5
<b>alarming</b> 72:17	266:24 266:25	176:16 184:15
74:24	267:12	185:3 190:1
<b>alarms</b> 253:9	<b>already</b> 10:12	207:25 210:9
<b>Alaska</b> 121:25	20:8 20:23 21:14	283:2 285:19
124:3 124:8	25:13 25:14	291:14 292:16
185:20 186:1	28:21 28:24	<b>American</b> 58:10
188:9	38:10 40:2	58:20 183:20
<b>albeit</b> 61:21	40:2 40:3	<b>ammonia</b> 51:6
<b>algorithm</b> 125:12	40:17 40:23	268:6 271:3
<b>align</b> 18:15	47:18 49:4 49:10	272:8 272:10
284:17	51:17 51:21 61:5	<b>ammonium</b> 51:8
<b>alike</b> 163:3	61:12 68:2	271:2 271:10
<b>alkanes</b> 304:20	85:5 85:6	<b>Amoco</b> 199:19
305:3	94:15 131:21	<b>among</b> 163:14
<b>alkenes</b> 304:21	131:22 133:12	258:20
305:2	143:6 143:7	<b>amount</b> 18:6
<b>allow</b> 11:16 11:17	150:17 157:3	22:7 72:7 72:8
11:20 13:18	184:13 186:1	73:18 133:12
86:18 86:23	191:8 230:13	152:16 175:4
95:13 95:24	233:3 286:9	184:20 185:5
98:11 208:25	<b>alter</b> 96:18	193:19 193:19
213:18 232:21	100:16	197:11 205:20
260:5 274:24	<b>alternative</b> 64:10	241:1
280:11	79:7 160:21	<b>ample</b> 67:10
<b>allowable</b> 42:22	220:19 227:25	<b>AMR</b> 173:8
55:2 64:7	<b>altitude</b> 286:21	<b>AMS</b> 223:15
119:9 122:20	<b>am</b> 4:6 60:3	<b>analogous</b> 35:20
166:11 212:10	74:1 131:22	<b>analyses</b> 17:23
215:19 302:6	206:19 212:17	65:11 67:17
304:1	310:25	68:21 76:9
<b>allowables</b>	<b>ambient</b> 7:15	85:5 92:14 95:24
54:22 212:21	41:23 77:21	102:25 103:18
<b>allowed</b> 23:16	97:21 101:25	104:1 106:19
	119:5 137:21	171:25 172:5
	139:22 141:24	172:10 173:11
	153:6 156:4	

176:2 212:20 219:1 219:5 219:11 221:11 224:6 224:7 224:9 224:25 259:10 259:17 259:21 259:23 260:5 260:12 273:23  <b>analysis</b> 31:9 31:23 34:1 34:3 34:19 35:20 37:2 37:3 37:4 37:7 37:15 37:18 39:25 41:25 46:23 47:25 48:25 49:3 51:20 56:15 56:22 63:12 65:2 86:18 90:20 92:17 103:7 106:24 107:19 108:1 115:6 134:9 134:10 153:8 154:22 164:21 169:18 182:6 204:3 208:2 211:21 212:6 212:23 214:23 229:10 245:13 257:12 258:1 258:2 262:3 262:3 263:17 263:18 264:25 265:10 267:14 271:22 276:9 302:4 302:22 314:13  <b>analyze</b> 98:17 258:4 259:5  <b>analyzer</b> 177:2 194:22 197:12  <b>analyzers</b> 194:22 194:25	<b>analyzing</b> 101:23 133:15  <b>and/or</b> 62:6  <b>Anderson</b> 200:17 201:10 240:15 257:2 257:3 262:23 271:17 312:20 315:18  <b>angst</b> 103:18  <b>angular</b> 289:6  <b>announce</b> 310:2  <b>annual</b> 13:7 13:14 23:10 24:1 27:14 42:11 45:14 45:17 46:3 46:6 46:9 46:14 47:1 48:11 48:13 95:1 97:12 97:25 100:23 102:13 104:15 125:24 162:20 172:24 173:4 261:20 263:22 264:4 265:11 266:2 266:9 273:10 273:14 311:10  <b>annum</b> 298:25 298:25 300:6  <b>answer</b> 10:17 19:10 57:15 57:19 67:15 79:1 81:23 118:9 132:3 151:16 151:18 159:11 172:19 182:12 198:13 202:19 210:19 270:4 275:20 309:22  <b>answers</b> 56:7 57:25 58:8 74:25 237:16	<b>anthropogenic</b> 236:20 298:5  <b>anticipate</b> 13:12 18:21 39:11 76:23  <b>anybody</b> 24:20 50:16 176:25 197:5 310:18  <b>anybody's</b> 17:21  <b>anything</b> 4:6 38:2 40:18 40:18 76:12 85:20 90:14 115:21 150:15 194:19 216:1 248:12 248:13 255:11 255:23 276:3  <b>anyway</b> 108:14 133:7 141:12 149:16 154:22 157:24 190:2 240:8 240:13 240:17 262:23 294:6 295:15 306:14  <b>anywhere</b> 125:11  <b>APCD</b> 92:11  <b>API</b> 185:16  <b>apologies</b> 4:18  <b>apologize</b> 32:19 78:12  <b>Appalachian</b> 243:18  <b>apparently</b> 314:4 314:24  <b>appear</b> 252:4  <b>appears</b> 287:20  <b>appendix</b> 4:14 5:3 5:12 5:13 5:24 6:22 7:3 7:10 9:23 9:24 10:2
---	---	---

26:21 32:15 35:2	225:14 234:14	261:23 276:25
35:12 35:22	252:2 266:12	<b>appreciate</b>
42:20 45:22	275:13 291:3	14:20 60:13
59:24 89:3 96:12	295:23 297:16	68:18 76:17
96:19 96:24 97:2	302:24 303:19	76:24 79:19
98:11 99:2	304:10 305:15	83:16 88:24
100:17 100:22	305:24 316:16	114:7 115:11
108:25 109:8	<b>applications</b>	138:16 158:5
109:20 111:19	47:22 54:1 56:17	206:3 217:13
111:20 160:1	59:15 74:9 99:22	218:4
166:3 207:10	218:19 226:2	<b>appreciated</b> 3:7
207:11 209:8	227:12 272:21	30:4 94:4
209:21 210:5	273:12 277:19	<b>appreciates</b> 60:5
212:6 212:9	277:21 277:24	<b>appreciation</b>
212:15 213:7	278:1 293:19	15:16 57:24
213:10 213:11	318:12	<b>approach</b> 7:5 7:12
213:19 218:14	<b>applied</b> 52:12	7:14 7:14
219:16 220:11	53:2 77:2	21:24 26:11
220:17 296:14	119:8 126:20	31:22 32:10
308:15 309:12	179:5 187:19	33:24 34:21 39:8
309:15	277:21 280:22	45:4 49:21 51:12
<b>applause</b> 217:15	304:2	52:24 69:8
321:18	<b>applies</b> 97:21	70:5 72:15 78:22
<b>apples-to-</b>	220:19	82:9 84:24 88:11
<b>apples</b> 187:21	<b>apply</b> 25:9 33:3	92:13 93:1
<b>applicability</b>	52:14 60:3	97:2 97:5 98:3
28:9 96:11	61:8 62:2 68:3	101:21 109:11
97:8 99:14	68:6 77:10	111:7 111:7
305:20 306:1	117:12 117:13	112:15 113:14
<b>applicable</b>	121:16 164:6	113:16 115:8
27:22 62:21 97:2	207:3 207:6	115:9 125:12
97:19 98:1	229:24 230:3	130:24 159:17
100:24 129:5	232:7 234:18	160:18 162:9
129:6 269:5	261:14 284:25	165:10 172:5
295:3	306:7 320:9	175:17 184:19
<b>applicant</b> 176:1	<b>applying</b> 15:25	184:20 202:13
<b>applicants</b>	54:12 68:13 73:1	202:25 204:13
23:18 52:12	114:5 114:19	204:20 204:23
97:13 172:3	142:1 162:22	206:6 206:10
<b>application</b> 36:18	230:25	213:2 213:4
71:11 98:21	<b>apportionment</b> 5:7	213:9 213:25
107:6 107:16	33:4 54:3 235:16	220:18 223:12
115:2 205:16	235:17 237:22	230:23 230:23
206:21 208:4	238:4 238:17	230:24 231:15

232:15 232:19	<b>approved</b> 36:12	147:18 147:19
233:21 234:17	93:4 221:16	147:22 148:1
235:5 235:8	<b>approving</b> 221:19	148:2 155:3
237:13 260:10	<b>approximation</b>	185:19 190:3
273:2 290:24	299:13	206:24 206:25
295:18 296:14	<b>April</b> 4:22	207:4 207:5
297:9 297:11	11:15 11:16	207:7 208:16
313:19 319:5	11:24 13:13	217:6 259:23
<b>approaches</b>	18:12 21:15 22:6	262:17 263:5
34:14 55:16	95:2 234:9	266:6 267:3
70:12 72:3	307:21 308:2	269:17 295:3
73:9 73:11 77:20	<b>APT</b> 236:5	297:19 298:12
79:7 84:23 98:20	<b>AQRV</b> 11:22	298:20 301:19
115:13 171:5	224:6 273:23	303:9 303:15
197:6 221:21	276:8	303:24 303:25
230:15 231:7	<b>AQRVs</b> 9:2 222:8	<b>area-by-area</b>
231:17 234:22	276:24 318:10	89:16
235:2 237:16	<b>AQS</b> 176:5 176:7	<b>areas</b> 9:14
239:14 260:9	177:4 178:25	27:15 28:21
309:14	<b>aqueous</b> 278:25	29:22 41:22 42:1
<b>approaching</b>	<b>arbitrary</b> 178:3	52:9 52:9 81:1
218:13	<b>ARC</b> 242:13 242:17	112:25 220:3
<b>appropriate</b>	242:19 243:1	221:20 227:10
8:16 12:8 16:3	243:5 243:6	227:18 229:15
22:25 30:14 42:3	243:16 254:22	229:19 229:20
51:20 54:19 55:6	255:1 255:5	262:1 268:22
56:10 79:6 86:18	313:22 313:23	269:8 269:12
93:16 95:24	314:5 314:8	269:16 269:20
102:4 102:7	315:6 320:25	295:8 298:19
107:12 107:14	<b>arcs</b> 120:4	302:7 302:10
111:16 111:23	147:1 242:11	303:4 303:5
112:5 112:18	242:13 288:24	305:9 320:10
125:15 125:20	312:7	320:17
179:10 205:14	<b>Arctic</b> 50:24	<b>arena</b> 6:20 8:17
223:18 231:17	<b>area</b> 8:5 28:12	25:14 36:6 274:7
232:7 309:11	43:2 55:13	<b>aren't</b> 35:18
<b>appropriately</b>	73:4 84:15	47:23 60:10
84:9 98:14	93:6 97:24 102:4	68:25 78:10
114:19 225:21	105:25 107:17	129:5 155:19
<b>appropriateness</b>	120:8 126:21	274:12 291:5
80:9 92:16	127:5 135:21	320:14
93:5 112:16		<b>Argonne</b> 241:15
<b>approval</b> 99:6		<b>arguably</b> 92:1
99:17		

<b>Arlington</b> 148:2	125:14	68:8 160:3
<b>ARM</b> 150:9	<b>asphalt</b> 145:16	160:18 186:24
171:24 172:8	146:2 146:4	271:9
172:20 173:5	<b>assess</b> 35:24	<b>assumed</b> 74:13
174:11 175:7	98:17 192:2	104:13 187:14
175:15 179:5	233:14	188:7
180:15 183:2	<b>assessed</b> 239:8	<b>assuming</b> 72:11
183:3	<b>assessing</b> 8:25	104:8 160:15
<b>ARM-2</b> 175:8	180:24 276:23	181:23 187:7
177:17 180:18	<b>assessment</b>	243:5 271:3
181:6 181:22	11:22 18:7 38:15	<b>assumption</b> 189:12
182:15 182:17	38:24 49:1	<b>assumptions</b> 179:7
182:21	49:5 49:9 106:11	179:25 180:17
<b>ARM3</b> 318:4	110:3 126:20	181:20
<b>arrived</b> 23:5	232:18 261:17	<b>assured</b> 31:1
<b>art</b> 72:18	<b>assessments</b> 15:24	<b>asterisk</b> 188:18
<b>articles</b> 12:18	53:9 80:18	<b>Atlanta</b> 126:21
258:10	107:10 227:5	134:7
<b>articulating</b>	227:6 227:13	<b>ATMEs</b> 242:3 249:6
60:11 79:20	227:24 230:11	249:11 252:20
<b>artifact</b> 177:1	230:14 232:23	315:2
<b>artificially</b>	233:5 239:24	<b>atmosphere</b> 255:22
179:13	269:25 287:16	<b>atmospheric</b> 181:1
<b>Ashley</b> 149:11	311:24 318:9	233:10
<b>aside</b> 57:5 105:11	<b>asset</b> 196:3	<b>attack</b> 308:20
108:18	<b>assign</b> 160:8	<b>attain</b> 136:5
<b>as-is</b> 144:2	<b>assigned</b> 205:19	<b>attainment</b> 52:9
<b>asleep</b> 19:25	<b>assimilating</b>	53:18 55:11
<b>ASOS</b> 186:5	147:18	72:19 136:7
<b>aspect</b> 13:20 14:5	<b>assist</b> 101:16	154:8 155:4
15:21 45:2 98:10	<b>associated</b>	212:4 212:8
104:18 105:4	26:17 43:20	220:16 227:7
129:1 132:4	122:16 123:5	295:8 295:9
203:14 313:16	257:20 259:9	295:12 301:19
<b>aspects</b> 5:20	272:13 280:14	302:10 303:4
7:1 9:14 15:9	<b>Associates</b> 171:22	303:9 303:15
15:20 20:16 26:9	<b>Association</b> 58:10	303:24
35:16 37:10	58:11 310:13	<b>attempt</b> 283:17
41:22 56:13 90:9	<b>associations</b> 12:9	<b>attend</b> 310:17
95:11 109:5	<b>assume</b> 68:4	<b>attention</b> 26:23

<b>attributable</b> 126:24	59:18 75:4 76:1 97:6 99:4 111:22 112:18 179:2 184:23 185:1 185:7 187:13 201:9 204:24 205:23 205:23 223:23 226:1 228:11 234:9 235:9 235:16 286:16	<b>award</b> 256:18
<b>attribute</b> 222:16		<b>aware</b> 14:7 14:11 66:10 90:4 95:14
<b>attributes</b> 222:14 222:19		<b>away</b> 66:13 108:10 116:6 116:6 116:14 146:15 157:22 180:21 186:4 198:1 212:21 282:24 283:4 290:8 293:15 300:8
<b>auctioneer</b> 217:10	<b>avenue</b> 36:10	<b>awful</b> 263:14
<b>audience</b> 16:18 18:9 18:23 19:3 19:24 50:4 78:16 82:24 85:1 86:6 87:6 87:16 88:12 90:10 91:14 92:9 168:8 199:15 200:17 201:21 203:16 206:11 209:4 211:16 214:17 310:4 310:21 310:25 311:20 318:22 320:1	<b>avenues</b> 13:18 114:11 308:8 309:2	<b>AWMA</b> 12:25
<b>audio</b> 211:9	<b>average</b> 45:17 45:17 45:18 45:19 46:6 46:8 46:10 46:15 46:15 46:18 47:1 47:8 65:15 66:16 75:20 103:3 125:3 125:7 161:1 161:23 161:24 167:13 172:24 178:5 181:3 194:10 197:3 202:11 203:2 286:21 295:4 295:6 313:21 313:23 313:24 315:3 320:13	<b>axiom</b> 64:19
<b>augmentation</b> 6:4 7:19		<b>axis</b> 264:1 264:2 264:6 264:7 301:5 301:6
<b>August</b> 95:5 245:23		<hr/> <b>B</b> <hr/>
<b>Australia</b> 89:22 294:9 294:13 295:4 297:22 301:22 319:3	<b>averaged</b> 47:1 47:11 48:1 180:4 202:5 250:24	<b>backed</b> 154:10
<b>Australian</b> 295:24 298:1	<b>averages</b> 96:17 111:21 119:13 160:2 195:2	<b>background</b> 8:7 11:19 23:4 25:8 25:10 26:24 27:2 34:8 34:25 35:3 35:16 37:5 37:11 41:9 43:17 43:23 44:4 45:12 45:14 46:5 46:24 47:15 47:16 48:16 50:8 50:12 51:3 51:14 59:17 64:23 65:6 67:3 69:5 69:9 70:11 77:3 77:5 78:18 81:4 81:7 82:15 84:14 98:15 102:23 106:18 107:2 110:1 111:6 111:22 112:14
<b>authorities</b> 36:4 274:18	<b>avoidable</b> 117:14	
<b>authority</b> 99:16 233:25	<b>avoids</b> 175:21	
<b>authors</b> 159:7 159:8		
<b>auxiliary</b> 143:11		
<b>available</b> 28:21 30:8 31:1		

134:13 135:22	<b>BART</b> 62:6	155:4 162:21
135:24 144:17	<b>base</b> 89:15	162:25 163:4
151:25 153:25	135:2 135:5	163:12 163:13
153:25 157:8	136:17 136:25	178:19 179:4
165:11 170:19	138:24 141:4	193:5 193:7
173:20 187:22	143:21 144:5	195:2 195:5
192:21 206:16	144:8 144:15	211:25 226:10
207:19 208:1	144:16 144:20	257:25 258:10
208:11 208:22	144:25 202:21	262:11 263:15
209:2 241:2	212:17 215:19	264:24 265:24
241:2 268:6	283:24 284:3	266:1 267:24
272:8 272:10	<b>based</b> 5:9 25:12	268:25 269:14
280:1 280:12	42:4 46:9 59:4	270:17 271:17
280:16 283:2	59:7 73:14 94:25	275:5 276:21
285:19 288:6	95:4 96:17 103:3	278:4 279:18
289:22 290:18	104:12 105:14	281:16 281:22
291:14 292:17	111:18 113:11	317:16
302:15	134:1 134:18	<b>Basin</b> 258:11
<b>backup</b> 160:12	140:13 142:1	258:12 262:20
<b>Bacon</b> 34:11	143:5 145:16	<b>basis</b> 14:1
<b>BACT</b> 63:25	173:25 175:10	14:13 28:12 48:7
<b>bad</b> 50:1 171:2	181:24 205:19	52:9 89:13 89:16
<b>Baker</b> 53:21 226:7	213:2 223:4	93:5 98:9 99:7
226:8	232:13 236:21	99:15 110:22
<b>balance</b> 107:11	237:12 273:20	112:6 214:12
<b>balancing</b> 107:11	274:2 274:7	230:20
<b>ballpark</b> 130:8	274:21 275:10	<b>bear</b> 271:22 274:5
<b>banker</b> 94:8	275:16 279:22	318:20
<b>bar</b> 137:25	280:7 280:17	<b>Bears</b> 244:15
140:9 143:17	282:20 284:11	<b>Beaufort</b> 50:25
143:20 143:20	284:13 286:8	<b>became</b> 318:7
143:21 149:13	305:16 320:12	<b>become</b> 19:6 25:19
167:7	<b>baseline</b> 142:18	36:5 95:14
<b>barely</b> 58:3	148:5 150:5	290:20
<b>BARF</b> 225:4	150:25 151:5	<b>becomes</b> 235:16
<b>barrier</b> 275:4	152:5 303:25	316:6
<b>barriers</b> 273:3	<b>basic</b> 119:14	<b>becoming</b> 16:20
277:4	136:6	102:16 117:22
<b>bars</b> 140:15	<b>basically</b> 29:3	191:1 310:18
140:22 229:18	53:8 111:18	<b>beer</b> 310:22
	124:4 124:14	<b>begin</b> 257:6 279:5
	133:22 135:9	<b>beginning</b> 98:10
	136:16 141:8	
	147:17 149:9	

285:2 287:22	109:11 110:2	246:19 248:4
<b>begins</b> 275:8	128:18 151:10	248:11 248:17
<b>behalf</b> 58:10	151:12 151:15	251:8 251:17
58:14 258:18	151:16 151:17	252:11 252:13
<b>behavior</b> 264:9	154:25 172:19	255:20 261:9
279:7 280:24	182:12 202:13	267:18 268:25
283:8 287:12	220:4 225:19	284:17 301:10
288:15 290:5	225:23 231:16	312:17
292:7	234:16 244:23	<b>beyond</b> 61:14
<b>behind</b> 73:20	247:24 248:9	61:23 104:10
<b>believe</b> 4:21	248:21 249:8	270:2 320:9
7:4 8:9 11:14	251:10 251:23	<b>bias</b> 122:16 125:5
11:24 12:25 80:5	252:8 252:24	125:8 188:18
93:8 99:10 100:6	253:6 253:11	246:14 247:5
100:21 103:14	253:11 253:13	247:8 247:11
105:25 107:23	253:15 253:19	247:13 247:13
112:8 113:12	253:22 253:25	247:14 247:15
114:1 119:1	255:16 255:25	247:16 247:25
143:5 183:3	256:4 256:10	249:14 250:2
221:24 224:11	303:10 318:3	250:2 250:10
266:18 272:1	318:4 318:13	250:15 250:17
312:24 313:6	<b>beta</b> 6:16 171:4	251:14 253:12
320:24	225:2 228:10	315:24 316:17
<b>benchmark</b> 248:1	<b>better</b> 15:15	316:19 316:20
279:8	63:24 63:25	316:23 317:6
<b>benchmarks</b> 246:11	72:11 72:16	317:7
<b>beneficial</b> 169:16	79:13 90:17	<b>biased</b> 122:7
<b>benefit</b> 7:23	110:23 113:1	130:15
115:19 118:24	117:19 118:18	<b>bigger</b> 171:11
168:3 169:1	118:20 122:3	<b>billion</b> 268:6
171:12 197:17	124:6 125:7	271:25 272:2
<b>benefits</b> 175:14	125:12 125:17	272:3
175:15	125:18 126:11	<b>bin</b> 177:19 177:22
<b>Bennett</b> 310:4	126:14 127:13	177:25
310:23	128:6 129:1	<b>binding</b> 275:17
<b>besides</b> 165:21	129:17 130:6	<b>bins</b> 177:18
<b>best</b> 16:5 20:19	131:22 141:2	178:18
33:2 59:16 68:19	171:9 172:18	<b>biogenic</b> 298:8
73:2 76:18 86:14	180:24 183:8	<b>biogenics</b> 236:20
88:11 95:16	185:16 188:16	<b>biometric</b> 298:7
98:23 106:7	190:11 190:11	<b>Biswanath</b> 310:25
	226:15 226:25	
	229:22 230:2	
	230:3 232:24	
	234:16 237:25	

<b>bit</b> 11:5 16:2 23:3 23:4 27:3 29:11 33:22 54:9 56:1 67:5 74:21 91:2 93:21 99:18 106:15 115:21 123:6 127:14 128:22 128:25 132:1 150:25 151:6 151:20 154:7 158:19 158:22 159:23 169:3 175:4 188:9 188:16 189:7 191:16 193:3 203:4 226:13 227:15 227:18 232:9 234:11 260:21 263:11 265:14 266:1 271:7 272:11 284:17 286:3 286:13 287:10 287:14 287:15 287:20 289:16 289:21 290:14 307:24	150:7 180:14 189:8 239:1 266:19 285:7 285:10 285:14 298:18 <b>blues</b> 288:3 288:11 <b>Bluett</b> 199:19 <b>Bob</b> 7:4 16:18 21:11 78:16 78:23 158:23 198:2 201:22 202:17 211:21 213:21 215:12 311:20 <b>Bob's</b> 81:21 <b>body</b> 52:25 <b>BOEM</b> 318:23 <b>boil</b> 64:17 <b>boiler</b> 61:9 62:4 68:5 69:23 69:24 143:10 143:11 145:1 <b>boilers</b> 61:8 67:20 155:20 <b>boiling</b> 65:20 <b>bonfire</b> 108:16 <b>book</b> 116:7 <b>boot</b> 187:19 317:5 <b>borderline</b> 137:7 <b>born</b> 13:23 <b>boss</b> 4:7 <b>bottle</b> 295:25 <b>bottom</b> 42:7 72:10 84:5 155:7 190:16 229:16 234:24 237:6 237:17 238:14 246:10 247:18	247:23 248:23 249:16 263:6 263:22 263:23 264:10 264:14 284:8 299:14 304:23 <b>bound</b> 173:4 177:19 181:24 <b>boundaries</b> 135:2 268:22 <b>boundary</b> 298:8 <b>box</b> 152:5 236:12 <b>boxes</b> 161:16 161:18 239:6 <b>Boylan</b> 87:16 93:23 <b>Boyle</b> 57:15 <b>BP</b> 199:16 199:20 <b>bracket</b> 260:12 <b>Brackets</b> 20:6 <b>break</b> 92:8 93:20 131:10 131:15 131:19 141:11 218:1 273:15 <b>Bret</b> 225:4 240:15 256:19 257:2 279:24 295:19 309:25 <b>Bret's</b> 229:10 <b>Brett</b> 6:18 228:1 <b>Brian</b> 55:21 <b>Brian's</b> 85:25 <b>Bridgers</b> 3:4 19:15 20:2 46:17 46:22 50:6 78:2 78:23 85:16 87:12 87:22 92:7 92:18 93:19 94:2 131:7 131:20
<b>black</b> 140:11 150:13 286:18 289:13 290:11 <b>Blade</b> 20:6 <b>blend</b> 245:22 <b>blended</b> 245:17 <b>blindly</b> 107:22 <b>BLM</b> 258:25 <b>blow</b> 302:12 304:9 <b>blowing</b> 189:22 <b>blown</b> 49:13 50:21 297:16 303:18 <b>blue</b> 140:7 140:21 143:20 143:20		



<b>calculation</b> 25:9 46:1 201:12	270:21	233:18 233:25 311:15
<b>calculations</b> 83:13 200:21	<b>CALPUFF</b> 6:17	<b>Campbell</b> 194:8
<b>CALDESK</b> 266:16	219:22 223:7	<b>campus</b> 321:14
<b>CALGRID</b> 253:3	229:6 229:20	<b>CAMx</b> 39:1 53:17
253:16 253:25	234:5 234:6	220:20 229:5
254:10 256:2	234:7 241:20	229:17 232:13
256:5	241:22 242:9	234:5 235:5
<b>calibrated</b> 197:9	242:15 243:24	235:15 236:23
<b>calm</b> 127:16	243:24 248:2	237:6 237:18
127:19	249:1 249:3	238:15 253:2
<b>CALMET</b> 242:7	249:4 249:7	253:11 253:24
244:19 244:23	249:9 251:3	254:2 254:5
245:3 245:5	251:23 251:24	254:8 255:25
245:8 245:12	252:10 252:11	256:3 256:9
245:13 245:14	252:22 252:25	259:8 261:22
246:7 246:8	254:9 254:14	264:1 264:1
246:15 246:21	255:17 255:20	264:3 264:3
247:15 248:5	255:21 256:1	264:11 264:19
248:10 249:1	256:5 256:10	264:20 265:6
249:3 249:5	259:8 261:21	266:8 266:11
249:7 249:7	261:22 263:24	266:11 267:18
251:5 251:6	264:2 264:6	268:1 270:12
251:25 252:10	264:7 264:9	270:18 270:24
252:12 252:22	264:12 264:13	271:1 271:5
252:23 252:24	264:14 264:16	271:13 271:14
254:14 254:17	264:20 264:21	271:18 296:22
255:16 255:21	265:6 265:12	296:24 297:25
261:21 263:24	265:19 265:22	299:8 302:25
263:24 264:2	265:22 266:3	314:8
264:7 264:8	267:17 267:19	<b>CAMXs</b> 238:14
264:12 264:14	267:24 267:25	<b>Canadian</b> 176:14
264:16 264:16	268:5 269:22	176:21
265:13 265:19	270:14 270:14	<b>candidates</b> 315:14
265:22 266:3	270:15 270:19	<b>capabilities</b>
266:8 266:10	270:21 270:25	48:22 88:5
266:13 266:17	271:3 271:6	90:4 116:3
266:18 266:20	271:8 271:20	261:23 278:20
266:21 266:23	271:20 271:24	<b>capability</b>
266:25 267:9	272:7 272:9	69:10 88:8
267:11 267:17	312:8	<b>capable</b> 276:23
267:19 267:24	<b>CALPUFF's</b> 244:1	<b>capacities</b> 203:22
269:22 270:15	<b>camera</b> 94:6	
	<b>campaign</b> 235:13	
	<b>campaigns</b>	

<b>capacity</b> 88:5	44:25 45:1	313:21 317:24
88:8 160:3	49:2 49:6 50:9	<b>case-by-case</b> 7:24
203:22 316:18	50:19 51:10 53:6	8:5 15:18 36:5
<b>capital</b> 64:2	57:15 59:3 63:16	36:8 39:10
<b>CAPTEX</b> 229:3	66:10 66:19 67:1	93:4 98:8 99:6
244:3 244:10	68:7 69:25 70:24	99:14 110:22
245:1 255:13	74:22 78:10 80:5	118:19 214:12
255:19	80:12 99:21	<b>cases</b> 14:2
<b>CAPTEX3</b> 252:18	100:25 102:25	36:14 37:13
<b>capture</b> 59:24	107:21 121:13	37:16 37:16 39:7
210:9 291:1	121:25 122:5	39:10 40:21 48:3
291:3 291:7	122:6 123:1	48:12 61:3
314:24 315:8	123:18 124:17	64:2 66:8
<b>captured</b> 210:4	124:23 125:6	68:12 72:1
<b>capturing</b> 285:24	127:14 127:18	72:3 72:6
<b>CARB</b> 31:4	130:6 136:25	73:23 79:9
<b>carbon</b> 238:9	137:2 137:20	80:4 80:11
238:11	138:24 141:4	82:4 89:6 89:9
<b>cards</b> 194:6	144:5 144:20	97:20 103:11
<b>care</b> 10:1 121:2	145:3 145:5	104:20 107:8
271:6	151:5 156:20	120:13 124:18
<b>carefully</b> 187:24	161:18 162:12	125:16 125:17
<b>Carlo</b> 159:17	162:15 163:7	125:19 126:15
164:21 212:23	164:16 168:3	128:22 135:2
214:18 214:22	168:13 168:14	144:1 144:21
216:13	169:6 169:8	144:24 144:25
<b>Carolina</b> 142:16	169:11 173:23	151:4 151:9
206:12	181:6 182:16	152:20 152:20
<b>carried</b> 183:24	191:3 196:7	152:21 154:4
<b>carry</b> 268:9	201:14 208:19	161:15 161:16
<b>carrying</b> 271:19	222:25 234:25	161:25 162:13
271:20	236:17 249:4	162:13 163:7
<b>Cartesian</b> 147:2	252:24 253:10	164:2 164:23
<b>Carvey</b> 113:6	274:23 279:21	164:25 166:10
<b>case</b> 37:19 38:4	280:10 280:12	166:24 167:4
38:10 38:16	280:14 281:8	167:19 167:23
39:17 39:24	281:15 283:24	167:24 170:19
40:17 40:18	284:3 284:6	185:22 201:3
43:14 44:18	284:10 284:14	207:16 285:8
	284:19 284:20	290:9 309:19
	287:11 287:19	<b>catching</b> 27:3
	287:25 289:25	<b>categories</b> 184:25
	290:1 290:7	316:11 316:12
	293:5 293:8	317:22
	296:21 298:21	
	300:2 304:6	

<p><b>category</b> 61:22 62:5 99:3</p> <p><b>cause</b> 37:8 52:17 75:19 146:18 150:19 297:10 311:10</p> <p><b>causing</b> 103:8 142:10 206:21 207:20 215:14</p> <p><b>caution</b> 108:3 123:9</p> <p><b>cautioned</b> 107:5 206:20</p> <p><b>caveat</b> 44:10 44:20 248:22</p> <p><b>caveats</b> 22:24 42:7 122:11 135:15 190:18</p> <p><b>Celebrate</b> 38:3</p> <p><b>cells</b> 239:6 239:11</p> <p><b>CEM</b> 236:18 280:17</p> <p><b>cement</b> 191:25 192:8 214:22</p> <p><b>center</b> 178:9 178:10 215:2 237:11 237:21 242:20 264:5 265:17 281:21 289:3</p> <p><b>centered</b> 146:3 288:20</p> <p><b>centering</b> 289:9</p> <p><b>central</b> 298:18 300:15</p> <p><b>centroid</b> 298:14</p> <p><b>centroids</b> 298:19</p> <p><b>certain</b> 14:1 35:16 55:21 96:3 112:25 113:20</p>	<p>204:23 208:10 221:6 291:6 299:23 303:6 303:8 309:3</p> <p><b>certainly</b> 59:13 74:18 76:25 79:13 97:17 122:23 123:19 125:8 125:16 126:5 126:14 126:23 160:16 166:10 174:7 177:8 200:14 207:3 207:18 220:25 318:17 318:17</p> <p><b>certainty</b> 255:23</p> <p><b>cetera</b> 65:24 75:23 80:10 165:16</p> <p><b>CFR</b> 45:23</p> <p><b>CH2M</b> 310:4</p> <p><b>Chadwick</b> 214:20</p> <p><b>chain</b> 213:24</p> <p><b>chair</b> 310:12</p> <p><b>challenge</b> 50:15 64:13 66:3 73:25 107:10 118:24</p> <p><b>challenged</b> 118:17</p> <p><b>challenges</b> 5:1 7:7 60:1 94:17 113:19 114:15 121:19 160:15 261:10 272:17</p> <p><b>challenging</b> 48:4 63:3 77:17 88:18</p> <p><b>chamber</b> 193:9 193:17</p> <p><b>Championship</b> 50:3</p> <p><b>chance</b> 211:5</p>	<p>321:11</p> <p><b>Chang</b> 317:5</p> <p><b>change</b> 59:11 75:13 77:16 130:13 140:20 140:24 141:17 142:1 142:21 144:21 163:1 166:2 189:13 199:5 212:5 212:9 212:15 226:24 299:15 311:6 312:16</p> <p><b>changed</b> 88:15 139:1 139:16 139:17 144:19 242:9 243:25</p> <p><b>changes</b> 9:25 10:11 62:16 74:13 91:19 145:4 179:20 251:1 312:8</p> <p><b>changing</b> 76:9 119:21 141:14 141:19 142:1</p> <p><b>channel</b> 177:2</p> <p><b>characteristic</b> 67:19 67:22 73:15</p> <p><b>characterization</b> 33:6 42:18 42:23 42:25 84:7 89:25</p> <p><b>characterizations</b> 88:21</p> <p><b>characterizing</b> 26:25 71:21 114:17</p> <p><b>charge</b> 29:24 29:24</p> <p><b>charges</b> 35:6</p> <p><b>Charleston</b> 142:16</p>
---	--	--

145:5	<b>Chicago</b> 18:12	269:12 269:16
<b>chart</b> 227:2	22:12	269:17 269:20
<b>charts</b> 138:1	<b>choice</b> 35:23	311:24 318:10
140:9 143:17	<b>choose</b> 169:7	<b>clay</b> 147:14
158:12 167:8	<b>chose</b> 166:24	147:24 152:17
<b>chase</b> 217:12	166:25	203:22
<b>check</b> 20:4	<b>Chowdhury</b> 311:1	<b>clean</b> 79:2
<b>checked</b> 78:2	311:12 311:16	<b>clear</b> 18:18 33:22
<b>chemical</b> 53:3	<b>Chu</b> 149:11 172:20	210:19 218:21
55:24 61:10	<b>Chukchi</b> 50:25	222:10 254:8
66:22 67:21	<b>circumstances</b>	<b>clearinghouse</b>
69:22 93:6	100:3 125:14	25:5 25:6
221:14 223:24	172:17	25:11 32:1 45:10
224:16 233:9	<b>cisco</b> 250:7	114:11 210:23
261:15 272:15	<b>cited</b> 173:9	<b>clearly</b> 121:21
278:24 279:13	<b>cities</b> 28:20	128:5 130:15
<b>chemiluminescence</b>	<b>city</b> 112:7	161:12 292:13
191:13 192:16	178:9 178:10	<b>client</b> 192:1
192:22	232:14 295:2	<b>clients</b> 196:9
<b>chemistry</b> 5:12	296:23 311:17	<b>Clifty</b> 166:13
8:15 11:23 32:13	<b>clarification</b> 7:9	168:5
32:18 51:7 87:19	16:16 95:8 96:11	<b>clock</b> 131:22
87:21 88:9 88:10	96:13 97:23	<b>close</b> 44:6
88:17 88:20	100:20 124:12	51:16 57:4 72:23
123:23 130:24	206:15 210:24	117:7 148:22
131:4 172:22	220:13 245:24	152:15 152:18
174:20 184:20	248:8 255:16	168:10 170:2
184:25 218:20	<b>clarified</b> 101:22	180:10 239:10
219:7 221:5	<b>clarify</b> 32:9	241:2 251:13
222:11 225:13	81:12 91:23	251:15 269:20
225:14 225:17	106:15 206:19	285:15 300:23
225:20 231:8	<b>clarifying</b>	300:23 312:13
241:5 278:11	83:16 199:17	312:15
292:1 294:5	<b>clash</b> 275:6 275:7	<b>closely</b> 28:14
298:1 298:10	<b>class</b> 27:15	162:6
301:11 305:17	85:5 85:11 224:6	<b>closer</b> 110:15
309:16	227:18 229:15	114:1 162:5
<b>Chernobyl</b> 242:5	229:19 261:16	174:15 174:16
<b>chest</b> 51:22	261:25 266:6	179:18 189:7
<b>Chet</b> 101:8	268:22 269:8	207:18 235:20
<b>chew</b> 94:23		265:14 312:17

<b>closes</b> 321:14	<b>coalesced</b> 29:21	<b>colliding</b> 55:12
<b>closure</b> 278:11 278:15	<b>coal-fired</b> 142:14	<b>co-located</b> 266:7
<b>cloud</b> 249:21 249:21 314:3 321:2 321:6	<b>code</b> 159:20 165:20 170:12	<b>color</b> 140:14 238:22
<b>clouds</b> 249:22 321:1	<b>coded</b> 175:18	<b>colors</b> 112:11 141:8 141:12 238:25 281:25 282:1 282:25 285:8 285:11 285:11 285:15 287:6 287:12 288:12
<b>Club</b> 5:10 10:7 219:13 230:8 261:2	<b>codifying</b> 6:22	<b>column</b> 75:9
<b>cluster</b> 170:24 170:24	<b>coefficient</b> 249:25 254:3	<b>combination</b> 52:16 111:15 112:5 135:3 142:19 145:6 150:1 228:1
<b>clustering</b> 180:10	<b>coefficients</b> 129:2 129:5 299:25 304:12 304:18 304:24 306:13	<b>combinations</b> 135:4 145:9 145:10 229:6
<b>CMAQ</b> 39:1 53:17 220:20 235:5 235:17 236:4 236:23 237:5 237:7 238:5 238:11 238:24 278:7 280:4 280:19 280:20 280:22 281:2 281:3 281:7 281:10 281:15 281:17 282:3 282:6 282:10 282:18 283:3 283:6 283:11 284:5 284:9 285:25 287:2 287:11 287:19 288:11 292:3 292:12 293:10 303:1	<b>coffee</b> 94:14 94:15	<b>combine</b> 45:7 93:18 107:1 165:8 170:17 187:2 187:4 189:4 301:7
<b>CMAQs</b> 282:2	<b>coherent</b> 174:3	<b>combined</b> 48:17 81:15 85:13 111:2 170:16 187:1 225:18 298:24
<b>CMAS</b> 52:21 232:10	<b>coke</b> 66:23	<b>combines</b> 250:9
<b>CO</b> 37:23	<b>collaborate</b> 200:5	<b>combining</b> 46:2 46:5 99:24 102:23 112:15 112:18
<b>coal</b> 66:23 212:7 215:24 216:2	<b>collaboration</b> 12:17 184:4	<b>combustion</b> 31:10 62:3 114:23
	<b>collaborative</b> 14:10 21:23 29:5 184:11	<b>comes</b> 21:10 59:14 71:15 149:24 162:24 278:14
	<b>colleagues</b> 60:7	
	<b>collect</b> 191:4 191:20 192:12 192:17 195:16 196:6 197:16 197:18 199:25	
	<b>collected</b> 122:13 153:9 192:18 196:25 197:2 199:19 199:21	
	<b>collecting</b> 121:16 156:6 191:6 191:9 191:12 194:2 195:22 200:2	
	<b>collection</b> 199:20	

