Agricultural Modeling Team

January 9, 2026
8:00-11:00AM

Visit the meeting webpage for meeting materials and additional information.

Purpose: To discuss the nutrient application algorithm and next steps for the AMT past February 2026.

Summary of Actions & Decisions

Decision: The AMT approved the December 2025 meeting minutes.
Action: Please submit acres for pasture high and hay high to Jess Rigelman (jrigelman@j7llc.com) by the end of January 2026 if you have not done so already.
Action: Tom Butler will edit the application algorithm presentation to reflect the correct groups for inorganic nitrogen in Phase 6 and will change the mentions of small grains and soybeans to be double cropped land.
Action: Tom Butler, Jess Rigelman, and Joseph Delesantro will investigate state and county specific examples of nitrogen replacement to further understand the implications of a cap on fertilizer at a subsequent meeting. Additional follow up will take place with AMT members to get a sense of high/low manure counties or additional counties of interest in a respective state.
Action: Joseph Delesantro and Robert Sabo will follow-up to discuss the best options for visualization and analysis of Phase 7 inputs/outputs for AMT review.
Action: The AMT generally supported meeting bi-monthly with the option to cancel post-February 2026 to continue their familiarization with source data and eventual review of inputs. An additional calendar invitation will be sent to the group once this meeting frequency has been finalized.

Meeting Minutes

I. Introduction & Announcements

Lead: Tom Butler, EPA; Zach Easton, VT

Zach Easton walked the group through the agenda and asked the AMT to review the December minutes for approval. Tom Butler reminded the group of the ongoing submissions for pasture high

and hay high acres. Please note: an additional meeting has been scheduled for February 27th (08:00-11:00).

Decision:

1. The AMT approved the December 2025 meeting minutes.

Actions:

2. Please submit acres for pasture high and hay high to Jess Rigelman (jrigelman@j7llc.com) by the end of January 2026 if you have not done so already.

II. Nutrient Application Algorithm Discussion

Lead: Tom Butler, EPA

We discussed the current algorithm for applying nutrients in CAST with the intent of informing the group how this process operates. After providing background information, the AMT discussed what would appropriate changes to improve this for Phase 7. This includes such elements as the replacement of organic nutrients with inorganic nutrients. This topic impacts the sources of applied nutrients on Load Sources in conjunction with the impacts of manure treatment and nutrient management.

Actions:

1. Tom Butler will edit the application algorithm presentation to reflect the correct groups for inorganic nitrogen in Phase 6 and will change the mentions of small grains and soybeans to be double cropped land.
2. Tom Butler, Jess Rigelman, and Joseph Delesantro will investigate state and county specific examples of nitrogen replacement to further understand the implications of a cap on fertilizer at a subsequent meeting. Additional follow up will take place with AMT members to get a sense of high/low manure counties or additional counties of interest in a respective state.

Discussion Notes:

James Martin: Small grains and soybeans- I don't remember seeing this on other lists. Am I just forgetting seeing it? I remember small grains and grains.
Tom Butler: They are a slightly different aggregation in terms of what they are. I can bring up Section 3 (terrestrial inputs) of the documentation for the land uses within that one.
Jess Rigelman: Tom, I think small grains and soybeans is actually double cropped land. It is just mislabeled there.
Tom Butler: That's on me. I need to change that there, but that would be the land use associated with it. It is mislabeled. Thank you, James, good catch.
Scott Heidel (in chat): Where does MTT fit into this? Thanks
Tom Butler: That's a great question. That could be in any one of these things like ammonia reduction. It could be in animal waste management. It's not that these would work sequentially. They work in some capacity in conjunction based on what the efficiency is. That would be depending on what the treatment is.

Jess Rigelman: Manure Treatment Technology is basically the same thing as the manure transport BMP, so that's where that would fit in.
Tom Butler: Thanks.

Tom Butler walked the group through an example of the nutrient application process.