289:16 298:1 <b>comfort</b> 230:3 <b>comfortable</b> 19:18 84:25 100:2 112:20 215:8 280:23 <b>comfortably</b> 67:5 <b>coming</b> 11:13 18:8 32:18 32:19 62:12 84:24 104:24 157:21 193:5 193:9 194:15 247:14 256:19 259:1 265:6 286:20 317:15 <b>comment</b> 5:23 6:10 10:3 11:15 11:21 16:19 20:14 21:10 33:1 76:8 76:24 106:10 129:22 203:18 205:12 206:4 206:9 220:3 307:20 310:6 310:7 310:12 311:2 311:8 315:11 318:18 321:11 <b>comments</b> 4:23 11:12 11:16 12:6 16:25 17:1 17:4 17:9 17:13 17:22 19:7 19:11 21:11 21:13 21:18 21:19 21:21 43:13 59:1 59:4 60:20 70:13 76:13 78:4 78:9 86:20 87:12 90:3 112:22 113:1 183:11 205:6 210:20	218:12 219:25 220:8 221:1 221:23 221:25 307:7 307:14 307:17 307:19 308:4 320:4 <b>Commissioner</b> 211:19 <b>commitment</b> 5:9 219:7 <b>commitments</b> 222:9 <b>committed</b> 10:6 309:10 <b>committee</b> 14:12 220:1 310:12 <b>common</b> 165:5 192:17 224:22 228:5 <b>communicate</b> 15:12 <b>communication</b> 308:8 <b>communities</b> 33:11 275:24 <b>community</b> 9:8 12:7 12:13 14:2 14:3 14:5 14:6 14:15 15:6 16:4 20:15 21:18 25:21 25:24 39:19 40:13 54:16 56:6 95:13 98:23 101:7 108:6 108:19 117:19 133:17 157:11 200:15 204:15 205:7 206:5 218:6 218:11 219:21 225:12 226:1 226:4 272:18 273:6 273:25 274:6 274:11	277:3 309:3 310:10 <b>companies</b> 60:8 <b>companion</b> 259:1 <b>company</b> 66:11 196:13 <b>comparability</b> 236:24 <b>comparable</b> 82:14 122:23 182:1 231:16 238:12 238:19 <b>comparably</b> 182:25 <b>compare</b> 46:10 47:13 68:11 81:15 128:5 166:3 182:4 229:12 233:14 243:23 246:11 261:6 261:24 264:5 264:13 278:6 283:17 286:23 309:8 <b>compared</b> 48:2 48:18 50:11 66:17 121:1 123:4 152:19 155:13 160:17 174:4 228:25 238:11 244:3 252:19 263:19 264:1 264:12 265:6 266:22 269:21 271:19 273:22 287:21 293:8 311:25 <b>compares</b> 286:6 <b>comparing</b> 42:3 120:10 122:7 123:9 124:15 228:7 228:21 234:21 235:13 281:14 284:5
--	--	--

284:9 288:20	221:14 230:24	<b>composite</b> 250:7
<b>comparison</b>	<b>complexities</b>	250:16 254:7
31:24 44:24	20:25 26:17	<b>composition</b> 44:21
78:13 80:20	<b>complexity</b>	<b>comprehensive</b>
103:2 103:20	185:4 259:9	32:13 278:23
179:1 187:21	<b>compliance</b> 24:5	295:22
190:7 251:20	25:3 25:10 25:17	<b>comprehensively</b>
257:19 313:8	26:4 26:14	109:15
<b>comparisons</b> 127:2	27:5 27:13 27:20	<b>compressor</b> 147:18
224:18 293:1	38:13 38:21 39:4	148:6
312:3 313:6	40:3 40:9 40:9	<b>compressors</b>
<b>compelled</b> 224:3	40:22 53:6 62:20	145:14 145:25
<b>compensating</b>	62:23 63:1	147:10
250:19 250:22	63:3 67:13	<b>comprised</b> 29:14
<b>competing</b> 120:17	86:8 87:3	133:18
<b>compilation</b> 30:7	94:18 95:25	<b>compromise</b> 130:20
<b>compile</b> 114:4	97:14 101:11	<b>computational</b>
163:1 172:24	101:17 104:12	273:24 277:7
313:5	105:22 113:13	<b>computer</b> 32:18
<b>compiled</b> 178:22	113:15 113:23	170:14
233:2	114:6 114:13	<b>computers</b> 23:22
<b>complain</b> 60:10	114:23 115:3	<b>conceivable</b> 213:9
<b>complaining</b> 60:11	115:25 118:1	<b>concentrated</b>
79:21	118:4 152:1	285:16 287:7
<b>complete</b> 32:8	160:22 203:8	<b>concentration</b>
88:21	212:13 214:6	37:9 45:7
<b>completed</b> 134:5	<b>complicated</b>	45:15 47:11
<b>completely</b> 39:3	84:4 84:18 109:6	66:20 69:9 109:1
49:11 74:25	175:25 231:4	109:2 109:10
88:13 271:10	231:7 232:1	120:25 127:11
294:6 296:7	232:3 301:11	164:6 164:10
<b>completeness</b>	<b>complication</b> 65:9	165:10 167:7
37:21	79:11	167:7 168:22
<b>completing</b> 114:6	<b>complied</b> 80:17	172:25 172:25
<b>complex</b> 90:15	<b>comply</b> 106:5	173:6 173:7
90:23 120:13	<b>complying</b> 72:23	173:23 175:1
121:6 121:17	<b>component</b> 79:12	175:3 176:17
121:22 121:23	128:4 224:15	177:10 182:14
146:13 166:16	224:15	182:17 182:20
175:24 182:16	<b>components</b> 106:23	182:24 182:25
	224:14	186:17 188:22
	<b>composed</b> 84:14	

190:6 193:12	267:16 269:3	195:13 198:22
197:4 207:4	270:4 280:2	248:5 251:21
207:14 207:21	280:3 280:12	254:11
208:13 209:5	282:2 282:18	<b>concrete</b> 109:8
209:6 209:21	283:3 283:17	110:24
210:8 210:14	285:10 287:8	<b>concurred</b> 106:11
216:24 242:22	287:13 289:24	<b>concurrence</b>
263:17 278:17	291:14 292:8	105:13 105:17
281:14 281:17	292:17	106:9
281:20 283:9	<b>concept</b> 74:5	<b>concurrent</b> 183:7
283:14 284:2	109:1 274:4	<b>condensable</b> 65:11
286:5 287:3	<b>conceptual</b>	65:17 68:14
290:6	49:17 174:18	<b>condition</b>
<b>concentrations</b>	<b>concern</b> 72:8	167:24 203:5
26:24 27:10 34:8	104:7 135:21	<b>conditions</b>
35:1 37:11 43:18	307:12 321:2	44:14 44:14
44:4 45:17 45:20	<b>concerned</b> 71:8	70:17 97:24
46:7 46:24 47:16	76:14 91:18	127:17 129:4
47:16 48:18	269:2 270:6	129:7 188:3
50:10 50:12	312:11 314:21	196:2 204:6
51:14 54:24 65:6	316:17 316:18	204:12 204:14
75:15 77:6	318:10	277:23 277:25
100:13 103:4	<b>concerning</b> 74:21	278:21 285:21
104:16 106:19	<b>concerns</b> 58:24	293:6 293:7
109:24 110:5	60:11 64:15	293:20 298:9
111:3 111:13	71:15 79:20	<b>conduct</b> 219:10
111:15 111:22	101:10 119:3	<b>conducted</b>
123:10 125:3	120:19 128:23	172:15 268:21
126:13 126:13	134:20 268:19	280:19
126:19 127:17	269:4 318:19	<b>conducting</b>
127:19 143:25	<b>concert</b> 272:23	31:22 191:23
152:7 162:21	<b>conclude</b> 249:14	219:19 259:17
163:2 163:5	<b>concluded</b>	259:20 291:17
163:10 163:12	271:18 321:21	<b>conference</b> 3:2
163:14 173:17	<b>concludes</b> 171:16	5:6 9:20 9:21
173:20 174:5	<b>conclusion</b>	10:6 10:9
177:8 177:9	72:17 76:12	10:10 12:24
179:21 180:5	276:21	20:12 21:12 22:8
180:11 181:4	<b>conclusions</b>	30:9 30:11 56:23
181:9 181:11	159:25 171:3	75:25 105:12
181:23 181:25	181:13 181:14	105:13 132:5
182:1 188:3	182:10 191:21	132:16 132:19
190:2 193:1		
208:1 209:19		
254:5 254:15		
265:15 266:9		

<p>200:8 206:9 216:9 219:16 219:25 222:23 307:15 308:24 309:1 310:9 310:16 321:21</p> <p><b>conferences</b> 12:21 13:1 20:17 315:21</p> <p><b>confidence</b> 7:21 8:21 126:18 188:20 222:25 317:8</p> <p><b>confident</b> 195:8</p> <p><b>configuration</b> 249:8 251:24 252:1 252:25 261:20 264:7 264:17 264:21 267:17 267:19 267:25 268:14 279:17 292:5 311:9</p> <p><b>configurations</b> 182:9 244:4 244:20 244:23 249:10 251:25 252:7 254:14 268:15 269:22 291:6</p> <p><b>configured</b> 249:20 263:24 266:11 271:24</p> <p><b>confirmation</b> 40:8</p> <p><b>confound</b> 68:21</p> <p><b>confusion</b> 99:24</p> <p><b>conjecture</b> 267:13</p> <p><b>Connecticut</b> 211:18 211:22</p> <p><b>connecting</b> 14:8</p> <p><b>consequence</b></p>	<p>76:8 229:10 257:11 262:3 263:16 264:25 284:22</p> <p><b>consequences</b> 63:5 92:2</p> <p><b>conservatism</b> 112:3 119:8 126:5 166:23 215:9</p> <p><b>conservative</b> 7:14 45:13 67:13 76:15 97:9 107:9 108:1 111:7 111:10 112:1 119:7 119:11 121:21 152:19 163:13 163:16 166:7 166:10 167:25 167:25 168:2 172:4 172:8 173:16 174:10 175:8 175:9 181:22 182:23 183:1 206:22</p> <p><b>conserving</b> 221:9</p> <p><b>consider</b> 6:6 7:10 17:21 27:21 32:12 41:6 42:11 43:17 60:16 76:8 91:12 147:6 151:11 184:18 187:23 203:13 205:6 293:3 309:20</p> <p><b>considerably</b> 259:11</p> <p><b>consideration</b> 5:3 7:2 9:9 12:2 34:4 37:10 38:21 43:21 44:19 45:5 48:6 86:1 92:6 97:20 203:3</p>	<p>223:16 277:19 321:5</p> <p><b>considerations</b> 17:8 40:25 41:1 41:2 41:18 42:4 64:11 80:23 97:3 98:2 186:20 187:10 191:22 195:14 197:8 257:16 270:7 272:12 273:24 275:22 294:24 312:23</p> <p><b>considered</b> 8:8 41:23 42:12 44:22 48:8 79:8 99:2 103:22 105:8 186:20 187:17 203:10 207:13 258:15 259:7 320:15 321:4</p> <p><b>considering</b> 10:12 65:1 100:10 171:5 219:15 292:4 301:17 320:10</p> <p><b>consistency</b> 77:4 256:6 275:12</p> <p><b>consistent</b> 56:19 69:19 78:20 83:7 83:10 103:4 174:17 178:10 178:17 207:9 219:4 221:21 223:12 226:2 228:8 237:16 237:23 276:3 276:14</p> <p><b>consistently</b> 67:7 71:12 229:13 229:25 252:2</p>
---	--	---

<b>constant</b> 81:8 91:24 170:18 217:1 280:13	<b>contexts</b> 104:6	103:5 110:17 142:4 210:10 224:24 231:13 237:9 237:11 237:14
<b>constraints</b> 59:15 59:19 88:25 200:11 275:20 307:10	<b>continental</b> 236:10	<b>contributions</b> 43:19 44:1 44:16 84:9 84:12 102:24 159:8 235:11 235:12
<b>construct</b> 88:19 150:3 275:9 275:14	<b>continue</b> 11:10 12:14 14:21 23:17 24:17 54:15 62:1 77:16 98:25 221:20 308:7 309:4 310:9 320:19	<b>control</b> 61:6 63:25 68:1 68:10 72:11 72:19 72:22 77:14 135:4 137:14 140:19 142:11 147:21 203:23
<b>constructive</b> 117:17	<b>continued</b> 134:8 181:19 308:9 320:8	<b>controlled</b> 61:4 61:21 104:23 137:2 140:6 143:7 143:14 144:21 145:9 149:6 154:4 154:9 245:18
<b>constructs</b> 149:24	<b>continuing</b> 33:1 60:22 137:6 157:15 186:22 238:3	<b>controllers</b> 192:20
<b>consultant's</b> 202:4	<b>continuous</b> 34:15 80:2 80:5 80:13 81:2 81:9 81:11 82:7 104:8 104:14 142:6 160:4 191:9 196:16 204:16 254:25	<b>controlling</b> 64:20 102:15 102:16 167:8
<b>consultation</b> 36:3 36:10 49:13 51:18	<b>continuously</b> 160:6 160:16	<b>controls</b> 64:3 68:8 139:3 139:4 140:14 140:14 142:2 142:19 142:20 142:22 143:6 143:10 148:23 150:16 150:19 154:6 154:20 154:23 155:12 155:13 155:15 156:15 157:14 216:3
<b>consumed</b> 85:6	<b>contour</b> 155:5	<b>controversial</b> 39:18
<b>consumption</b> 85:3 87:10	<b>contract</b> 228:15	
<b>contained</b> 34:2	<b>contractors</b> 231:19	
<b>containing</b> 187:18	<b>contrast</b> 252:6	
<b>contains</b> 285:20	<b>contribute</b> 52:17 104:15	
<b>content</b> 60:6	<b>contributes</b> 103:9	
<b>context</b> 4:15 10:13 17:15 24:19 25:21 27:4 32:7 56:10 60:20 64:6 74:11 76:6 86:18 89:1 90:6 100:22 105:15 106:11 107:13 107:21 109:18 110:24 117:12 150:25 217:5 220:21 220:24 276:7 307:14 308:5 308:15 316:8 318:12	<b>contributing</b> 103:8 115:6 117:5	
	<b>contribution</b> 35:14 93:12	

<b>convective</b> 124:17	13:21 15:8 15:11	<b>count</b> 3:24 84:9
<b>convenient</b> 64:17	<b>coordinated</b>	163:11 186:9
<b>convention</b> 26:14	128:25	249:19
<b>converge</b> 169:24	<b>coordination</b>	<b>counted</b> 116:18
<b>convergence</b>	13:23 14:17	<b>counterparts</b> 60:8
169:25	14:21 21:2 308:8	<b>counting</b> 43:23
<b>converges</b> 170:9	308:11 310:9	110:4
<b>converging</b> 170:2	310:16	<b>country</b> 28:10
<b>conversation</b>	<b>corners</b> 262:14	28:20 44:23 51:1
128:12	262:17 263:2	51:11 66:8
<b>conversations</b>	269:13	147:25
132:17	<b>Corporation</b> 92:10	<b>county</b> 80:21
<b>conversion</b> 7:14	<b>Corrales</b> 85:17	<b>couple</b> 25:4
97:10 124:19	<b>correct</b> 71:22	25:8 26:1 26:6
125:9 126:6	76:20 103:20	34:13 37:16
149:2 150:8	207:8	40:15 56:20 60:9
152:4 153:21	<b>corrected</b> 78:14	66:7 70:8
153:23 174:6	<b>corrections</b> 47:4	74:24 75:8 79:18
174:22 177:12	<b>correctly</b> 92:25	92:12 136:15
177:14 180:14	206:18	138:7 138:10
181:1 181:8	<b>correlated</b>	149:11 152:12
181:24 181:25	47:23 216:19	158:20 174:12
183:9 189:8	254:4 254:6	181:14 182:9
189:10 189:15	<b>correlation</b>	184:7 187:9
<b>conversions</b>	76:4 249:15	188:21 194:1
221:14	249:25 250:1	197:10 211:2
<b>convert</b> 137:8	254:3	239:5 249:16
179:12	<b>correlations</b>	<b>coupled</b> 299:6
<b>converted</b>	80:25 216:15	299:8
188:10 192:24	250:10	<b>course</b> 3:25 8:1
193:16 193:18	<b>correspond</b> 281:23	22:11 64:25 65:9
279:23 280:5	281:25 282:2	70:11 73:20
<b>converter</b>	<b>corresponding</b>	74:11 80:12
193:10 197:13	249:10 263:9	81:24 101:20
<b>converting</b> 61:16	<b>corresponds</b>	135:12 154:6
<b>converts</b> 124:18	64:8 162:23	157:7 157:18
188:12 193:11	<b>cost</b> 155:12	159:11 163:25
<b>cool</b> 226:22	193:24 195:15	184:5 211:18
<b>cooperation</b> 310:9	197:15 259:9	212:2 214:13
<b>coordinate</b>	260:1	216:22 267:7
		301:20 306:8
		<b>Courtyard</b> 310:14

<b>cover</b> 8:13 118:11 138:23	<b>critically</b> 77:10 117:23 307:7	63:12 102:25 103:6 103:11 106:19 106:23 115:5 133:9 134:10 135:17 135:17 145:12 147:13 152:23 154:14 157:16 161:5 161:17 166:9 198:13 208:2 249:15 250:4 250:11
<b>covered</b> 119:22 310:24	<b>cross</b> 94:7 242:23 243:17 266:5	<b>curious</b> 197:5
<b>covering</b> 166:9	<b>crossed</b> 315:6	<b>current</b> 4:16 5:19 6:2 6:8 7:11 8:4 17:19 18:19 41:24 62:21 67:16 67:18 68:25 69:4 72:13 72:19 75:7 76:14 88:19 100:21 115:12 129:18 130:12 170:12 170:19 172:7 173:8 173:10 173:15 175:8 179:19 181:20 183:1 191:18 192:14 194:1 199:1 220:11 224:5 243:23 273:23 276:1 295:6 312:9
<b>covers</b> 112:21	<b>cross-</b> <b>fertilization</b> 14:6	<b>currently</b> 130:3 170:17 171:4 192:18 225:25 228:11 228:15 233:2 302:15 320:15 321:3
<b>Cray</b> 170:23	<b>crowd</b> 133:21 240:25	<b>curve</b> 121:7 162:6 177:16 178:1 178:1 178:24 178:25 179:6 189:8 299:12
<b>Crays</b> 170:23	<b>CTDM</b> 120:13 121:11 121:14	
<b>create</b> 50:14 52:11 83:19 162:9 162:19 163:5 313:20	<b>CTEX</b> 248:5	
<b>created</b> 83:10 83:20 135:2 158:1	<b>CTEX3</b> 244:7 244:13 245:3 245:6 251:23 252:3 255:14 255:21 255:24 256:1	
<b>creates</b> 74:9 250:17 274:9	<b>CTEX4</b> 248:19	
<b>creation</b> 277:7	<b>CTEX5</b> 244:14 244:24 248:19 251:25 252:3 255:14 255:22 256:3	
<b>creativity</b> 115:11	<b>cubed</b> 140:11 149:17	
<b>creatures</b> 19:16	<b>culmination</b> 30:6	
<b>credible</b> 89:12 89:15 118:3 118:3 219:4 219:9 231:24	<b>culpability</b> 134:10	
<b>credit</b> 160:10	<b>Cumberland</b> 234:1 236:19 278:5 279:3 286:17 292:3	
<b>Creek</b> 166:13 168:5	<b>cumulative</b> 33:25 34:2 37:3 37:7 37:15 37:17 41:7 43:14 46:23 47:15 50:11 53:9	
<b>creeked</b> 34:21		
<b>criteria</b> 35:18 54:19 186:12 221:18 297:8 301:23 311:5 311:6		
<b>criterion</b> 109:3 207:14 210:6		
<b>critical</b> 12:4 95:12 120:8 213:1 223:7 291:2 309:13		

<b>curves</b> 178:3 241:11 289:18	142:16 142:17 153:8 153:12 153:16 157:9 157:13 164:14 165:6 166:1 171:6 172:24 173:12 174:15 175:11 175:20 175:21 175:23 176:4 176:5 176:8 176:10 176:11 176:15 176:20 176:21 176:22 177:3 177:15 177:17 177:18 177:24 178:8 178:16 178:19 178:25 179:2 179:4 179:11 180:2 180:19 180:20 181:10 181:16 181:18 182:5 182:6 182:11 182:13 183:5 183:8 183:8 185:10 185:16 185:21 185:24 185:25 186:6 187:12 187:13 189:19 190:9 190:17 191:9 191:12 192:18 192:18 193:25 194:1 194:2 194:8 194:18 195:24 196:5 196:6 196:8 196:15 196:25 197:4 199:18 199:20 199:20 199:21 200:1 200:2 200:23 201:3 201:4 201:8 202:22 204:24 205:20	206:1 215:22 223:15 223:23 224:23 225:11 246:2 247:14 248:15 248:18 248:24 267:2 267:8 274:15 279:10 280:17 314:13 317:19 317:22
<hr/> <b>D</b> <hr/>	<b>database</b> 176:6 176:8 176:13 178:25 197:19 242:11 242:12 248:25 263:2 314:1	
<b>daily</b> 23:9 23:25 45:18 47:6 47:10 48:10 80:1 95:1 104:16	<b>databases</b> 119:18 159:21 165:23 185:12	
<b>Dallas</b> 133:5	<b>date</b> 95:7 172:15	
<b>Dallas-Fort</b> 147:25	<b>dates</b> 23:7 24:18	
<b>Dan</b> 87:13 190:23 197:23	<b>Dave</b> 159:9	
<b>Dana</b> 113:6 199:15	<b>Dawn</b> 138:18	
<b>dangerous</b> 205:25	<b>day</b> 3:25 5:4 13:15 34:16 34:18 40:20 45:23 65:20 75:7 81:8 98:10 111:23 112:13 128:3 128:4 131:8 163:11 163:11 218:3 278:6 279:4 300:2	
<b>dark</b> 155:5	<b>days</b> 16:21 16:22 30:2 65:1 116:2 163:14 241:11 299:22 299:23 299:25 307:2 308:1	
<b>data</b> 6:17 28:21 34:15 43:7 45:24 46:11 59:17 59:17 65:14 66:5 66:24 70:19 74:11 74:19 75:6 75:13 75:13 76:3 80:10 80:14 82:7 82:7 91:1 91:17 91:21 91:23 92:1 92:1 92:3 96:20 96:21 98:15 100:8 100:18 100:19 112:5 112:17 121:16 122:13 127:5 135:13 135:14 138:22	<b>day's</b> 163:12	

<b>daytime</b> 293:8	175:22 258:23	<b>definition</b>
<b>Dayton</b> 244:12	261:8	156:3 163:22
244:13 244:14	<b>deciview</b> 303:12	<b>degree</b> 25:12
<b>DC</b> 105:17	<b>decoupled</b> 296:24	55:21 187:18
<b>DDM</b> 33:4 54:7	<b>decrease</b> 305:5	269:7 270:17
54:8 89:18	<b>dedicate</b> 274:20	314:14 314:14
232:13 235:8	<b>deemed</b> 15:2	314:17
235:9 237:12	<b>deep</b> 288:7	<b>degrees</b> 221:6
237:13 237:21	<b>default</b> 97:22	248:1
238:12 238:16	99:4 141:21	<b>delayed</b> 20:16
299:11 299:19	192:7 268:6	<b>deliver</b> 132:11
<b>deal</b> 17:15	280:14 304:14	309:8
17:18 25:2 59:15	311:5	<b>delivered</b> 30:4
106:16 159:15	<b>defaults</b> 8:4	293:11
172:10 258:2	101:25 102:2	<b>delivery</b> 216:2
258:3 258:12	102:5 304:14	<b>delta</b> 193:20
260:17	<b>defending</b> 240:7	<b>demonstrate</b>
<b>dealing</b> 6:25	<b>defensible</b>	8:19 62:20 62:25
8:2 15:18	118:4 296:16	63:3 113:15
15:19 15:22 26:9	305:18	117:25 118:4
84:1 89:9 90:5	<b>defer</b> 8:5 78:24	173:13
95:16 118:12	<b>deficiencies</b>	<b>demonstrated</b>
190:16 221:13	76:20	62:23 113:12
277:10	<b>define</b> 37:14	113:23 115:13
<b>deals</b> 15:22 242:2	109:6 109:9	<b>demonstrating</b>
<b>dealt</b> 50:23 57:20	109:15 129:25	25:17 39:4 97:14
89:22	130:5 209:7	99:14 101:11
<b>decade</b> 77:14	209:8 224:3	101:17 114:13
176:6	295:15	114:23 115:3
<b>December</b> 297:21	<b>defined</b> 27:12	115:24 158:6
297:24	65:23 65:25	<b>demonstration</b>
<b>decide</b> 164:1	128:2 222:5	25:3 25:10
294:25 295:8	224:12	27:5 38:13 38:21
318:13	<b>defining</b> 55:23	39:5 40:22 51:23
<b>decided</b> 4:10	187:21	52:13 86:8
23:24 103:24	<b>definitely</b>	105:22 114:7
156:15 165:20	26:21 57:25	261:13
169:22 192:11	68:18 83:22	<b>demonstrations</b>
193:23 194:7	149:17 160:6	26:15 27:13
<b>decision</b> 77:17	193:24 248:17	27:21 104:12
<b>decisions</b>		156:18 220:17

227:8 <b>dense</b> 73:4 146:24 <b>density</b> 52:10 312:10 <b>Department</b> 176:12 211:17 219:2 219:3 259:14 259:14 <b>depend</b> 125:13 <b>depending</b> 41:20 137:8 153:24 169:23 181:16 182:11 <b>depends</b> 35:25 157:19 252:2 253:16 253:19 <b>deploy</b> 268:21 <b>deployed</b> 66:20 <b>deployment</b> 258:7 <b>deposition</b> 9:2 224:7 227:17 229:15 229:18 229:20 241:5 253:4 260:20 263:18 268:9 268:11 269:4 269:6 270:10 270:13 270:14 270:17 270:18 270:20 270:24 271:14 317:16 320:23 321:2 321:6 <b>depth</b> 227:19 <b>DEQ</b> 85:2 <b>derivatives</b> 299:16 299:17 <b>Deroeck</b> 87:13 <b>describe</b> 160:20 161:25 260:14	299:10 299:20 <b>described</b> 186:1 189:13 <b>describing</b> 183:23 261:18 <b>description</b> 49:17 159:16 <b>descriptions</b> 139:7 <b>desert</b> 187:14 <b>design</b> 45:15 45:16 45:25 47:3 56:25 66:15 66:24 67:8 67:12 96:16 100:16 110:21 111:9 112:9 136:19 140:10 141:6 141:25 142:4 144:10 144:22 145:1 145:23 147:4 160:3 163:5 164:10 167:7 168:22 186:12 227:7 257:10 <b>designed</b> 69:14 97:25 119:10 119:11 130:3 160:9 204:23 273:11 <b>desk</b> 30:4 94:8 <b>destroy</b> 285:18 <b>destruction</b> 288:5 <b>detail</b> 9:6 35:9 59:13 70:13 79:25 93:8 98:19 127:21 136:13 193:3 209:9 228:16 234:10 266:1 <b>detailed</b> 13:3	96:23 97:16 175:20 184:23 184:24 309:6 <b>details</b> 16:12 40:14 59:9 80:6 82:8 86:22 97:4 115:23 116:4 118:14 118:15 129:21 137:24 284:25 292:1 292:6 <b>determine</b> 9:14 10:23 48:16 93:16 173:7 203:4 221:18 <b>determining</b> 19:9 102:17 103:7 106:18 180:25 <b>deterministic</b> 26:11 <b>develop</b> 9:15 28:15 34:19 49:20 56:11 76:18 77:2 83:9 160:21 177:16 228:2 275:25 276:4 296:2 320:19 <b>developed</b> 31:1 55:19 55:20 89:12 151:12 165:20 172:20 178:24 236:5 280:6 291:19 294:8 296:4 296:24 297:6 297:8 300:20 301:25 305:12 306:15 316:1 <b>developers</b> 9:4 311:1
--	---	--

<b>developing</b>	144:22 186:7	162:13 162:17
88:16 200:12	<b>difference</b> 20:4	163:18 163:21
202:3 258:22	56:12 56:14 70:8	163:24 165:3
296:7	70:22 71:5	166:16 166:25
<b>development</b>	71:9 80:7	170:5 170:7
9:16 30:24	130:2 131:2	170:17 171:13
32:4 96:6	140:18 140:20	171:13 172:17
219:1 258:25	140:23 140:25	180:2 188:3
259:18 259:21	141:15 143:25	188:19 190:9
260:1 260:2	169:12 188:4	193:6 195:20
260:13 260:15	189:15 248:16	196:1 197:6
294:21 320:8	250:6 252:7	203:21 203:22
320:22	283:23 284:3	204:4 204:5
<b>developmental</b>	286:11 289:24	204:6 204:14
119:20	292:23 302:11	204:25 208:3
<b>developments</b>	<b>differences</b>	208:20 216:16
321:7	70:9 90:13	216:20 223:6
<b>deviate</b> 300:9	92:4 123:8 151:8	225:11 225:12
<b>deviations</b>	157:7 224:25	227:3 228:25
215:2 215:6	229:23 237:24	229:1 229:6
<b>devil</b> 94:11	237:25 238:1	229:7 229:19
118:14 118:15	238:19 238:20	229:21 231:13
<b>devils</b> 40:14	268:13 275:23	233:17 233:24
<b>DFW</b> 147:18	282:21 284:25	234:21 235:2
<b>DHEC</b> 206:12	290:2 301:13	238:25 239:14
<b>DIAG</b> 279:20 280:7	<b>different</b> 13:25	245:9 245:15
284:10 286:8	14:4 14:4	245:19 251:2
290:1 290:7	28:18 29:20 34:1	254:13 262:1
<b>diagnose</b> 118:18	34:13 37:13	265:4 265:7
<b>diagnostic</b> 245:11	37:13 41:5	266:13 270:8
267:14	48:6 54:1	271:1 275:16
<b>diagnostics</b>	55:16 65:15	283:18 284:21
313:19	66:25 67:4 67:25	292:16 292:24
<b>dialogue</b> 60:22	67:25 69:18	292:25 294:7
132:5 309:5	69:20 70:12	298:12 300:5
<b>diamond</b> 177:25	71:13 71:21 81:1	304:22 304:24
<b>dice</b> 162:22	83:13 83:13	305:9 305:17
<b>Dick</b> 214:17	84:16 84:17	315:16 315:16
<b>diesel</b> 143:11	84:20 84:23	<b>differently</b>
	90:14 97:3	240:22 251:2
	112:11 120:1	295:7 295:15
	133:16 138:22	<b>differs</b> 284:14
	140:14 140:18	<b>difficult</b> 62:20
	141:10 145:9	77:18 84:5 88:19
	147:1 149:4	136:5 153:14

187:20 213:12	247:25 255:17	33:10 123:23
263:15 314:16	271:11 282:9	129:2 129:4
<b>difficulty</b>	283:10 284:12	129:10 129:12
85:11 113:19	286:11	130:1 130:17
115:3	<b>directions</b>	131:1 131:2
<b>diffusion</b>	168:6 247:12	154:16 174:21
224:15 225:21	284:7 284:17	186:21 186:22
278:16	286:12	228:5 233:9
<b>digest</b> 11:17	<b>direction's</b> 123:6	240:14 241:4
<b>digesting</b> 308:10	<b>directly</b> 31:17	241:7 241:9
<b>diligently</b>	41:9 101:6 101:7	241:10 261:15
30:15 103:21	310:15	262:8 273:6
<b>dilution</b> 175:5	<b>dirty</b> 48:23 150:9	274:11 278:17
177:14 282:19	<b>disagreement</b>	<b>displacement</b>
287:9 289:22	129:23	289:6
290:2 292:10	<b>disavowed</b> 296:7	<b>dispute</b> 259:23
<b>dim</b> 19:25	<b>disclaimer</b> 22:16	<b>disseminate</b> 14:14
<b>dimension</b> 123:24	<b>disclosure</b> 13:19	<b>distance</b> 110:8
<b>dimensional</b> 280:3	<b>disconnect</b> 273:18	124:15 137:21
280:20	<b>discount</b> 114:14	139:22 141:24
<b>diminish</b> 114:14	<b>discreet</b> 167:4	153:5 155:6
<b>diminished</b> 287:14	268:21	173:14 174:14
<b>diminishes</b> 289:21	<b>discuss</b> 59:21	174:23 175:5
<b>Dinosaur</b> 272:6	257:7 257:9	210:15 243:4
<b>dioxide</b> 263:23	<b>discussed</b> 6:11	290:9 291:9
264:4	9:6 32:7 53:14	312:12
<b>direct</b> 24:9	206:16 222:20	<b>distances</b> 146:5
38:7 38:22 42:19	<b>discussing</b>	152:12 221:15
43:15 45:1	10:10 222:1	245:21 270:1
49:3 50:10 52:14	<b>discussion</b> 13:4	270:9 286:18
54:23 73:14 85:6	13:4 13:15	311:24 312:1
85:12 87:10	22:4 40:19	312:12
98:21 296:24	51:3 57:6	<b>distant</b> 177:13
299:6 299:9	95:10 99:11	269:8
<b>direction</b> 120:5	204:1 205:21	<b>distinct</b> 257:22
152:15 187:14	<b>discussions</b> 53:16	<b>distinction</b> 60:12
187:18 209:23	59:12 60:14	<b>distract</b> 68:21
220:2 221:24	309:6	<b>distribution</b>
246:8 246:13	<b>dispersed</b> 278:13	68:14 84:17 95:1
247:16 247:16	<b>dispersion</b>	95:5 104:15
		120:25 121:9
		128:1 160:19
		161:6 161:17

162:1 162:10	57:13 57:23	90:17 99:3
162:21 166:9	85:15 85:22	100:22 108:12
166:20 167:13	85:22 85:23	113:6 113:7
178:6 201:25	92:11 92:24	124:13 125:24
202:8 202:12	158:3 220:15	128:16 129:12
203:6 204:18	222:18 240:23	135:18 136:1
205:2 205:19	259:1	148:12 149:10
215:13 215:15	<b>documentation</b>	152:2 158:3
216:23 249:15	50:16	158:3 187:7
250:12 253:15	<b>documented</b> 124:10	200:14 200:16
269:10 269:15	166:16 240:18	202:23 213:19
289:17	243:15	218:10 221:11
<b>distributions</b>	<b>documents</b> 55:22	228:14 228:15
159:16 171:9	100:4 124:11	232:14 240:22
203:20 203:24	240:14 260:3	246:5 259:23
204:7 204:8	262:8	262:9 273:7
250:4	<b>DOJ</b> 56:18	281:4 289:9
<b>diurnal</b> 111:13	<b>domain</b> 41:1 41:20	291:22 294:10
<b>divide</b> 162:1	43:21 110:19	299:21 301:15
162:3	110:20 116:10	302:4 306:21
<b>divided</b> 135:8	135:20 207:18	312:5 317:5
172:25 249:22	216:15 228:20	318:19
298:11 305:16	236:10 236:11	<b>door</b> 11:4 11:7
316:23	236:14 236:15	17:2 17:20 308:6
<b>division</b> 21:3	262:16 262:19	<b>do-over</b> 25:25
86:16 87:15	262:24 262:25	<b>dose</b> 94:15
113:8 213:16	267:3 281:5	<b>dot</b> 236:13
<b>divisions</b> 162:2	297:19 297:20	<b>dots</b> 14:8 298:18
162:4 162:5	298:9 314:24	<b>double</b> 43:22 84:8
168:17	319:14	110:4 116:18
<b>DIX</b> 190:24	<b>domains</b> 236:9	<b>double-check</b>
<b>doable</b> 154:2	262:12 293:18	154:13
155:11	300:14 319:8	<b>doubt</b> 66:8
<b>docket</b> 4:23 21:13	<b>dominates</b> 174:19	<b>Doug</b> 199:19
22:11 113:10	<b>done</b> 9:10 15:13	<b>downtimes</b> 105:2
114:4 132:21	23:12 25:14	<b>downwash</b> 121:25
<b>document</b> 20:25	27:24 32:14 35:7	121:25 122:5
21:5 21:20 21:25	35:21 36:14	135:13 135:14
22:20 24:4	36:19 38:2 38:12	144:1 156:2
33:2 37:1	38:24 39:9 48:22	182:7 182:8
53:24 56:9 56:12	48:25 49:10	186:25 187:7
56:13 56:13	51:22 51:25	187:10 198:10
56:16 57:11	52:17 52:24 74:8	

200:21 200:24 201:12 <b>downwashes</b> 120:15 <b>downwind</b> 80:13 123:16 241:3 279:12 285:19 285:23 286:3 286:19 287:8 287:14 288:6 288:16 289:11 289:16 289:21 290:14 290:23 291:5 291:13 312:13 <b>dozens</b> 25:20 25:21 <b>Dr</b> 296:4 <b>draft</b> 4:16 11:20 20:10 21:17 21:20 26:5 31:17 33:1 38:18 59:4 73:7 76:23 85:22 107:7 136:13 137:24 157:25 220:23 <b>dragged</b> 95:21 <b>drain</b> 120:12 120:14 121:6 <b>drastically</b> 181:8 <b>draw</b> 232:2 <b>Draxler</b> 250:9 <b>dreaded</b> 36:6 <b>drink</b> 38:3 <b>drinking</b> 94:15 <b>drive</b> 153:16 155:19 269:24 279:22 <b>driven</b> 44:17 142:5 144:22 145:1 145:23	147:5 282:12 <b>driver</b> 255:20 257:9 319:18 319:23 <b>driving</b> 91:2 91:6 146:16 <b>drop</b> 151:3 168:12 168:20 169:2 305:23 <b>dropped</b> 149:15 <b>dropping</b> 178:2 <b>drops</b> 153:3 154:17 <b>drove</b> 281:7 <b>dryers</b> 155:20 <b>due</b> 75:12 120:5 124:5 128:8 142:10 190:12 214:9 238:20 292:9 308:2 <b>during</b> 3:18 77:11 128:5 160:14 196:14 199:20 244:11 318:18 <b>dust</b> 61:18 61:19 <b>dwell</b> 164:12 287:24 <b>dynamic</b> 106:3 <hr/> <b>E</b> <hr/> <b>eager</b> 293:13 <b>eagerly</b> 76:22 <b>earlier</b> 49:15 54:9 54:21 55:9 55:12 84:4 96:5 101:10 151:7 184:10 200:10 222:4 255:8 270:11 277:1 283:1	293:9 <b>early</b> 4:5 4:22 11:24 12:25 13:13 23:20 24:24 29:8 115:16 234:9 241:8 308:2 309:4 <b>easier</b> 14:9 171:18 193:24 196:7 <b>easiest</b> 38:10 <b>easily</b> 175:18 <b>east</b> 147:20 298:17 <b>easy</b> 112:2 175:17 182:22 191:4 194:24 195:23 197:15 <b>echo</b> 200:8 <b>economy</b> 58:20 <b>ecosystems</b> 320:20 <b>edge</b> 152:10 186:3 264:15 290:17 <b>edges</b> 290:16 290:21 <b>edits</b> 48:19 <b>Edward</b> 294:11 <b>effect</b> 23:16 95:7 146:20 147:7 159:14 173:24 199:12 201:11 <b>effective</b> 15:8 16:6 95:2 95:5 95:7 170:13 193:24 195:15 197:15 <b>effectively</b> 28:4 49:20 51:2 104:9
--	--	---

108:19	12:8 12:16 89:13	102:11 104:21
<b>effects</b> 33:17	97:13 101:7	104:23 139:9
42:11 245:11	101:8 104:22	142:5 155:21
267:14 299:10	113:14 113:16	156:9 160:11
320:20	118:19 123:7	215:16
<b>efficient</b> 15:8	175:17 177:10	<b>emerging</b> 5:5 8:11
16:6 36:18	191:10 201:18	53:15 87:25
<b>efficiently</b>	206:13 244:11	218:15 261:7
197:12 232:21	269:21 307:12	320:5
<b>effort</b> 9:5	307:17 309:2	<b>emission</b> 24:9
14:20 15:11	<b>Eladio</b> 159:10	30:25 52:10 63:8
15:16 83:19	203:16 205:8	63:9 64:7
93:23 96:7 222:5	213:22	65:13 65:14
<b>efforts</b> 9:11	<b>electric</b> 166:14	65:22 73:15
12:14 14:4	<b>elegant</b> 88:21	135:4 143:9
14:7 14:10 76:17	<b>element</b> 257:5	148:25 159:14
118:8 124:9	261:14	159:16 160:3
138:13 223:2	<b>elemental</b> 238:9	160:8 160:13
223:6 223:10	238:11	160:16 160:19
223:13	<b>elements</b> 257:10	160:22 160:24
<b>Egan</b> 184:1	<b>elevation</b> 289:12	160:25 161:9
<b>EGU</b> 142:14	<b>eliminate</b> 277:1	161:12 161:14
143:5 144:18	289:7	161:20 161:23
212:7 263:3	<b>eliminated</b> 105:21	161:24 162:3
266:4	<b>eliminating</b>	162:23 163:24
<b>EGUs</b> 145:8 211:22	208:25	164:5 164:17
212:19 263:8	<b>else</b> 4:6 20:19	166:22 167:2
266:4	60:16 150:16	167:13 167:13
<b>eight</b> 123:3 155:7	210:24 302:6	167:15 167:21
214:19 223:3	313:5	167:21 167:24
241:14 244:7	<b>else's</b> 316:6	168:17 168:20
295:6 317:18	<b>elsewhere</b> 10:15	171:7 171:8
<b>eighth</b> 45:21	107:24	171:13 173:14
69:11 70:4 70:10	<b>eluded</b> 89:14	174:4 183:8
70:23 71:1	<b>email</b> 310:17	191:9 203:6
71:4 72:14	<b>embrace</b> 88:20	203:24 212:7
<b>eight-thirty</b>	117:25	212:10 212:12
321:19	<b>EMDIST</b> 164:1	215:10 216:23
<b>EIS</b> 258:25	164:12	235:9 283:19
<b>either</b> 4:21	<b>emergency</b>	299:4 303:6
7:17 10:11		<b>emissions</b> 7:5
		27:1 30:22
		31:7 34:5 36:1
		37:5 37:24 37:24
		38:7 38:9

38:20 39:22	189:17 199:21	164:18 165:12
39:23 42:18	199:23 200:1	165:14 165:20
42:22 44:11	201:25 202:8	166:4 166:7
47:23 49:24	203:20 204:7	166:21 167:18
54:21 56:3 62:14	204:8 204:17	168:13 168:25
64:22 66:4 67:14	204:18 205:18	169:15 169:17
67:25 69:21	215:25 216:16	169:20 169:23
69:23 77:22	232:13 236:18	201:23
80:21 84:11	236:20 237:8	<b>encountering</b>
84:13 85:7 85:13	280:17 281:9	86:22
89:10 102:10	283:22 285:9	<b>encourage</b> 24:20
104:5 104:12	285:12 297:2	102:7 264:23
104:22 105:3	297:2 297:9	275:18
106:20 119:9	298:5 298:6	<b>encouraged</b> 66:6
122:14 122:15	298:7 298:8	73:24
122:21 127:22	298:14 298:19	<b>encouraging</b> 100:6
128:2 136:17	298:24 299:2	129:13
136:18 139:3	299:18 299:18	<b>endorsements</b>
139:14 139:18	300:22 301:1	22:23
142:6 142:9	301:8 303:5	<b>energy</b> 211:17
142:21 143:4	303:7 303:7	219:1 259:18
143:13 143:21	304:3 305:22	<b>enforce</b> 201:25
143:22 144:8	306:1	<b>enforceable</b>
144:15 144:16	<b>emit</b> 199:23 215:1	201:24
154:10 154:12	<b>emphasis</b> 30:24	<b>engage</b> 12:7
154:17 156:1	316:10	91:7 117:13
156:10 156:25	<b>emphasize</b> 17:19	117:19 218:11
159:18 160:5	157:10 307:9	219:20 308:18
162:3 162:7	<b>emphasizing</b> 77:4	<b>engaged</b> 42:15
162:10 162:12	<b>Empire</b> 125:1	115:15
162:15 163:8	176:10 176:20	<b>engagement</b> 218:7
163:19 164:1	179:3 179:8	<b>engaging</b> 88:16
164:3 164:4	179:18 180:2	118:8 218:17
164:14 165:9	199:18	219:15 309:9
165:24 166:1	<b>empirical</b> 172:23	<b>engineering</b> 10:19
166:5 166:8	<b>empirically</b>	<b>engineers</b> 29:16
166:11 166:15	175:12	<b>engines</b> 147:21
166:20 167:9	<b>EMPOST</b> 164:9	148:11 148:14
167:11 167:17	165:13 216:25	148:17 160:12
168:1 168:2	<b>empty</b> 194:16	176:23 179:18
168:12 168:17	194:24	
168:24 168:24	<b>EMVAP</b> 159:18	
169:4 169:5	164:3 164:18	
169:13 169:16		
170:18 171:9		
171:11 186:11		

<b>ensure</b> 276:2	35:6 58:22 62:21	280:11 314:12
<b>entered</b> 259:15	71:6 76:14 87:20	<b>Epsilon</b> 183:25
<b>entertain</b> 216:7	88:16 110:9	<b>equal</b> 65:13 65:22
<b>entire</b> 47:12	172:13 173:9	72:4 74:16 75:22
113:21 190:8	174:9 179:23	189:12 255:14
<b>entitled</b> 25:16	180:8 182:13	<b>equally</b> 231:17
<b>entrained</b>	184:5 200:4	<b>equation</b> 278:16
174:18 184:21	202:14 203:12	297:5 299:20
187:4	204:1 206:9	300:4 300:13
<b>entrainment</b>	211:25 213:24	300:25 301:4
124:21 174:2	218:10 219:2	301:14
174:21 177:12	219:13 220:5	<b>equations</b>
177:14 180:23	220:21 221:17	299:17 300:20
<b>entrains</b> 186:24	223:10 240:15	301:10
<b>envelope</b> 161:17	241:20 244:12	<b>equilibrium</b> 97:24
202:8	244:24 245:22	149:5
<b>EnviroMet</b> 91:14	247:7 247:10	<b>equipment</b>
<b>Environ</b> 228:13	248:7 248:20	191:19 191:20
228:15 229:9	252:4 254:22	274:24 275:1
232:11 233:2	257:10 259:15	<b>equivalent</b> 24:13
240:5 261:12	260:25 261:2	<b>era</b> 27:18
262:9 262:12	261:5 261:11	<b>Erik</b> 91:10
265:24 268:5	263:25 272:20	94:21 96:5
268:17 269:9	272:24 273:1	118:11 131:13
270:23 294:10	273:2 275:17	132:8 133:1
294:13	275:24 276:16	142:15 145:14
<b>environment</b> 49:19	278:4 294:25	145:25 147:9
50:15 90:8	296:17 310:11	198:2 198:6
201:24 273:17	312:5 313:20	<b>error</b> 247:18
274:2 274:14	317:18	249:15 249:24
294:12 294:17	<b>EPA's</b> 22:22 172:1	249:24 250:20
298:6	179:16 223:3	250:22 251:11
<b>environmental</b> 3:1	244:21 272:23	253:18
64:14 118:6	<b>EPD</b> 87:17	<b>errors</b> 175:24
171:22 176:12	<b>episode</b> 237:4	250:19
211:17 258:22	238:8 279:6	<b>especially</b> 4:1
<b>environments</b>	286:15 297:23	29:6 33:13 44:16
204:5	<b>episodes</b> 75:14	44:22 53:6
<b>EPA</b> 9:17 10:11	297:20 297:22	54:5 60:13 62:15
12:16 15:20 20:2	<b>episodic</b> 54:18	77:11 91:19
24:23 29:3	<b>EPRI</b> 159:9	120:23 134:20
	171:4 171:14	
	202:3 202:3	
	203:16 236:5	

145:8 149:18	253:2 269:19	225:17 225:18
171:8 173:16	272:14 280:21	225:24 229:5
210:1 217:5	<b>Europe</b> 229:2	233:9 236:7
267:3 273:8	<b>European</b> 241:24	240:9 241:20
284:11	243:19	242:10 242:16
<b>essentially</b> 193:8	<b>evaluate</b> 6:13	244:22 246:8
261:17 262:2	80:9 88:4 96:7	248:24 248:25
299:3 314:3	117:24 119:22	249:2 251:21
<b>establish</b> 7:22	124:24 155:15	252:15 255:11
259:20 260:10	155:16 183:8	255:12 257:11
318:16	200:3 224:24	257:13 257:15
<b>established</b> 13:22	225:18 228:21	260:24 263:1
14:16 31:25	230:15 232:21	271:24 289:8
96:24 106:21	239:16 279:14	294:23 311:22
<b>establishing</b>	295:21 297:8	316:1 316:3
230:21	300:12	316:5 316:8
<b>estimate</b> 173:4	<b>evaluated</b>	<b>evaluations</b>
231:2 270:13	119:17 128:17	5:15 6:8 8:23
<b>estimates</b> 77:3	138:21 159:21	9:7 12:19
122:15 231:1	165:24 234:4	17:11 99:3
232:12 233:14	234:13 244:18	99:9 100:5
236:25 237:6	244:25 245:1	100:11 119:22
237:6 238:13	249:4 249:5	122:11 125:23
268:8 269:6	252:20 300:3	170:10 172:15
269:6	314:7	173:12 184:2
<b>estimating</b>	<b>evaluating</b>	184:16 201:17
96:25 101:1	234:4 241:6	219:19 219:20
189:18 270:24	301:17	225:9 225:14
<b>et</b> 65:24 75:23	<b>evaluation</b> 7:20	227:21 243:15
80:10 165:15	8:9 8:14 11:22	276:8 309:13
<b>ETEX</b> 229:2	11:23 32:8	317:13
244:3 256:7	56:1 56:2 56:4	<b>evening</b> 3:13
256:12 312:11	123:22 124:13	256:25 321:20
<b>ethane</b> 305:2	128:16 159:21	<b>eventually</b> 61:9
<b>ethanol</b> 137:13	165:19 166:2	144:14 303:16
138:17 139:10	183:24 190:8	<b>everybody</b> 3:5 3:8
145:15 146:1	199:22 200:20	3:12 3:14 4:1
146:3 146:9	215:22 221:17	4:10 4:12
155:20	221:21 222:23	14:24 15:6 19:12
<b>Eulerian</b> 53:11	223:10 223:11	19:16 19:17
53:16 220:4	223:14 223:22	31:18 59:5 90:21
220:5 221:8	223:24 224:10	93:22 94:3 94:23
	224:11 224:13	113:10 198:3
	225:7 225:17	217:13 217:25

294:3 321:12	81:24 85:13 87:8	182:15 207:15
<b>everybody's</b> 16:10	102:10 107:15	269:16 270:21
17:4 20:6 90:3	108:4 109:9	<b>exception</b> 39:15
133:2 198:19	112:8 114:15	89:8 117:21
220:13	117:23 119:10	117:22 178:15
<b>everyday</b> 45:21	120:6 120:12	<b>exceptionally</b>
<b>everyone</b> 23:4	123:15 125:21	202:11
34:9 60:4 284:9	136:25 138:17	<b>exchanges</b> 184:7
<b>everyone's</b> 39:1	160:11 160:23	<b>excited</b> 226:22
<b>everything</b> 3:16	161:18 162:11	<b>exclude</b> 48:11
5:24 20:19 35:10	166:24 178:11	52:5 208:15
36:1 52:15	178:21 184:10	<b>exclusively</b> 90:19
55:4 56:19 73:25	187:25 239:4	<b>excuse</b> 153:20
92:23 107:21	241:13 261:15	249:1
154:7 210:24	272:18 285:5	<b>exercise</b> 40:24
244:6 244:8	300:13 304:23	50:22 73:7
302:5 313:5	315:23 316:2	184:11 203:25
316:9	316:16 317:3	<b>exercises</b> 75:5
<b>evidence</b> 51:2	<b>examples</b> 66:7	<b>exhaust</b> 162:16
<b>evidenced</b> 84:19	67:16 79:14	164:17
<b>evolution</b> 308:9	90:18 90:25 96:4	<b>exhaustive</b> 96:23
312:15	110:24 118:11	<b>exist</b> 205:2
<b>evolve</b> 79:14	138:7 156:22	225:12
<b>evolving</b> 17:12	165:21 182:18	<b>existed</b> 318:17
226:21	184:16 209:15	<b>existing</b> 6:12
<b>exact</b> 146:5	218:25	18:18 26:18 31:3
154:13 195:20	<b>exceed</b> 106:20	42:1 43:20
207:17	<b>exceedance</b> 137:20	56:8 61:12
<b>exactly</b> 19:17	153:2 153:18	68:2 68:5
47:25 196:25	156:10	68:11 69:25 70:1
209:13 289:7	<b>exceedances</b> 135:5	87:25 88:4
<b>examine</b> 103:9	137:3 138:2	88:7 88:8
257:12	138:4 141:7	88:22 90:4
<b>examined</b> 261:22	144:2 144:14	96:7 97:1 98:6
<b>examining</b> 265:9	144:19 145:18	149:9 149:19
265:14	<b>exceeded</b> 115:4	149:22 153:15
<b>example</b> 31:3 31:9	145:21	192:11 194:18
35:13 49:22	<b>exceeds</b> 103:12	194:20 202:22
49:23 49:23 50:1	248:1 295:3	203:21 205:3
53:13 74:6 80:20	<b>Excel</b> 297:5	205:3 213:17
	<b>except</b> 75:22	214:5 227:24
	101:20 130:25	
	144:1 164:13	

260:5 261:3	242:1 242:4	<b>exposed</b> 80:22
261:7 308:7	242:5 242:7	<b>exposure</b> 126:20
308:22	243:18 243:20	320:13
<b>exists</b> 93:7	244:10 246:23	<b>express</b> 206:8
277:14	251:9 251:12	<b>expressed</b> 111:9
<b>exit</b> 142:23	252:18 255:12	<b>expressing</b> 203:18
164:16 167:1	255:19 256:7	<b>extend</b> 11:14
<b>expand</b> 104:18	313:2 313:9	13:14 94:7
<b>expanded</b> 134:17	313:12 313:18	198:24
276:13	315:1	<b>extended</b> 21:15
<b>expansion</b> 85:4	<b>experiments</b> 223:5	92:22 100:12
85:8 86:12 87:7	228:23 229:2	307:20 307:21
<b>expansive</b> 116:11	229:7 229:13	<b>extends</b> 198:9
<b>expect</b> 10:8 71:18	233:10 233:21	<b>extensively</b>
73:12 76:4	234:3 241:14	119:17
87:7 125:9	241:21 243:17	<b>extent</b> 60:1
130:16 152:6	244:2 246:22	238:20 260:6
166:7 166:21	254:13 312:6	308:17
167:2 168:12	313:1 313:11	<b>external</b> 196:8
234:8 266:23	<b>expert</b> 78:24	<b>extra</b> 13:15
285:24 292:11	<b>explain</b> 64:13	157:23 157:23
308:7	65:21 79:25 92:4	271:15
<b>expected</b> 56:5	167:5 240:21	<b>extracting</b> 291:24
71:6 168:4	263:12 271:7	<b>extrapolating</b>
168:21 169:1	271:15 271:16	77:15
169:16 283:4	288:21 296:9	<b>extreme</b> 69:6 70:4
<b>expecting</b> 16:15	296:22	82:5
85:7 88:6 121:5	<b>explained</b> 57:1	<b>extremely</b> 213:12
<b>expensive</b> 200:4	<b>explanation</b> 268:3	<b>extremes</b> 81:19
<b>experience</b>	268:4 290:4	170:4
58:23 59:7	<b>explicit</b> 35:11	<hr/>
84:3 97:15	117:3 304:16	F
133:12 136:3	305:24	<hr/>
148:13 206:6	<b>explicitly</b> 10:8	<b>faces</b> 3:10
<b>experiences</b> 86:21	35:15 41:11	<b>face-to-face</b>
90:5 101:6	43:24 107:1	184:7
157:20	<b>exploded</b> 170:15	<b>facilitate</b> 4:22
<b>experiment</b>	<b>exploding</b> 55:14	6:17 13:11 225:8
74:12 190:15	<b>exploratory</b>	225:9 307:22
229:3 234:13	191:24 196:21	<b>facilities</b> 27:1
234:23 241:24	<b>exploring</b> 292:16	
	<b>export</b> 194:23	

40:9 55:2 62:7	<b>fact</b> 12:2 13:24	<b>fairness</b> 43:8
63:22 87:11	17:22 21:19	78:23
133:24 134:2	21:22 95:15	<b>fall</b> 19:5 19:25
134:2 134:16	100:21 104:7	20:11 36:24
136:24 137:12	114:14 115:4	81:18 105:5
138:1 138:2	115:4 115:17	112:12 272:22
138:3 145:16	117:25 124:17	<b>falling</b> 288:5
147:1 148:4	170:1 203:2	<b>false</b> 253:7 253:9
148:5 148:20	210:1 210:22	<b>false-negative</b>
148:22 149:1	220:9 264:10	317:7
149:19 149:22	271:18 274:5	<b>false-positive</b>
150:1 151:9	274:18 277:9	317:6
152:8 152:9	301:16 314:21	<b>familiar</b> 66:9
152:14 153:4	317:2 317:12	94:24 135:11
153:15 154:3	<b>factor</b> 65:14	148:2 229:4
157:1 157:4	121:12 121:20	249:24 250:1
157:14 191:8	167:12 169:10	278:8 280:23
195:19 196:10	169:12 180:18	314:13
196:11 197:17	188:15 189:2	<b>familiarity</b>
<b>facility</b> 37:21	254:15 254:16	274:20 293:16
37:23 38:5	270:13	<b>famous</b> 160:1
38:6 38:6	<b>factors</b> 30:25	<b>fan</b> 148:18
43:20 44:10 68:9	30:25 107:11	<b>fancy</b> 139:12
134:6 134:22	127:4 203:22	<b>far-field</b> 258:2
136:17 137:19	225:2	261:16 269:11
140:4 141:1	<b>failing</b> 119:13	<b>farther</b> 144:13
144:7 145:22	<b>fair</b> 5:24 40:23	174:15
145:23 145:24	49:1 87:22 88:12	<b>fashion</b> 15:7
146:23 146:23	131:12 133:12	20:13 29:5
147:6 148:7	152:16 190:7	118:22 234:18
149:7 149:9	210:18 262:10	<b>fashioned</b>
149:24 149:25	<b>fairly</b> 38:4	165:12 170:23
150:16 150:23	44:6 47:23 51:16	216:4
150:23 153:5	104:24 112:2	<b>fast</b> 95:17
154:25 155:2	122:12 143:7	119:3 169:24
155:3 155:25	152:15 152:18	169:25 170:10
156:3 156:14	154:2 154:3	170:22
191:18 191:25	155:12 168:11	<b>fault</b> 83:17
192:14 195:11	192:16 196:16	<b>favor</b> 77:7
196:1 235:6	214:9 251:15	<b>feasibility</b>
237:9	257:25 265:16	
<b>facility's</b> 147:7	287:7 300:17	
<b>facing</b> 95:21	300:22 301:12	
118:18 118:23	319:18 321:1	
156:15		

231:23 308:20	137:17 137:18	165:2 165:3
<b>feasible</b> 135:6	139:23 140:4	165:10 165:15
213:25 275:20	140:8 140:15	<b>files</b> 81:4 116:25
<b>features</b> 285:24	140:23 141:5	164:9 216:24
291:7	141:7 141:13	<b>fill</b> 138:3 175:10
<b>February</b> 24:22	141:15 146:25	183:1 226:12
25:1 25:7 45:9	173:17 227:5	232:20
133:7	227:12 227:20	<b>filling</b> 80:10
<b>fed</b> 164:9	235:19	<b>filterable</b> 65:2
241:21 244:23	<b>fewer</b> 120:7	65:14 65:16
283:1	<b>field</b> 6:12 6:12	65:19
<b>federal</b> 5:16 9:17	34:21 97:1	<b>final</b> 18:8
15:23 24:16	119:24 120:2	18:10 19:6
66:11 191:11	122:13 123:2	21:6 22:19 85:23
219:1 219:8	124:22 148:23	113:12 113:22
219:23 222:2	171:6 190:15	173:7 288:19
222:2 222:21	199:25 200:12	291:9
231:20 248:7	229:7 233:10	<b>finalize</b> 17:7
258:24 268:19	233:13 233:15	<b>finalized</b> 22:1
<b>feed</b> 14:15 128:10	233:17 233:25	306:16
236:22 240:1	234:3 234:13	<b>finalizing</b> 22:13
245:12	234:23 235:13	<b>finally</b> 26:22
<b>feedback</b> 10:13	245:9 245:22	34:6 35:1 130:21
109:25 156:13	254:13 255:13	182:3 190:14
210:20 226:5	266:21 268:25	251:16 276:16
<b>feel</b> 8:16 14:20	282:4 314:23	285:1 288:1
19:18 52:23	<b>fields</b> 245:11	290:10 293:15
62:17 79:5 84:25	245:17 246:18	<b>finding</b> 102:11
84:25 94:5 95:15	266:15 281:18	234:16
99:11 100:2	284:21	<b>findings</b> 75:1
112:15 112:19	<b>figure</b> 165:22	92:16 141:23
180:5 197:16	231:20 237:25	144:18 243:3
222:17 224:3	250:10 251:7	<b>finds</b> 62:20
<b>feelings</b> 92:16	253:24 263:4	<b>fine</b> 17:17 151:24
<b>fell</b> 192:4	263:6 263:21	235:24
<b>fellow</b> 91:16	285:8 289:23	<b>finer</b> 239:17
159:7	302:3	246:18 267:9
<b>felt</b> 28:11	<b>figured</b> 19:14	<b>finish</b> 4:19 113:3
71:25 101:16	134:22 298:22	136:15
195:8	<b>figures</b> 184:21	<b>finishing</b> 61:16
<b>fence</b> 33:17	263:9 281:14	
	283:16 283:25	
	291:24	
	<b>file</b> 35:1 81:7	

<b>fire</b> 139:9 142:5 143:12	299:14 316:5 317:1 318:7	286:20
<b>fired</b> 186:7	<b>fits</b> 25:23 32:6 50:19	<b>flexibilities</b> 96:8 108:7
<b>firm</b> 86:9 113:9	<b>fitted</b> 178:1 242:15 242:20 255:9	<b>flexibility</b> 64:9 95:13 95:18 102:20 108:3 108:21 203:4 213:14 213:17 275:11
<b>firmer</b> 87:1	<b>fitting</b> 162:5	<b>flexible</b> 95:24 214:2
<b>firmly</b> 112:17	<b>five</b> 23:2 43:5 46:19 47:2 47:11 48:2 54:17 61:2 96:20 100:18 135:12 143:12 162:1 162:4 164:7 166:25 167:18 167:20 168:15 168:16 170:20 171:2 186:7 186:9 202:5 202:7 208:24 217:16 243:18 244:10 252:10 259:11 263:3 276:10 298:12 298:13 298:15 298:15 301:13 305:7	<b>FLEXPART</b> 229:6 253:1 253:10 253:13 253:16 253:19 254:10 256:1 256:4 256:10
<b>first</b> 7:13 9:20 24:3 24:7 37:19 47:17 47:21 47:24 59:6 70:10 70:22 71:2 71:3 86:20 86:20 97:13 111:6 111:8 111:10 112:1 113:4 113:5 115:1 138:17 139:24 141:4 145:13 145:15 146:1 147:13 147:25 149:14 154:23 158:21 159:4 174:14 180:2 181:14 185:15 187:25 203:20 205:12 205:12 206:1 206:4 208:23 227:15 244:18 245:9 256:24 260:10 261:14 270:25 278:3 282:24 285:5 296:15 299:16 303:5 307:2 312:23 313:10 313:14 314:7 315:5 317:18	<b>fix</b> 135:6	<b>FLM</b> 245:22 247:7 247:10 252:4 255:15 257:10 263:25 272:19
<b>fit</b> 8:17 64:24 65:8 65:25 66:1 66:4 67:14 73:3 208:3 224:2 242:18 243:8 243:11	<b>fixable</b> 155:21	<b>FLMs</b> 8:12 12:17 218:11 218:17 222:13 257:22 260:25 261:3 261:5 272:3 275:25
	<b>fixed</b> 160:15 173:10 173:15 174:10 175:9	<b>floor</b> 171:18 183:16 198:5
	<b>flares</b> 139:8	<b>flow</b> 193:4 267:6 267:7 307:6
	<b>flat</b> 90:14 90:19 90:22 146:17 166:17 168:20 169:2 169:6 170:1 291:10	<b>flowchart</b> 36:21 305:21
	<b>flavor</b> 59:6	<b>flowing</b> 307:1
	<b>flew</b> 279:11	<b>flown</b> 233:19
		<b>fluency</b> 274:10
		<b>fluent</b> 274:12
		<b>flurry</b> 313:3

<p><b>fluxes</b> 278:18</p> <p><b>flying</b> 185:18</p> <p><b>focal</b> 92:21</p> <p><b>focus</b> 9:23 29:21 69:17 69:18 75:17 95:10 110:10 133:6 207:11 227:10 306:6</p> <p><b>focused</b> 13:4 77:1 125:24 126:23 133:14 174:9 233:24 262:16 291:22 291:25</p> <p><b>focusing</b> 13:16 60:24 71:11 86:8 110:14 222:6 306:5 312:7</p> <p><b>fold</b> 236:4</p> <p><b>folks</b> 15:17 16:1 95:19 101:4 102:6 203:13 213:16 294:13 295:1 297:7</p> <p><b>follow-up</b> 91:15 96:2 200:8</p> <p><b>footprint</b> 58:18 58:20 153:4</p> <p><b>footprints</b> 155:17</p> <p><b>forbade</b> 275:2</p> <p><b>force</b> 235:5 237:7 237:12 237:19 238:11 238:18 255:13 262:14 263:2 277:2 300:4 300:9 300:15 300:19 300:23 301:6 301:14</p> <p><b>forcing</b> 5:11</p> <p><b>forecast</b> 242:2</p>	<p>249:19 253:10</p> <p><b>foresee</b> 86:23</p> <p><b>foresight</b> 228:2</p> <p><b>Forest</b> 58:10 58:12 257:3 258:19 259:2 320:2 320:6 320:11 321:3</p> <p><b>forget</b> 51:3 207:17</p> <p><b>form</b> 7:6 21:6 33:15 45:6 69:12 101:23 102:6 102:25 104:6 111:11 136:6 163:9 174:2 177:21 203:1 206:23 228:10 232:11 271:21</p> <p><b>forma</b> 251:9</p> <p><b>formal</b> 16:25 17:1 22:21 22:22 98:5 259:21</p> <p><b>formally</b> 10:2 11:14 132:20</p> <p><b>format</b> 279:24 280:5</p> <p><b>formation</b> 31:8 31:11 34:4 35:15 37:6 38:15 38:23 39:5 40:11 43:20 44:2 44:3 45:2 54:20 71:16 71:22 72:1 72:3 73:5 77:4 84:12 87:18 88:2 92:14 277:16 299:23</p> <p><b>formed</b> 26:19 27:22 29:9 29:23 29:24 33:19 39:2 49:6 54:13 56:15</p>	<p>133:5 133:7 133:10</p> <p><b>forming</b> 14:25</p> <p><b>forms</b> 27:3</p> <p><b>formula</b> 10:19 198:10 200:22 201:1 201:12</p> <p><b>formulate</b> 68:12</p> <p><b>formulated</b> 129:6 246:6</p> <p><b>formulation</b> 60:2</p> <p><b>formulations</b> 6:4 7:20</p> <p><b>Fort</b> 148:1 148:1</p> <p><b>forth</b> 8:12 9:8 15:17 32:24 54:2 89:15 100:21 101:20 102:20 111:20 115:7 128:15 193:14 225:8 225:24</p> <p><b>forthcoming</b> 4:21</p> <p><b>fortunate</b> 124:3 185:24</p> <p><b>forum</b> 58:25</p> <p><b>forward</b> 8:8 9:3 11:9 16:5 19:10 20:9 28:3 51:21 60:18 60:21 63:6 73:1 77:13 79:16 85:21 100:8 109:7 114:8 118:5 121:18 156:15 157:11 157:18 158:9 195:9 202:24 206:2 218:7 219:4 219:5 222:22 222:24 224:1 231:6</p>
---	--	--

232:25 236:3	<b>frameworks</b> 225:11	<b>fully</b> 53:20 55:15
237:24 257:14	<b>frankly</b> 72:22	80:9
270:7 277:4	107:19	<b>function</b> 167:1
309:9 309:12	<b>fray</b> 52:1	173:14 174:14
318:20 320:22	<b>frenzy</b> 36:19	174:25 176:16
<b>foundation</b> 26:2	<b>frequency</b> 161:5	238:22 297:1
26:2 26:4 86:9	162:10 166:19	299:15
87:2 87:4	250:4 253:14	<b>fundamental</b> 68:22
<b>fours</b> 246:22	<b>frequent</b> 70:18	<b>funding</b> 200:13
<b>fourth</b> 39:17	<b>frequently</b> 74:8	<b>future</b> 9:4 21:9
139:9	104:14	48:23 96:6
<b>four-tiered</b> 31:21	<b>friends</b> 41:17	100:11 108:15
<b>Fox</b> 4:7 4:9 16:23	<b>Froning</b> 138:18	134:14 192:3
18:11 18:25 19:7	<b>front</b> 35:8	222:18 223:22
29:2 84:3 86:7	61:15 94:5 197:1	224:8 257:14
87:23 88:15	198:4 239:5	293:11 320:22
90:24 92:25	247:21	321:6
94:13 116:18	<b>fronts</b> 204:22	
116:21 200:7	<b>frowned</b> 241:11	<hr/> G <hr/>
203:11 204:10	<b>fuel</b> 145:15 146:3	<b>gain</b> 15:15 79:13
204:10 206:3	146:10 146:17	<b>Galani</b> 311:16
212:24 212:24	146:19	<b>game</b> 5:24 244:15
214:16 215:11	<b>fuels</b> 64:10	<b>gap</b> 175:10 183:1
216:5 217:3	<b>fugitive</b> 44:10	<b>gaps</b> 226:12
217:23 217:23	61:17 61:19	<b>gas</b> 87:11
217:24 306:24	68:16 73:1 76:18	145:14 145:25
<b>fraction</b> 303:23	<b>fulfilling</b> 226:3	147:10 147:14
<b>fractional</b> 188:18	<b>full</b> 3:25 7:14	153:10 182:16
250:2 250:15	13:19 49:12	193:8 197:12
251:14 253:12	50:21 88:21 89:7	198:14 263:4
315:24 316:17	90:1 97:10 98:23	263:8 278:24
316:20 316:23	125:9 126:5	<b>gate</b> 321:14
317:6 317:6	133:3 135:19	<b>gathering</b> 205:20
<b>frame</b> 13:13 60:19	150:8 167:3	<b>Gaussian</b> 242:16
60:23 213:11	181:8 189:8	242:18 243:5
257:24	217:25 232:17	255:9
<b>frames</b> 214:5	271:4 287:16	<b>geared</b> 233:4
<b>framework</b> 37:12	290:4 297:16	<b>gears</b> 49:2 158:19
224:10 225:7	303:18 304:9	230:5
257:18 260:11	309:18	<b>general</b> 26:14
277:8 294:22		67:3 123:22
306:14 315:2		

155:11 230:23	58:9 79:23	316:4
259:19 275:12	80:4 81:9	<b>gives</b> 120:21
306:8	81:17 81:22	130:4 130:14
<b>generally</b> 60:25	82:13 82:21	136:19 141:21
61:18 61:23	90:16 91:22	150:24 151:16
64:20 74:5	93:24	164:10 192:24
100:24 174:16	<b>gets</b> 7:18 36:14	279:16 301:14
182:14 252:11	98:14 117:10	304:5
259:16 275:11	150:13 150:14	<b>giving</b> 19:25
<b>generate</b> 81:6	186:18 208:20	168:3
<b>generating</b>	220:24 256:17	<b>glad</b> 294:3
70:18 150:1	<b>getting</b> 4:19	<b>Glass</b> 34:10
166:12 166:14	10:13 11:3	206:11 208:9
<b>generation</b> 222:6	11:6 14:18 58:23	209:3
<b>generator</b>	68:19 76:23 86:9	<b>glean</b> 28:22 36:8
104:24 143:11	95:23 105:10	<b>glimpses</b> 22:18
144:23 215:16	153:13 155:24	<b>global</b> 249:13
<b>generators</b> 102:11	156:2 157:1	255:2 298:9
104:21 186:8	158:17 169:16	<b>GMR</b> 295:3
186:13	178:18 193:21	<b>goal</b> 22:13
<b>generic</b> 114:17	200:16 212:21	36:20 239:21
133:25 134:1	226:4 256:18	<b>gold</b> 256:17
134:25 135:1	291:5 291:23	<b>gone</b> 10:25
<b>geographic</b> 32:5	293:21 293:23	20:23 22:20
<b>geographical</b>	300:1 304:12	36:15 39:22
178:13	<b>gibberish</b> 94:8	65:10 119:19
<b>geography</b> 168:10	<b>Gill</b> 91:14	291:17
<b>George</b> 4:11	<b>Gina</b> 5:10 28:4	<b>Google</b> 286:17
4:17 13:6	211:19	<b>gotten</b> 18:5
13:22 16:7	<b>given</b> 7:6 18:18	83:4 112:22
20:2 59:1 63:7	31:4 31:9	153:12 292:5
71:20 77:25 85:2	35:14 43:22	<b>GP</b> 243:16 243:23
86:15 87:19	52:21 81:8 97:20	<b>GP80</b> 254:12
88:23 89:2 90:10	97:22 98:20	254:23
171:22 197:22	101:23 102:19	<b>gracious</b> 280:11
240:4 275:6	104:6 105:18	<b>graciously</b> 57:14
<b>George's</b> 89:20	109:16 111:11	<b>grade</b> 248:2
91:15	125:12 127:21	<b>gradient</b> 37:9
<b>Georgia</b> 87:16	163:11 172:2	109:1 109:2
<b>GEP</b> 155:16 200:22	193:19 209:25	
<b>Gesser</b> 57:22 58:2	211:2 211:3	
	251:19 260:13	
	274:25 275:20	
	307:6 307:9	

109:10 207:4	313:9 313:12	228:12 280:23
207:14 208:13	313:17 315:1	296:3
209:5 209:22	<b>greater</b> 65:22	<b>grouping</b> 134:9
209:22 209:23	70:13 98:13	<b>groups</b> 163:8
209:24 209:25	121:5 169:15	170:16 170:17
210:3 210:8	266:1 270:15	170:18 200:6
210:14 211:13	271:14 295:2	310:10
269:2 269:3	297:18	<b>growing</b> 43:4
270:3 270:5	<b>greatly</b> 14:19	<b>grown</b> 259:11
<b>gradients</b>	30:4 94:3	<b>grows</b> 154:7
109:21 110:6	<b>green</b> 136:21	<b>growth</b> 74:14
207:21 209:6	140:22 144:16	74:15
209:19	180:15 236:13	<b>guaranteed</b> 282:15
<b>grading</b> 264:11	239:7 258:11	<b>guess</b> 3:22 16:8
<b>gram</b> 148:25	<b>Greg</b> 52:21 294:10	28:19 29:1 53:10
<b>grams</b> 139:14	<b>grey</b> 282:25	81:12 81:18
139:16 139:19	<b>grid</b> 32:22 33:5	82:24 83:6 88:12
139:19 143:14	41:18 47:9 47:12	96:23 108:13
143:15 143:16	55:3 136:21	109:12 113:2
154:11 161:1	146:2 147:2	119:3 133:1
161:11 161:19	147:3 235:20	136:9 149:8
161:21 161:22	235:24 239:6	156:21 158:4
<b>grandfathering</b>	245:15 248:10	185:2 201:8
24:16 24:24	249:10 252:12	204:13 204:21
<b>grant</b> 5:9 10:7	253:2 253:3	206:4 217:22
89:2	266:12 269:5	217:25 245:9
<b>granted</b> 50:24	273:22 276:22	251:4 255:1
219:13	280:4 280:21	271:8
<b>graph</b> 149:13	282:20 296:21	<b>guidance</b> 4:16
177:23	<b>grins</b> 155:1	6:19 7:7 11:20
<b>graphic</b> 321:1	<b>grossly</b> 127:3	15:24 16:24 17:6
<b>graphs</b> 175:2	127:18	17:17 17:24 18:2
<b>Grass</b> 120:2	<b>ground</b> 299:5	18:4 18:8
<b>grateful</b> 58:15	<b>groundwork</b> 38:11	18:10 18:16
<b>Graw</b> 320:1	<b>group</b> 15:3	18:17 18:19
<b>great</b> 26:8 35:9	15:22 55:21	18:22 18:24 19:2
67:10 197:23	58:14 58:14	19:4 19:8
200:15 211:21	59:24 133:6	20:11 20:25
211:22 229:3	136:6 157:11	21:12 21:17 24:4
241:9 242:10	163:11 165:7	26:5 29:14
312:1 313:1	170:19 180:9	31:6 31:17
	180:15 222:16	32:9 33:1
		36:25 38:18

55:18 55:19 56:9	<b>guideline</b>	<b>happens</b> 10:16
56:12 57:2 57:11	159:13 226:3	45:20 61:13
57:13 59:5	272:20 272:21	283:12 290:9
59:9 62:22	276:14	<b>happy</b> 58:4
63:1 63:4	<b>guidelines</b> 275:10	58:13 202:1
67:16 67:18	<b>gulping</b> 94:14	<b>HAPs</b> 61:14
68:25 69:4	<b>guys</b> 211:20 214:3	<b>hard</b> 65:21
69:7 70:1	226:8 246:10	73:19 114:21
71:10 71:14	295:25	185:21 227:2
72:13 72:20		236:12 240:16
72:22 73:8 76:10		240:20 247:19
76:14 76:23 77:2		247:20 247:21
77:8 77:10 77:21		<b>hat</b> 23:1 202:4
79:4 79:14 79:17		<b>haul</b> 61:16
83:2 83:3		<b>haven't</b> 45:2 69:1
83:20 85:3 85:14		92:23 93:8
85:20 85:25 86:1		121:15 151:11
89:14 91:20		156:13 156:17
92:11 95:11		291:8 291:15
95:17 96:1		291:25 292:4
96:2 96:6 96:7		292:21 292:25
96:8 96:9		<b>having</b> 13:7
96:16 96:22 99:9		61:6 62:8
100:22 103:15		63:22 65:21 76:7
106:13 108:2		77:14 103:22
108:2 108:20		109:8 115:3
109:20 111:18		115:24 172:11
112:9 112:21		175:21 179:11
112:23 114:5		216:17 228:1
114:9 114:19		259:21 288:4
114:25 115:12		310:14
115:17 116:9		<b>Hawaii</b> 124:25
117:12 118:20		124:25
118:21 125:18		<b>haze</b> 19:1 55:18
141:21 172:1		62:6 85:25
172:8 173:9		220:16
179:19 181:20		<b>HDDM</b> 300:13 301:5
206:21 206:23		304:11 306:12
213:13 214:3		<b>head</b> 158:19
220:15 220:15		214:19 255:6
220:23 230:9		<b>headed</b> 294:10
239:22 308:5		
308:16 308:22		
309:11		
<b>guidances</b> 16:20		