Dave Montali: I am just trying to understand this example. The reason that it's greater than 100% is because of the available sales data in this year?
Tom Butler: Yes. It is a combination of the available manure in that county and the sales data for the aggregate state. How that is applied is based on what's grown and how much of it you have. So, in this case, we're just saying there's more than enough manure and fertilizer to meet this crop's application goal.
Dave Montali: Ok.
Tom Butler: Great question. That obviously would vary in each crop in each county. It used to, in Phase 6, have implications because the fertilizer would be across the entire watershed. We have agreed to move that to the state scale, so that's a big difference there. We've also now changed it so that we have new land uses for pasture and hay that have higher applications. So, there's a lot of shifting of things that is happening. We have fertilizer that is available differently than it was before. So, a lot of big changes.
James Martin: So, in this example, we don't know whether there was excess manure in the county or excess fertilizer in the county. Does it matter which one is in excess? Maybe I am forgetting that because we apply manure first and then fertilizer to top it off, the excess is always going to be from fertilizer.
Tom Butler: In this example, it's not necessarily that the manure is the excess, it's that we have the excess from fertilizer. There are rare situations where your manure itself would be 110%. That could happen. It is not frequent. The way we are operating at the county scale is that the whole county would have to be in excess based on the manure, and it's very rare that the county would have more than enough manure to meet all of its crop application goals. So, in this example, that's not necessarily what I am illustrating, but it could happen.
James Martin: If there is more than 100% of nutrient need available from manure, is it still possible that there would be inorganic fertilizer on top of that as well if there is also enough fertilizer to go around?
Tom Butler: Theoretically. That's really based on the curves, though, so it would tailor off the manure, the organic source, and change where things go inorganically. Jess, you probably have a comment on that as well.
Jess Rigelman: No, you got it. The fertilizer is not going to touch that crop unless there is no more crop need in the rest of the entire state for that fertilizer to go.
Tom Butler: Thanks. Awesome clarification. James, was there an additional point to address there? I want to make sure I got it.
James Martin: No, thanks. I think that's good.
Dave Montali: Is it right for me to assume that, for this crop, since it is at 110%, all the fields in this county are at this 110% range or pretty close to it? You can't have one crop with 110% and then other things at 85%, right?

Tom Butler: Yeah, so it would be anything that was in that first group or whatever group. In this case, I'd say, yes, they'd all load pretty high. Jess, maybe you can clarify.
Jess Rigelman: You got it right. It's not everything in the entire county or everything in the entire state. You have those curves, and there are situations where stuff doesn't actually get set off until a certain point.
Dave Montali. Ok, thanks.
Hunter Landis: Can you pull up one of those curves? I thought I understood it, and then the recent comment made me a little confused. When the line turns grey, I was assuming that was supposed to be all three colors hidden under the grey. Is that what's happening, or does the purple stop when it's grey?
Tom Butler: They all go there, and they overlap.
Jess Rigelman: The convergence point is 120%, so just because group one is at 110% doesn't mean group two and group three are anywhere near 110%.

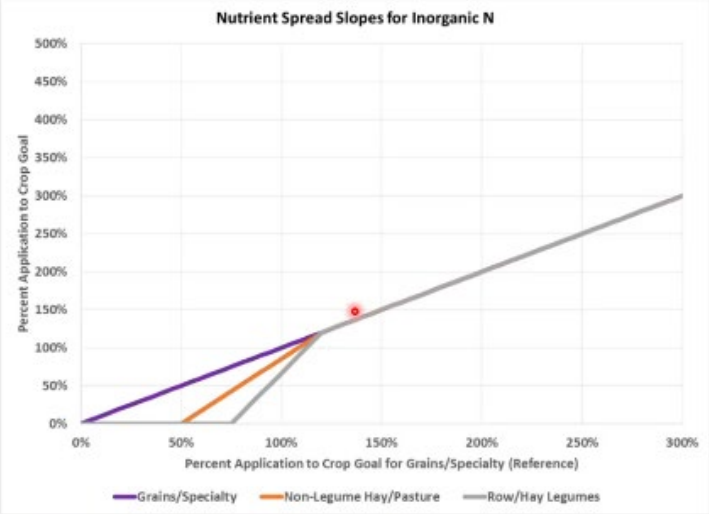

Figure 3-10: Inorganic Nitrogen Application Curves by Crop Group

Tom Butler: For manure, we essentially cut it because I don't suspect there is any way we will have enough manure and fertilizer to ever get crops to 300% with their organic plus the inorganic. So, perhaps I could've tailored this so we didn't look at the extremes.
Hunter Landis: I was wondering if there was a reality where we see 200 or 250 in a certain county anywhere. To clarify, did you say that even if the county has 100% of the crop need in manure, but there's also fertilizer data in that county, that fertilizer can potentially go to a different county in the model if there is a need?
Tom Butler: Within the state. That's a big shift because it used to be that it could go anywhere in the watershed. Now it is tied to the sales data in that state and can only go within that state.
Sarah Xenophon (in chat): For MTT, in some cases I know about, the manure being treated is not being transported out of the watershed, but the manure being applied would have less N and P. How can that be addressed?
Jess Rigelman: That is addressed by the Manure Treatment Technology BMPs. You say where it came from, then it went to the facility, and then you say where that end product is applied. So, the "county from" is where manure came from. The "county to" is where the manure treatment technology product gets applied. Depending on whichever manure treatment technology you choose, or the monitored one, a portion of that nitrogen is reduced in the manure that is treated, and then that lesser value is what goes into "county to". So, that is exactly how our manure treatment technologies work.
Tom Butler: Sarah, did that get to your question before I go to Ken?
Sarah Xenophon: I think that covers it. Thanks.

Ken Staver: At what point do all the acres in a county become grain with manure? What load of manure does that happen at? We don't get to 120% still having corn acres that aren't getting manure, do we?
Tom Butler: The discussion we had was to make the split based on plant available nitrogen. So, we would split those acres and then we would have those acres. From those acres, if it is corn without manure, it can't get manure, and these curves hit it. If it is corn with manure, it gets manure, and then these curves could theoretically hit it. So, it would happen prior to this based on the plant available nitrogen.
Ken Staver: I know we had that discussion, but it seems like there should be a relationship between the percentage of grain with manure and grain without manure in this curve.
Tom Butler: That is how it is done with the organic. You are saying it should happen with inorganic as well?
Ken Staver: No, I'm not saying that. It's not really happening with the inorganic. The more you start putting manure on other crops, say on legume crops, I am wondering what percentage of your grain acres have manure applied when you get to the point where you are starting to put manure on other groups?
Jess Rigelman: At this point in the process, we have the grain with and without manure split. That was done way earlier in the process where we have those acres of one or the other. Then we take grain with manure, and we start applying manure to it according to the curves that were shown. Once we get to fertilizer, if grain with manure has 50% of its crop need met with manure, it's not actually going to start getting fertilizer until everything in group 1, along with grain with manure, is also at 50%. It will then start to get manure. So, we have already defined with and without manure prior to the application process, based on that curve that we did in one of the earlier AMT meetings.
Ken Staver: I'm presuming that there is some relationship between that split and the manure load in the county.
Jess Rigelman: It's based on plant available manure and crop need, and it factors in all of the nutrient management and that sort of stuff. So, it's basically the difference between crop need and plant available manure. I forget all the details of it, but everything that would normally go into crop need and plant available manure is already factored in as far as BMPs.
Ken Staver: My other question is when you put manure on legumes, you are basically substituting manure N for fixation N. So, I guess it actually reduces the N coming into accounting because it reduces fixation, and it's fixed atmospherically. I will save that one for later. That's too much. One thing at a time.
Jess Rigelman: That is accounted for in the N fixation equation. So, the plant available manure and fertilizer that was applied reduces the fixation.
Ken Staver: Right now, we have a pretty high bar. We're applying an awful lot of manure before we put any on legumes. So, I guess my question would be related to places people have experience with. I know in my area, poultry litter gets applied to soybeans, and we're not anywhere near saturation in the county with manure. People just use it for P and K. I guess that makes room for inorganic fertilizer on corn ground, right? You take manure N and you're putting on a legume where there was never going to be any fertilizer N. So, your N rates on your corn aren't as high. These are all established curves, so we aren't going to tinker with them. I guess it