<b>heading</b> 74:4 82:9	148:11 148:16	140:6 146:3
<b>heads</b> 247:21	150:20 151:19	146:10 152:3
<b>head-to-head</b>	151:23 152:5	160:23 166:18
263:16	153:20 198:10	167:18 178:9
<b>hear</b> 6:6 7:16 8:9	200:22 201:1	181:5 187:25
17:24 17:24 58:3	201:13	188:23 284:18
77:23 98:3 110:7	<b>heights</b> 65:24	301:3
113:18 115:21	135:4 139:1	<b>Heritage</b> 294:12
119:5 128:24	143:2 143:9	294:17 298:6
132:24 209:5	143:23 144:20	<b>Herman</b> 124:8
210:19 256:11	150:15 155:16	<b>he's</b> 32:17 53:24
308:13	<b>helicopter</b> 279:11	<b>hey</b> 113:5
<b>heard</b> 5:21	286:15 286:19	<b>Hi</b> 211:16
12:10 20:6 22:10	286:23	<b>high</b> 26:11
60:14 68:19	<b>helicopters</b>	51:16 66:20
70:16 73:22	233:18	69:11 70:4 70:10
76:18 76:22 77:9	<b>Hello</b> 92:9 171:21	70:10 70:22
78:17 101:3	<b>help</b> 13:20	70:23 70:23 71:1
115:1 156:13	14:18 29:4 34:19	71:2 71:3 71:4
156:17 158:21	37:14 39:10	72:14 75:15
190:25 240:5	48:25 79:15	121:15 127:16
<b>hearing</b> 3:15 14:2	84:24 118:18	154:1 161:8
87:15 115:22	138:15 142:8	163:13 163:19
239:25	147:22 153:16	169:8 171:11
<b>hearings</b> 183:12	158:8 230:20	180:10 180:12
<b>heart</b> 61:11	232:24 260:14	181:2 181:3
222:24	279:14 283:24	181:4 181:23
<b>heavily</b> 61:24	320:17	188:25 189:2
61:25 62:1 65:13	<b>helped</b> 14:17	190:6 215:15
318:2	30:18 293:23	215:25 222:12
<b>heavy</b> 214:21	<b>helpful</b> 53:24	223:19 235:24
<b>heels</b> 25:11	83:25 104:1	265:12 267:16
<b>Heidle</b> 159:9	110:12 168:13	269:7 272:5
<b>height</b> 139:17	204:11 228:9	282:17 292:8
139:18 140:13	233:7 256:23	299:6 299:23
142:1 142:19	320:16	300:25 306:2
142:20 142:21	<b>helping</b> 24:8	319:8
142:22 143:1	<b>helps</b> 24:3 106:15	<b>higher</b> 49:24
143:22 144:6	155:24 280:25	51:14 54:8 59:14
144:9 144:11	<b>Hendrick</b> 183:25	71:3 72:7
144:12 144:21	<b>here's</b> 33:21 34:6	75:24 82:1
144:25 145:4	72:6 94:11 120:6	82:4 121:12
		121:20 141:22
		142:23 153:11

154:15 160:13	<b>highlighted</b>	100:9 106:15
169:3 170:3	126:10 139:15	109:19 133:2
170:3 174:2	259:13	158:25 217:18
176:24 177:7	<b>highlights</b>	218:6 232:23
178:11 179:14	69:16 126:5	307:1 307:22
179:21 179:22	<b>highly</b> 275:9	308:3 308:7
180:18 182:1	<b>hill</b> 120:8 166:19	<b>hopes</b> 21:4
182:24 183:6	310:5	<b>hoping</b> 16:21
198:17 200:22	<b>hired</b> 232:13	40:20 88:6 233:3
235:8 237:21	<b>historical</b> 150:22	233:20 234:15
248:15 251:8	223:2 243:16	236:3
251:17 252:10	<b>history</b> 23:7	<b>horizon</b> 54:8
252:13 264:3	24:21 74:10	<b>horizontal</b> 55:3
264:8 264:11	75:17	238:21
264:17 264:21	<b>hit</b> 3:9 69:16	<b>hornet's</b> 276:19
266:11 266:23	<b>Hobson</b> 321:14	<b>horsepower</b> 148:25
267:25 270:12	<b>hold</b> 108:21	154:12
270:13 270:18	<b>holds</b> 100:14	<b>host</b> 15:5
270:20 270:24	278:22	<b>hot</b> 56:15 56:22
271:14 272:15	<b>Holy</b> 266:5	83:3 198:4
273:5 273:25	<b>Home</b> 294:1	<b>hour</b> 27:16
283:14 296:23	<b>honorary</b> 310:20	40:10 69:22
299:9 299:13	<b>hook</b> 194:20	69:23 81:9
305:3 305:22	<b>hooked</b> 194:9	100:25 111:6
312:10	194:16 196:5	111:23 112:12
<b>highest</b> 45:21	<b>hoops</b> 83:12	121:3 123:19
46:6 46:9	<b>hope</b> 3:12 33:21	123:19 128:3
46:16 46:18	40:11 40:18 53:5	133:15 148:25
46:18 46:20 47:1	59:3 59:8 60:4	154:12 160:15
47:10 48:1	60:13 60:17	163:9 163:10
48:2 69:11	60:20 69:6 74:14	164:6 164:7
70:4 70:9	79:23 104:1	170:25 171:25
70:10 70:23 71:1	108:24 117:9	172:3 172:8
71:1 71:3 71:4	125:17 200:4	172:11 173:8
103:3 111:5	208:5 266:22	173:11 174:11
125:3 163:10	318:18	175:11 176:5
174:9 178:2	<b>hopefully</b> 10:17	183:2 183:4
178:20 179:20	11:19 11:25	191:2 191:7
180:4 181:9	15:14 58:6 86:25	191:24 192:2
188:14 188:24	91:9 94:8	195:12 196:15
208:23 247:13		196:18 212:11
253:23 254:6		286:10 295:4
254:9 299:24		295:5 295:5
<b>highlight</b> 72:10		
104:7		



78:23 79:24	37:2 37:3 37:7	268:2 269:10
92:18 92:20 94:5	41:2 41:8	276:23 294:21
94:14 94:16	41:25 43:14	294:23 295:16
111:3 117:20	47:22 48:13	296:25 297:8
119:15 120:18	50:11 53:9 56:25	297:17 301:17
122:20 122:21	71:17 71:22	<b>implement</b> 77:14
123:21 129:19	72:13 73:14	112:2 175:17
133:5 136:12	103:2 103:7	182:22 205:13
138:23 142:11	103:11 106:23	213:2 213:5
147:9 157:22	115:5 120:8	238:4 279:2
158:13 159:13	152:2 157:9	<b>implementation</b>
159:22 160:20	206:24 206:25	24:6 33:8 77:8
161:10 161:25	207:5 207:7	77:12 91:19
164:12 167:5	208:2 208:16	118:10 124:4
168:19 171:21	238:8 258:22	129:18 130:12
176:18 191:3	261:19 283:25	132:8 171:5
191:15 191:16	292:16 297:10	273:4 275:4
193:21 202:2	297:13 299:5	277:5 278:3
208:1 208:16	301:18 302:1	282:24
226:10 226:13	302:2 302:6	<b>implemented</b>
226:18 227:15	302:20 302:21	68:2 76:16
240:4 240:8	303:15 306:10	80:1 81:3 82:6
240:11 244:7	306:11 306:17	129:9 129:24
246:14 249:17	<b>impacts</b> 5:9	213:23 291:8
251:13 258:9	5:14 9:1 33:19	297:4
262:7 263:10	35:24 38:22	<b>implementing</b>
264:22 265:2	51:16 68:24 70:9	202:25 261:10
276:19 284:8	71:19 73:1	<b>implications</b>
294:3 294:9	73:3 73:5 77:3	55:15
294:19 301:22	77:6 89:4	<b>implicitly</b> 175:12
303:2 306:21	89:10 89:16	<b>implies</b> 207:6
310:11 320:2	93:17 96:25	<b>imply</b> 109:22
<b>image</b> 265:17	101:2 109:23	<b>importance</b>
<b>images</b> 263:14	119:5 119:5	58:19 157:10
<b>imagine</b> 10:14	126:23 126:24	<b>important</b> 26:1
13:12 25:23	128:20 141:1	26:6 26:25
50:17 78:5	173:22 173:25	27:7 36:23
167:12 167:22	174:2 176:24	44:1 48:21
171:10	179:11 180:5	53:5 58:16 59:25
<b>immediate</b> 86:3	181:2 183:6	67:23 68:17
86:4	210:4 226:17	68:20 75:1
<b>immediately</b>	227:11 227:13	76:6 76:19
296:10 305:23	230:6 231:2	77:9 94:22 96:18
<b>impact</b> 27:9	231:25 232:12	
	239:8 259:5	
	260:15 261:8	

<p>98:17 110:16  120:6 132:4  137:21 139:12  156:11 157:3  174:4 191:1  203:13 227:23  238:1 265:9  269:18 277:22  277:24 278:20  278:22 307:7  308:18</p> <p><b>impose</b> 104:9  272:17</p> <p><b>imposed</b> 104:2  121:15</p> <p><b>impossibility</b>  101:11</p> <p><b>impossible</b>  62:25 109:6  113:5</p> <p><b>impression</b> 91:23</p> <p><b>improve</b> 79:16  128:21 230:20  232:24</p> <p><b>improved</b> 244:1</p> <p><b>improvement</b>  9:16 131:3</p> <p><b>improvements</b>  6:3 7:19</p> <p><b>improving</b> 308:22</p> <p><b>Incidentally</b>  188:7</p> <p><b>include</b> 31:7 42:9  85:20 91:17  106:25 107:18  135:22 184:24  196:24 203:25  206:24 208:11  218:25 224:5</p> <p><b>included</b> 68:25  106:14 132:14</p>	<p>164:20 185:14  187:10 188:18  207:24 211:13  220:3 271:3</p> <p><b>includes</b> 251:22</p> <p><b>including</b> 37:4  65:10 68:23 77:3  92:14 96:8  103:11 106:24  208:2 240:1  314:8 321:6</p> <p><b>inclusion</b> 41:9  207:13</p> <p><b>incorporate</b>  9:24 103:22  148:16 252:16</p> <p><b>incorporates</b>  319:19</p> <p><b>incorporating</b>  43:11</p> <p><b>increase</b> 37:24  37:24 39:23  142:22</p> <p><b>increased</b>  150:20 151:19</p> <p><b>increases</b>  142:21 151:24  152:6 154:5</p> <p><b>increasing</b> 140:13  142:19 142:20  150:15 153:20  305:5</p> <p><b>increment</b> 27:8  84:15 85:3  85:5 85:8  85:21 86:2 86:11  86:12 87:5  87:7 224:6 300:2  301:5 304:1  304:5 304:7</p> <p><b>increments</b> 296:6</p>	<p><b>indeed</b> 168:14  169:10</p> <p><b>independent</b> 55:20  55:22 119:22  224:13 248:24  249:2</p> <p><b>independently</b>  208:7 278:13</p> <p><b>Indiana</b> 168:8</p> <p><b>Indianapolis</b>  122:6</p> <p><b>indicate</b> 172:18  177:10 267:17  287:6 288:13</p> <p><b>indicated</b> 6:18  86:15 89:1  93:3 125:19  214:4</p> <p><b>indicating</b> 288:4</p> <p><b>indicative</b>  145:7 174:1  267:6</p> <p><b>indicator</b>  123:13 177:21</p> <p><b>indicators</b>  80:19 315:25</p> <p><b>indifferent</b> 57:23</p> <p><b>individual</b> 12:9  35:24 134:9  221:3 225:15  260:15 304:13  304:18 304:25</p> <p><b>individuals</b>  115:25</p> <p><b>induced</b> 148:18</p> <p><b>industrial</b>  51:15 57:8  61:3 61:8  62:19 73:4  134:16 298:20</p>
--	---	--

<b>industrialized</b> 190:3	190:25 191:5 191:7 191:14	133:11 136:3 137:13 141:23
<b>industries</b> 205:13	191:21 192:12 192:13 195:16	149:10 222:14 268:5 271:23
<b>industry</b> 58:12 58:19 60:23 62:20 63:22 67:22 68:3 135:10 154:22 155:12 184:11 200:5 307:12	197:7 197:16 197:18 197:20 204:3 204:4 204:17 205:17 205:22 205:23 213:21 217:7 220:1 225:10 226:4 230:10 233:6 238:17 269:19 269:23 270:6 305:11 307:1 307:6 307:8 307:23 308:10 315:21	<b>injury</b> 320:18 <b>inner</b> 281:5 <b>input</b> 5:25 6:9 8:3 12:3 18:6 54:21 81:7 116:24 128:2 158:5 164:13 248:25 259:22 303:22
<b>inert</b> 188:23 225:18 241:1		<b>inputs</b> 41:4 74:16 74:19 75:22 76:10 91:5 122:17 137:25 142:23 167:4 223:20 224:20 236:22 254:17 291:21 291:23 303:22
<b>influence</b> 107:17		<b>inside</b> 137:19 281:25
<b>info</b> 195:22	<b>informative</b> 264:25	<b>insofar</b> 90:20
<b>inform</b> 8:23 12:15 14:12 18:2 48:25 79:15 96:5 98:13 206:2 230:20 257:20	<b>informed</b> 22:4 <b>informing</b> 102:6 218:6	<b>inspection</b> 225:10
<b>information</b> 8:6 9:5 11:12 11:17 11:19 12:15 14:14 14:15 15:5 15:15 28:22 30:15 33:16 36:7 43:3 47:19 53:23 69:13 80:16 84:21 94:22 98:24 99:17 99:20 100:7 101:8 102:4 103:17 105:19 109:19 110:12 110:25 112:13 114:4 117:9 117:9 118:9 118:16 123:14 132:14 132:22 155:25 156:1 156:8 156:21 157:4 157:12 160:21 161:3 184:6 190:13	<b>infrequently</b> 104:25 160:13 215:20 <b>infusion</b> 34:23 <b>inherently</b> 224:19 <b>inhomogeneity</b> 268:24 <b>inhomogeneous</b> 278:21 <b>in-house</b> 234:12 280:6 <b>initial</b> 135:15 143:23 146:11 163:21 188:7 257:13 301:7 <b>initialized</b> 314:12 <b>initially</b> 14:25 29:19 104:3	<b>Insta</b> 20:5 <b>in-stack</b> 8:6 98:16 101:25 145:4 149:4 156:1 157:1 157:13 175:20 178:4 179:15 179:24 181:18 188:7 192:8 195:7 197:20 <b>install</b> 193:24 194:8 <b>installed</b> 69:24 <b>instead</b> 179:15 190:16

<b>Institute</b> 183:21	67:1 131:3 131:5	<b>intersection</b>
<b>integral</b> 225:6	146:10 146:19	12:11 215:23
<b>integrated</b>	164:19 210:12	<b>interval</b> 268:22
60:24 66:13	<b>interests</b>	<b>intervals</b> 317:8
67:19 242:23	132:23 176:19	<b>introduce</b>
278:11 313:20	218:22 307:13	175:24 285:11
313:22 313:24	309:3	<b>introduced</b> 5:6
315:3	<b>Interface</b> 6:16	9:19 79:11 159:5
<b>integrating</b>	225:3	192:23 193:17
278:16	<b>interim</b> 27:11	199:3 199:5
<b>intended</b> 20:9	106:20 309:7	<b>introducing</b> 75:18
20:13 71:6	<b>Interior</b> 219:3	130:9 193:10
96:7 104:10	259:14	218:3 218:9
105:1 108:2	<b>intermediate</b>	<b>inventories</b> 29:17
248:3	184:18 184:19	<b>inventory</b> 30:22
<b>intensive</b> 53:20	<b>intermittent</b>	106:25 209:1
119:23 120:2	7:8 102:10 104:5	<b>inverse</b> 174:14
295:19	105:9 105:20	174:23
<b>intent</b> 207:2	106:6 106:13	<b>inverted</b> 71:2
<b>intentions</b> 20:20	160:11 215:18	<b>investigate</b>
<b>inter</b> 312:2	<b>internal</b> 4:20	91:7 130:18
<b>interaction</b> 83:24	11:1 22:21	<b>investment</b> 64:3
109:23 128:9	307:17	<b>invited</b> 14:19
<b>interactions</b>	<b>internally</b> 21:7	59:2 132:24
13:18 13:20	213:15 228:12	158:20 158:20
222:20	<b>interpolation</b>	<b>involve</b> 163:10
<b>inter-comparisons</b>	246:3	<b>involved</b> 24:18
8:23 224:17	<b>inter-pollutant</b>	40:20 116:1
312:25	230:21 232:24	121:4 122:1
<b>interest</b> 30:9	<b>interpolluting</b>	122:12 123:23
111:3 131:9	28:5	128:16 157:18
142:2 145:24	<b>interpret</b> 213:18	225:15 273:21
146:24 260:23	<b>interpretation</b>	294:17 313:7
<b>interested</b>	207:8	317:17 318:1
83:14 120:23	<b>interpretations</b>	318:2
123:14 158:8	240:19	<b>involvement</b>
185:17 214:18	<b>interpreted</b> 71:24	133:20
267:22 268:24	<b>interpreting</b>	<b>involves</b> 13:9
272:14 285:3	184:3 206:17	294:23 302:23
285:3 310:18	206:18	<b>involving</b>
<b>interesting</b>		

105:15 220:10	95:16 96:3 100:1	132:9 133:1
<b>Iowa</b> 138:19	101:12 101:15	136:9 155:14
<b>ISC</b> 120:12 121:20	108:24 112:24	158:11 198:2
122:2 122:7	113:1 114:12	198:13
122:7 124:13	118:13 127:9	<b>January</b> 297:21
129:9 130:23	133:13 134:12	297:24
131:4	134:12 146:18	<b>jaw</b> 149:15
<b>ISC-PRIME</b>	175:22 210:2	<b>Jen</b> 138:19
120:14 122:1	212:4 214:14	<b>Jersey</b> 132:16
122:3	218:13 218:18	<b>jest</b> 32:19
<b>isn't</b> 49:23 68:17	218:19 219:6	<b>Jim</b> 57:15 78:2
117:21 316:19	220:25 221:9	87:16 93:23
<b>isolate</b> 235:12	222:11 235:18	234:11 234:24
283:24	260:17 260:18	277:12 310:1
<b>isolated</b> 207:24	261:4 265:4	311:2
<b>isoprene</b> 305:2	317:19	<b>Joaquin</b> 92:11
<b>issuance</b> 114:25	<b>items</b> 9:25 12:5	<b>job</b> 15:13 16:2
<b>issue</b> 6:21 6:21	13:4 13:15 29:20	90:18 99:20
12:16 19:4 23:22	307:11 308:17	183:14
29:5 48:10	<b>iteration</b> 170:6	<b>Joe</b> 312:23
64:1 113:25	<b>iterations</b> 165:16	317:5 318:1
115:23 115:24	169:23 170:1	<b>John</b> 34:10
118:21 201:11	170:5	91:14 206:11
231:3 239:3	<b>it'll</b> 59:11	214:20
274:17 276:18	<b>I've</b> 10:6 31:13	<b>joined</b> 23:9
292:18 292:19	33:22 36:15	<b>jointly</b> 218:10
315:23 316:6	40:17 48:19 55:9	<b>joked</b> 87:19
316:16 320:21	68:16 90:11	<b>joking</b> 108:18
<b>issued</b> 7:7	122:25 129:12	<b>journal</b> 12:18
95:17 101:14	153:12 157:2	<b>judgment</b> 110:3
172:10 213:13	195:4 219:12	313:10
<b>issues</b> 5:2 5:22	227:1 227:9	<b>Julie</b> 92:9
6:5 18:20	233:3 240:5	<b>July</b> 28:3 278:6
32:23 32:24	285:5 286:9	279:4
42:16 43:2	<b>IWAQM</b> 9:11 219:19	<b>jump</b> 75:19 155:14
44:5 54:16 55:23	222:5 222:16	<b>jumped</b> 74:24
59:18 59:21	241:21 268:5	<b>June</b> 13:13
59:22 59:25 60:4	271:25	111:5 134:6
63:7 63:14 63:23		
68:22 79:15	J	
86:14 86:23 87:3	<b>James</b> 41:13 91:10	
91:11 95:14	94:20 96:4	
	103:16 116:23	
	118:11 131:13	



<b>laptop</b> 170:25	161:25 211:4	313:1 320:25
<b>large</b> 31:12 66:13	229:11 232:9	321:4
116:14 120:3	234:10 282:7	<b>leave</b> 129:21
147:24 173:1	282:11 286:12	243:2 244:6
175:11 176:4	296:7 296:8	<b>leaves</b> 67:11
177:17 206:5	<b>lateral</b> 209:24	<b>leaving</b> 68:20
228:20 273:10	209:25 210:3	93:22
289:20 314:24	<b>laugh</b> 296:19	<b>led</b> 223:6
315:8	<b>launch</b> 131:13	<b>leftovers</b> 131:25
<b>largely</b> 273:20	190:22	<b>legal</b> 39:19 86:16
283:11	<b>layer</b> 226:11	<b>legally</b> 118:3
<b>larger</b> 44:7 153:4	282:6 283:14	<b>legitimate</b>
176:24 177:13	<b>layouts</b> 65:24	79:10 92:5
186:22 293:18	<b>lead</b> 69:7 75:14	<b>legitimately</b> 92:3
<b>last</b> 9:23 10:1	89:4 118:9 204:2	<b>Leigh</b> 34:11
13:11 19:5 19:24	234:15	<b>Leland</b> 92:19
20:11 21:5 27:18	<b>leading</b> 288:8	<b>length</b> 16:19 26:8
50:3 52:21 90:11	<b>leads</b> 285:12	41:5 276:12
92:7 96:14 110:8	<b>lean</b> 212:14	<b>lens</b> 281:2
113:8 133:7	<b>learn</b> 14:3 125:18	<b>less</b> 16:22 23:3
133:8 134:6	230:1 279:6	37:25 38:1
136:14 138:8	280:24	38:9 45:13 66:12
147:12 149:18	<b>learned</b> 155:14	72:4 111:10
156:12 158:22	223:9 233:6	131:15 144:7
159:5 169:6	317:2 317:13	146:14 154:6
176:6 182:15	<b>learning</b> 227:10	154:9 154:20
198:4 198:15	234:14 257:17	166:10 168:1
202:17 206:15	<b>least</b> 22:10 28:20	168:13 172:4
218:3 232:10	39:5 40:21 42:11	173:22 175:8
240:16 259:11	42:19 44:11 45:1	177:11 178:19
315:14 321:10	45:3 52:8	179:11 187:3
<b>lasted</b> 241:12	56:24 57:14 64:4	201:7 248:12
<b>late</b> 12:24	92:22 95:12	254:17 269:21
13:13 18:12	97:22 112:19	274:12 286:3
22:14 115:22	120:21 122:14	288:17 295:9
254:12 309:4	124:1 124:2	297:11 302:2
309:24	126:4 130:8	302:8 302:18
<b>later</b> 7:16 12:6	130:20 149:15	303:6 303:8
17:5 19:22 19:23	203:7 218:16	303:9 303:12
21:21 31:16	225:4 243:7	304:6
47:20 52:19	243:22 256:23	<b>lesser</b> 36:17
78:15 84:4		
87:1 98:3 128:10		
128:10 128:24		

149:6 270:16	302:17 302:21	<b>limited</b> 51:7 61:7
<b>lessons</b> 155:14	302:21 302:23	67:18 100:8
223:9 233:6	303:11 303:14	172:16 221:5
317:13	303:15 303:18	312:4 312:6
<b>let's</b> 29:4 30:2	304:7 304:8	<b>limiting</b> 98:7
35:7 40:14 40:15	304:9 305:24	173:24
44:24 49:1	<b>levels</b> 44:15 50:8	<b>limits</b> 64:5 142:7
49:5 74:15 93:21	63:9 63:25 68:10	170:12 171:13
117:23 117:25	70:10 72:21	185:4 213:2
118:2 122:5	82:14 147:23	<b>line</b> 8:16 12:11
131:10 131:15	152:2 153:11	33:17 58:17 84:5
164:13 164:18	153:25 155:4	110:13 121:7
165:19 170:23	156:10 156:25	121:8 137:17
198:2 202:6	178:2 215:19	137:18 139:23
206:1 217:16	306:10 306:11	140:7 140:7
289:7	<b>leverage</b> 31:2	140:8 140:11
<b>letter</b> 105:13	51:24	140:16 140:23
106:9 239:8	<b>leveraged</b> 99:21	141:5 141:7
<b>letters</b> 296:11	260:14	141:13 141:14
296:13	<b>leveraging</b> 260:5	141:15 146:25
<b>letting</b> 212:19	<b>light</b> 53:6	150:13 155:5
226:3	60:13 72:24	173:17 180:10
<b>level</b> 18:18	127:17	215:3 221:25
27:9 31:21 32:15	<b>lighter</b> 239:1	227:12 227:20
35:20 37:2 44:11	<b>lights</b> 19:25	232:2 235:19
46:4 46:4 49:9	<b>likelihood</b> 214:25	242:20 272:4
52:25 59:14	<b>likely</b> 6:21 43:25	280:16 286:13
61:19 64:23 65:5	132:17 152:1	291:10
72:11 73:17	177:1 207:20	<b>linear</b> 299:12
80:21 104:9	215:6 226:23	299:12
104:10 112:10	266:6 276:4	<b>linearly</b> 192:25
117:5 121:4	276:13 290:1	<b>lines</b> 59:23 86:21
121:15 125:20	295:21 298:22	140:4 156:2
127:21 133:17	<b>likewise</b> 264:18	204:21 210:20
135:5 135:19	266:24	227:5 232:2
140:12 151:9	<b>limit</b> 148:13	<b>link</b> 56:21 188:14
153:2 154:9	160:5 170:13	211:10 220:17
177:22 183:6	174:6 178:3	<b>linked</b> 56:22
185:17 230:3	188:20 203:14	165:4 210:25
231:23 232:3	213:23	224:19
232:10 232:15	<b>limitations</b> 60:14	<b>links</b> 56:20
274:10 297:10	189:16 313:11	<b>Linux</b> 170:24
302:1 302:1		
302:4 302:7		

170:24 273:20	286:3 286:13	<b>logarithmically</b>
274:10 274:13	287:15 287:20	195:4
274:21 274:24	289:16 290:14	<b>logger</b> 193:25
274:25	295:7 298:18	194:8 195:24
<b>liquid</b> 310:23	<b>living</b> 85:22	196:8 197:4
<b>list</b> 61:1 101:12	85:23	<b>logic</b> 192:19
<b>listed</b> 29:22	<b>Liz</b> 183:25	<b>logically</b> 104:13
100:4	<b>lo</b> 190:2	<b>logistics</b> 3:9
<b>listing</b> 190:17	<b>load</b> 167:3 167:3	132:1
<b>lists</b> 164:20	<b>local</b> 8:5 13:8	<b>logs</b> 186:10
<b>literal</b> 107:5	18:13 20:14 22:2	186:10 189:18
<b>literally</b> 117:7	22:12 28:13 36:4	<b>long</b> 117:8 119:24
<b>literature</b> 296:16	36:13 57:7 57:18	161:16 216:7
<b>little</b> 23:2	101:4 134:7	218:19 219:6
23:4 24:15 33:21	157:19 186:5	221:15 222:11
35:22 48:3 48:25	187:11 258:2	223:11 223:17
54:9 58:4	259:5 259:6	223:25 224:11
65:18 67:5 67:11	274:19 278:14	224:18 227:13
74:21 93:21	286:10 306:15	227:17 227:22
99:18 106:15	<b>locally</b> 27:3	233:4 240:8
115:21 123:6	<b>locals</b> 21:17 22:8	241:6 241:22
128:22 128:25	<b>located</b> 42:9 44:6	243:1 243:4
132:1 150:24	58:21 66:12 73:4	252:19 261:14
151:20 152:14	120:8 145:22	302:5 311:10
154:7 158:19	180:21 301:18	311:22 311:23
159:23 169:3	<b>location</b> 44:3	312:12 318:9
177:1 178:11	109:25 162:17	321:14
179:20 180:11	188:10 189:20	<b>longer</b> 27:2 27:25
180:12 180:22	231:5 282:14	44:14 95:22
182:3 184:24	288:25 297:3	124:22 126:25
186:2 187:17	298:13 298:21	293:17 311:13
187:20 188:9	300:16 305:14	<b>longitudinal</b>
188:16 188:18	305:15 305:19	209:23
189:7 191:16	<b>locational</b> 305:10	<b>long-range</b> 5:16
192:21 193:3	<b>locations</b> 34:18	8:15
203:4 226:13	42:2 42:2 43:5	<b>long-term</b> 123:2
227:15 227:18	134:3 190:9	<b>looming</b> 73:20
232:9 234:10	258:15 298:12	<b>loop</b> 157:20
234:11 240:22	298:14 298:15	<b>loosely</b> 275:16
244:16 263:11	298:15 305:7	<b>lose</b> 36:20
265:14 266:1	306:20	
269:14 271:7	<b>Lochness</b> 20:5	
272:11 284:17		

<b>lost</b> 315:13	306:25 307:22	193:12 193:18
<b>lot</b> 15:10 19:22	309:13 311:6	<b>lunch</b> 131:10
20:24 21:1 23:20	317:4 317:12	131:11 131:16
25:13 29:10	320:11	131:18 131:19
31:14 36:13 42:6	<b>lots</b> 169:7 210:16	132:7
42:14 44:13	241:8 243:20	<b>lurking</b> 92:3
45:24 49:2	<b>loud</b> 83:1	
51:8 53:12 54:22	<b>Lovett</b> 120:6	<hr/> M <hr/>
58:23 59:9 59:11	121:6 166:12	<b>machine</b> 275:1
62:11 62:11	166:18	<b>machines</b> 273:16
62:17 64:11	<b>low</b> 44:11 50:9	<b>MACT</b> 61:9 61:12
64:21 78:8	51:5 70:16 70:17	62:2 62:4
83:8 85:7 103:15	70:19 76:21	63:25 68:3
103:18 118:15	125:20 150:23	68:5 68:10 69:24
119:16 120:20	151:9 153:9	<b>MACTEC</b> 182:5
124:10 131:14	155:16 170:19	<b>magnitude</b> 64:13
131:21 132:13	173:21 173:22	64:18 70:9 70:24
135:2 135:10	173:25 177:10	301:18 315:5
135:23 138:14	180:11 181:25	<b>main</b> 29:21 139:25
140:18 140:23	182:24 185:17	140:6 155:17
141:18 141:20	200:23 201:13	207:11 312:18
141:22 147:14	291:15	<b>mainly</b> 133:10
150:6 152:17	<b>lower</b> 67:5	240:15
152:19 153:4	68:11 151:6	<b>main-stack</b> 137:15
154:4 154:24	153:10 169:3	<b>maintenance</b>
158:21 159:6	169:4 174:16	134:23
166:23 184:13	177:7 177:9	<b>major</b> 24:14 37:22
190:25 191:11	177:12 178:16	38:5 38:6 40:2
194:14 195:19	181:23 189:2	60:25 61:2
195:21 196:11	209:2 251:12	61:2 61:21 257:9
197:16 198:8	254:4 265:15	259:25
198:14 213:3	<b>lowers</b> 179:13	<b>majority</b> 89:9
215:7 216:8	<b>lowest</b> 73:22	126:23 274:5
226:17 227:24	182:14 182:17	<b>man</b> 94:12 201:8
228:14 230:18	182:20 247:10	<b>manage</b> 203:15
231:12 231:14	247:13 247:16	<b>management</b> 19:9
233:5 234:14	251:13 253:6	21:3 61:19 64:16
235:19 235:19	254:10	65:22 101:9
237:1 239:15	<b>LRT</b> 261:13 266:12	213:15 258:5
240:17 241:10	269:25	258:19 258:20
246:20 248:6	<b>lucky</b> 194:22	258:23 259:7
263:11 263:14	<b>luminescence</b>	
271:13 274:15	192:24 192:25	
284:24 286:1		
291:16 304:20		
304:21 304:22		

261:8 261:19	310:4	289:4 299:5
310:13 311:1	<b>Mark's</b> 185:11	300:18 302:6
<b>managers</b> 5:16	<b>Marriott</b> 310:15	302:11 302:21
9:18 184:1 202:1	<b>mass</b> 221:9 228:19	303:14 304:1
222:2 222:21	<b>match</b> 123:18	304:6 306:10
248:7 268:19	248:3	<b>may</b> 3:10 5:2 5:22
<b>maneuver</b> 215:7	<b>matches</b> 126:3	6:3 6:5 6:20 7:9
<b>manipulation</b>	300:17	8:8 12:19
274:15	<b>matching</b> 69:12	13:13 17:24
<b>manner</b> 219:21	126:12 289:8	17:25 18:14
<b>manual</b> 107:8	<b>material</b> 3:15	21:19 21:22
107:9 107:23	147:12 241:1	24:21 27:18 28:7
<b>manufacturers</b>	<b>materials</b> 241:9	28:22 28:24
186:12	<b>math</b> 215:3	37:15 37:17 39:3
<b>manufacturing</b>	<b>matters</b> 116:12	39:17 39:19 44:8
58:12	116:22	44:10 44:19
<b>map</b> 148:9 286:17	<b>max</b> 141:13 141:16	48:12 48:23 52:7
<b>mapping</b> 265:5	144:13 153:17	53:13 56:9 79:14
271:1 271:5	<b>maximum</b> 31:24	82:17 84:14 96:9
271:9	42:22 44:15 47:2	99:10 105:4
<b>mappings</b> 271:15	47:12 54:22 55:2	105:4 105:7
<b>maps</b> 136:15 138:1	64:6 69:4 70:1	109:7 112:2
138:4 158:12	70:15 95:1 103:5	113:22 123:14
<b>March</b> 3:3 7:8	104:16 119:9	125:13 125:20
25:15 32:1 95:11	122:20 136:19	127:8 128:18
95:17 96:8 96:14	140:9 141:6	129:2 142:6
99:9 101:14	141:25 142:4	142:7 142:10
111:4 111:8	144:10 144:22	145:7 145:8
112:22 114:25	145:1 146:9	151:18 152:18
115:17 172:1	147:4 160:3	152:20 153:6
180:8 206:14	160:5 163:12	153:9 154:21
209:20 211:2	167:11 168:2	157:2 157:23
213:14	169:11 173:21	160:7 171:14
<b>margin</b> 65:8 67:10	181:11 212:10	172:3 172:17
215:9 295:14	212:11 212:21	173:15 173:25
<b>marginally</b> 49:24	215:1 237:4	174:1 174:3
<b>Mark</b> 171:19	237:9 238:8	174:5 174:23
171:21 183:15	242:19 242:20	189:23 190:12
183:19 183:21	242:21 250:5	196:10 198:21
184:14 186:1	254:14 266:2	203:3 204:24
189:6 198:3	266:8 288:25	205:13 208:15
	289:1 289:2	210:4 210:9
		214:23 215:17
		215:22 217:6
		223:18 232:19
		242:21 242:24

243:6 248:8	137:4 150:13	109:25 174:18
255:1 274:3	152:20 153:9	<b>mechanisms</b> 223:24
274:4 292:23	153:13 154:3	<b>MEDOC</b> 279:24
298:4 300:9	188:16 188:18	<b>meet</b> 9:16 14:1
308:12 308:14	196:14 201:5	68:4 68:5 88:5
309:19 316:12	202:20 205:9	218:14 222:7
<b>maybe</b> 6:6 23:2	209:13 210:5	<b>meeting</b> 4:23
37:22 39:18	251:11 253:17	14:13 222:13
39:24 39:25 40:6	271:12	256:9 259:9
40:19 49:25 50:1	<b>meaning</b> 39:1	310:14
50:1 51:24 65:15	64:24 254:18	<b>meetings</b> 13:24
69:22 71:2	<b>means</b> 17:20 22:19	184:7 218:18
73:6 73:6	58:22 71:10	<b>meets</b> 249:23
74:22 74:23	109:10 131:16	<b>Meg</b> 83:1
79:22 81:22	210:3 245:11	<b>MEGAN</b> 298:7
86:25 89:23 92:7	259:4 260:7	<b>megawatt</b> 143:10
99:18 112:24	273:9	<b>member</b> 16:18 18:9
122:21 123:3	<b>meant</b> 59:24	18:23 19:3
124:1 128:10	<b>meantime</b> 310:20	50:4 60:8
128:21 143:7	<b>measurable</b> 302:3	66:11 78:16
146:15 148:13	<b>measure</b> 241:3	82:24 85:1
148:20 148:23	<b>measured</b> 173:21	86:6 87:6
149:19 159:25	173:25 174:8	87:16 88:12
161:7 161:11	174:9 174:13	90:10 91:14 92:9
162:1 169:10	176:25 193:19	168:8 199:15
171:1 171:1	279:13	200:17 201:21
171:1 175:4	<b>measurements</b>	203:16 206:11
189:1 201:19	233:10 233:15	209:4 211:16
203:8 204:15	234:1 234:1	214:17 310:4
209:25 210:13	235:14 279:14	310:19 310:21
216:2 217:7	280:16 286:25	310:25 311:20
244:2 250:20	292:21	318:22 320:1
253:11 271:13	<b>measures</b> 223:22	<b>members</b> 133:19
287:20 290:2	249:12 249:14	133:23 159:8
291:13 308:15	249:19	159:9 310:16
310:19	<b>measuring</b> 186:6	<b>memo</b> 25:15
<b>McCarthy</b> 5:10	191:14 193:22	25:20 25:23
28:4 32:7 52:4	241:4	25:24 26:1
89:2 211:19	<b>meat</b> 38:17	28:4 28:17
<b>MCHISRS</b> 210:23	<b>mechanically</b> 81:6	32:1 32:2 32:7
<b>mean</b> 16:24	<b>mechanism</b>	35:4 35:9
17:20 38:25 50:6		38:11 47:18 52:4
92:5 99:15 117:6		
123:13 125:13		
134:19 135:17		

95:11 97:23	317:25 318:2	298:1 319:15
98:19 101:18	<b>mesoscale</b> 6:16	319:23
111:4 111:8	223:5 225:2	<b>meter</b> 137:17
180:8 206:15	246:12	137:18 139:22
206:15 207:2	<b>mess</b> 79:2 194:19	139:23 140:4
207:6 207:23	<b>message</b> 116:10	140:4 140:10
208:10 209:20	265:9	140:22 140:23
211:2 245:24	<b>met</b> 56:2 74:19	141:5 141:13
248:8 255:16	91:17 91:23	141:15 143:1
<b>memorandum</b> 259:15	100:18 121:14	143:22 144:6
<b>Memorandums</b>	122:12 127:5	144:8 144:25
210:24	135:13 142:16	149:17
<b>memos</b> 25:21	142:17 186:5	<b>meters</b> 139:1
95:8 101:7	194:15 236:22	139:17 139:18
106:21 107:3	244:17 244:18	140:7 140:7
124:12	247:1 251:19	141:16 143:2
<b>mention</b> 15:21	252:6 252:15	144:7 144:20
35:8 49:15 55:12	252:16 252:16	148:11 148:16
57:5 113:3 281:6	280:8 280:9	151:23 153:21
305:21	284:21 298:2	154:8 154:20
<b>mentioned</b> 10:6	318:24 319:4	180:21 181:10
12:23 13:6 13:22	319:24	186:4 286:22
15:9 21:14 21:22	<b>metal</b> 214:21	289:12 297:20
22:5 55:9	<b>meteorological</b>	<b>method</b> 7:16
55:17 56:8	41:3 59:17	54:2 97:21
59:1 74:7	75:6 75:12 75:13	98:7 98:7 100:10
86:12 91:16 98:9	91:1 138:22	171:24 172:17
101:10 132:7	186:6 223:20	173:5 173:15
166:13 200:10	223:21 224:14	175:7 181:22
219:12 222:1	224:20 224:23	182:12 182:21
222:4 224:2	225:5 228:4	183:3 184:15
235:2 239:2	239:9 273:19	185:3 191:1
241:15 252:10	274:3 275:15	192:7 195:9
255:8 257:21	276:12 278:21	205:8 295:16
279:1 282:23	279:22 293:6	296:23 296:24
283:1 285:2	314:23 319:18	299:7 299:7
286:14 292:2	<b>meteorology</b>	299:9 305:13
292:18 293:9	43:6 54:18 75:23	316:7
296:12 315:24	145:6 225:1	<b>methodologies</b>
<b>merging</b> 278:19	228:9 278:14	172:14
<b>merit</b> 251:7	280:8 281:7	<b>methodology</b>
<b>Mesa</b> 269:17	281:8 282:13	111:23 223:11
<b>Mesopuff</b> 317:25	284:11 284:14	223:14 294:7
	284:15 286:9	296:15