would be a question for folks in counties that have a lot of manure. How much manure gets spread on these acres when we aren't totally overloaded?
James Martin: When group one is at 50% of its need met by manure applied, then you start spreading on full season soybeans and the legume hay. When group 1 gets up to 75%, group two will be at 50%. Then you start spreading on pasture and other hay, which, in our world are the Phase 6 groups. So, we have established how much manure goes on group one before we start applying on group two. If you have less manure available than what's required to meet 50% of your group one crop need, then group two never sees any manure.
Ken Staver: I understand how these curves work. I'm just wondering whether some folks might be looking at their situation with a lot of fertilizer and wondering, well, maybe we are putting manure on legume ground sooner than this. So, I guess that's the heart of this question.
Tom Butler: Good question. I wonder if maybe some other jurisdictions had insight on that. You've named a few practices here that you've seen locally in different areas, and I might rely on other people to tell me what's happening. We are trying to do the average behavior for the whole watershed. The point of the curves is that we are trying to average it out and capture what it would be. So, on average, people might not do that. If that's not the case, I would appreciate someone coming forward with that. We don't have to do it now in front of everyone, but if we got that feedback that could certainly be discussed.
Ken Staver: I think it's probably for down the road. It just sort of jumps out at me when I look at these curves. If we have places awash in fertilizer N, and it seems like we have too much fertilizer N, maybe it's because we aren't satisfying all that crop need. We are using up some manure N on legumes where it's not equivalent to fertilizer N. It's fixation N. So, it doesn't affect our fertilizer bucket at all. It's just, by putting it there, it makes space somewhere else for fertilizer N. So, your rates don't look so high on other acres if you use more manure on legume acres. I understand we have our curves, and we did this before, and it is what it is, but when you get to the end product, you have to look back and say, well, maybe this is something we did earlier that is putting us in a spot where we didn't think we were going to end up. I'm fine with leaving this. I am not going to push on this any further. I know you've got a lot of territory to cover today.
Tom Butler: That's a good perspective. I will highlight that after this presentation we want to talk about direction to go and how we would look at that. Once we finish our current decisions and put our pencils down, run things, and see what it looks like, there are definitely opportunities to look at things and tweak them. So, if that came up in our results or any processed inputs discussion, that might be an avenue that we could do this. I am not trying to dismiss anyone. But, if that was a concern, I think that's an avenue. Dave, you had a comment.
Dave Montali: Looking at this slide, am I reading things right comparing the graphs with the columns? In columns it says group two is full season soybeans and legume hay. I would assume that should be the orange line in the graph. But, the orange line in the graph is labeled non legume/pasture, which kind of looks like group three. Am I missing something here? Or is this material confused?
Tom Butler: It is very potential that I could have confused it. Group one is purple. That's pretty much everything that isn't pasture, hay, or legumes. Let me pull up the documentation. Land use groups for inorganic nitrogen application. Grains and specialty are double cropped, specialty crop low, speciality crop high, other agronomic crops, small grains and grains, silage with manure, and

grain with manure. Those are all in the gratins and speciality, so that's that first curve. Second is non legume hay and pasture. That includes pasture or other hay. So, I think I made a mistake. Row/hay legumes is the third line, and that includes full season soybeans and legume hay. So, that is totally on me.
Ken Staver: You put manure on grass/hay before you put manure on soybeans, don't you? That's what your graph says, doesn't it?
James Martin: That's what the graph said, it's just not what the columns said. I think he's got group two and group three confounded.
Tom Butler: Yes. I mixed them up.
Dave Montali: So, it goes on corn, it goes on other hay, and then it goes on soybeans, and it's 50 and 75 as you go. So, you're not putting all your manure on the row crops. You are not meeting their need before you start these other things. You are starting the other things earlier, like James said. But, the deal is the legumes done get it until last. So, to answer your question, I know that in chicken country, leguminous hay gets applied nutrients not so much. I don't know all the reasons why, but one of the reasons why is it depends on the field that the person who grows the chicken has. So, it is possible, but I don't think there is anything wrong with this curve. We can tweak some for sure, but it is allowing some nutrients to go on leguminous fields all the time until everything is met. So, I don't know if we can get real into tweaking this line for that reason.
James Martin: Is the error just for the presentation we are seeing today, or do we need to go back and make sure the decisions we made are properly documented as it relates to Phase 7?
Tom Butler: I am fairly confident that it's me and it's an error I made in the presentation. I am 96% sure. Thank you, Dave, for helping to correct that and your input there.
Jess Rigelman (in chat): It's only in the presentation. 100% certainty.
Sarah Xenophon (in chat): So for a crop that gets no manure (maybe hay), does it get assigned up to 100% inorganic manure?
Tom Butler: Sarah, if you are talking about no manure, it would be your corn for grain. We have grain with manure and grain without manure. For those cases, it would not get any manure. It would be ineligible for that, and it would be fully inorganic. I think that's the only one, but I would have to double check that.
Sarah Xenophon: Would there be any case where you deploy more than 100% or just up to 100%?
Tom Butler: Theoretically, if you had an excess of the fertilizer, you could.
Sarah Xenophon: Ok.
Scott Heidel (in chat): Could we see an example of this formula in use in a county that has MTT as well as cropland BMPs ? It would be helpful to visualize the process to see it being run. Thanks
Sarah Xenophon (in chat): To Ken's point, there are farmers out there spreading organic manure just to get it out of the barn or out of the storage, and not necessarily for crop need. Though I would agree that a farmer would apply to legumes last. I think it would be ideal to know exactly where the highest levels of inorganic N is being applied, so we could focus our programmatic efforts on reducing those applications where possible (if that data is available).
Tom Butler: Scott, we have maybe an example that's close to what you are asking. I didn't mean to cut you off, Sarah. I didn't see your other comment, if you want to keep going.

Sarah Xenophon: No, that comment is kind of long. To your earlier point, it may be better for a second discussion somewhere.

Crediting Manure Transport

Hunter Landis: Where the nutrients are going over the crop goal in both of those nitrogen columns, is there a cap of how much we would put there? Would it be sucked somewhere else that's keeping it from going too far over the line?

Tom Butler: That's a great question. So, theoretically, if a county had 800% of its nitrogen requirement met by manure and then you said we are going to transport manure, if you didn't have the fertilizer and you just had the crop need you could theoretically backfill to 800%. There is not a cap. That's an extreme example. That's obviously not very real, but there is no cap.

James Martin: I'm trying to think about this in the context of a state, rather than Baywide fertilizer bucket. Essentially, if we left things as they are now, when there was manure treatment applied, additional fertilizer would be applied in that county to the extent that it is available in the statewide bucket following the curves and the distribution across the rest of the state. If you run out of fertilizer, we're not going to invent new fertilizer to make sure that bar comes back up to crop need or right above. The fertilizer would stop when you run out of your pool of fertilizer.