<b>methods</b> 35:24 97:16 98:9 98:12 120:9 172:7 172:12 175:10 181:1 182:2 182:4 182:19 183:3 218:8 296:16	<b>microphones</b> 3:20	197:3
<b>metric</b> 208:21 209:2 250:15 251:16 298:25 299:1 316:11 316:21	<b>middle</b> 42:13 53:4 120:14 190:1 287:2 290:25 301:8	<b>minutes</b> 4:5 23:2 58:4 58:6 131:15 131:23 170:25 216:7 217:17 217:17
<b>metrics</b> 223:15 249:6 251:8 252:21 261:25 320:11 320:12 320:14	<b>midnight</b> 19:22 19:23 19:23 47:4	<b>mirror</b> 249:20 250:10 253:24
<b>metropolitan</b> 295:2 297:19	<b>midwest</b> 51:15 178:14	<b>misinterpretation</b> 123:12
<b>Mexico</b> 125:1 126:7 128:13 176:12 176:21 199:22	<b>mid-yellows</b> 153:1	<b>misleading</b> 243:9
<b>Meyers</b> 172:21	<b>Mike</b> 34:10 85:1 87:12 200:17	<b>miss</b> 123:7
<b>mic</b> 78:10	<b>milestone</b> 72:21	<b>missing</b> 45:24 127:20
<b>Michigan</b> 94:12	<b>mill</b> 66:13 66:22 69:17 69:20 136:25	<b>missions</b> 186:15
<b>micro</b> 42:12	<b>Milligan</b> 142:15	<b>mission's</b> 29:16
<b>microgram</b> 72:4 72:5 140:11 144:6	<b>mills</b> 60:24 67:20 69:18 90:14	<b>Mississippi</b> 315:13
<b>micrograms</b> 50:15 64:24 65:7 65:25 70:25 72:7 73:18 136:20 137:8 140:10 141:17 144:9 144:12 144:17 149:16 150:6 151:2	<b>mimic</b> 84:23	<b>Missouri</b> 138:18 142:17
<b>microphone</b> 217:23	<b>mimicked</b> 31:16	<b>mistaken</b> 92:18
	<b>mind</b> 62:15 79:21 208:6 226:19 271:22 274:5 318:20	<b>Mitchell</b> 92:10 93:13
	<b>mindful</b> 3:17 4:2 42:17 80:6	<b>mix</b> 59:21
	<b>minimum</b> 61:18 64:4 167:3 187:23 290:13 290:15 290:25 299:4	<b>mixed</b> 185:5
	<b>Minnesota</b> 145:20 146:22	<b>mixes</b> 285:19
	<b>minor</b> 63:19 74:8 246:3	<b>mixing</b> 172:22 180:23 289:22 290:2 290:18 319:9
	<b>minus</b> 250:17 254:19 316:22	<b>MM4</b> 245:6 248:18
	<b>minute</b> 74:2 148:9 194:10 195:2	<b>MM5</b> 244:25 245:5 245:7 245:7 245:8 245:14 246:2 246:16 246:18 247:2 247:3 247:14 247:25 248:4 248:15 249:10 251:5

266:16 266:22	75:23 76:9 76:21	248:9 248:14
267:2 267:11	77:16 78:18 81:3	250:13 250:16
314:11	81:7 82:3	251:3 251:20
<b>MMIF</b> 43:9 225:2	82:16 88:16 89:5	252:6 252:15
228:2 246:1	89:5 89:8	252:17 253:6
246:15 247:1	90:22 92:4 92:12	253:8 253:22
247:1 247:14	96:25 98:14	255:2 255:11
247:25 249:9	101:1 102:6	257:10 261:6
251:9 251:23	103:10 109:4	262:8 268:9
252:22 252:24	109:13 119:4	269:5 271:19
254:18 255:20	119:8 119:10	272:15 272:20
261:22 264:6	119:14 119:19	272:21 273:22
264:9 264:13	119:21 120:13	274:14 277:17
264:20 264:21	120:22 120:23	277:20 277:22
265:13 265:23	120:24 121:11	277:25 278:9
266:8 266:13	121:22 122:17	278:11 278:19
267:25 269:22	123:13 126:17	279:2 279:7
270:14 270:19	126:18 127:11	279:15 279:16
279:24	127:18 128:2	279:22 280:4
	128:6 130:3	280:21 280:24
<b>MMIFSTAT</b> 225:8	130:14 131:2	281:1 281:7
<b>mobile</b> 126:17	143:3 143:25	282:6 283:2
126:19 126:24	144:2 144:8	284:15 287:2
127:22	149:6 154:24	288:21 291:1
<b>mode</b> 146:11 193:7	155:9 160:2	291:17 291:21
193:15 193:15	160:17 161:8	291:23 291:23
<b>model</b> 6:4 6:16	161:10 162:11	292:5 292:6
6:20 7:17 7:19	162:18 166:3	293:10 293:12
8:23 9:3 25:5	175:25 186:25	293:24 294:14
25:9 31:25 33:12	187:6 190:8	295:23 296:5
33:13 33:20	200:19 216:14	296:21 296:25
34:23 35:11 39:1	220:19 222:7	297:16 298:2
39:2 39:13 40:24	223:3 225:3	298:2 298:2
41:11 45:9 45:11	225:5 225:16	298:3 298:8
47:8 51:4	225:19 225:20	298:10 299:23
54:12 54:17 55:1	227:7 228:4	300:5 300:9
55:24 64:25 65:8	231:12 232:6	302:24 302:25
66:2 67:13	232:12 232:17	303:10 303:19
69:5 69:10 69:10	233:14 234:16	304:10 305:15
70:1 70:15 72:12	234:18 235:21	305:25 306:2
74:5 74:10 74:16	236:25 237:15	306:12 312:2
74:16 74:18 75:2	241:14 241:23	312:14 312:25
75:4 75:6	242:24 244:3	313:8 315:13
75:15 75:20	244:18 244:22	315:13 316:16
75:22 75:22	245:5 246:12	316:18 317:16
	247:25 248:6	317:18 318:3

318:4 318:5	33:8 33:10 33:10	211:24 212:1
319:15 319:17	35:19 36:9 36:11	212:15 212:22
319:18 319:19	40:16 40:20 41:1	214:9 219:25
319:23 319:25	41:20 42:8 42:20	220:15 220:22
321:6	43:24 46:8 47:25	224:18 224:23
<b>modeled</b> 31:24	49:13 49:15	227:3 227:4
41:21 45:7	49:17 49:20	227:4 227:19
46:2 46:6 46:7	50:21 51:23	227:25 228:7
48:17 50:11	51:25 52:13 53:1	228:19 228:22
73:14 77:22	53:4 55:18	229:1 230:9
82:12 111:2	56:4 56:23	231:9 232:1
115:4 117:4	63:7 63:14 63:18	232:14 233:1
135:5 136:17	63:23 64:1	234:22 235:1
137:18 139:21	64:6 64:15 64:17	236:6 236:9
139:22 139:23	65:12 65:22	238:2 239:11
142:6 142:16	67:15 67:17	239:22 240:15
142:17 142:18	67:24 74:8 75:25	257:24 258:13
143:1 143:4	76:19 77:8 77:11	258:17 259:22
143:13 143:15	85:11 85:21 86:1	260:4 260:8
143:15 143:23	90:2 94:18	260:11 260:17
146:12 146:13	98:6 102:24	260:22 261:3
149:1 153:5	106:25 107:1	262:12 263:2
162:15 169:9	107:18 109:16	263:19 263:20
173:5 179:20	110:22 116:4	268:20 272:18
195:10 202:9	116:6 116:8	272:25 273:6
221:6 221:6	117:2 119:9	274:11 275:8
228:22 244:12	121:19 122:20	275:9 275:15
255:11 263:8	123:10 128:15	275:19 276:1
296:20 321:1	132:15 133:6	278:4 294:20
<b>modeler</b> 91:16	133:13 133:17	296:18 306:6
274:23	133:25 134:6	308:24 309:19
<b>modelers</b> 13:8	134:14 134:17	310:10 314:12
18:13 22:2 29:15	134:21 134:22	319:14
137:16 138:19	134:23 135:11	<b>models</b> 5:5 5:8
149:11 274:3	135:15 135:16	5:17 5:19 6:3
274:4 320:17	135:19 146:23	6:14 8:11 8:15
<b>modeling</b> 9:20	153:16 153:18	8:16 8:19 8:24
9:21 10:5	157:6 159:15	9:7 9:13 9:15
10:10 18:4 18:16	160:14 165:16	12:19 15:25
19:1 20:10 20:11	166:22 168:1	26:18 32:8 32:22
20:15 21:18	170:21 179:16	33:3 53:11 53:12
23:12 25:16	181:21 183:4	53:15 53:17
28:23 29:6 30:10	191:8 191:24	54:17 60:2
31:8 31:14 31:22	192:5 195:17	72:2 74:12
32:10 33:7	196:21 196:23	76:5 76:10 78:19
	202:6 203:12	80:10 87:25 88:1

88:5 88:7 88:8	293:7 293:17	116:16 116:17
88:22 88:24	293:19 295:17	116:19 123:1
89:13 89:18 90:5	311:23 311:25	123:4 123:7
90:9 91:3 120:11	312:16 313:7	123:11 123:11
120:16 121:24	314:6 314:8	123:16 124:25
184:23 200:3	315:1 315:12	126:7 126:8
219:14 219:17	315:16 317:17	127:2 127:2
220:4 220:4	317:25 320:5	127:12 127:24
220:5 220:8	320:9 320:16	128:17 128:17
220:14 220:20	321:2	128:18 128:20
220:21 221:2	<b>model's</b> 241:6	128:21 129:15
221:8 221:10	<b>MODELS</b> 3:2	129:16 129:17
221:17 221:19	<b>modern</b> 27:18	129:19 130:7
221:19 221:22	<b>modes</b> 193:6	160:17 166:4
222:15 222:16	<b>modification</b>	167:9 187:19
223:1 223:12	213:10	189:23 190:17
223:17 223:20	<b>modifications</b>	192:16 192:17
223:25 224:5	63:20 88:7	193:1 193:4
224:5 224:12	309:12	193:22 194:4
224:18 225:14	<b>modified</b> 101:24	197:9 203:15
225:25 228:6	102:1 103:16	208:21 208:22
229:14 229:24	134:2	210:4 210:9
231:8 232:4	<b>modify</b> 17:6 34:24	239:7 239:9
232:4 233:9	35:2 98:4 319:5	239:9 253:8
233:13 233:22	<b>modifying</b> 6:10	<b>monitored</b> 43:16
234:4 235:3	210:13 213:7	45:7 46:3
235:4 238:22	267:11	81:16 81:16
245:1 246:5	<b>modules</b> 163:25	82:11 102:24
250:8 251:1	175:25	107:2 109:24
252:19 252:21	<b>molar</b> 98:7	110:1 111:2
252:23 253:1	<b>molecule</b> 285:17	111:6 111:9
253:2 253:3	<b>moment</b> 205:24	111:15 127:11
254:9 257:7	<b>money</b> 246:20	180:4 181:2
257:17 261:7	<b>monitor</b> 25:8	188:3
261:7 261:15	41:10 43:23	<b>monitoring</b>
269:19 270:8	45:24 45:24	23:11 26:24 27:9
272:15 272:16	66:12 66:21 67:3	34:20 42:2
273:5 273:11	67:7 78:20	42:5 43:18
273:14 273:19	80:2 80:3	66:5 76:3
273:23 274:1	80:22 84:7	80:18 96:16
274:6 274:7	112:14 116:15	121:14 135:23
275:13 276:13		135:25 151:25
276:15 276:23		172:24 173:12
277:15 282:12		173:16 173:19
289:6 291:5		175:11 176:14
292:23 292:24		

177:4 180:3	184:15 186:19	<b>moves</b> 273:25
180:21 186:4	200:20 256:24	<b>moving</b> 23:25 28:3
186:5 187:11	282:7 283:12	51:21 85:21
189:20 191:10	284:12 286:10	105:24 106:2
200:2 204:17	307:5 321:19	106:3 114:8
208:24 272:5	<b>Morris</b> 52:19	171:17 220:2
301:19	240:4 240:5	221:24 223:22
<b>monitors</b> 78:18	262:22 271:8	224:11 231:6
80:5 80:7	294:3 312:4	249:3 277:4
80:13 80:19 81:3	319:1 319:7	285:22 287:20
120:7 123:3	319:13 319:17	293:18 303:13
125:2 127:4	319:24	303:16
128:13 130:4	<b>mostly</b> 125:6	<b>Mozart</b> 298:9
166:19 168:6	247:1	<b>multi</b> 261:11
168:22 169:7	<b>motivating</b> 225:1	<b>multi-model</b>
173:2 176:22	<b>motivation</b> 257:23	255:25
179:14 185:13	294:19	<b>multiple</b> 187:1
191:11 192:11	<b>MOU</b> 219:4	216:14 218:23
258:7	<b>mountain</b> 178:14	234:18 244:3
<b>monkey</b> 26:13	178:16 178:18	244:19 244:22
<b>monologue</b> 58:3	241:19 317:15	245:1 273:16
<b>Monster</b> 20:5	<b>mouthful</b> 42:6	277:2
<b>Monte</b> 159:17	<b>move</b> 8:8 16:5	<b>multiplied</b> 300:19
164:21 212:23	17:3 19:9 20:9	<b>multiply</b> 173:6
214:18 214:22	60:18 63:6 72:10	186:18 300:21
216:13	79:16 93:20	<b>multi-source</b>
<b>month</b> 4:22 9:21	100:8 108:10	217:6
11:13 83:19	109:7 111:4	<b>multi-tier</b> 230:22
103:15 127:12	118:5 157:11	<b>multitude</b> 20:23
157:21 157:21	157:17 164:25	<b>multi-use</b> 258:21
195:25 240:10	202:24 206:2	<b>multi-year</b>
299:22 308:2	222:22 222:24	103:3 111:21
<b>months</b> 23:14	236:3 237:24	203:2 203:9
101:15 211:2	257:14 270:7	<b>myriad</b> 92:22
212:1 296:6	285:18 287:8	<b>myself</b> 142:15
297:22	287:14 289:15	240:7
<b>Monument</b> 272:6	290:14 290:22	<hr/>
<b>moonshine</b> 139:13	291:5 291:9	N
<b>Moore</b> 149:11	293:15 303:13	<hr/>
<b>morning</b> 3:4	303:17 320:21	<b>NAAQS</b> 5:2 6:25
3:11 21:14 93:25	<b>moved</b> 7:13	23:10 24:12
131:25 172:9	26:12 27:10	25:17 31:24
	43:14 291:12	

33:24 42:1 42:4 44:25 45:13 46:4 47:5 47:14 51:6 51:17 56:25 62:21 67:9 78:12 78:13 83:8 83:10 83:12 83:21 86:8 87:3 94:19 96:15 98:18 100:14 100:16 100:24 101:23 102:13 102:14 102:16 102:22 103:12 103:21 108:12 113:4 114:24 117:4 121:2 126:21 136:23 140:12 144:2 144:19 145:17 145:21 150:13 150:14 156:9 171:25 172:11 180:6 183:6 191:2 191:24 192:3 192:5 195:12 224:6 227:8 257:8 258:3 <b>NACAA</b> 29:3 29:8 29:15 30:8 35:5 43:1 52:3 53:8 54:14 57:16 71:20 73:11 78:4 87:17 89:14 93:2 93:10 230:13 230:22 <b>Naresh</b> 159:10 <b>narrow</b> 59:23 124:20 187:16 287:7 289:14 289:20 <b>narrowing</b> 9:12 <b>national</b> 50:3	58:11 96:21 100:18 102:1 241:16 272:6 <b>nationwide</b> 58:21 <b>natural</b> 87:11 145:14 145:25 147:10 153:10 <b>naturally</b> 59:20 <b>nature</b> 35:10 35:25 49:18 49:19 97:21 102:19 102:20 108:11 110:23 112:3 204:17 <b>NCAA</b> 244:16 <b>nearby</b> 102:23 106:24 109:4 109:12 109:22 110:2 110:10 117:3 120:8 123:11 149:24 177:11 201:6 207:12 <b>nearest</b> 122:21 269:17 298:20 <b>near-field</b> 33:18 40:24 101:2 172:22 173:17 174:20 175:13 254:23 258:1 276:9 <b>necessarily</b> 38:24 71:18 89:4 121:2 122:19 122:23 123:12 129:6 136:1 142:12 156:24 282:15 <b>necessary</b> 7:21 9:14 32:9 64:1 84:11 96:10 101:16 107:20 157:5 172:4 219:19 222:25	225:6 274:1 <b>necessitated</b> 261:2 <b>necessity</b> 76:7 <b>negative</b> 254:4 305:4 <b>NEI</b> 236:21 <b>NEPA</b> 56:18 218:25 219:5 227:23 257:8 257:21 257:24 258:17 259:10 259:17 260:3 260:20 261:1 261:18 276:7 <b>nest</b> 276:19 314:22 <b>nesting</b> 236:10 239:18 <b>nests</b> 235:24 <b>net</b> 37:23 39:23 285:13 285:21 288:4 288:8 290:20 <b>Netherlands</b> 185:14 <b>network</b> 23:11 80:17 146:24 176:14 176:22 275:2 275:3 <b>neutralized</b> 271:4 271:10 <b>Nevermind</b> 256:16 <b>Newcastle</b> 298:16 305:8 <b>newer</b> 234:6 <b>nice</b> 30:5 144:16 282:13 <b>niche</b> 224:13 <b>night</b> 19:24
---	--	---

315:14	145:13 145:19	302:7 303:4
<b>nighttime</b> 293:5	145:22 156:24	303:24
293:7	157:6 157:13	<b>non-complex</b>
<b>nine</b> 28:19 139:19	163:9 172:3	120:12
263:4 286:10	172:11 172:25	<b>non-controlled</b>
<b>Nipping</b> 159:10	173:7 173:21	150:22
<b>nitrate</b> 51:8	174:19 179:12	<b>non-cumulative</b>
268:7 268:12	179:21 180:6	134:6
271:4 271:9	181:3 182:14	<b>non-downwash</b>
271:21	182:20 183:6	120:12
<b>nitrates</b> 85:10	184:22 186:16	<b>none</b> 188:4
<b>nitric</b> 268:10	188:1 188:10	253:9 314:8
271:19	188:12 188:14	314:25
<b>nitrogen</b> 229:18	189:5 190:1	<b>nonetheless</b>
264:4 268:8	191:2 191:5	23:9 27:23
270:10 270:14	191:6 191:14	40:7 50:7
271:2 271:12	191:24 192:2	50:17 51:1 55:22
271:14 271:20	192:5 192:7	132:21
<b>NO2</b> 5:1 6:24 7:13	192:13 192:16	<b>non-linear</b> 221:14
35:21 40:1	193:11 193:16	<b>non-modeling</b>
40:4 40:10	193:18 193:21	64:14
53:7 78:18	193:22 193:25	<b>non-regulatory</b>
91:9 93:14 93:17	194:5 194:11	99:4
94:11 94:19	194:21 195:3	<b>normal</b> 40:25
94:25 95:8 96:15	195:5 195:8	135:12 164:8
96:22 96:25	195:12 195:17	<b>normalize</b> 75:5
100:13 101:1	196:14 197:11	<b>normalized</b> 249:23
101:19 101:21	197:13 197:20	253:17
102:13 103:13	211:3 211:12	<b>normalizes</b> 250:12
107:4 110:23	234:24 263:22	<b>normally</b> 216:24
111:12 113:13	266:2 266:9	<b>north</b> 128:14
113:24 123:21	<b>nobody</b> 20:7	128:17 128:18
123:23 124:18	134:21	128:20 179:3
124:24 126:12	<b>nobody's</b> 149:15	179:8 179:10
126:13 126:21	<b>no-brainer</b> 37:20	179:14 298:16
127:11 128:11	<b>nominal</b> 110:7	<b>Northeast</b> 178:14
128:14 128:18	303:23	<b>note</b> 68:16
133:6 133:15	<b>non</b> 52:8 155:3	70:21 73:10
134:14 136:12	165:1 212:3	83:24 96:18 99:8
136:24 137:5	285:17	149:15 158:15
137:6 138:17	<b>non-attainment</b>	
140:15 140:21	28:12 147:19	
141:9 141:21	147:22 153:17	
	155:4 212:2	

174:16 179:7 184:3 <b>noted</b> 88:23 91:1 99:22 100:5 105:7 172:9 172:21 <b>notes</b> 96:11 <b>nothing</b> 41:23 60:15 117:5 117:6 117:7 <b>notice</b> 10:2 10:4 76:7 176:23 178:1 180:18 188:5 <b>noticed</b> 251:18 311:25 <b>Notwithstanding</b> 229:12 <b>Nouri</b> 311:16 <b>novel</b> 115:7 <b>nowhere</b> 190:1 <b>NOx</b> 38:9 39:22 50:14 128:11 128:14 147:19 147:21 153:25 155:11 172:22 172:25 173:5 173:19 173:20 174:25 174:25 175:3 176:5 176:6 176:16 177:2 177:2 177:7 177:9 177:10 178:2 178:12 178:21 179:5 180:6 180:14 181:2 186:16 186:17 188:1 188:9 188:22 189:1 190:1 191:5 191:6 191:7 191:9 191:12	192:7 192:11 192:13 192:16 192:17 192:18 193:15 193:19 193:20 193:22 194:2 194:11 194:21 195:3 195:5 195:8 196:11 197:9 232:13 236:18 237:4 283:8 283:9 283:14 284:23 285:21 287:23 288:7 290:5 290:8 290:19 292:8 292:20 296:6 297:2 298:24 299:2 299:10 299:17 300:10 301:7 301:8 301:10 301:11 303:7 304:3 <b>NOXCEMS</b> 195:20 196:10 196:19 <b>NOz</b> 292:20 <b>NSPS</b> 62:2 <b>NSR</b> 24:6 36:22 55:11 107:8 230:7 230:15 <b>nuances</b> 42:7 42:14 42:16 86:11 <b>nudge</b> 20:1 <b>nugget</b> 24:3 28:2 <b>nuggets</b> 27:6 <b>numerous</b> 176:22 278:12 <hr/> <hr/> <b>O3</b> 192:23 193:10 <b>Oakley</b> 234:2	<b>OAQPS</b> 29:19 119:12 133:20 184:5 204:10 212:24 <b>objective</b> 29:12 223:21 242:8 244:21 245:13 267:14 <b>objectively</b> 50:19 <b>objectives</b> 224:4 <b>obligation</b> 15:4 114:18 <b>observation</b> 248:4 284:11 284:13 286:8 293:4 <b>observational</b> 314:1 <b>observations</b> 34:24 76:13 126:3 242:17 242:18 243:11 245:13 245:16 245:25 250:5 252:16 255:10 278:7 280:8 286:16 286:24 287:5 287:21 288:2 288:21 289:14 290:8 290:12 319:20 <b>obviously</b> 10:19 15:10 18:13 20:17 29:14 41:14 43:4 56:20 59:5 59:8 63:4 64:16 68:18 69:1 70:3 73:7 74:14 74:22 75:11 76:11 76:22 77:6 80:6 81:17 83:6 85:21 97:9 98:16
--	---	---

107:25 110:13 131:25 141:19 160:4 162:4 164:22 166:22 169:9 170:3 179:23 189:9 221:13 221:23  <b>occur</b> 104:14 104:24 163:8 163:20 243:11  <b>occurred</b> 128:8 258:14 266:5  <b>occurrence</b> 314:2  <b>occurring</b> 173:24 174:1 174:22 175:6 175:13 215:1 315:9 320:18  <b>occurs</b> 260:8 266:3 267:12 267:15 314:3  <b>ocean</b> 50:25 318:25 319:4 319:6 319:8 319:9 319:10  <b>OCS</b> 50:24  <b>October</b> 20:12 20:21 27:7 232:11 244:13  <b>odd</b> 202:11  <b>offered</b> 28:19 57:14  <b>offering</b> 60:19  <b>office</b> 28:15 29:17 36:4 36:13 57:7 57:18 99:6 99:16 105:6 106:7 108:8 110:21 115:15 236:8 294:12 294:16 295:24 298:6 301:25	<b>offices</b> 101:5 113:9 117:14 133:20  <b>officially</b> 10:5  <b>offset</b> 32:4 52:5 52:11 52:14 72:2 73:11 89:17 93:2 93:11 93:15 231:1 231:4  <b>offsetting</b> 175:24  <b>OFM</b> 244:24  <b>OGC</b> 21:3 213:16  <b>oh</b> 116:18 116:21 198:25 214:19  <b>Ohio</b> 168:7 168:10 244:12 244:13 244:14  <b>oil</b> 19:22 19:23 19:23 21:4 47:4 147:14 176:14 176:21 198:14 263:4 263:8  <b>okay</b> 10:15 18:25 35:6 49:1 50:14 60:4 66:7 81:12 82:23 86:6 94:2 131:20 141:9 145:21 147:11 148:19 149:21 150:25 152:3 159:4 165:13 168:11 169:22 183:18 198:25 199:1 199:4 199:8 199:14 201:10 202:2 202:15 216:5 217:9 245:3 277:13 286:14 289:5	295:2 297:18 299:6 303:2 318:8  <b>Oklahoma</b> 142:15 143:15 143:18 145:3 223:4 242:10  <b>old</b> 18:14 23:1 54:2 64:19 108:21 165:11 170:23 206:21 211:18 216:4 268:5 271:24 276:18 295:5  <b>older</b> 145:8 243:24  <b>olefin</b> 305:2  <b>OLM</b> 7:17 99:1 99:22 113:16 113:17 124:4 125:6 125:8 125:12 125:16 126:6 127:5 127:6 137:1 137:2 137:4 149:3 149:8 150:11 151:5 151:8 172:6 176:10 179:2 179:6 180:9 180:11 180:15 180:17 181:6 181:15 182:23 183:24 184:14 185:2 186:15 186:18 188:11 188:16 188:17 189:5 189:8 190:5 190:11 191:1 191:7 192:6 195:9 195:17  <b>OLMGROUP</b> 99:23 100:3 125:6
--	--	--

<p>125:8 126:1 126:6 126:10 126:14 127:6 127:8</p> <p><b>OMB</b> 10:25</p> <p><b>omitted</b> 312:3</p> <p><b>one-fifteen</b> 132:10</p> <p><b>one-one</b> 180:10</p> <p><b>ones</b> 136:21 145:8 147:25 246:16 247:5 247:6 249:16 249:18 256:23 262:1 269:16</p> <p><b>one-to-one</b> 121:8</p> <p><b>ongoing</b> 5:15 20:24 56:18 218:15</p> <p><b>online</b> 104:24</p> <p><b>onto</b> 108:21 249:3 281:17</p> <p><b>open</b> 16:8 78:10 150:3 151:13 198:5 202:22 212:18 256:13</p> <p><b>opening</b> 58:3</p> <p><b>operate</b> 160:5 160:13 161:19 163:18 195:19 203:23 205:10</p> <p><b>operating</b> 58:21 63:20 64:8 64:10 74:9 119:24 120:7 186:10 186:10 189:18 196:2 202:21 204:5 204:6 204:12 204:18 215:19 274:10</p> <p><b>operation</b> 61:4</p>	<p>61:12 66:14 66:23 90:7 160:4 161:4 196:16 216:1</p> <p><b>operational</b> 64:15 171:4 275:8 275:11 275:14 275:23 275:25</p> <p><b>operations</b> 58:13 61:11 61:15 61:17 62:14 64:25 65:8 73:16 90:6 104:8 105:7 160:14 206:7</p> <p><b>opinion</b> 151:12 206:8</p> <p><b>opinions</b> 197:5</p> <p><b>opportunities</b> 74:15 76:8 77:19 77:19</p> <p><b>opportunity</b> 22:3 76:24 79:7 265:25</p> <p><b>opposed</b> 268:12</p> <p><b>ops</b> 242:19 252:9</p> <p><b>option</b> 89:24 131:4 254:23 258:5 258:5 259:7 261:19 309:19</p> <p><b>optional</b> 27:25</p> <p><b>options</b> 99:5 101:19 102:1 124:1 124:5 124:24 128:11 128:11 157:8 183:9 195:18 254:17 254:18</p> <p><b>oranges</b> 153:2</p> <p><b>orangy</b> 141:8</p>	<p>141:12</p> <p><b>ORD</b> 238:4</p> <p><b>order</b> 7:22 64:18 100:8 103:19 121:14 122:15 167:16 187:16 200:6 213:8 232:13 235:8 237:21 254:21 261:4 261:4 261:11 261:12 261:12 272:15 273:5 273:25 275:12 276:2 278:10 278:15 296:24 299:6 299:9 299:13 299:16 299:17</p> <p><b>ordered</b> 315:5</p> <p><b>organization</b> 15:5 223:15 317:20</p> <p><b>organizations</b> 12:25 13:25</p> <p><b>orient</b> 281:20 285:7</p> <p><b>oriented</b> 42:10 59:13 120:4</p> <p><b>original</b> 9:11 128:15 143:2 144:12 175:15 179:16 180:7 182:13 189:12 301:15 304:2</p> <p><b>originally</b> 20:12 129:10 132:10 147:16 172:20 179:22 244:5</p> <p><b>OSC</b> 106:1</p> <p><b>OTAQ</b> 25:13 41:17 56:15 83:1</p>
---	--	--

83:25	69:11 82:2 111:5	279:16
<b>OTAQ's</b> 83:17	120:15 124:16	<b>owe</b> 321:17
<b>others</b> 6:5 18:7	127:25 134:19	<b>oxidation</b> 292:20
19:9 29:9	141:17 304:15	<b>oxidizer</b> 139:11
35:18 96:5 106:7	<b>overcome</b> 59:19	<b>oxidizing</b> 174:19
115:16 116:24	<b>over-estimate</b>	<b>ozone</b> 5:13 8:7
125:16 140:1	129:3 271:13	9:1 18:14
204:15 206:18	<b>overlaid</b> 266:17	18:18 19:1 52:22
221:20 307:19	<b>overlap</b> 249:21	55:18 88:10 89:3
<b>Otherwise</b> 158:16	249:23	89:22 98:6 98:15
<b>ours</b> 64:21	<b>overlapping</b>	124:21 128:15
<b>ourselves</b> 65:12	218:22	128:17 128:20
72:5 278:8	<b>overlaps</b> 282:10	129:16 147:23
<b>outing</b> 262:6	<b>overlay</b> 281:16	173:21 173:23
262:7	<b>overlaying</b> 282:3	173:24 174:3
<b>outlier</b> 265:18	<b>overlays</b> 5:14	174:5 174:18
265:25 267:10	<b>overly</b> 76:15	175:21 175:23
<b>outliers</b> 265:13	107:9 107:25	179:9 179:10
265:22	119:6 173:15	179:12 179:13
<b>outline</b> 140:3	206:22	179:24 181:18
196:24 257:4	<b>overnight</b> 3:13	184:21 185:5
<b>outlined</b> 47:18	<b>over-predict</b>	185:6 186:24
239:7 257:6	125:5 126:9	187:3 189:21
<b>outlining</b> 259:16	169:10 190:6	189:23 193:10
<b>outperforming</b>	<b>over-predicted</b>	193:17 219:14
251:24	168:23 188:12	220:9 220:16
<b>output</b> 164:6	188:15	221:5 222:7
164:8 164:10	<b>over-predicting</b>	224:9 227:11
165:14 210:14	127:3 189:9	227:14 227:17
228:4 279:23	190:5	227:25 230:7
320:15	<b>over-prediction</b>	232:12 239:24
<b>outputs</b> 151:1	128:7 169:3	258:11 258:13
291:21 291:24	<b>over-ranging</b>	260:18 276:24
<b>outreach</b> 118:8	177:2	277:16 280:15
<b>outside</b> 5:23	<b>overshoot</b> 203:7	285:1 285:10
100:1 140:25	<b>overstate</b> 161:12	285:13 285:17
147:22 282:1	<b>overtop</b> 282:3	285:18 285:21
<b>outstanding</b> 11:21	<b>overview</b> 134:15	285:23 286:2
183:14	226:11 226:11	288:1 288:5
<b>overall</b> 19:8		288:5 288:8
		288:13 288:16
		288:17 290:10
		290:11 290:13
		290:16 290:20



292:20 293:4	166:1 166:5	149:16 154:12
302:25 307:13	166:11 167:14	161:1 161:11
<b>particularly</b>	167:14 168:17	161:19 161:21
107:7 199:18	168:24 169:5	161:22 170:19
218:21	169:8 171:9	197:9 212:11
<b>particulars</b> 108:9	289:16 289:20	268:6 271:25
118:17	<b>peaked</b> 187:8	272:2 272:3
<b>particulate</b> 268:7	<b>peaking</b> 215:15	298:25 299:1
268:12 271:21	<b>peaks</b> 289:8	300:6 300:18
<b>partly</b> 245:18	<b>peaky</b> 171:8	300:21 303:9
<b>partners</b> 219:8	<b>peer</b> 12:18	<b>percent</b> 65:16
219:23 222:2	<b>peers</b> 60:7	65:18 65:19 67:9
<b>pass</b> 154:4	<b>penalty</b> 221:4	68:11 71:1
193:8 247:2	<b>people</b> 5:23 10:14	71:3 73:13 73:17
254:18 304:7	14:7 15:1	75:19 75:24
<b>passed</b> 136:22	17:19 17:23	136:20 149:2
144:3	18:21 19:13	149:2 150:8
<b>passes</b> 137:2	19:19 23:1 30:17	150:9 150:25
<b>pass-fail</b> 248:2	31:13 36:19 57:9	151:3 151:20
<b>past</b> 23:21 43:6	60:9 74:23 78:11	152:4 153:21
54:6 74:17 92:20	87:14 112:20	153:22 154:15
100:1 117:24	114:5 114:6	161:7 161:20
124:1 162:12	119:12 120:19	161:21 179:22
218:16 241:13	123:25 131:14	180:14 188:20
<b>Pat</b> 129:10 130:1	133:21 135:10	192:10 195:7
<b>path</b> 54:10 209:24	138:12 156:7	195:9 195:10
<b>pathways</b> 303:3	158:5 184:2	249:23 253:23
<b>patient</b> 217:13	185:21 204:4	254:19 256:22
<b>pattern</b> 300:17	208:5 209:14	295:9 295:10
<b>patterns</b> 52:10	229:4 230:11	301:13 302:13
111:13 287:16	239:22 242:1	302:16 315:15
287:24 300:23	244:6 247:20	318:24 319:4
<b>Patulski</b> 83:1	249:24 249:25	<b>percentage</b> 162:23
83:18	274:8 293:22	169:8
<b>pay</b> 26:23	296:3 296:8	<b>percentile</b> 45:8
<b>paying</b> 246:20	<b>per</b> 24:12 38:8	45:11 45:11
<b>peak</b> 120:25 130:9	69:21 139:14	45:19 66:16
160:15 160:25	139:17 139:19	66:24 69:5 69:11
161:24 163:7	139:19 140:10	70:2 81:15 81:16
	143:14 143:15	82:2 82:11 82:12
	143:16 148:6	82:15 83:5
	148:7 148:7	83:5 83:11
	148:8 148:25	95:1 95:4 103:12
		103:13 111:22
		112:11 169:19

169:21 169:25 173:3 177:20 177:25 <b>percentiles</b> 82:1 169:22 <b>perfect</b> 124:16 126:2 127:14 130:8 250:1 250:13 251:16 <b>perform</b> 164:22 172:10 233:13 251:1 252:8 293:7 312:17 <b>performance</b> 6:8 55:25 56:2 56:4 61:7 70:15 76:21 120:10 122:11 123:13 130:20 172:18 179:1 180:1 180:8 181:15 181:19 189:19 200:19 223:21 224:3 224:19 225:6 244:1 246:12 246:19 247:3 248:6 248:9 248:11 248:21 249:6 249:8 249:11 249:13 249:13 249:14 251:4 251:23 252:1 253:5 253:21 254:21 255:17 255:18 262:2 278:8 279:15 281:1 299:24 312:8 312:14 313:25 <b>performed</b> 122:3 165:17 252:9 252:11 252:12 255:20 262:9	271:5 <b>performing</b> 168:4 171:25 180:19 181:7 225:19 233:22 244:23 247:24 250:18 251:9 251:18 252:5 252:25 253:6 253:11 253:13 253:13 253:15 253:16 253:18 253:19 253:22 253:25 253:25 256:1 256:4 256:10 256:11 318:3 318:5 <b>performs</b> 129:17 182:1 182:25 293:14 <b>perhaps</b> 6:6 6:10 7:15 7:16 9:25 12:24 16:22 73:22 91:12 98:10 108:15 109:20 110:25 115:18 116:2 188:15 291:15 320:9 <b>period</b> 3:13 11:15 195:25 196:18 202:6 202:7 203:9 206:9 279:10 280:20 286:16 307:20 318:19 320:10 <b>periodic</b> 14:1 14:13 <b>periodically</b> 13:1 <b>periods</b> 75:14 201:9 293:17 299:22 <b>permit</b> 20:10	20:15 23:17 29:15 63:20 63:20 64:5 74:8 74:9 90:7 102:18 113:23 123:10 142:7 142:7 155:21 161:9 172:3 181:21 194:3 201:24 203:5 203:14 213:2 213:23 227:12 275:8 275:9 276:1 <b>permits</b> 15:19 24:17 65:3 101:5 106:1 108:17 113:12 113:13 118:5 133:14 156:8 172:9 238:2 <b>permitting</b> 13:9 32:6 63:9 157:19 201:23 205:1 214:8 220:24 232:16 274:7 274:19 277:9 <b>perpetrator</b> 312:21 <b>Perry</b> 214:17 <b>perspective</b> 29:7 42:12 44:5 44:12 59:10 60:5 60:23 121:10 130:21 156:12 207:25 275:5 <b>pertinent</b> 147:14 <b>petition</b> 5:10 10:7 89:2 219:13 230:8 261:2 <b>Petroleum</b> 183:20 <b>Peyonce</b> 262:20
--	--	--

<b>phase</b> 9:4 9:11 9:11 119:20 222:5	299:24 314:9	203:8
<b>phases</b> 119:20 278:25	<b>picked</b> 242:21 279:5 296:17 299:3 302:7 315:4	<b>plant</b> 66:22 66:22 120:6 120:7 123:16 124:14 137:13 138:18 139:10 145:15 145:16 146:1 146:2 146:3 146:4 146:9 155:20 185:13 185:18 186:3 202:1 202:21 234:2 278:5 279:3 279:12 281:10 281:21 281:23 283:20 286:18 286:19 286:21 288:8 289:11 292:3 321:4
<b>philosophical</b> 72:20	<b>picking</b> 75:14 268:24	<b>plants</b> 119:24 204:5 205:17 212:7
<b>Phong</b> 149:11	<b>picks</b> 124:17	<b>plastered</b> 185:23
<b>photochemical</b> 5:8 32:22 33:12 33:13 33:20 38:25 39:13 50:21 53:1 54:12 54:17 54:25 56:4 72:2 85:25 89:13 89:18 220:14 225:16 228:6 229:1 231:9 231:12 232:4 232:6 232:17 234:21 235:1 235:3 235:4 235:21 236:9 236:25 237:15 253:3 273:10 273:14 273:19 273:22 275:15 276:13 276:22 280:4 280:21 295:17 295:22 296:18 296:21 297:16 302:24 303:19 304:10 305:15 305:25 306:6 306:11	<b>picture</b> 127:24 150:24 186:2 186:8 194:14 <b>pictures</b> 194:12 <b>piece</b> 190:13 269:18 <b>pieces</b> 35:5 56:16 208:3 208:6 <b>pipeline</b> 62:12 <b>pitfalls</b> 108:6 <b>placed</b> 41:22 281:24 316:10 <b>placement</b> 41:19 290:3 <b>places</b> 71:24 117:10 189:6 232:5 <b>Plains</b> 229:3 242:10 312:1 313:1 313:9 313:12 313:17 315:1 <b>plan</b> 68:5 76:25 85:13 86:4 290:3 <b>planned</b> 105:2 105:4 106:4 293:11 309:7 <b>planning</b> 55:11 184:2 192:3 <b>plans</b> 20:19 21:9 33:9 80:18 86:3 87:20	<b>plate</b> 16:2 <b>platform</b> 228:5 260:17 <b>platforms</b> 260:24 273:7 273:20 274:2 <b>plausible</b> 136:7 <b>play</b> 244:15 262:10 292:17 <b>played</b> 201:18 <b>play-in</b> 244:15 <b>plays</b> 28:3 34:22 <b>PLC</b> 194:5 <b>plea</b> 29:3 <b>pleasant</b> 3:13 321:20 <b>please</b> 16:16
<b>photochemicals</b> 56:9		
<b>photochemistry</b> 253:4 285:4		
<b>pick</b> 46:19 47:2 47:12 83:4 131:11 297:12 298:13 299:22		

19:20 22:21	278:5 278:12	265:10
45:22 183:10	279:12 282:9	<b>PM2.5</b> 4:16 5:14
309:20 312:24	282:10 282:14	9:1 11:20
<b>pleased</b> 184:4	282:24 283:4	16:20 17:17
<b>plenty</b> 63:17	283:10 283:17	20:10 21:11
312:5	283:25 284:7	23:10 23:19 24:6
<b>plot</b> 120:20 152:9	284:13 284:19	25:2 25:10 25:15
153:24 154:7	285:12 285:16	25:17 26:4 26:19
174:24 177:4	286:11 286:12	27:8 27:14 27:20
181:5 181:12	286:20 287:1	27:21 27:23 29:6
189:5 229:16	287:7 287:10	30:25 31:22
234:23 238:6	287:13 287:20	34:17 34:25
238:25 281:19	288:4 288:6	36:15 37:25 38:2
285:1 286:6	289:7 289:20	38:7 38:19 38:22
287:1 287:2	290:2 290:17	39:21 40:11
<b>plots</b> 120:19	290:20 292:7	40:22 42:2
126:1 141:3	292:10 292:24	42:3 42:4
144:4 152:3	293:4 293:10	42:17 42:19
174:12 177:6	293:13 296:5	44:21 45:3 45:17
177:16 180:2	299:4 319:10	46:3 47:10 48:25
188:21 210:12	<b>plumes</b> 99:24	49:3 49:6 49:7
211:13 282:5	124:14 174:3	49:18 50:10
283:9 288:19	187:1 187:2	52:14 52:24
<b>plotted</b> 174:24	187:4 238:20	52:25 54:13
174:25 176:15	<b>plume's</b> 210:3	55:18 55:24
180:1	<b>plus</b> 70:1	57:10 65:4 65:14
<b>plug</b> 156:16	120:13 121:12	66:12 66:20
<b>plume</b> 11:23	121:14 151:2	67:17 68:13 72:4
32:8 33:5 98:7	205:21 212:18	73:14 73:15
124:20 129:3	254:19 303:7	73:21 78:21
129:11 129:25	<b>PM</b> 18:14 19:1	79:12 84:14 85:6
130:5 130:10	20:9 24:10 43:15	86:1 88:9 89:4
172:22 174:20	50:15 61:6 61:14	91:13 92:12
184:21 184:23	61:21 61:23	93:18 219:14
185:13 185:18	64:22 65:2 65:11	220:22 221:6
186:24 188:10	65:17 65:19	222:8 224:9
209:24 233:10	68:14 85:13	227:11 227:17
233:19 235:25	87:18 89:23	230:7 230:14
236:1 236:4	118:2 220:9	230:21 231:1
238:24 239:17	220:16 227:25	238:16 239:24
242:16 242:18	<b>PM10</b> 23:15	260:18 273:14
242:20 242:22	23:18 24:17	277:16 308:5
243:5 254:25	24:25 64:19 65:1	<b>PM2.5's</b> 24:11
255:9 277:17	65:9 65:16 265:3	<b>podium</b> 132:25
		190:23 256:19

<p><b>Podrez</b> 171:20 171:21 183:19</p> <p><b>point</b> 18:11 18:15 26:21 27:19 36:23 48:2 75:21 79:3 79:5 86:10 87:23 88:3 90:16 90:21 92:19 92:21 93:7 108:15 112:19 117:16 122:10 125:11 131:5 137:12 139:2 152:24 155:13 156:4 172:13 174:2 201:10 207:11 207:22 213:7 215:5 216:18 216:20 218:5 221:5 263:5 263:5 270:21 281:21 315:20 317:11 320:24</p> <p><b>pointed</b> 115:16 222:22 277:14 286:9</p> <p><b>pointing</b> 27:14 28:8 284:18</p> <p><b>points</b> 30:20 31:10 94:10 143:9 165:3 174:15 174:16 177:18 177:25 178:17 178:19 183:5 209:20 221:12 221:12 281:6 289:13 290:11</p> <p><b>polar</b> 147:2</p> <p><b>policy</b> 21:3 23:15 24:18 24:25 27:19 27:25 52:8 59:22 59:25 60:3</p>	<p>65:10 86:16 86:16 87:15 113:8 202:4 213:16 276:17 294:24</p> <p><b>political</b> 117:16</p> <p><b>polled</b> 113:8</p> <p><b>polling</b> 113:11</p> <p><b>pollutant</b> 35:18</p> <p><b>pollutants</b> 24:14 33:25 38:1 40:1 220:9 258:14 277:20 285:4</p> <p><b>pollution</b> 298:2 298:3 320:19</p> <p><b>poor</b> 221:20 243:8 255:10</p> <p><b>pop</b> 75:16</p> <p><b>popular</b> 111:1</p> <p><b>populate</b> 158:2</p> <p><b>population</b> 42:10</p> <p><b>portion</b> 129:11</p> <p><b>Portland</b> 123:15</p> <p><b>ports</b> 194:9 194:20 194:23</p> <p><b>position</b> 28:10</p> <p><b>positioning</b> 314:11</p> <p><b>positive</b> 254:6</p> <p><b>possibilities</b> 39:14</p> <p><b>possibility</b> 88:14 231:10</p> <p><b>possible</b> 16:6 79:14 122:17 123:12 163:14 202:13 214:2 228:8 229:25</p>	<p>232:10 241:2 273:18</p> <p><b>possibly</b> 43:11 272:24 282:16</p> <p><b>post</b> 103:23 132:18</p> <p><b>posted</b> 30:9 137:10 210:25 211:11</p> <p><b>post-process</b> 103:17 115:19 163:2</p> <p><b>post-processing</b> 48:24 93:15 103:19 103:25</p> <p><b>post-processor</b> 103:23 162:25 163:3 163:23 164:9 175:19</p> <p><b>potential</b> 17:25 35:14 109:22 110:17 175:23 199:23 215:1 224:8 224:24 259:5 260:13 260:15</p> <p><b>potentially</b> 98:4 152:18 195:22 197:17 218:14 219:16 232:20 277:18 278:23</p> <p><b>pound</b> 212:11</p> <p><b>pounds</b> 69:21 69:23</p> <p><b>power</b> 66:22 67:20 120:6 120:7 124:14 185:13 185:18 186:3 204:5 205:16 278:5 279:3 279:12 281:9</p>
---	---	--

281:21 281:23	<b>predict</b> 119:4	102:14
286:18 286:19	120:25 122:8	<b>prefer</b> 102:3
286:21 288:8	126:18 128:20	<b>preference</b> 172:14
289:11 292:3	130:16 229:14	<b>preferred</b> 40:24
<b>ppb</b> 94:25 95:4	264:20	96:20 96:25
136:20 137:8	<b>predicted</b> 42:3	101:1 120:11
178:11 178:21	125:4 129:11	120:13 295:18
179:21 280:15	168:25 171:7	<b>preliminary</b>
295:5 295:11	188:6 188:17	236:16 278:3
300:18 302:3	188:25 249:21	291:3 291:20
302:8 302:8	261:8 287:3	301:24
302:8 302:15	290:8	<b>premature</b> 76:11
302:15 302:16	<b>predicting</b> 100:12	<b>prepare</b> 84:1
302:17 302:18	167:12 181:8	<b>prepared</b> 57:22
303:12 304:6	182:17 182:20	<b>preparing</b> 176:2
<b>practical</b> 77:7	189:1 264:8	<b>pre-released</b>
122:19 257:15	264:16 264:17	280:10
260:6 260:17	282:17 283:13	<b>prescribed</b> 160:19
272:12 273:3	<b>prediction</b>	<b>prescriptive</b>
312:22	125:9 188:1	107:6 108:10
<b>practically</b> 76:16	247:9	109:12 206:20
<b>practice</b> 73:2	<b>predictions</b> 34:23	206:22
77:10 109:11	128:6 164:11	<b>present</b> 160:14
303:10	228:22 242:24	174:12 200:25
<b>practices</b> 68:20	261:6 262:4	256:21 274:22
76:18	263:17 263:19	294:9
<b>pragmatic</b> 309:17	264:3 264:12	<b>presentation</b> 3:15
<b>Prairie</b> 120:2	268:15 269:7	19:21 20:1 22:15
<b>Prakash</b> 294:11	270:20 278:6	22:18 49:16
<b>preamble</b> 28:6	281:15 281:17	52:21 52:22
<b>precise</b> 63:2	282:1 283:20	57:11 57:13
<b>preclude</b> 12:2	284:5 286:23	57:22 59:7 59:10
17:1 205:15	289:25 292:13	60:7 69:15 89:20
<b>precursor</b> 24:11	<b>prediction's</b>	89:21 131:14
34:5 38:1 38:8	250:5	132:14 132:18
38:20 39:22	<b>predicts</b> 181:9	137:10 158:23
49:24 50:4 84:13	182:14 270:18	171:23 176:12
85:9 89:10	<b>predominant</b>	185:11 185:11
<b>precursors</b>	156:25	190:10 222:4
27:23 49:8 73:16	<b>preempt</b> 96:18	259:13 262:7
220:10	100:16 102:6	294:4 306:23
	128:10	
	<b>pre-existing</b>	

317:12	238:12 238:19	101:13 307:18
<b>presentations</b>	239:10 251:13	307:18
3:24 4:3 7:1	263:14 279:10	<b>priority</b> 12:5
11:18 57:6	280:13 281:2	222:12 307:11
132:19 216:11	282:10 284:7	308:14 308:14
218:4 225:24	286:11 287:25	<b>privilege</b> 274:25
228:17 256:22	289:14 289:24	<b>pro</b> 251:9
307:25 315:21	<b>prevents</b> 276:3	<b>proactive</b> 192:1
<b>presented</b>	<b>previous</b> 100:23	<b>probabilistic</b>
147:12 179:22	102:12 107:3	26:10 26:12 45:6
200:20 202:17	108:12 125:23	115:9 163:23
232:11 315:20	183:19 219:13	164:4
<b>presenters</b> 4:1	222:3 263:9	<b>probabilities</b>
256:20	277:14	164:5 171:14
<b>press</b> 304:4	<b>previously</b>	<b>probability</b> 160:9
<b>pressure</b> 148:14	10:25 26:10	162:1 162:22
<b>presumably</b> 287:9	65:23 65:25	167:20
<b>presumed</b> 297:13	115:19 165:24	<b>probably</b> 14:24
<b>presumptions</b> 28:9	219:21 222:15	22:6 26:8 29:9
<b>presumptive</b>	224:2	29:20 36:17 39:7
28:6 52:4	<b>primarily</b> 49:3	44:12 48:9 51:13
<b>presumptuous</b>	227:23	53:4 56:7
298:4	<b>primary</b> 27:1	56:10 64:4
<b>pretty</b> 4:3 24:2	27:22 33:15 38:7	74:4 78:6
25:18 45:4 51:16	38:22 39:7 39:21	78:15 88:18
57:4 61:4	40:22 42:19	90:17 101:14
66:25 71:12	43:15 44:11 45:3	115:21 119:16
75:19 90:20	47:22 49:7 51:16	124:13 139:12
120:16 122:8	54:12 54:23	141:1 146:6
122:15 124:18	84:11 93:10	148:18 167:11
126:2 126:3	231:1 238:9	192:10 206:13
126:12 127:8	268:18 315:14	208:12 208:17
127:23 130:12	<b>prime</b> 102:10	227:1 230:1
130:14 130:18	121:25 122:2	240:21 240:25
130:19 130:23	122:2	250:15 268:11
133:4 148:2	<b>principles</b> 259:16	309:6 312:20
161:8 166:20	259:19	318:1
169:8 169:25	<b>prior</b> 257:23	<b>probing</b> 299:8
170:1 170:10	279:9 315:21	<b>problem</b> 34:16
180:10 197:14	317:13	79:22 82:25
229:4 236:7	<b>priorities</b> 12:6	118:20 137:16
237:16 237:23	12:12 60:15	142:11 146:21
	60:17 60:18	147:8 149:17

150:2 150:19	120:10 120:15	205:4 288:20
153:6 155:17	134:8 156:6	289:3 292:8
160:6 211:23	157:16 163:15	292:22
312:21 313:10	191:13 192:22	<b>prognostic</b> 6:17
318:7 321:16	212:14 214:4	228:4 267:8
<b>problematic</b> 142:9	217:2 219:2	284:15 319:19
157:2	219:15 219:19	<b>program</b> 6:16 8:13
<b>problems</b> 68:24	222:15 223:8	103:23 222:9
86:22 108:23	226:24 230:19	225:3 228:3
136:22 158:6	259:22 276:4	320:3
239:20 258:8	278:24 307:4	<b>programmatic</b> 31:3
258:16 274:9	309:10 318:18	<b>programmed</b> 194:10
311:10	<b>processed</b> 246:3	<b>programming</b>
<b>procedure</b>	<b>processes</b> 22:21	274:13 274:16
159:17 159:22	95:22 172:22	<b>programs</b> 61:6
160:9 162:8	174:1 175:13	77:15 191:11
162:14 163:17	181:1	195:21 218:23
164:19 168:3	<b>processing</b> 291:21	<b>progress</b> 13:5
171:15 259:20	<b>processor</b>	62:7 159:6
267:15 314:19	159:19 160:20	226:18 226:20
<b>procedures</b>	161:15 214:22	315:22 317:10
10:22 25:16	216:25	318:15 318:21
101:22 107:6	<b>processors</b> 74:20	<b>project</b> 31:11
159:14 220:22	<b>produce</b> 248:11	37:6 63:12 63:15
245:12 245:18	248:21 275:19	84:10 84:10
259:24 276:1	<b>produced</b> 184:22	84:11 89:11
276:3 276:5	248:9 255:16	93:12 103:9
<b>proceed</b> 185:8	<b>producer</b> 285:21	110:6 110:15
<b>process</b> 4:13	290:20	110:18 116:13
6:1 6:14 8:24	<b>production</b> 285:13	118:22 149:23
9:10 9:19	285:23 286:3	156:16 157:2
10:20 11:1	288:9 288:13	182:18 184:1
11:3 12:4	288:17 290:16	191:17 191:22
12:15 14:22 16:4	290:21 292:18	191:25 192:19
16:9 16:14 16:15	<b>productive</b> 218:5	195:14 196:23
16:25 17:1 17:12	<b>products</b> 58:12	257:5 257:9
17:19 28:19	58:13 66:14	257:11 257:18
40:16 51:18	292:20	260:3 260:16
58:16 58:18 62:3	<b>professional</b>	261:6 261:13
62:9 62:11 62:18	110:3	262:14 317:16
63:9 63:12 67:23	<b>profiles</b> 138:5	<b>projected</b> 104:23
69:22 77:17 80:8		<b>projecting</b> 227:7
95:21 113:4		
114:11 115:16		

<b>projects</b> 63:6 156:17 257:25 259:18	<b>protect</b> 72:5 295:13	209:14 213:14 280:9 307:23 307:25
<b>prominent</b> 35:16 54:4 286:1	<b>protection</b> 3:1 118:6 211:18	<b>provides</b> 11:25 96:10 112:15 207:15
<b>promise</b> 53:12 278:22	<b>protective</b> 40:10	<b>providing</b> 15:15 41:13 91:10 99:20 108:8 114:20 204:3 293:23 307:7 307:17 308:16
<b>promote</b> 12:18 77:11 260:16 275:12	<b>protocol</b> 36:10 36:12 49:15 49:17 80:8 196:24 197:1 200:12	<b>provision</b> 24:16 24:24
<b>promotion</b> 260:4	<b>protocols</b> 153:13	<b>provisions</b> 41:24
<b>promulgate</b> 223:1	<b>prototype</b> 165:21 296:20 303:23 304:3	<b>proximity</b> 110:15 235:18 239:3 239:10 239:12 269:20
<b>promulgated</b> 9:22 23:15 24:7 26:20 27:10 35:12 119:18	<b>prototypical</b> 296:25 298:23 299:19	<b>proxy</b> 290:19
<b>promulgation</b> 10:20 88:18 219:22 223:7	<b>provide</b> 4:14 6:19 7:21 9:5 11:21 12:15 13:17 20:18 31:6 53:21 80:25 92:1 94:20 94:22 95:18 98:24 99:9 99:19 108:2 109:19 110:11 110:24 114:15 114:21 118:9 118:11 118:19 118:21 125:18 183:11 220:1 220:22 222:18 226:10 230:10 231:24 240:12 272:20 308:3 309:18	<b>PSD</b> 27:20 35:19 36:22 36:24 38:6 41:25 42:8 55:12 61:1 63:8 63:19 95:7 114:24 123:9 145:20 172:9 191:25 196:22 196:23 224:6 230:7 230:15 261:16 276:9 276:25
<b>pronounced</b> 238:25		<b>public</b> 3:15 6:7 11:12 12:6 12:16 13:11 106:10 106:10 108:14 206:9 216:11 256:21 257:20 307:2 307:17
<b>proper</b> 107:11		<b>published</b> 24:23 223:15
<b>properly</b> 110:5		<b>puff</b> 231:7 232:4 244:1
<b>property</b> 135:2 137:19 141:14 144:7 144:10 145:22 155:17 156:2 156:3	<b>provided</b> 7:7 11:18 30:15 53:22 79:4 96:5 96:13 101:8 105:19 111:25 112:8 112:13 115:20 117:8 125:19 209:2	
<b>proponents</b> 260:4		
<b>proportional</b> 192:25		
<b>proposal</b> 10:12 10:20 11:3 73:23		
<b>proposal's</b> 296:13		
<b>propose</b> 79:7		
<b>proposed</b> 10:10 10:13 37:24 109:23 143:5		
<b>proposing</b> 37:12		
<b>prospect</b> 77:15		

<p>278:11 278:19 282:20</p> <p><b>puffs</b> 278:12 311:5 311:7 311:13</p> <p><b>pull</b> 113:24 156:16 220:7</p> <p><b>pulled</b> 114:12 150:22 156:17</p> <p><b>pulling</b> 156:7 157:12</p> <p><b>pulp</b> 60:24 67:19</p> <p><b>pulping</b> 61:11</p> <p><b>pump</b> 139:9 142:5</p> <p><b>pumps</b> 143:12</p> <p><b>purchase</b> 194:6</p> <p><b>purely</b> 196:20 262:24</p> <p><b>purpose</b> 8:18 66:20 80:19 163:22 224:2 316:5 316:13 316:14 318:8</p> <p><b>purposes</b> 6:9 9:2 15:25 16:1 53:18 214:6 221:15 227:6 230:4 230:7 230:15 230:17 231:18 232:8 232:16 233:23 236:2 286:15 316:25 318:3 318:5 318:14</p> <p><b>pursue</b> 89:24</p> <p><b>pursuing</b> 7:17</p> <p><b>pursuit</b> 89:3</p> <p><b>push</b> 113:1</p> <p><b>pushed</b> 116:1</p>	<p><b>puts</b> 49:6 114:18</p> <p><b>putting</b> 8:12 9:8 32:19 53:23 87:19 111:19 292:24</p> <p><b>puzzle</b> 116:7</p> <p><b>puzzling</b> 282:23</p> <p><b>PVMMR</b> 7:17 8:10 99:2 100:10 113:16 113:18 124:5 124:13 125:4 125:5 125:11 125:14 125:20 126:3 126:9 126:11 129:1 129:9 129:14 130:4 130:23 130:23 137:1 137:3 137:4 149:3 150:10 151:8 151:10 151:23 152:23 153:7 154:8 155:10 172:6 176:9 179:2 179:6 179:20 179:23 180:9 180:11 180:14 180:17 181:6 181:15 182:5 182:13 182:23 183:24 184:14 184:17 185:3 186:15 186:18 188:16 188:17 188:20 189:4 189:7 190:4 190:11 191:7 195:17</p> <p><b>PVMMRs</b> 151:4</p> <hr/> <p style="text-align: center;">Q</p> <hr/> <p><b>QA</b> 197:8 240:23</p>	<p><b>QAed</b> 240:18</p> <p><b>QC</b> 197:8</p> <p><b>QQ</b> 120:19 120:20 126:1</p> <p><b>Q-Q</b> 180:1 181:5 181:12 188:21 189:5</p> <p><b>qualify</b> 62:22 62:23</p> <p><b>qualitative</b> 39:3 39:8 49:11 49:12 49:21 51:12 56:15 56:22 73:8 285:24 287:12 292:12</p> <p><b>qualitatively</b> 282:8</p> <p><b>quality</b> 3:2 21:25 23:8 31:1 31:22 80:7 80:10 80:19 218:25 229:14 229:14 257:7 257:8 257:24 258:3 258:13 259:4 259:6 259:10 259:17 259:21 260:12 260:19 261:25 261:25 262:14 263:2 272:22 276:15 320:2</p> <p><b>quantified</b> 66:15</p> <p><b>quantify</b> 295:16</p> <p><b>quantitative</b> 39:8 49:12 51:12</p> <p><b>quantitatively</b> 287:15 288:14</p> <p><b>quarter</b> 161:6 273:15</p>
---	---	--

<b>quarterly</b> 48:7	153:3 154:18	240:4 256:17
<b>quasi</b> 97:24	231:24 315:11	262:6 262:21
<b>question</b> 3:19	<b>quickly</b> 37:19	271:6 294:2
3:21 10:15 10:16	58:23 59:22 74:6	306:22 311:21
16:19 20:8 27:19	124:18 133:4	313:3 315:23
66:3 79:10 81:13	176:18 282:8	318:23
81:21 85:2 85:16	<b>quirk</b> 24:15	<b>Ralph's</b> 232:9
87:20 87:22	<b>quit</b> 264:22	318:4
90:11 91:15 92:7	<b>quite</b> 11:5 16:2	<b>rambling</b> 264:22
92:10 105:20	20:7 43:25	<b>ramping</b> 234:17
126:16 132:3	48:5 56:1	<b>ran</b> 116:25
155:10 198:6	84:17 91:2	145:3 145:16
200:18 201:5	121:24 126:4	146:11 165:25
201:21 202:17	127:14 151:5	166:4 166:6
203:12 204:22	158:21 173:22	179:4 179:6
206:13 207:23	178:10 238:24	201:2 245:14
207:24 208:20	260:21 307:24	255:3 255:3
209:10 210:18	316:9 320:25	268:5 298:7
211:20 211:24	<b>quo</b> 23:17 63:21	300:9 304:11
212:5 213:1	<b>quote</b> 247:10	319:21
214:16 215:11	254:21	<b>random</b> 163:6
216:13 217:4	<b>quoting</b> 35:22	163:19 163:21
239:7 249:7	<hr/>	165:1 165:2
309:21 310:7	R	165:2 165:5
311:21 313:14	<b>R1</b> 245:18 245:19	170:6 170:7
314:6 318:8	<b>radicals</b> 285:20	170:8 216:18
318:23 319:2	290:19 291:15	216:20
<b>questions</b> 16:10	<b>radioactive</b> 241:9	<b>Randy</b> 57:17
16:16 16:17 56:7	<b>radius</b> 289:10	78:4 78:5 93:24
57:16 57:19	290:14	<b>range</b> 27:2
57:25 58:8 71:17	<b>raise</b> 144:11	65:15 67:8
78:3 78:6	198:16	119:23 128:12
78:11 78:11	<b>raised</b> 119:4	154:9 162:3
79:18 83:4 84:19	120:19 128:24	163:24 175:13
105:10 106:16	148:10 148:11	192:10 195:7
110:9 118:9	315:6	218:19 219:6
150:3 159:12	<b>raising</b> 154:16	221:22 222:11
201:16 201:18	154:21 214:19	223:11 223:17
202:24 205:5	<b>Raj</b> 19:12 19:12	223:25 224:12
211:15 213:3	19:14	224:18 227:13
216:8 217:11	<b>Ralph</b> 52:19 240:3	227:17 227:22
256:14 256:15		233:5 240:9
315:6 321:10		241:6 241:22
<b>quick</b> 60:19		252:19 261:14
78:8 120:21		

300:25 304:19	99:25 160:22	177:22 178:7
305:20 305:25	175:18 214:3	178:12 178:21
311:22 311:23	247:25	180:25 181:3
318:9	<b>ratings</b> 315:12	188:13 230:21
<b>ranges</b> 182:24	<b>ratio</b> 7:15	231:1 231:4
182:25	93:11 93:15	232:25
<b>rank</b> 45:25 169:21	97:21 97:22 98:7	<b>react</b> 151:9 185:6
250:8 250:22	101:25 101:25	285:17
251:16 254:7	125:2 125:4	<b>reaction</b> 175:5
316:21	140:15 140:21	180:23 193:9
<b>ranked</b> 128:1	140:24 141:5	193:11 193:17
250:13 250:25	141:20 148:23	<b>reactive</b> 272:16
<b>ranking</b> 250:8	149:5 154:15	277:17 293:12
318:6	157:13 171:24	<b>reactivities</b>
<b>Rao</b> 19:12	173:4 173:6	305:6
<b>rare</b> 39:15 53:5	173:10 174:10	<b>reactivity</b> 304:19
171:10 207:16	174:10 174:17	304:24 305:5
<b>RATA</b> 196:17	174:24 175:7	305:9 305:10
<b>rate</b> 25:25	175:9 175:20	<b>readily</b> 204:24
65:19 65:23	176:16 177:13	<b>reading</b> 30:5
148:25 154:12	177:16 178:4	193:21 194:21
160:3 160:8	178:4 178:20	<b>readings</b> 192:17
160:24 160:25	178:23 179:6	194:1 194:5
161:9 161:12	179:15 179:24	194:11 195:3
161:20 161:23	181:18 184:15	<b>readout</b> 54:15
161:24 162:3	185:3 186:16	<b>ready</b> 242:6
162:23 164:5	188:1 188:7	<b>real</b> 24:3 50:19
166:22 167:2	191:5 192:7	59:14 59:16
167:15 168:17	192:8 192:9	71:10 78:8 80:11
212:10 212:12	192:13 195:5	84:22 94:22 96:4
253:7 278:17	195:8 197:7	118:21 134:2
<b>rater</b> 160:16	198:8 299:2	154:17 170:21
<b>rates</b> 24:9 63:8	<b>ratios</b> 8:7 28:5	177:3 190:15
64:7 65:13 73:15	28:6 28:11 28:16	242:1
154:10 156:1	32:4 52:5	<b>realistic</b> 54:25
159:14 160:14	52:11 52:15	84:6 152:20
160:19 163:24	89:17 93:2 98:16	152:21 164:16
167:21 167:21	124:15 139:24	166:5 272:8
168:20 212:7	141:14 141:25	272:10
282:19	149:4 153:14	<b>reality</b> 50:14
<b>rather</b> 17:5	156:1 157:1	84:23 112:16
27:7 84:4 89:8	157:7 173:1	
	173:1 173:13	
	174:8 174:13	
	177:7 177:9	

<b>realizations</b> 162:20	291:22 292:25 306:2 310:18 313:13 320:16	47:9 47:11 47:12 48:1 48:2 103:4 103:6
<b>realize</b> 156:19		121:3 137:3
<b>realized</b> 127:7 128:1	<b>realm</b> 39:14 54:11 88:13	137:18 145:21 146:2 164:7
<b>really</b> 5:25	<b>reason</b> 20:22	228:20 239:3
12:3 13:23 14:20	143:3 196:4	242:21 269:25
16:24 23:12 26:2	268:23 279:4	270:9 281:17
37:19 39:11	280:21 306:7	281:23 288:24
47:23 49:18	306:19	
51:18 52:23 59:7	<b>reasonable</b> 51:8	<b>receptors</b> 42:9
60:9 74:10 75:12	62:7 71:18	42:12 84:8 120:3
75:17 90:19	77:7 155:12	136:21 146:25
108:18 112:21	173:3 177:19	146:25 164:23
117:18 129:5	215:8 231:24	164:24 170:13
133:14 136:2	254:14 292:6	170:14 231:2
136:4 136:4	<b>reasonably</b> 123:17	242:14 242:17
136:6 138:16	123:18	242:25 243:17
140:20 146:18	<b>reasons</b> 62:11	243:20 266:7
146:20 148:24	79:6 122:24	268:18 268:21
151:12 152:7	147:15 194:2	269:11 269:15
152:25 153:3	238:1 270:25	312:7 312:10
153:3 153:18	295:12 296:22	<b>recess</b> 94:1
155:24 157:11	<b>reassess</b> 261:3	217:21
158:2 170:13	<b>reassuring</b> 282:12	<b>recirculating</b>
173:13 173:22	<b>recall</b> 78:18	56:3
174:19 175:2	92:25	<b>recirculation</b>
175:15 175:24	<b>received</b> 280:10	314:25 315:9
178:10 181:19	<b>recent</b> 54:4	<b>recognition</b> 26:22
181:19 182:1	55:4 75:17	30:14 58:16
182:10 183:7	126:21 158:15	<b>recognize</b> 34:9
184:4 188:8	173:9 199:10	80:8 95:19 100:7
189:10 189:17	201:2 211:1	185:20 220:23
189:21 190:7	211:7 219:25	307:23 308:12
194:3 195:15	233:18 238:15	<b>recognized</b>
199:23 199:24	<b>recently</b> 50:23	58:15 103:18
201:18 204:1	51:22 108:5	<b>recognizes</b> 124:19
204:2 205:14	125:25 128:9	185:7
205:22 205:24	199:10 219:12	<b>recognizing</b> 94:18
206:4 226:21	<b>receptor</b> 41:18	98:20
231:4 239:11	46:16 46:17	<b>recommend</b> 103:1
239:22 275:7	46:19 47:1	<b>recommendation</b>
277:21 285:5		
288:7 289:23		
291:8 291:16		

30:23 31:6 34:18 71:15 173:10 174:11 241:22 255:15 271:25 <b>recommendations</b> 22:23 29:13 30:1 30:7 30:18 30:20 31:15 31:20 32:25 34:12 35:2 35:6 42:5 43:1 52:2 53:8 57:16 73:11 87:18 93:2 101:21 101:24 102:22 230:13 244:24 252:4 275:17 <b>recommended</b> 31:2 31:21 32:3 34:14 93:9 104:11 173:2 221:21 223:11 230:22 231:10 245:23 247:7 247:10 248:7 248:20 263:25 272:3 <b>recommending</b> 36:25 196:9 196:12 <b>reconsider</b> 31:23 <b>reconsidered</b> 107:20 <b>record</b> 20:3 30:13 41:14 63:2 83:17 94:13 106:10 108:14 183:12 276:12 <b>recorded</b> 3:17 <b>recovery</b> 61:10 67:21 68:3 69:22 <b>red</b> 121:7 140:7 140:21 143:20	150:9 180:15 284:18 285:11 287:6 287:12 <b>redder</b> 288:12 <b>redo</b> 306:11 <b>redoing</b> 272:1 <b>redone</b> 271:23 <b>reds</b> 285:25 288:7 <b>reduce</b> 99:13 176:1 224:24 260:1 260:7 <b>reduced</b> 139:18 232:11 247:15 319:9 <b>reducing</b> 62:13 130:10 <b>reduction</b> 64:8 <b>reductions</b> 62:8 64:5 85:9 85:12 87:9 285:10 <b>refer</b> 260:11 <b>reference</b> 27:16 45:22 66:11 85:2 99:17 <b>referenced</b> 89:20 99:1 101:18 124:11 <b>referred</b> 25:22 213:22 257:12 <b>refine</b> 109:19 110:25 <b>refined</b> 7:17 7:22 98:9 98:12 100:10 111:14 112:14 121:22 125:15 175:9 183:2 <b>refineries</b> 137:7	<b>refinery</b> 66:22 <b>reflect</b> 60:1 <b>reflected</b> 32:4 65:3 77:21 167:4 <b>reflection</b> 307:18 <b>reflects</b> 59:14 <b>refreshments</b> 310:24 <b>refused</b> 274:24 <b>regard</b> 91:15 100:11 107:23 <b>regarding</b> 102:23 207:12 <b>regards</b> 25:7 29:6 33:8 107:4 <b>regenerative</b> 139:11 <b>regime</b> 93:6 <b>region</b> 25:6 50:24 53:2 57:20 105:14 105:14 105:16 105:17 105:25 113:22 124:2 133:5 133:11 149:12 153:12 156:13 156:14 156:18 262:15 295:3 306:12 <b>regional</b> 13:8 18:13 19:1 22:2 28:12 28:14 28:23 29:17 36:4 36:13 51:23 52:9 55:18 57:7 57:18 57:18 62:6 67:3 68:23 73:3 85:25 99:6 99:16 99:16 101:5 105:6 106:7 108:8
---	---	---

110:21 113:9	<b>relate</b> 206:6	293:19
115:15 117:14	<b>related</b> 31:14	<b>reliable</b> 30:25
133:20 134:7	101:21 105:11	<b>relied</b> 201:4
159:5 220:4	177:20 218:18	<b>relies</b> 83:2
220:8 220:16	218:20 219:6	<b>rely</b> 28:1 28:24
259:6 260:12	229:14 258:4	65:13
320:17	259:17 260:19	<b>relying</b> 24:17
<b>regions</b> 58:22	261:25 272:22	272:20
113:11 113:21	278:17 290:1	<b>remain</b> 277:5
113:21 135:9	291:11 291:14	<b>remainder</b> 22:18
156:23 158:7	292:24	216:9
292:25 306:8	<b>relates</b> 257:11	<b>remained</b> 139:6
<b>RegText</b> 35:22	<b>relationship</b>	<b>remarks</b> 77:24
<b>regularly</b> 13:1	140:5 239:12	78:7
<b>regulate</b> 61:13	<b>relationships</b>	<b>remedied</b> 215:17
<b>regulated</b> 61:24	176:18 239:19	<b>remember</b> 45:4
61:25 62:1	<b>relative</b> 33:6	59:2 64:5
310:10	33:7 44:21 55:10	138:8 146:5
<b>regulations</b>	67:11 129:2	319:20
8:20 272:23	129:4 181:14	<b>remembers</b> 318:1
275:10	186:21 258:5	<b>remind</b> 3:14
<b>regulatory</b> 5:19	264:8 270:19	284:10
6:2 6:9 6:14	270:20 277:25	<b>reminder</b> 307:3
6:20 8:17	<b>relatively</b>	309:15
60:25 61:5 74:10	60:19 61:20	<b>remote</b> 258:15
76:5 77:12	104:14 146:17	<b>remotely</b> 27:4
218:23 221:15	207:16	<b>remove</b> 28:10
223:16 224:4	<b>release</b> 4:17 6:16	122:16 123:5
224:12 226:2	21:16 42:24	<b>removed</b> 28:9 51:6
234:5 234:17	57:10 103:15	51:19 52:4
257:17 275:5	115:1 225:2	<b>removing</b> 120:4
275:22 277:8	228:23 229:2	<b>renewals</b> 63:21
277:21 277:23	240:25 299:3	74:9
278:1 293:18	299:4 314:5	<b>repeal</b> 24:23
301:20 316:8	<b>released</b> 25:15	<b>repeat</b> 118:15
316:13 316:15	244:11	<b>replace</b> 120:11
316:17 316:25	<b>releases</b> 243:18	<b>replacing</b>
318:12 318:14	244:11	
<b>reinforce</b> 307:5	<b>relevance</b> 244:16	
308:25	<b>relevant</b> 7:2	
<b>reinforced</b> 32:1	98:25 101:20	
<b>reiterated</b> 89:2	204:8 277:23	

<p>120:17 121:11  <b>replicated</b> 163:4  <b>report</b> 30:3  30:8 66:15  137:10 146:14  157:25 158:13  158:16 159:22  165:18 172:21  205:7 222:17  228:24 229:9  229:17 233:24  234:8 240:10  244:8 250:22  263:12 264:24  313:4  <b>reported</b> 180:7  184:9  <b>reporting</b> 219:20  <b>reports</b> 11:22  11:23 12:16  12:16 17:11  17:17 233:2  307:24 308:1  <b>represent</b> 178:4  208:22 239:12  254:25 285:8  310:11 314:22  316:12  <b>representation</b>  29:18 29:18 34:8  89:16  <b>representative</b>  56:6 57:7 57:8  57:8 57:19  84:6 84:13 97:23  122:21 122:22  175:21 201:7  <b>representativeness</b>  <b>s</b> 98:15  <b>representatives</b>  14:14 15:3  <b>represented</b></p>	<p>15:7 109:24  273:6 278:12  <b>representing</b> 93:6  <b>represents</b> 98:5  141:6 285:15  <b>reproduce</b>  254:21 255:4  <b>request</b> 19:24  29:2 29:2  30:23 31:5 34:24  105:14 105:16  196:13 256:20  320:21 320:24  <b>requested</b> 32:3  <b>requests</b> 87:15  <b>require</b> 28:13  32:15 40:21  52:24 63:18 64:2  64:4 175:19  175:20 203:19  213:9 275:24  295:21 295:22  <b>required</b> 8:20  31:7 42:1 42:8  42:10 106:19  121:13 134:17  165:14 166:2  194:6 196:11  219:10 232:16  232:22 277:20  <b>requirement</b> 96:19  100:17 194:3  302:9  <b>requirements</b>  8:3 18:17  23:18 42:5  53:7 61:19 63:18  95:7 98:13  103:19 197:10  257:19 257:22  260:8 260:23  261:1 261:9  276:8 276:14</p>	<p>276:24 277:6  277:7 277:9  299:24 301:21  <b>requires</b> 99:5  110:2 224:13  <b>re-running</b> 116:1  <b>reruns</b> 142:3  <b>research</b> 9:15  148:12 157:5  <b>reserve</b> 309:5  <b>residual</b> 62:10  <b>resolution</b> 55:3  235:20 235:24  246:21 246:23  248:10 248:16  249:10 251:6  252:11 252:13  259:23 266:23  267:2 267:7  281:5  <b>resolutions</b>  245:15 246:24  <b>resolve</b> 63:14  64:1 239:18  291:12  <b>resolved</b> 63:7  100:2 117:10  213:6  <b>resolves</b> 311:7  <b>resource</b> 53:20  78:3 78:6  88:25 221:4  257:19 258:5  258:23 258:25  259:6 260:22  261:8 261:9  261:18 295:19  312:18  <b>resources</b> 16:5  219:10 274:20  306:6</p>
---	---	--

<p><b>respect</b> 5:1 23:17  26:3 27:15 27:21  29:14 31:8 31:20  32:5 32:21 33:12  34:7 34:12 34:15  35:23 36:1 37:25  38:14 39:23  41:25 42:19  42:21 42:22  43:16 45:3  46:2 46:3 47:4  48:15 53:25  54:16 54:19  56:24 56:25  57:21 85:3 85:20  205:12 219:9  221:10 277:9  315:24 319:5</p> <p><b>respectful</b> 4:2</p> <p><b>respectfully</b>  57:12</p> <p><b>respectively</b>  48:19 266:10</p> <p><b>respects</b> 16:4  119:7</p> <p><b>responding</b> 221:25  267:8</p> <p><b>response</b> 81:21  259:12 266:21  267:1 310:7</p> <p><b>responsibilities</b>  218:24</p> <p><b>responsibility</b>  15:4</p> <p><b>responsible</b>  258:22 260:2</p> <p><b>rest</b> 22:15 138:3</p> <p><b>restful</b> 3:13</p> <p><b>restraints</b> 312:19</p> <p><b>restrict</b> 275:11</p> <p><b>restrictions</b></p>	<p>155:22</p> <p><b>result</b> 45:12  63:24 66:18 67:4  67:13 69:5  70:1 70:2 70:5  75:4 75:20 75:23  82:3 82:16  104:11 107:9  123:8 160:16  166:5 166:7  184:22 265:8  268:15 314:9  316:20 316:24</p> <p><b>resulted</b> 126:22  179:20 219:22</p> <p><b>results</b> 67:24  68:1 68:11  69:4 69:19 70:15  71:12 74:10  74:16 75:9 75:16  75:18 77:16  81:14 81:16  83:14 83:22  90:13 91:3 91:11  92:5 94:21 100:6  101:23 107:2  113:25 122:24  123:10 128:21  129:14 136:12  138:23 141:24  145:7 146:8  159:22 159:23  160:17 165:13  167:6 169:17  171:7 171:8  174:7 179:22  181:17 195:1  199:13 200:20  206:22 229:17  236:15 236:16  238:14 239:16  240:18 240:23  257:13 265:10  267:16 268:1  270:21 279:8</p>	<p>279:18 284:23  285:9 287:4  287:23 301:24  309:8 313:5  313:17 317:15</p> <p><b>retained</b> 24:1</p> <p><b>retrospective</b>  242:3</p> <p><b>reusable</b> 260:11</p> <p><b>reveals</b> 63:23</p> <p><b>reversing</b> 128:19</p> <p><b>review</b> 4:20  5:18 10:22 10:24  11:1 12:19  18:5 20:14  21:7 22:7  22:21 41:14  62:10 95:20  95:22 96:2  105:18 126:22  134:19 182:23  205:7 211:6  307:22</p> <p><b>reviewed</b> 92:15  92:23 93:8  186:19 296:16</p> <p><b>reviewers</b> 241:16</p> <p><b>reviewing</b> 92:2  176:2 241:18</p> <p><b>revise</b> 23:24  250:20</p> <p><b>revised</b> 23:24  73:20 96:16  183:4 243:14  272:7</p> <p><b>revisit</b> 77:20</p> <p><b>revisited</b> 128:12</p> <p><b>RFP</b> 295:24</p> <p><b>rich</b> 74:10  159:9 279:10</p>
---	---	--

296:9	<b>robust</b> 99:3	<b>rooted</b> 111:20
<b>Rick</b> 320:1 321:9	121:13 122:12	112:17
<b>rigid</b> 275:9	125:3 196:2	<b>rose</b> 101:12
275:25	277:11 305:18	<b>rough</b> 158:1
<b>rigorous</b> 232:22	<b>Rocky</b> 241:19	<b>roughly</b> 67:9
<b>rigs</b> 106:1	317:15	180:19 282:14
<b>ring</b> 286:2	<b>Roger</b> 26:7	<b>round</b> 217:15
<b>rings</b> 281:17	32:17 32:20	321:18
281:22 281:23	46:12 46:13	<b>route</b> 276:11
281:25 282:1	48:22 78:25 79:1	<b>routine</b> 105:7
282:3 283:5	87:19 99:10	268:22
311:3 311:4	100:5 103:16	<b>routinely</b> 99:23
311:18	104:17 107:23	257:17
<b>ripe</b> 5:3 5:21	116:23 119:1	<b>routines</b> 103:25
<b>rise</b> 299:4	132:10 132:17	<b>row</b> 237:5 237:6
<b>risk</b> 62:10 126:20	151:7 179:8	284:8
<b>River</b> 223:4	184:8 184:15	<b>rows</b> 239:5
242:12 243:8	186:19 189:5	<b>RPM</b> 184:24
243:16 243:23	189:13 190:24	<b>RSL</b> 157:21
255:9 258:11	200:18 200:19	<b>RTP</b> 171:21
312:2 313:13	206:14 210:21	<b>rule</b> 24:21
<b>RMAX</b> 245:18	215:22 296:19	24:23 28:6 39:16
245:19	<b>Roger's</b> 46:13	43:5 85:8 87:8
<b>RMAX1</b> 247:6	84:19 185:11	89:8 117:21
248:20 251:7	190:10 226:12	117:22
252:5 252:7	<b>Roland</b> 250:9	<b>rulemaking</b> 6:23
255:14	<b>role</b> 26:25	10:3 10:11 10:24
<b>RMAX2</b> 247:7	35:16 54:4	214:3 214:4
248:20 251:7	201:19 292:17	<b>rulemakings</b> 54:5
252:5 252:7	<b>rolling</b> 162:21	<b>rules</b> 15:23
<b>road</b> 43:12	166:17	24:6 62:6 95:6
91:13 107:25	<b>Ron</b> 318:22	147:19 147:21
308:23 321:14	<b>roof</b> 187:9	271:6
<b>roads</b> 61:16	<b>room</b> 3:11 10:15	<b>run</b> 39:1 39:14
<b>roadway</b> 174:4	19:17 19:19 20:5	47:19 54:24
<b>roadways</b> 127:5	23:1 29:9	72:14 75:10
173:19	30:19 33:23	75:10 75:21 76:5
<b>Robinson</b> 57:17	34:10 41:17	93:10 93:14
93:24	53:22 67:12	115:18 121:14
	72:25 73:5 85:18	130:3 142:25
	87:14 159:10	
	185:20 215:7	
	217:24	

149:20 149:22	177:24 178:8	313:13
151:1 152:19	<b>Ryan</b> 57:21	<b>save</b> 216:24
157:2 162:18	57:24 58:1	<b>saw</b> 59:5 59:6
164:3 164:22	58:9 85:17 90:11	71:24 73:12 85:2
164:23 165:7	90:11 93:24 96:5	97:1 116:12
165:11 165:12		252:6 278:18
165:22 167:15	<hr/> S <hr/>	288:17 288:17
169:23 170:18	<b>S1</b> 299:16	291:25 307:19
170:21 171:1	<b>S2</b> 299:16	<b>SC2</b> 150:13
196:1 198:1	<b>safe</b> 161:11	<b>SC5</b> 149:18 150:22
214:24 216:23	<b>safety</b> 295:14	<b>scale</b> 42:13
216:23 237:20	<b>Sage</b> 311:1	67:3 89:8 90:1
245:14 246:16	<b>sales</b> 136:18	149:15 150:21
248:13 249:9	<b>Salt</b> 112:7	152:25 227:12
252:24 253:4	<b>Sam</b> 211:16	227:20 230:6
266:24 273:14	<b>Sampieri</b> 211:17	232:17 233:7
273:15 274:17	214:7	233:12 258:3
284:3 297:6	<b>sample</b> 34:17	258:16 260:12
297:21 299:18	193:5 193:8	267:6 267:9
300:5 300:15	<b>sampled</b> 286:20	293:12 309:18
304:17 306:2	<b>sampler</b> 45:21	<b>scaled</b> 195:4
306:12 311:13	<b>samples</b> 34:16	<b>scales</b> 77:5 227:3
319:24	45:22	227:5
<b>running</b> 39:13	<b>sampling</b> 236:1	<b>scatter</b> 249:15
55:5 72:12 164:2	<b>San</b> 92:11	<b>scavenging</b> 175:23
165:8 166:5	<b>Sands</b> 176:14	179:9
169:12 214:20	176:21	<b>scenario</b> 64:10
214:21 216:6	<b>Sasquatch</b> 20:5	72:11 72:18
221:4 259:8	<b>sat</b> 19:17 19:18	137:2 139:2
266:23 273:21	<b>satisfied</b> 302:22	139:4 140:10
291:23	<b>satisfy</b> 23:18	145:20 147:17
<b>runs</b> 135:17	299:23 301:20	148:5 148:10
142:14 142:15	302:3 302:5	148:15 148:19
143:18 143:19	302:9 303:17	149:14 149:14
147:13 151:23	<b>Savannah</b> 223:4	149:18 150:4
164:8 184:9	242:12 243:8	150:5 150:20
187:6 189:25	243:16 243:22	151:10 152:5
198:14 198:20	255:8 312:2	153:19 154:19
240:19 246:9		266:4
248:6 272:7		<b>scenarios</b> 37:13
272:9 273:13		67:25 69:20
277:2 291:18		71:13 102:15
300:4 312:5		
312:5 312:6		
<b>rural</b> 177:4		

102:16 104:13	287:19 288:15	<b>screen</b> 3:16
104:22 119:23	288:17 288:24	185:24 207:1
134:25 135:3	289:19 289:25	236:7 294:21
137:22 138:21	290:1 290:7	<b>screening</b> 7:12
138:22 138:24	291:7 291:10	35:10 35:20 37:2
138:25 140:12	291:20 292:3	52:23 71:7
140:18 142:18	292:11 292:12	90:1 97:1 97:5
145:12 150:7	293:23 311:2	97:16 175:16
157:17 158:6	311:18	206:16 207:4
284:4	<b>SCICHEM-WRF</b>	231:23 232:3
<b>schedule</b> 4:2 18:9	279:19 279:21	232:10 232:12
19:5 57:5 58:7	281:8 281:15	232:15 232:21
78:9 94:20 131:7	281:16 284:6	294:7 294:14
131:12 131:23	286:7 287:4	294:15 295:20
132:10 158:18	287:19	296:6 297:6
158:18 217:18	<b>science</b> 88:3	297:11 302:2
<b>scheduled</b> 20:12	184:2 275:18	302:4 302:18
<b>schedules</b> 138:14	275:21	303:11 303:12
<b>Scheffe</b> 296:2	<b>scientific</b> 90:8	303:14 303:18
296:4 296:4	186:20 192:15	303:21 304:8
296:10	194:8	305:13 305:13
<b>schematic</b> 193:4	<b>scientifically</b>	306:1 306:9
<b>scheme</b> 238:23	275:19 276:2	309:14
<b>schemes</b> 223:17	277:10 305:18	<b>Sea</b> 50:25
238:21	<b>SCIPUFF</b> 229:5	<b>SEAR-1000</b> 194:8
<b>Schewe</b> 90:10	252:23 254:1	194:10 194:13
<b>SCICHEM</b> 6:18	254:5 254:8	194:16
53:13 184:24	255:25 256:4	<b>search</b> 289:1
234:5 234:12	256:9	<b>searched</b> 288:23
234:14 234:25	<b>scope</b> 4:13 5:22	<b>season</b> 111:23
272:16 277:17	16:9 16:14 59:23	128:3
278:4 278:10	<b>score</b> 251:17	<b>seasonal</b> 32:5
279:19 279:20	<b>SCRAM</b> 30:10	44:9 44:19
279:22 280:5	124:11 132:15	48:4 48:7
280:7 280:11	132:19 136:14	48:16 81:24
280:24 281:10	137:10 158:14	81:25 82:1
281:11 281:24	210:22 210:25	111:13 112:6
281:25 282:3	211:7 228:11	<b>seats</b> 3:6 3:8
282:9 282:17	240:10 307:25	94:3 131:21
282:25 283:2	308:2	198:4
283:11 283:13	<b>scratch</b> 132:11	<b>second</b> 21:20
284:10 285:3	<b>scratcher</b> 255:7	26:11 31:18
286:2 286:7		32:11 34:9 47:17

48:8 48:15 72:9 72:11 97:14 97:19 112:1 139:15 139:17 139:19 139:20 142:24 143:14 143:15 143:16 145:19 148:10 161:1 161:11 161:20 161:21 161:22 205:18 229:8 253:11 278:10 278:15 283:16 296:22 299:16 303:11 313:16 314:2 314:9 315:4 320:23  <b>secondaries</b> 265:5 <b>secondarily</b> 26:18 27:22 33:19 49:5 54:13  <b>secondary</b> 5:14 9:1 27:3 31:8 31:11 33:15 34:4 35:15 37:6 38:15 38:23 39:5 40:11 43:19 44:1 44:1 44:5 44:16 45:2 54:20 68:24 71:8 71:16 71:16 71:22 72:1 72:3 73:5 77:4 77:6 79:12 84:12 85:9 85:12 87:10 87:18 88:1 89:4 89:10 89:23 92:13 93:11 93:17 100:24 219:14 222:8 226:16 227:11 231:2 231:8 231:25 277:16 277:19 285:4  <b>seconds</b> 3:6	193:14  <b>Section</b> 35:21 35:23 42:21 57:1 83:19  <b>sections</b> 167:22  <b>sector</b> 61:24 61:25 62:1 91:20 187:18  <b>sectoring</b> 91:18  <b>sectors</b> 62:19 309:3  <b>seed</b> 321:5  <b>seeing</b> 17:12 70:14 84:22 85:4 123:14 127:2 130:9 169:11 169:14 178:6 226:23 237:10 284:20  <b>seem</b> 106:4 113:25 217:25 246:17  <b>seemed</b> 91:2 91:5 145:4 188:4 252:8  <b>seems</b> 75:12 82:5 88:10 154:4 156:20  <b>seen</b> 20:7 33:23 36:14 41:4 59:4 98:12 108:5 119:16 123:1 152:22 153:10 153:11 166:13 190:10 258:9 284:5 307:8 308:13  <b>select</b> 164:5  <b>selected</b> 177:20  <b>selecting</b> 189:22  <b>selection</b> 163:6	<b>selections</b> 170:6  <b>semi-</b> <b>qualitative</b> 73:9  <b>send</b> 197:11  <b>senior</b> 19:8 21:2  <b>sense</b> 33:17 50:11 54:23 55:1 61:1 145:2 208:4 208:8 210:7 292:7 316:4 318:16  <b>sensitive</b> 141:24 145:4 157:6 159:24 162:8 179:24 181:18 272:25 295:13  <b>sensitivities</b> 89:17 91:8 140:15 237:13 305:19  <b>sensitivity</b> 51:25 70:14 91:1 129:15 137:4 169:18 182:4 182:6 189:25 223:19 235:8 235:9 245:4 246:1 249:4 249:5 299:7 299:25 300:8 304:12 304:18  <b>sent</b> 32:25 116:9 193:16 295:25  <b>sentiment</b> 200:8  <b>separate</b> 103:23 162:18 220:14 262:12  <b>separately</b> 106:17  <b>sequence</b> 163:19
--	---	---

<b>sequences</b> 165:5	190:17 215:22	<b>she's</b> 5:11
<b>SER</b> 24:10 49:7	223:23	<b>shift</b> 158:19
49:25	<b>setting</b> 90:18	<b>shifted</b> 258:17
<b>serial</b> 273:12	291:17	<b>shifts</b> 272:25
<b>series</b> 127:11	<b>settings</b> 80:20	<b>shop</b> 187:9
234:6 247:6	166:16 245:23	<b>short</b> 90:1
247:9 247:10	248:7 248:20	117:8 119:23
247:17 247:24	263:25	149:8 154:2
251:18 252:4	<b>set-up</b> 148:3	160:2 221:22
252:8 275:10	150:4 162:8	309:18 320:10
<b>serious</b> 83:23	164:2 191:18	<b>shortage</b> 312:6
114:14	192:14 192:17	<b>shorter</b> 209:18
<b>seriousness</b> 85:19	193:25 194:5	<b>shortly</b> 89:15
<b>SERs</b> 24:8 24:11	194:14 194:23	95:3 214:10
24:13 36:25	194:24 196:24	<b>short-term</b> 173:19
37:22 39:22 40:2	236:6 291:23	<b>showed</b> 26:8 81:14
<b>serve</b> 200:14	293:23	81:19 82:14 91:3
<b>served</b> 7:12	<b>seven</b> 133:20	100:6 128:4
<b>Service</b> 96:21	<b>Seventeen</b> 113:15	162:10 184:15
100:18 257:3	<b>several</b> 36:14	189:6 189:6
258:19 259:2	83:19 100:4	189:9 215:14
320:2 320:6	124:5 164:14	240:2 251:5
320:11 321:3	184:6 184:25	287:25 304:13
<b>session</b> 6:7 13:11	187:2 229:1	<b>showing</b> 24:5
53:15 78:8	240:6 296:20	124:14 130:2
131:24 132:1	<b>shaded</b> 247:6	137:21 149:17
132:3 216:7	<b>shale</b> 147:14	151:24 166:18
216:9 217:14	147:24 152:17	227:3 236:14
218:3 256:21	<b>shallow</b> 168:11	246:14 246:16
307:2 309:22	<b>shape</b> 102:6 124:6	266:20
309:24	<b>share</b> 58:25	<b>shown</b> 172:16
<b>sessions</b> 3:19	<b>shared</b> 60:6 92:19	209:16 281:5
132:4	123:15	286:17
<b>sets</b> 75:13	<b>sharing</b> 59:4	<b>shows</b> 52:16 125:8
153:8 161:17	308:10	126:1 137:4
165:6 166:1	<b>sharp</b> 289:15	142:9 152:2
175:23 176:8	<b>shear</b> 243:7	191:4 219:7
176:15 176:20	<b>shed</b> 260:13	239:4 266:22
179:2 179:4	<b>shelf</b> 316:7	267:1 281:19
180:2 182:5		284:2 286:5
182:6 182:13		286:17 286:25
183:5 190:9		

287:23 299:14 314:4 314:5 <b>shrub</b> 187:14 <b>shut-down</b> 215:16 <b>shuts</b> 17:20 <b>sides</b> 290:24 <b>Sierra</b> 5:10 10:7 219:13 230:8 261:1 <b>sight</b> 36:20 <b>sigma</b> 130:13 130:13 <b>sigmas</b> 129:25 131:1 <b>sigmoidal</b> 320:13 <b>sign</b> 219:3 <b>signed</b> 25:20 28:4 <b>significance</b> 276:18 294:18 297:12 297:15 317:9 <b>significant</b> 10:24 23:12 24:9 27:8 27:9 36:3 37:2 37:3 37:8 63:8 63:9 64:2 72:20 75:10 75:19 109:1 109:2 109:10 121:18 123:8 201:19 206:23 206:25 207:3 207:5 207:7 207:13 207:20 208:13 208:16 209:5 209:7 209:9 209:21 210:8 265:18 267:4 268:13 277:4 294:16 294:24 297:13	302:1 306:10 306:17 <b>significantly</b> 103:10 104:15 115:6 188:19 265:7 267:1 315:15 315:16 <b>SIL</b> 27:14 33:25 37:15 37:17 46:4 46:4 47:5 47:14 48:3 48:19 52:15 78:13 103:2 103:21 106:20 115:5 117:1 117:7 <b>SILs</b> 27:11 <b>similar</b> 18:3 52:10 80:22 83:4 89:21 91:12 93:9 127:24 137:11 168:20 168:21 169:14 175:2 176:17 181:11 181:12 182:11 182:15 221:22 264:9 265:21 267:23 270:16 270:22 276:1 283:8 283:10 284:7 284:23 287:11 287:18 287:23 287:25 288:10 288:15 290:5 290:6 <b>similarities</b> 292:12 <b>similarly</b> 218:9 218:11 289:1 289:19 <b>simple</b> 90:20 174:17 182:21 194:7 195:16 230:24 235:5	<b>simpler</b> 36:16 36:16 163:15 <b>simplified</b> 175:16 184:19 <b>simply</b> 173:5 194:20 262:3 <b>simulate</b> 69:9 242:2 277:15 278:5 293:17 <b>simulated</b> 159:24 159:25 162:20 163:2 164:21 166:6 170:20 281:9 284:6 292:2 <b>simulating</b> 279:3 286:15 <b>simulation</b> 231:12 237:8 261:20 280:1 280:7 281:10 281:11 281:24 282:10 282:25 283:1 283:3 283:6 283:21 283:24 285:9 285:12 285:25 286:2 286:7 286:8 287:4 288:25 <b>simulations</b> 84:20 169:20 262:8 273:10 273:22 278:7 278:24 279:8 279:19 280:4 280:18 280:19 281:3 281:4 281:12 283:18 283:19 283:22 289:19 291:1 291:11 292:11 293:14 311:11 <b>simulator</b> 164:4
---	---	--

<b>single</b> 5:8 8:25 29:6 32:6 39:12 53:19 54:1 82:12 123:4 123:11 134:5 138:7 145:11 146:11 220:24 222:7 224:8 224:9 225:13 226:17 227:4 227:11 227:19 230:6 230:14 231:13 231:25 232:11 233:1 234:22 236:25 239:23 257:10 260:16 261:13 276:18 276:23 277:15 277:18 294:8 314:22	42:9 176:6 178:22 178:25 248:4 267:20 <b>sitting</b> 30:18 42:5 78:25 247:19 247:21 <b>situation</b> 36:9 89:21 90:23 91:25 102:5 104:25 105:15 106:1 106:8 107:22 109:17 112:17 114:22 117:15 125:13 151:13 154:21 155:11 217:5 285:16 <b>situations</b> 15:19 39:11 44:12 49:22 51:13 63:17 76:15 84:22 90:20 102:12 104:20 104:21 105:1 105:3 109:18 113:20 114:12 117:15 118:16 121:17 155:9 205:1 208:10 221:13 235:22 308:6 <b>six</b> 62:13 62:17 133:19 142:18 155:6 155:6 162:12 166:24 168:5 168:22 176:22 195:7 234:6 246:23 252:19 261:12 282:7 296:6 313:7 313:8 313:21 314:15 321:15 <b>sixth</b> 238:5	<b>size</b> 55:24 58:18 68:13 187:3 236:12 <b>skill</b> 121:4 <b>skills</b> 274:13 <b>skip</b> 126:25 245:11 <b>skipped</b> 248:6 <b>slam</b> 308:6 <b>slamming</b> 17:2 <b>slew</b> 158:20 <b>slices</b> 166:25 167:19 167:20 168:15 168:16 169:2 <b>slicing</b> 151:2 <b>slide</b> 32:10 43:7 48:20 69:14 69:14 72:9 74:3 111:4 113:3 127:10 162:12 189:11 222:3 263:10 265:2 309:25 <b>slides</b> 22:17 31:16 78:12 133:3 211:6 <b>slight</b> 264:15 <b>slightly</b> 167:10 169:13 264:3 264:8 264:11 264:11 270:15 270:18 270:19 <b>slipped</b> 131:8 <b>slots</b> 194:16 194:25 <b>slowing</b> 267:11 <b>slug</b> 215:24 254:23 254:24 255:4
<b>SIP</b> 13:10 18:4 18:16 19:1 31:14 51:22 53:18 55:11 56:1 211:24 212:1 212:15 214:9 214:13 217:5 220:15 220:21 274:3 274:14 <b>SIPS</b> 134:24 220:16 <b>sit</b> 22:3 275:2 <b>site</b> 43:7 44:6 46:9 91:21 96:19 100:17 121:13 121:16 122:12 179:8 179:10 180:21 180:24 186:2 189:10 190:4 192:13 201:3 231:5 302:24 <b>sited</b> 123:17 <b>sites</b> 34:20		

<b>small</b> 63:11 115:9 124:20 148:6 152:11 153:18 155:17 225:15 295:22 297:10	236:18 264:10 264:12 265:11 266:2 280:15 281:19 282:18 284:2 286:25 287:2 287:3 287:7 287:25 292:8	158:17 163:15 168:23 172:16 175:3 178:3 188:12 258:18
<b>smaller</b> 16:20 16:20 129:11 177:11 187:3 236:13 306:4 315:5	<b>SO6</b> 242:12	<b>somewhere</b> 54:7 73:13 82:19 82:21 146:9 147:5 314:4
<b>smallest</b> 266:3	<b>social</b> 296:23	<b>sooner</b> 17:5 17:14
<b>smart</b> 247:20	<b>software</b> 163:4 187:19 266:16	<b>sophisticated</b> 319:19
<b>SMCs</b> 27:11	<b>Sold</b> 217:12	<b>sophistication</b> 221:7
<b>snapshot</b> 195:2 266:15	<b>sole</b> 109:3	<b>sorry</b> 47:14 168:9 225:3
<b>Snyder</b> 91:10 132:9 133:1 133:2 147:11 151:17 198:11 198:18	<b>solely</b> 12:17	<b>sort</b> 22:22 34:21 39:24 57:22 61:11 67:22 68:22 73:10 74:23 79:4 81:19 120:2 120:14 120:17 120:21 122:19 125:2 127:13 127:24 128:9 128:11 129:20 165:1 168:20 169:8 189:18 190:5 203:17 283:23 289:3
<b>SO2</b> 5:1 6:24 18:24 19:4 24:12 38:9 39:22 40:1 40:4 40:10 53:7 55:13 78:19 91:9 93:14 93:17 94:11 94:19 95:3 95:9 96:23 100:14 100:24 101:20 102:14 103:13 107:4 110:23 111:12 113:24 114:24 116:6 116:14 133:6 133:15 134:14 134:21 134:21 137:11 141:9 142:14 145:13 156:7 156:17 163:9 191:24 192:2 211:3 211:24 212:1 234:23	<b>solenoid</b> 193:6 193:13	<b>sorted</b> 177:18
	<b>solicit</b> 33:1	<b>sorts</b> 64:10
	<b>soliciting</b> 21:22 54:15	<b>so-to-speak</b> 321:5
	<b>Solid</b> 140:11	<b>sound</b> 36:17 77:2 232:20 239:22 274:3 274:4 276:2 295:20
	<b>solidified</b> 14:18	<b>sounds</b> 139:12
	<b>solution</b> 53:13 118:19 169:24	<b>source</b> 5:7 5:8 8:5 8:25 29:7 31:12 32:6
	<b>solvable</b> 156:9	
	<b>solve</b> 150:2 154:21	
	<b>solved</b> 68:24 155:10	
	<b>somebody</b> 316:6	
	<b>somehow</b> 25:19 33:18	
	<b>someone</b> 71:22	
	<b>sometime</b> 21:21 22:6 256:25 293:11	
	<b>somewhat</b> 32:6 44:25 49:4 109:6 132:2 134:3	

33:4 35:25 35:25	207:19 207:23	303:23 304:2
37:6 37:9	209:17 214:8	304:3 304:4
39:13 41:2 41:25	220:24 222:7	304:7 304:16
42:18 42:23	224:8 224:9	305:23 305:23
42:24 44:7 49:19	224:22 225:13	306:3 312:14
53:19 54:1	227:4 227:11	312:17
54:3 60:25	227:19 228:20	<b>sources</b> 7:8
61:7 61:21 61:21	230:6 230:14	31:7 31:10
62:5 63:20 67:22	231:3 231:13	33:4 37:8
68:2 68:2	231:25 232:11	41:12 41:21
68:10 73:1	233:1 233:15	43:23 61:2
73:3 74:13 76:19	233:20 234:22	61:2 61:17
80:21 84:10	235:10 235:13	62:3 62:3
84:10 84:11	235:16 235:17	63:13 64:7 64:21
89:11 93:12	235:19 235:24	65:15 67:19
102:4 103:2	237:1 237:4	68:17 68:23
103:5 105:9	237:14 237:22	90:21 91:24
105:21 109:3	238:4 238:9	102:13 102:20
109:22 109:23	238:17 239:3	102:21 102:23
110:6 110:15	239:6 239:23	104:9 105:19
110:18 114:22	241:3 254:25	105:24 106:6
114:23 116:6	255:2 257:10	106:8 106:12
116:13 116:13	261:13 261:23	106:14 106:24
116:14 117:5	269:25 270:9	107:18 109:4
118:23 123:17	271:3 276:23	109:13 109:22
124:16 134:1	276:25 277:15	110:2 110:10
134:9 134:9	277:18 282:17	110:14 116:8
138:7 139:6	283:14 285:15	116:15 117:3
139:10 139:15	285:22 287:6	117:3 117:6
139:25 140:6	287:13 288:3	118:23 125:21
140:21 140:25	288:11 288:16	126:17 126:19
142:3 145:11	289:15 290:13	126:24 127:6
146:11 155:13	291:4 292:9	127:22 135:18
160:10 161:4	294:8 294:20	139:8 139:24
161:7 161:9	296:25 297:1	140:2 140:5
162:11 165:6	297:2 297:14	152:15 152:16
170:16 170:17	297:17 298:13	154:24 156:25
170:19 171:12	299:4 300:14	160:4 160:7
173:14 177:11	300:16 300:18	160:11 163:18
177:13 180:4	300:21 301:8	165:3 165:4
180:22 181:5	301:9 301:15	165:7 165:9
181:11 182:9	301:18 301:18	165:11 165:12
182:11 183:7	302:2 302:5	170:8 171:10
185:23 204:24	302:14 302:19	174:2 174:5
205:3 205:19	302:20 302:25	179:17 185:17
207:19 207:19	303:6 303:22	200:13 204:25

205:3 205:13	<b>spacing</b> 152:13	265:5 268:10
206:16 206:24	<b>span</b> 198:2	271:1 271:2
207:12 207:16	<b>spark</b> 18:1	271:5 271:9
208:11 208:25	<b>sparsity</b> 100:7	271:15 271:16
215:18 216:3	<b>spatial</b> 44:2 77:5	279:13 304:13
216:14 216:16	106:3 138:5	304:15 304:16
216:18 216:22	140:5 141:3	304:18 304:25
217:1 217:1	141:17 144:4	304:25 305:1
221:3 225:16	152:3 152:9	305:3 305:4
226:17 227:6	154:6 238:20	<b>specific</b> 8:5
232:17 232:22	249:12 249:18	8:6 13:4 28:12
261:16 263:3	250:11 253:24	29:24 29:24
263:5 263:5	268:17 269:2	30:10 42:17
276:18 295:17	269:3 269:21	45:25 46:9 52:22
295:21 296:20	270:3 270:5	53:19 57:15
298:11 298:24	<b>spawned</b> 242:4	57:20 60:11 78:4
299:19 300:1	<b>speak</b> 29:10 58:13	79:9 79:20 86:21
300:5 300:5	115:10 134:1	96:20 101:5
301:7 301:20	202:3 205:15	102:4 105:16
304:15 304:20	258:18	109:25 121:14
306:4 306:7	<b>speakers</b> 14:19	121:16 122:12
<b>source's</b> 205:2	57:12 132:24	133:24 133:25
210:10 297:2	217:14 277:14	136:2 183:23
302:17	306:25 309:24	185:10 192:13
<b>south</b> 128:14	321:18	201:3 231:5
128:19 129:14	<b>speaking</b> 4:7 58:9	302:24 305:10
142:16 179:14	94:11	305:14 305:15
206:11 287:21	<b>speaks</b> 74:4 76:7	305:19 306:12
294:12 294:16	<b>spearheading</b>	309:3
297:7 298:17	57:17	<b>specifically</b>
301:25	<b>special</b> 26:23	79:19 85:17
<b>southeast</b> 44:17	66:20 319:5	92:23 97:25 99:1
51:15 178:14	<b>specialized</b>	101:18 110:20
<b>southward</b> 284:19	311:14	201:14
<b>Southwest</b> 178:15	<b>specialty</b> 12:24	<b>specificity</b> 7:9
<b>southwestern</b>	309:1 310:8	<b>specifics</b> 104:19
262:17	310:15	<b>speculating</b>
<b>space</b> 85:12	<b>speciation</b>	205:24 205:24
87:9 103:11	55:24 304:14	<b>speed</b> 70:17 70:19
249:20 251:8	305:9 305:19	200:23 201:13
253:24 317:20	<b>species</b> 238:16	246:8 246:13
317:21 318:3		247:5 247:8
318:6 318:11		255:17 293:21
		<b>speeds</b> 70:16

76:21	139:18 139:24	197:2
<b>spell</b> 20:4	140:13 140:15	<b>stake</b> 58:17 62:18
<b>spend</b> 36:22 41:12	140:19 140:21	62:18
56:1 155:24	141:14 141:25	<b>stakeholder</b> 58:16
<b>spent</b> 292:4	142:1 142:2	101:7 259:22
<b>spike</b> 105:3	142:12 142:19	<b>stand</b> 75:9
289:15	142:20 142:21	<b>stand-alone</b> 275:1
<b>spirit</b> 60:20	142:22 143:1	<b>standard</b> 7:6 7:13
106:5	143:2 143:9	8:2 18:14
<b>splitting</b> 244:1	143:22 143:23	18:15 18:18
278:20 311:5	144:6 144:8	23:14 23:24
<b>spoke</b> 151:7	144:11 144:12	23:25 24:1 26:10
<b>spoken</b> 3:16	144:16 144:20	27:16 35:17 40:4
<b>sponsored</b> 124:4	144:21 144:25	40:23 42:11 45:6
183:20 294:11	145:9 148:16	45:8 48:10 48:11
<b>spot</b> 32:20	150:15 150:20	48:13 50:13
56:15 56:22 83:3	151:19 151:23	51:19 61:13
<b>spread</b> 163:13	152:5 153:14	64:20 64:20
177:8	153:20 154:2	64:22 65:5
<b>spreadsheet</b>	155:16 157:7	66:4 66:17
175:17 297:5	162:17 164:16	67:1 67:9
297:5 303:21	164:25 166:18	67:11 67:14
<b>spring</b> 44:18	180:25 196:13	69:12 70:3 72:23
112:12	197:7 198:8	73:17 73:21 80:2
<b>Springfield</b>	198:17 204:7	82:18 94:25 95:4
142:17 143:18	209:18 209:18	95:9 95:9 97:3
145:3	216:1 265:1	97:12 97:17
<b>squared</b> 249:24	299:2	100:25 102:19
251:11 253:18	<b>stacks</b> 142:10	103:1 104:6
<b>stability</b> 74:5	143:1 148:14	104:11 107:13
77:11 91:4	149:8 150:24	110:13 111:24
<b>stable</b> 44:13	154:6 154:15	112:10 113:13
44:14 124:18	154:16 154:20	113:24 121:15
129:4 129:7	154:20 154:21	126:22 155:6
188:2 293:6	155:16 155:19	156:19 172:3
293:7	160:12 164:24	177:21 198:11
<b>stack</b> 65:24 65:24	186:8 186:9	203:1 210:2
122:6 134:2	200:21 200:25	212:12 215:2
135:3 137:15	201:12	215:6 258:1
139:1 139:17	<b>staff</b> 29:16 64:14	264:4 273:13
	64:16 159:8	286:10 295:9
	165:22 277:6	295:10 302:12
	<b>stage</b> 23:3	302:13 302:14
	90:18 133:22	314:19
	153:7 153:19	

<b>standards</b> 26:12	113:4 129:8	<b>art</b> 72:21
40:10 53:7	134:16 156:5	<b>states</b> 18:6
61:6 61:7	258:8 279:1	18:7 21:17
61:13 62:2	279:2 281:13	22:4 22:7 29:4
67:6 68:3 68:5	295:23 296:10	52:5 52:8 55:4
77:8 95:19 96:12	317:3	55:5 58:22 63:17
98:1 106:22	<b>starting</b> 9:12	74:7 80:17 80:25
107:4 109:18	53:18 75:3	133:19 135:9
111:11 118:1	79:5 138:25	136:3 138:20
118:2 120:24	165:3 216:18	138:23 156:5
121:11 125:25	216:20 219:15	178:15 178:16
133:11 133:13	224:4 228:8	178:18 274:19
136:4 163:9	231:14 235:4	<b>state's</b> 66:14
295:4 306:15	285:5	<b>States</b> 262:17
<b>standing</b> 94:5	<b>starts</b> 10:5 170:7	<b>static</b> 74:13
<b>standpoint</b> 12:5	314:17	<b>station</b> 166:12
25:3 86:17	<b>start-up</b> 215:16	180:3 186:4
87:3 90:1 90:6	<b>stat</b> 246:7 253:20	186:5 186:5
114:18 148:17	<b>state</b> 13:8	187:11
149:22 213:4	18:13 20:14 22:2	<b>stations</b> 147:18
<b>stands</b> 159:18	22:11 23:9 28:13	166:15 177:5
278:10 298:3	29:15 31:3	280:9
<b>star</b> 141:6 256:17	33:8 36:3	<b>statistic</b>
<b>starch</b> 155:19	36:12 47:24	169:19 250:21
<b>start</b> 36:11	51:22 57:7 61:18	253:17
41:8 51:17	66:19 67:2 72:18	<b>statistical</b> 197:6
94:3 115:22	91:25 101:4	252:21 317:22
131:24 139:16	124:2 124:8	<b>statistically</b>
156:4 165:2	134:7 156:19	317:8
170:8 178:2	176:21 191:10	<b>statistics</b> 164:15
178:18 212:19	214:13 258:7	165:17 188:13
212:20 212:22	273:8 274:23	214:25 242:25
218:2 228:7	275:20	250:24 250:25
230:25 238:2	<b>stated</b> 10:8	251:2 251:4
239:23 267:5	35:9 125:11	253:5 253:10
279:6 288:7	172:13	253:22 253:24
289:20 290:16	<b>statement</b> 8:13	254:8 312:15
290:21 290:24	50:13 62:24	317:5
293:18 303:3	172:2 199:18	<b>status</b> 5:20
314:19 317:7	199:24	7:17 23:17 63:21
320:5 320:7	<b>statements</b> 40:1	171:3 192:2
321:18	258:23	<b>stay</b> 132:2 272:23
<b>started</b> 3:5	<b>state-of-the-</b>	
5:18 30:3		

<p>321:13</p> <p><b>stayed</b> 187:5</p> <p><b>staying</b> 4:4</p> <p><b>steady</b> 47:24</p> <p><b>steam</b> 67:20</p> <p><b>steel</b> 136:25</p> <p><b>steep</b> 166:20</p> <p><b>step</b> 37:14 37:17 39:12 46:25 68:8 100:9 119:14 121:18 219:5 228:1 239:14 245:10 245:12 245:17 315:19</p> <p><b>steps</b> 28:18 34:3 230:10 292:14 308:19</p> <p><b>Steve</b> 25:20 176:11 183:17 190:21 198:3 199:24 209:4 216:12 317:4</p> <p><b>sticking</b> 294:4 321:13</p> <p><b>Stinger</b> 214:17</p> <p><b>stop</b> 70:7 77:24 108:1 131:6</p> <p><b>stopped</b> 141:11</p> <p><b>storage</b> 187:9</p> <p><b>story</b> 51:9 117:8 126:25</p> <p><b>straight</b> 152:4 189:1 192:6</p> <p><b>straightforward</b> 33:9 45:4 49:4 107:15 182:22</p> <p><b>strange</b> 274:4</p> <p><b>strategies</b> 223:15</p>	<p><b>strategy</b> 49:20 137:14</p> <p><b>strength</b> 300:6</p> <p><b>stress</b> 11:10 49:13 95:15 114:3 186:15</p> <p><b>stressed</b> 14:25 107:3</p> <p><b>stressing</b> 11:9</p> <p><b>stretch</b> 294:1</p> <p><b>striking</b> 289:23</p> <p><b>stringency</b> 104:10 172:2</p> <p><b>stringent</b> 40:4 40:5 65:5</p> <p><b>strong</b> 210:3 260:23 265:16</p> <p><b>structure</b> 78:9 215:9</p> <p><b>structures</b> 182:8</p> <p><b>stuck</b> 307:1</p> <p><b>studied</b> 279:6</p> <p><b>studies</b> 6:12 6:12 6:13 119:24 119:24 123:2 124:23 173:9 173:12 173:18 192:9 201:15 221:17 272:5 293:4 312:9</p> <p><b>stuff</b> 90:12 111:18 119:16 136:5 146:12 147:15 152:21 153:13 155:22 156:8 157:17 158:13 226:23 240:21 243:7 272:6 296:1</p> <p><b>sub</b> 30:22</p>	<p>186:23 189:12 319:7</p> <p><b>subcommittees</b> 30:8</p> <p><b>sub-grid</b> 33:6 33:14 54:9 54:10 55:7 235:25 235:25 236:4 239:17 293:12</p> <p><b>subject</b> 61:5 61:9 61:12 61:18 62:4 123:11</p> <p><b>submit</b> 70:13 106:10 113:10 132:20 212:1 212:2</p> <p><b>submitted</b> 212:16</p> <p><b>submitting</b> 12:18</p> <p><b>sub-region</b> 262:15</p> <p><b>sub-regions</b> 305:16</p> <p><b>subsequent</b> 115:1 228:17 260:18</p> <p><b>subsequently</b> 24:4 174:19</p> <p><b>subset</b> 178:8 178:9</p> <p><b>subsets</b> 14:1 176:7 178:14</p> <p><b>substance</b> 188:23</p> <p><b>substantial</b> 70:8 72:7 73:18</p> <p><b>substantially</b> 65:5</p> <p><b>substantive</b> 16:13</p> <p><b>subtle</b> 60:12</p> <p><b>subtracted</b> 283:21</p> <p><b>suburban</b> 177:24</p>
---	---	--

178:8	<b>sulfate</b> 44:17	12:10 14:7 14:10
<b>sub-workgroup</b>	271:4 271:9	15:6 16:8
34:7 54:14	<b>sulfates</b> 85:9	16:11 42:24
<b>successful</b> 156:18	<b>sulfur</b> 215:25	43:22 56:11
<b>successfully</b>	216:4	56:19 68:15
113:23 114:6	<b>sulphur</b> 263:22	71:23 110:4
114:9	270:17 270:18	110:4 110:14
<b>Sudbury</b> 244:12	270:20	132:2 156:2
244:14	<b>sum</b> 34:14 38:23	157:22 158:14
<b>suffice</b> 63:2	<b>summaries</b> 80:24	199:1 202:7
<b>sufficiency</b>	137:5 137:6	206:17 208:3
112:23	<b>summarize</b> 12:5	208:7 224:21
<b>sufficient</b> 7:20	22:10 189:16	240:11 258:9
11:25 18:19 55:6	291:19 295:1	284:8 301:22
99:19 305:13	<b>summarized</b> 75:2	303:2
308:3 315:7	<b>summarizes</b> 125:2	<b>surface</b> 187:13
316:13	<b>summarizing</b>	245:20 266:19
<b>sufficiently</b>	307:16	266:19 267:12
8:4 315:8	<b>summary</b> 66:15	286:5
<b>suggest</b> 92:1	75:21 76:13	<b>surge</b> 160:23
103:1 110:19	136:11 136:13	<b>surprise</b> 167:14
116:11	137:24 137:25	<b>surprising</b> 155:18
<b>suggested</b> 111:8	146:14 182:21	301:9
111:12 111:20	240:12 240:13	<b>surprisingly</b>
112:14	305:12	170:21 284:21
<b>suggesting</b>	<b>summer</b> 44:15	<b>surrogacy</b> 65:1
12:24 110:10	44:18 112:12	65:10
<b>suggestion</b> 309:1	115:22 147:12	<b>surrogate</b> 23:15
<b>suggestions</b>	198:15 211:4	24:17 24:25
183:11 184:8	297:22	27:18 61:14
210:20	<b>summertime</b> 258:16	175:4
<b>suit</b> 222:17	<b>sums</b> 69:8 70:5	<b>surrounding</b> 27:1
<b>suitability</b> 6:8	72:14 79:25 82:5	<b>susceptible</b>
90:7 224:20	<b>support</b> 103:14	268:11
225:19 261:3	103:17 103:25	<b>suspect</b> 70:12
270:8 308:21	156:21 173:10	70:14 70:20
<b>suitable</b> 88:2	220:2	77:18
221:3 277:8	<b>supporting</b> 228:12	<b>switch</b> 49:2
306:4	<b>supposed</b> 296:19	<b>switches</b> 193:13
<b>suite</b> 6:13 279:13	<b>sure</b> 5:21 8:20	<b>switching</b> 230:5
		<b>Sydney</b> 89:22



230:20 294:22	66:1 73:19	91:4 93:5
294:23	113:13 121:20	96:11 97:4
<b>technically</b> 59:13	123:3 162:2	97:8 100:10
118:3 147:6	162:4 165:6	100:20 101:5
219:9 232:20	166:25 167:18	101:12 101:24
272:22 295:20	167:20 168:15	102:17 102:21
<b>technique</b> 34:19	168:16 170:17	102:25 103:6
71:7 175:16	180:4 192:10	104:25 106:6
242:16 306:8	193:14 195:7	106:7 106:12
<b>techniques</b> 5:5	195:9 195:10	106:18 107:17
5:7 7:18 7:21	214:19 268:6	110:3 110:17
7:22 8:1 8:12	271:25 282:6	112:23 113:19
8:25 9:7 17:25	300:7 300:10	114:13 114:19
23:13 26:19	301:7	115:24 118:17
53:15 54:3	<b>tend</b> 129:3 203:7	119:9 121:15
73:2 87:25 89:12	<b>tended</b> 248:10	121:18 125:7
89:15 89:18	<b>tendency</b> 126:9	129:2 185:3
89:23 97:6	264:20	200:10 200:12
98:6 98:13 98:22	<b>ten-minute</b> 69:14	205:9 206:6
108:22 114:9	<b>Tennessee</b>	206:10 213:3
218:8 223:1	146:12 233:25	213:10 215:13
225:17 235:11	279:3	218:6 218:14
243:25 260:4	<b>term</b> 109:16	218:18 219:6
275:19 276:25	119:23 119:24	220:8 220:18
277:2 309:18	124:22 160:2	221:2 221:4
320:5	268:25 320:10	221:8 221:9
<b>technologies</b>	<b>termed</b> 69:17	221:16 222:13
203:23	<b>terms</b> 4:14 5:3	223:10 224:1
<b>technology</b>	5:19 5:24 6:1	224:8 224:10
62:10 69:25	6:2 6:19 6:22	224:17 225:13
272:25	6:24 8:1 8:6	226:16 260:22
<b>television</b> 94:6	8:11 8:18 9:2	263:12 268:1
<b>temperatures</b>	9:19 11:6	277:6 282:19
186:11	12:11 15:13 16:9	291:20 299:9
<b>templates</b> 175:18	16:23 17:11	299:13 307:7
<b>temporal</b> 44:3	17:17 36:6	307:11 308:20
77:5 249:13	50:5 58:19 58:20	310:8 321:5
<b>temporally</b> 47:23	64:9 65:23 74:19	<b>terrain</b> 41:21
<b>temporary</b> 193:25	76:12 79:25	90:15 90:19
<b>ten</b> 24:10 37:25	80:17 84:8 84:22	90:22 121:17
38:8 58:4	84:24 86:12	121:22 121:23
58:22 65:7	86:14 86:21	145:6 145:10
	87:24 88:3 88:25	146:13 146:16
		146:17 146:19
		166:16 169:7
		182:16 266:21

267:1 267:9 272:5 <b>test</b> 63:10 97:10 153:14 172:15 189:24 240:9 242:9 243:14 251:4 253:14 255:9 261:15 277:22 277:25 280:10 280:14 293:16 294:5 304:2 304:4 305:23  <b>tested</b> 170:14 184:9 186:14  <b>testing</b> 105:7 171:4 171:15 176:9 179:1 182:4 196:12 196:13 196:14 196:17 293:19  <b>tests</b> 75:2 129:12 173:19 181:19 189:14 240:24 241:9 245:4 246:2 246:14 246:15 246:15 249:4 249:5 300:8 301:24  <b>Texas</b> 147:20 147:20 152:22  <b>TEXAX</b> 234:2  <b>thank</b> 19:16 82:23 86:6 87:11 87:13 93:23 94:4 116:21 131:18 138:13 168:9 171:20 171:22 183:13 183:18 190:19 190:21 190:24 206:3 209:3 214:15 214:16 217:20 257:1 257:2	262:6 306:24 321:8 321:12 321:17 <b>thankful</b> 124:2 <b>Thankfully</b> 97:5  <b>thanks</b> 41:12 77:25 93:18 93:19 226:8 226:8 240:4 258:6 293:25 306:22 311:19 321:9  <b>That'll</b> 11:16  <b>themes</b> 259:25  <b>themselves</b> 24:14 76:10  <b>theorem</b> 299:11  <b>thereabouts</b> 133:4  <b>therefore</b> 36:1 105:21 106:14 162:6 177:3 177:12 304:8  <b>there'll</b> 89:21  <b>there's</b> 6:7 11:1 15:10 16:10 16:15 20:24 21:1 24:18 26:6 33:3 33:4 35:9 36:2 39:7 40:19 41:23 42:6 42:7 42:14 42:16 47:18 52:18 52:20 53:12 54:1 54:7 55:17 56:17 63:16 64:11 66:8 66:10 66:11 66:19 69:13 76:3 78:3 78:8 79:6 80:12 84:15 85:10 86:3 86:11 109:5 109:25 118:7 120:20	122:6 122:10 124:19 124:20 124:25 125:1 125:5 126:25 127:14 129:23 133:18 135:24 141:3 144:1 146:20 147:14 155:8 156:21 157:7 168:18 170:12 172:14 179:11 184:13 184:16 185:6 185:13 186:2 186:4 186:7 187:3 187:8 187:11 188:8 188:24 189:10 189:20 193:5 194:14 195:21 196:4 197:10 201:6 209:6 209:23 209:24 210:16 210:16 210:18 211:1 213:17 221:8 223:12 229:8 235:2 237:1 239:2 241:4 241:5 243:6 246:14 249:12 265:18 271:2 282:5 285:23 286:10 288:3 288:11 288:12 289:22 289:24 292:20 305:25 306:7 307:10 312:5 312:22  <b>thermal</b> 139:11  <b>Thermo</b> 192:15  <b>They'd</b> 242:17  <b>they'll</b> 7:1 159:11
---	--	--

<p><b>they're</b> 8:17 8:19  17:11 17:14  22:18 22:19  34:10 38:8  40:1 40:4 40:5  53:19 55:22  61:12 63:11  68:17 94:6  105:24 116:12  117:16 120:1  131:21 154:3  163:20 168:19  178:10 181:7  187:1 191:12  209:7 210:25  216:19 229:21  233:4 237:23  238:1 238:12  239:10 251:13  251:15 253:3  260:6 272:16  289:14 291:15  296:9 301:16  301:22 306:17</p> <p><b>they've</b> 53:17  57:20 209:16  218:5 316:10</p> <p><b>thinkings</b> 196:22</p> <p><b>third</b> 13:21  34:6 38:16  97:6 97:15 112:3  139:8 148:15  161:2 161:24  233:8</p> <p><b>Thirdly</b> 102:9</p> <p><b>thoroughly</b> 57:1  92:2 185:6  277:22 277:24</p> <p><b>thoughts</b> 14:23  17:21 90:3 217:8  218:12</p> <p><b>thousands</b> 162:20</p> <p><b>three-hour</b> 100:23</p>	<p><b>threes</b> 151:22</p> <p><b>three-tiered</b> 7:11  97:1</p> <p><b>three-year</b>  45:16 45:18  100:15</p> <p><b>threshold</b> 70:19  294:25 297:12  303:8</p> <p><b>thresholds</b> 187:22  276:18 294:15  294:18 297:15  303:7</p> <p><b>threw</b> 36:21</p> <p><b>throughout</b>  11:10 11:10  14:15 17:7 22:17  43:21 47:24  86:24 91:24  222:23 223:6  267:15 309:10</p> <p><b>throw</b> 50:2 130:22</p> <p><b>throws</b> 26:13</p> <p><b>Thurman</b> 91:10  132:9 133:1  136:11 198:19  199:2 199:5  199:9 199:12</p> <p><b>thus</b> 222:23  255:10 274:22</p> <p><b>tie</b> 205:1</p> <p><b>tied</b> 21:12 156:10  156:24</p> <p><b>tier</b> 32:9 32:14  32:21 47:17  47:21 47:24 48:8  48:15 53:9  53:9 53:10 53:11  69:8 78:21 78:22  83:14 83:21  83:21 92:13 97:6</p>	<p>97:9 97:13 97:14  97:16 97:19 98:5  98:20 101:24  102:1 111:6  111:8 111:11  112:1 112:1  112:4 113:14  113:14 113:15  124:1 149:2  149:3 150:8  150:8 151:22  153:23 154:1  157:8 172:4  172:6 172:12  175:9 176:9  181:17 182:2  183:2 184:16  184:17 184:17  192:6</p> <p><b>tiered</b> 97:5  101:21 111:7  297:9</p> <p><b>tiers</b> 32:10  34:1 34:2  92:12 97:4  97:9 111:25</p> <p><b>tight</b> 156:19</p> <p><b>tighter</b> 110:19  269:15</p> <p><b>tile</b> 237:3 238:5</p> <p><b>tiles</b> 237:2  238:10</p> <p><b>till</b> 93:21</p> <p><b>timeline</b> 22:5</p> <p><b>timely</b> 20:13 84:1  118:22</p> <p><b>tinkering</b> 194:4</p> <p><b>Tino</b> 183:25</p> <p><b>tired</b> 22:17</p> <p><b>tissue</b> 66:13  66:21</p>
--	--	---

<b>title</b> 61:2	148:8 298:25	229:18 229:20
<b>titration</b>	299:1 300:18	268:8
285:22 288:16	301:8 303:9	<b>totally</b> 56:10
290:12 291:4	<b>tool</b> 43:9 52:23	117:14 304:22
292:10	53:1 83:20	<b>touch</b> 276:19
<b>today</b> 4:11 4:15	90:1 202:3	<b>touched</b> 228:18
4:15 7:16	205:13 205:16	233:3 233:11
11:10 15:14	225:3 225:8	<b>toward</b> 82:9
16:12 20:3 20:21	228:2 228:10	167:23
22:10 23:6	231:23 232:3	<b>towards</b> 100:9
26:3 60:7	232:10 232:21	109:8 189:23
76:12 138:9	232:23 279:24	233:4 234:15
138:24 171:23	280:6 294:21	264:15 305:7
179:9 184:10	295:20 297:7	316:19
190:25 226:13	303:21 306:6	<b>tower</b> 194:15
236:15 278:2	<b>tools</b> 23:13 26:19	<b>town</b> 186:2 186:3
291:22 291:25	27:12 51:21 75:4	<b>Tracer</b> 120:3
306:25	75:25 83:9 99:10	225:18 228:22
<b>tolerances</b> 134:4	114:8 115:20	229:2 229:3
<b>toluene</b> 305:4	117:13 225:9	229:13 240:9
305:5	226:15 232:3	240:24 241:13
<b>Tom</b> 310:1	291:20 299:8	241:24 242:9
<b>tome</b> 240:23	305:13 309:14	243:1 243:5
<b>tomorrow</b> 6:7	309:18 320:22	243:14 243:18
11:11 22:10	<b>top</b> 31:21	243:19 249:8
216:11 256:12	101:12 195:3	253:8 254:5
256:22 307:3	233:3 233:8	254:12 255:5
321:11	234:24 237:5	255:9 255:18
<b>tomorrow's</b> 256:21	237:7 237:11	256:7 286:6
<b>ton</b> 69:13 300:21	238:3 238:10	313:1 313:9
<b>tonight</b> 244:15	247:4 263:4	313:12 313:17
<b>tonnage</b> 154:17	263:21 263:22	314:3 315:1
<b>tonnes</b> 298:25	284:4	315:4
298:25 300:6	<b>topic</b> 20:3	<b>Tracers</b> 242:1
<b>tons</b> 24:10	<b>topics</b> 111:1	<b>track</b> 48:22 203:6
24:12 37:25 38:1	<b>total</b> 69:22	231:13 235:9
38:8 39:23	119:18 129:10	237:14 254:12
40:3 49:25 50:14	129:12 130:1	256:18 289:7
138:25 139:4	130:17 130:17	<b>trade</b> 12:9
143:4 148:6	130:25 131:1	13:25 58:11
148:7 148:7	172:25 173:5	<b>trade-off</b> 95:22
	174:25 178:11	
	178:21 179:5	
	180:13 187:3	

<b>trading</b> 28:5 230:21 232:25	227:22 228:19 233:5 240:9 241:4 241:6 241:7 241:22 252:19 261:15 262:8 311:22 311:23 318:9	<b>triggered</b> 38:7 38:19 40:3 49:7
<b>traditional</b> 77:20 165:8		<b>triggering</b> 39:20 39:21
<b>traditionally</b> 225:16		<b>Trinity</b> 90:11
<b>traffic</b> 52:10	<b>travels</b> 319:10	<b>true</b> 54:2 243:6
<b>train</b> 158:17	<b>TRC</b> 200:17	<b>truly</b> 200:2
<b>training</b> 30:5 83:21 277:6	<b>treat</b> 106:8 225:21 241:7	<b>try</b> 4:2 15:11 16:3 29:11 74:6 79:1 81:1 84:19 94:17 94:19 94:20 95:10 98:23 99:13 103:22 106:2 106:22 114:16 118:8 119:2 119:15 131:13 133:3 135:1 157:4 160:9 177:15 205:8 210:12 218:11 219:8 230:3 231:15 231:20 233:14 233:21 244:5 254:11 272:19 272:23 273:1 289:7 291:7 313:4 316:7
<b>trajectory</b> 284:19	<b>treated</b> 105:20 106:13	
<b>trans-chemistry</b> 220:10	<b>treating</b> 102:13 102:21	
<b>transects</b> 279:11 286:18 286:22 287:1 289:2	<b>treatment</b> 7:8 33:14 54:9 54:10 55:8 99:25 101:19 102:9 104:4 215:18 235:25 236:4 239:17 293:10 293:13	
<b>transformation</b> 71:9 223:24 224:16	<b>treatments</b> 292:16	
<b>transit</b> 314:7	<b>treats</b> 316:23	
<b>transition</b> 19:15 267:5 283:12	<b>tremendous</b> 14:18 22:7 168:3	
<b>transitions</b> 288:12	<b>trend</b> 169:14 177:7 287:18 289:19 291:3	<b>trying</b> 13:17 17:18 18:15 21:5 40:7 51:18 54:24 72:5 84:18 87:9 104:20 110:11 133:16 133:16 158:8 165:21 185:9 185:15 190:7 214:1 221:12 225:23 227:10 228:21 229:22 260:7 269:24 300:24 318:13 318:15
<b>translate</b> 122:19 205:9 228:4	<b>trends</b> 288:10 290:6	
<b>translated</b> 259:8	<b>tribal</b> 22:12 101:4	
<b>transparency</b> 13:19	<b>tried</b> 33:22 54:2 91:11 165:23 177:19 207:22 242:2 316:2 316:3	
<b>transport</b> 5:16 8:15 27:2 53:4 85:8 87:8 218:19 219:7 220:10 222:11 223:12 223:17 223:25 224:12 224:18 227:13 227:17	<b>trigger</b> 37:22 63:8	

<b>TSD</b> 132:16 132:22	226:11 317:12	227:6 227:13
<b>turbine</b> 146:2	<b>type</b> 8:6 8:18	227:20 227:25
146:4 146:10	9:25 13:3	228:7 230:2
146:17 146:20	13:18 17:23	230:4 230:11
182:16	26:11 33:5 33:10	231:18 232:22
<b>turbulent</b>	40:23 44:18 47:7	236:2 237:17
278:16 278:17	51:2 51:20	239:19 262:5
<b>turn</b> 16:7 77:25	52:6 54:18 61:20	270:8 293:14
118:25 132:25	82:7 87:11	308:17 309:1
136:9 171:18	93:1 93:6	309:14
183:16 197:21	94:21 110:25	<b>typical</b> 33:24
226:6 309:22	118:23 148:3	36:22 38:5 38:12
<b>turnabout</b> 262:9	148:25 149:19	65:6 68:13
<b>turned</b> 255:6	149:25 154:22	134:16 161:4
<b>turns</b> 170:10	159:17 161:9	170:21 179:19
<b>TVA</b> 234:13 234:23	162:8 193:22	<b>typically</b> 73:12
234:25 236:17	195:20 196:16	122:12 122:14
278:5 281:9	196:21 197:18	123:3 246:11
281:21 283:20	203:18 204:3	258:24 273:11
283:22 285:9	204:16 204:23	273:15 274:12
286:17 292:3	212:6 213:8	274:12 275:17
<b>tweaking</b> 12:20	215:17 220:18	276:7 311:23
<b>twenty-four</b>	222:5 222:18	<b>typing</b> 32:17
100:23	224:2 227:23	<hr/>
<b>twice</b> 167:16	232:23 272:17	U
<b>two-pronged</b>	316:5	<hr/>
308:19	<b>types</b> 12:9	<b>U.S</b> 3:1 20:2
<b>Tyler</b> 4:7 21:8	15:23 18:17	176:7 236:10
21:21 22:5	18:20 31:7 52:10	258:19 320:2
29:2 94:9 171:23	64:21 80:23	320:6
172:9 203:11	86:13 86:13	<b>U.S.D.A</b> 257:3
203:17 204:10	88:24 89:25	<b>Uintah</b> 258:12
206:14 212:24	90:25 91:8 91:11	262:20 262:22
215:12 217:3	93:3 103:24	262:23
217:22 217:23	104:8 104:21	<b>ultimate</b> 36:20
226:9 228:18	105:1 105:3	<b>ultimately</b> 109:20
230:7 241:15	105:24 106:8	117:10 176:1
257:5 259:13	107:9 112:25	223:6
272:19 310:8	115:12 115:14	<b>ultra</b> 235:23
316:4	117:15 117:16	<b>unambiguous</b> 90:21
<b>Tyler's</b> 20:22	118:6 118:12	<b>unbiased</b> 77:2
	157:13 171:8	119:11 122:9
	203:24 219:10	<b>uncertainties</b>
	219:17 225:8	
	226:15 227:4	

127:22	319:1	154:16 156:9
<b>uncertainty</b> 120:5	<b>understanding</b>	168:19 203:21
122:16 123:5	15:16 16:10	203:21 205:21
<b>unchanged</b> 139:6	16:13 57:10	215:15 215:19
<b>unclear</b> 255:2	79:13 96:9 98:22	<b>Unix</b> 273:20
<b>uncontrolled</b>	109:9 109:17	274:10 274:14
136:17 143:4	115:2 120:22	274:21
143:13 143:21	203:20 203:21	<b>unless</b> 78:8
144:5 144:15	204:12 204:16	144:19
144:24 144:25	206:7 206:8	<b>unlikely</b> 88:14
<b>uncorrelated</b>	207:10 213:22	<b>unpaired</b> 121:8
165:4	214:1 215:23	318:3
<b>uncritical</b> 107:6	226:24 234:16	<b>unrealistic</b>
<b>under-predicted</b>	259:15 320:19	160:17
127:18 169:13	<b>understood</b> 115:25	<b>unsaid</b> 83:7
<b>under-</b>	<b>undertaking</b>	<b>unstable</b> 188:2
<b>predicting</b>	5:15 8:22	<b>unsure</b> 267:13
167:10 189:3	83:22 200:4	<b>unused</b> 194:9
190:12	309:11	<b>unusual</b> 64:23
<b>under-</b>	<b>undertook</b> 261:5	<b>upcoming</b> 10:12
<b>prediction</b>	<b>unexplained</b> 314:2	12:22
127:15 130:10	<b>unfortunately</b>	<b>update</b> 5:12
247:9 316:19	159:6 273:8	7:10 10:5 17:6
316:24	<b>uniform</b> 273:2	18:16 18:21
<b>understand</b> 5:22	<b>uniformity</b> 44:4	18:23 25:5 32:15
23:5 27:4	<b>unimaginable</b>	109:20 171:24
42:25 45:25	215:3	198:21
49:18 51:19	<b>union</b> 234:2	<b>updated</b> 9:23 10:2
53:20 55:15	249:22 311:17	18:4 100:12
78:17 88:24	<b>unique</b> 34:17	125:25 136:14
95:15 97:12	41:19 41:20	158:16 180:13
108:9 110:23	50:25 67:22	180:17 199:10
113:17 113:18	84:16 258:20	219:16 308:16
116:2 118:19	<b>uniqueness</b> 109:16	<b>updates</b> 5:20
119:13 204:4	<b>unit</b> 148:24 149:9	6:3 7:15 48:24
204:19 205:8	155:21 162:11	158:11
215:14 221:11	162:15 164:3	<b>updating</b> 4:14 5:3
229:23 231:15	186:10	5:24 6:22 7:2
237:25 261:7	<b>United</b> 262:17	12:20 89:3 98:11
261:9 266:10	<b>units</b> 67:21	109:7 213:11
268:20 279:15	152:18 153:10	218:14 308:15
280:25 296:1		

309:15	<b>user-defined</b>	288:6 316:22
<b>upgraded</b> 64:3	151:18	<b>values</b> 48:16 67:8
<b>uploaded</b> 78:14	<b>user's</b> 59:10	81:10 81:12 95:2
<b>uploads</b> 158:13	<b>usual</b> 245:10	96:17 100:16
<b>upon</b> 5:11 24:17	255:22	103:20 130:9
28:1 28:22 28:25	<b>usually</b> 67:15	135:23 141:16
35:25 41:20	80:12 80:18	141:25 142:5
51:24 137:8	82:15 82:25	179:13 188:24
153:24 169:23	172:6 193:14	189:3 197:4
181:16 182:11	194:22 225:15	227:7 229:15
201:4 205:19	240:20	245:19 252:5
241:11 259:16	<b>Utah</b> 258:12	257:8 258:4
259:20 275:10	<b>utility</b> 67:20	260:19 265:7
275:16 308:22	231:23	272:8 272:22
320:12		280:13 280:14
<b>upper</b> 101:9		283:5 300:22
148:13 173:3		<b>variability</b> 7:5
177:19 177:22		48:4 75:10 81:24
181:24 187:8		81:25 159:19
258:11		161:15 182:19
<b>upset</b> 226:23		214:21 215:10
<b>upwind</b> 67:2 80:13		216:4 268:17
189:21		269:7 269:21
<b>urban</b> 43:5		<b>variable</b> 77:22
84:15 122:6		159:15 165:9
178:9 178:10		173:13 174:8
227:5 227:12		175:7 177:16
227:20 230:5		179:5 216:23
233:7 233:12		217:1
258:15 320:10		<b>variation</b> 44:9
<b>urge</b> 108:6		44:20 174:13
<b>URS</b> 92:10		254:16 267:4
<b>useful</b> 4:12 90:25		<b>variations</b> 32:5
91:8 123:14		<b>varied</b> 245:4
164:15 183:2		254:18
196:17 204:14		<b>varies</b> 65:15
217:7 228:21		65:17
239:22 307:14		<b>variety</b> 191:10
313:13		195:20 228:5
<b>usefulness</b> 204:13		228:25 234:21
313:14		235:2 235:4
		239:13
		<b>various</b> 9:3 13:24

19:19 41:21	<b>versions</b> 74:17	<b>Virginia</b> 85:1
52:12 54:1 54:16	74:18 75:6	<b>virtually</b> 58:21
55:16 62:5	76:9 186:14	61:3 63:11
72:2 74:17 74:18	<b>versus</b> 55:9 78:13	<b>visibility</b> 9:2
75:2 75:5 122:24	90:14 95:23	224:7 260:19
167:4 167:22	107:12 122:1	263:18 267:21
168:6 176:7	122:7 127:11	267:23 268:1
178:13 183:9	129:25 131:4	268:14 268:14
218:18 260:24	139:23 140:4	268:20 269:4
268:15 313:7	169:11 188:2	269:6 269:10
<b>vary</b> 135:23	210:14 282:20	<b>visual</b> 120:21
178:21 181:16	300:18	225:10
254:15	<b>vertical</b> 167:19	<b>visualization</b>
<b>varying</b> 33:3	168:16 238:21	225:9
254:16 280:2	292:22 292:25	<b>VOC</b> 232:12
280:3 283:2	<b>verticals</b> 297:20	296:6 297:2
<b>vast</b> 89:9 274:5	<b>vet</b> 12:10	298:24 299:1
<b>vastly</b> 275:15	<b>viable</b> 8:24	299:10 299:18
<b>vectors</b> 266:17	8:25 9:13	300:10 301:7
<b>vegetation</b> 320:18	89:24 309:19	301:9 303:7
<b>vehicle</b> 24:7	<b>vicinity</b> 109:3	304:4 304:13
<b>velocity</b> 142:23	109:21	304:18 305:19
164:16 164:17	<b>view</b> 25:3 87:4	<b>VOCs</b> 285:20
167:1	209:25 320:6	290:19 291:15
<b>venue</b> 13:3 42:15	<b>viewed</b> 35:19	301:10
<b>venues</b> 12:8	107:21	<b>volume</b> 98:7 129:3
12:9 114:11	<b>viewing</b> 219:24	129:25 130:6
<b>Verde</b> 269:17	<b>Vin</b> 183:25	130:10 139:5
<b>version</b> 21:20	<b>vintage</b> 75:25	<b>volunteer</b> 93:23
75:7 75:22	155:2	<b>volunteered</b> 59:3
115:17 116:25	<b>violate</b> 136:21	<b>vote</b> 60:16
159:6 198:9	<b>violation</b> 52:16	
198:12 198:20	52:17 103:8	W
198:23 199:1	115:14 137:13	<b>Wainwright</b> 176:10
199:6 199:6	<b>violations</b> 103:10	176:20 179:4
199:10 201:2	110:17 110:18	181:10 185:25
234:6 234:6	115:7 115:8	188:9
238:15 242:15	117:2 117:4	<b>wait</b> 206:1
243:23 243:24	136:19 137:1	<b>waiting</b> 293:9
251:7 279:23	141:12 146:8	<b>Wales</b> 294:12
280:10 281:4	146:13	294:16 297:7
292:4 297:25		

301:25	<b>we'd</b> 10:10 16:3	69:1 69:3 69:3
<b>walk</b> 237:2	66:6 66:6	70:13 77:19
<b>walked</b> 87:13	72:24 121:3	77:22 78:7 78:14
<b>walking</b> 83:12	136:5 138:3	88:6 89:14
<b>Wang</b> 173:18	188:1 214:11	98:2 108:15
<b>war</b> 51:22	285:24 292:11	113:10 114:4
<b>WARM</b> 289:25	292:19 292:22	131:9 131:9
<b>wasn't</b> 21:7 23:13	293:1 293:3	131:11 131:16
23:22 51:7	293:17	134:11 142:23
51:8 92:6	<b>week</b> 41:12	143:9 157:16
98:22 117:6	128:4 136:14	158:2 158:14
137:14 137:15	138:2 237:3	161:19 161:20
191:25 196:21	237:9 238:8	216:7 217:9
201:13 256:5	<b>weekday</b> 128:5	217:11 222:4
282:14 298:22	<b>weekend</b> 21:5	238:5 244:20
<b>watching</b> 131:22	<b>weekends</b> 128:7	256:11 257:9
<b>water</b> 54:8	128:8	265:13 278:4
94:14 187:15	<b>week-long</b> 13:7	281:13 281:16
298:22 321:2	13:9	281:16 282:19
321:6	<b>weeks</b> 136:15	283:7 283:15
<b>wave</b> 315:4 315:5	<b>weight</b> 51:2	286:22 308:23
<b>Wayland</b> 101:9	161:23 210:1	<b>well-controlled</b>
<b>ways</b> 36:16	<b>weighted</b> 298:14	108:16 150:16
36:18 71:21 89:7	298:19 317:19	150:23
91:3 105:23	317:23 320:13	<b>well-defined</b>
118:4 160:21	<b>weighting</b>	257:25
231:13 245:9	223:18 318:11	<b>well-developed</b>
<b>wealth</b> 28:23 36:7	<b>welcome</b> 3:11	36:11
39:9	4:9 6:9 13:3	<b>well-mixed</b> 174:4
<b>wears</b> 284:16	16:11 17:22	<b>we're</b> 3:25 4:13
<b>Weather</b> 96:21	19:12 21:13	10:21 11:2
100:18	86:20 90:3	11:8 13:7
<b>web</b> 78:14	112:25 210:19	13:16 13:17 14:2
<b>webinar</b> 209:15	310:17	14:11 14:12
211:1 211:13	<b>we'll</b> 3:5 4:15	15:13 15:15
<b>webinars</b> 210:25	4:25 5:4 6:6	15:22 16:14 17:3
<b>website</b> 20:21	7:16 8:9 10:23	17:18 17:21
30:10 56:23	12:14 12:18	18:15 18:20
132:15 132:19	12:20 17:18	20:25 22:13
	18:11 18:20 22:9	22:19 26:9 32:25
	25:24 33:16	33:11 34:20 36:6
	57:25 61:9 68:23	36:25 37:12
		38:14 39:24
		40:17 40:18

40:20 43:15	200:2 202:22	309:10 309:16
44:25 46:4	205:20 205:21	309:21 310:14
46:5 47:7 47:7	205:23 210:19	320:24
50:18 53:10	212:1 212:11	<b>west</b> 148:1
53:18 54:11	212:20 212:21	272:5 298:17
54:24 56:6 58:14	212:22 214:1	298:18
58:22 60:24 61:1	216:6 218:2	<b>western</b> 44:23
61:4 61:5	218:9 218:13	<b>wet</b> 268:11
61:24 61:25 62:4	220:23 221:13	<b>we've</b> 3:23 3:25
62:9 64:6	221:24 221:25	5:15 6:25 7:7
65:21 65:22 66:3	222:6 227:10	8:12 10:6 11:9
68:1 68:13 70:14	227:16 227:19	11:18 12:10 13:2
71:7 71:8	227:24 228:8	14:16 18:5 21:13
71:17 72:5	228:11 229:21	22:10 23:5 25:22
72:6 72:16 72:22	229:25 230:6	26:11 35:3
72:23 73:3	230:12 231:14	35:4 35:4 35:5
73:7 75:21	231:19 231:22	35:10 36:2 36:14
77:1 77:7	233:3 233:20	38:10 41:4 49:10
77:13 80:6 83:12	234:4 234:12	51:13 55:10
84:1 84:18	234:14 234:15	55:23 56:16 59:4
85:4 85:7 86:7	234:20 234:21	60:14 61:24
86:15 86:19 87:2	235:3 235:4	68:24 69:17
87:2 87:23	235:8 235:13	69:17 73:22
88:9 89:9	235:15 235:16	74:17 75:21
89:19 92:8 93:20	235:21 236:3	76:17 77:9 81:23
94:17 95:21	236:6 236:10	82:8 83:3
104:20 108:7	236:17 236:19	83:20 86:4
110:11 111:19	237:10 238:3	87:1 94:16
114:20 120:23	238:23 239:16	105:10 108:5
121:5 122:18	241:4 246:20	108:10 109:14
123:14 124:3	250:20 254:13	111:25 112:14
124:6 131:22	258:21 260:7	112:22 118:8
132:6 132:7	267:22 268:24	118:10 121:17
132:11 138:6	269:1 269:1	124:24 125:19
138:9 141:4	269:1 272:20	128:9 131:25
142:13 148:2	272:24 280:2	133:4 135:18
150:6 151:13	280:13 280:16	137:25 147:19
157:15 158:8	280:22 282:2	147:24 152:22
158:18 159:18	284:20 285:2	153:8 153:10
162:7 166:9	285:3 285:5	153:11 157:25
167:11 169:14	285:23 286:3	158:3 158:3
169:16 169:19	288:4 289:5	159:5 159:20
189:1 189:18	292:15 293:13	166:13 183:21
189:21 189:23	293:21 300:24	184:4 184:6
191:6 196:9	306:5 306:18	184:8 190:10
196:12 198:1	308:19 309:9	

190:14 190:25 218:4 218:17 218:17 222:1 222:5 226:14 228:3 228:24 230:8 233:1 233:6 234:13 235:7 235:18 236:9 236:13 237:5 237:17 239:3 239:19 256:15 279:1 279:19 284:4 289:9 291:22 306:25  <b>whatever</b> 20:20 25:24 25:25 51:4 134:24 135:20 151:17 186:18  <b>whereas</b> 44:15 126:10 181:8 285:11 297:14  <b>WHEREUPON</b> 94:1 131:19 217:21 321:21  <b>wherever</b> 78:5  <b>whether</b> 10:23 18:19 33:4 34:15 34:15 34:19 34:20 57:23 62:6 64:9 82:6 102:17 103:7 103:9 111:14 129:15 129:23 186:21 186:25 204:19 213:1 213:17 213:24 243:12 243:25 267:13 303:24 314:10 314:23 315:6 315:7  <b>whichever</b> 59:3 71:4	<b>whining</b> 79:21  <b>white</b> 143:20  <b>whole</b> 21:18 32:22 51:1 55:25 141:18 164:19 207:18 208:7 217:2 239:15  <b>who's</b> 198:3  <b>wide</b> 97:24 175:12 177:8 186:23 304:19  <b>widely</b> 53:17 277:21  <b>wider</b> 65:17  <b>widths</b> 242:22  <b>Wilderness</b> 266:5  <b>willing</b> 200:5  <b>wind</b> 70:16 70:17 70:19 76:21 120:5 123:6 127:16 127:17 127:19 187:17 189:22 200:23 201:13 242:23 243:4 243:6 245:10 245:17 246:8 246:13 246:19 247:5 247:8 247:12 247:16 247:16 247:25 248:9 248:11 248:21 248:24 255:16 255:17 266:14 266:21 268:25 310:12  <b>Windows</b> 273:7 273:11 273:17 274:2 274:7 297:6  <b>winds</b> 245:20 245:21 246:9	247:2 248:3 266:16 267:9 267:11  <b>wings</b> 290:23 290:24 291:6 291:12 311:7  <b>winter</b> 44:13 112:12 258:11 297:23  <b>wire</b> 194:17  <b>wires</b> 194:14 194:15 194:19  <b>wish</b> 128:24  <b>Wolfpack</b> 50:2  <b>Wollongong</b> 298:16 305:8  <b>won</b> 50:3 315:13  <b>wonder</b> 71:6  <b>wonderful</b> 16:1  <b>wondering</b> 79:24 312:3  <b>Wong</b> 124:8  <b>wood</b> 61:16 66:13 199:15  <b>wording</b> 207:17  <b>work</b> 11:2 14:9 15:13 15:24 17:16 17:23 20:18 21:23 24:5 25:12 25:14 28:14 29:4 31:3 36:14 48:23 55:14 55:21 59:18 64:24 68:19 73:8 73:19 73:24 80:15 84:18 86:15 86:24 99:12 99:15 99:19 100:9 101:15 103:16 105:6
--	--	--

105:6 105:25	241:19	54:25 55:11
106:6 108:8	<b>workgroup</b> 13:23	55:12 55:25 56:1
108:9 108:19	14:17 14:25 29:8	59:14 59:16
108:24 109:8	29:10 30:21	71:11 80:11
109:13 110:20	30:23 31:2 31:12	122:20 177:3
117:11 117:18	31:15 34:6 34:13	295:18
117:19 118:2	52:3 57:16	<b>worlds</b> 55:11
133:8 133:9	118:10 132:8	55:13 275:6
134:11 134:13	133:10 133:15	<b>worms</b> 212:19
135:8 135:11	134:18 157:18	<b>worried</b> 63:19
136:7 138:14	<b>workgroups</b>	<b>worry</b> 11:5 11:5
138:16 156:22	29:23 30:16	63:14
156:22 157:3	<b>workhorse</b> 220:20	<b>worse</b> 116:12
157:12 158:6	<b>working</b> 8:12	116:22 252:9
158:7 158:9	9:3 13:16	253:14 255:21
183:23 198:12	21:24 59:8 73:10	271:13
198:13 198:14	76:23 114:21	<b>worst</b> 44:12 252:1
212:8 213:15	126:2 134:11	252:5 253:16
213:24 214:5	138:20 156:6	253:18 254:1
218:10 218:12	158:2 159:20	255:17 256:2
219:8 221:21	165:20 183:21	256:5 256:11
226:14 226:16	183:22 193:2	300:1
226:17 226:20	197:13 200:11	<b>worth</b> 27:14
227:16 228:14	214:2 220:23	28:8 148:1 148:1
230:16 230:19	224:1 229:9	148:1 187:12
231:14 231:15	231:19 243:12	276:7
234:12 234:15	<b>workload</b> 15:20	<b>wrap</b> 58:6 158:4
236:1 238:4	<b>workloads</b> 157:19	<b>wrench</b> 26:13
239:25 240:17	<b>works</b> 120:22	<b>wrestling</b> 306:18
243:13 261:11	130:19 154:25	<b>WRF</b> 236:22 279:23
261:12 273:7	170:11 297:23	281:6 284:14
291:16 291:22	316:9	284:20
294:9 294:22	<b>workshop</b> 13:7	<b>writing</b> 15:24
301:10 311:17	13:9 13:14	296:10
315:22 317:4	22:3 22:9	<b>wrong</b> 71:23
317:9 318:15	107:8 107:23	75:1 76:2 271:11
318:21	108:11 110:8	<b>wrote</b> 105:13
<b>workable</b> 156:20	134:7 138:8	<b>W's</b> 100:17
<b>worked</b> 29:16	157:21 159:5	<b>Wyoming</b> 258:7
29:19 29:25	<b>workshops</b> 12:21	258:11
30:15 31:13	<b>world</b> 25:1	
36:19 80:15 83:3	26:12 27:11	
103:21 130:18	27:11 33:7 39:19	
133:23 134:19		
135:10 187:24		

<hr/> <p style="text-align: center;">X</p> <hr/> <p><b>x-axis</b> 167:20 176:24</p> <hr/> <p style="text-align: center;">Y</p> <hr/> <p><b>yards</b> 61:16</p> <p><b>Yarwood</b> 52:21 294:10</p> <p><b>y-axis</b> 160:24</p> <p><b>Yay</b> 247:11</p> <p><b>year's</b> 187:12 276:7</p> <p><b>yellow</b> 136:18 139:16 150:10 180:15 227:9 239:5</p> <p><b>yellowish</b> 150:9</p> <p><b>yellows</b> 153:1 155:5</p> <p><b>yesterday</b> 3:10 3:12 4:4 5:19 6:5 6:11 6:15 9:20 19:14 19:18 25:5 41:5 43:10 59:12 68:19 70:16 76:22 104:17 105:12 107:24 118:14 123:1 123:15 131:8 228:3 244:19 306:25</p> <p><b>yet</b> 26:5 39:2 45:2 69:1 82:8 205:2 239:16 292:1 296:17 306:15</p> <p><b>yield</b> 190:23</p> <p><b>yielded</b> 58:5</p> <p><b>yielding</b> 267:25</p>	<p><b>York</b> 105:16</p> <p><b>you'll</b> 15:15 87:24 128:24 138:8 140:17 165:14 173:20 178:1 178:9 188:5 209:11 225:23 259:1 262:18 262:18 265:12 265:17 265:20 265:21 266:25 270:16 272:9 300:10 311:6 314:1</p> <p><b>yours</b> 159:3</p> <p><b>yourself</b> 3:20 215:8</p> <p><b>you've</b> 26:5 33:13 37:22 38:6 38:19 38:20 40:3 43:13 49:25 54:3 54:7 69:24 112:9 112:10 115:13 115:14 119:16 149:20 153:15 156:3 164:5 214:4 215:7 238:14 240:11 247:20 258:9 302:12 302:16 306:2 307:8 317:19</p> <hr/> <p style="text-align: center;">Z</p> <hr/> <p><b>zero</b> 54:3 152:13 188:19 235:6 237:19 238:11 241:1 241:2 250:3 250:17 251:15 277:2 283:20 283:23 284:3 289:4 289:9 300:15</p>	<p><b>zeroing</b> 237:8</p> <p><b>zonal</b> 267:6</p> <p><b>zone</b> 153:17</p> <p><b>Zs</b> 130:13</p>
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