Tom Butler: Yes, that's beautifully said. The point that really builds into is that the problem is not necessarily when we have known fertilizer and known manure. It's that we fixed the percentages. We have fertilizer in Phase 6 though 2020. We run scenarios beyond 2020, and we don't have the known fertilizer. So, in those cases, if we have the actual data, it's pretty tied to that data. When we don't have that data, we tie it to the percentage that was met when we last had data. So, if it was higher than 100% and the yields go up, you are going to keep going up to meet that yield's nitrogen requirement or phosphorous requirement for fertilizer. So, that's very well put, James. The concern then becomes when we don't have the data and things change based on the yield. Then you can have fertilizer that could, theoretically, be invented to meet that crop need. So, from my perspective, it's more of a concern when you don't have the data than when you do have the data. When our data stops for fertilizer, and you move forward with the new yield, this can become something that's less constrained by the actual data because we don't have the data for those years.

James Martin: It seems to me that if we don't have one or the other (yield data or fertilizer data) for a given year, we ought to hold both constant. I know that's not the way we currently do it. We hold the ratio. I think I understand that.

Scott Heidel (in chat): Could we get a visual of that?

Jess Rigelman: The reason we use the fraction of crop need met is partially because CAST is run on any sort of scale. So, we aren't always running the entire watershed. So, we use our fertilizer bucket and our manure bucket to create those fractions of crop need. In this case, it's a state scale fertilizer bucket, so we're distributing that across the state. If you were to only run one county, we don't have a county level fertilizer bucket. Sure we could run it for the whole state, but if you're not applying the appropriate BMPs throughout the rest of the state and you are only running it for your one county, that's going to skew your fertilizer numbers for that county. So, even if we were to hold it constant moving forward, we could see some anomalous results for somebody who is running just one county or one land river segment or one HUC because we still have to spread that statewide fertilizer bucket.

James Martin: When in the process do we assign that state fertilizer to a specific county? We do that in the process, right? At some point we break the state bucket down to how much fertilizer is in each county, but I think we do that now before we have an understanding of any BMPs.
Jess Rigelman: We do all the BMPs. We have everything- we do the crop need, we spread the manure, and then we determine how much remaining crop need is in each county after the manure and the biosolids have gone down. Then we distribute that fertilizer state bucket into the counties within the state. So, that's all pretty far into the process of the scenario.
Alisha Mulkey: Thanks for the review on this, Tom. I think the thing I want to bring up to folks is, looking at this graphic on the one for one distribution in AMS, the thing we have found in Maryland for one of our counties that is particularly out of balance is that even with high levels of nutrient management, that one for one replacement with fertilizer to the manure, you really need to make sure that your precision nutrient management also gets stacked on core nutrient management. Your edge of stream loads are going to increase because that fertilizer is so much more bioavailable. So, that combination of BMPs for management, not just the manure transport, but how you replace that, is maybe a conversation folks want to have. I'm not objecting to keeping the curves. My question is more as we're going to this state bucket and the idea that fertilizer can now move forward in time, what is the ceiling or assurances or proxy for not exceeding crop need if the nutrient management acreage is in place? The bar charts Tom had before where you could give 110% even though crop need was defined by nutrient management. If there were enough nutrients in a county or watershed, it still went and exceeded that 110% example you showed. If a state is being very rigorous about its nutrient management compliance like Maryland and trying to increase those levels, between the application curve and the new fertilizer methods that Joseph helped us introduce, how is that ceiling being reconciled behind the scenes? Maybe that is a Jess question.
Jess Rigelman: We use your core nutrient management acres to create a blended application rate. So, we don't have nutrient management acres and non-nutrient management acres for crop need. We say that if the application rate is 100 with nutrient management and 110 without nutrient management and you submit 50% nutrient management, your application rate is going to be 105. So, we don't have, per se, nutrient management acres. We just use that information to get a blended application rate. So, all of that is subject to the curves, and everything just kind of moves along the curves in the same way in that all of it can go above 100% or all of it can stay at 50%. It just depends on how much manure and fertilizer you have in the county. Does that answer your question?
Alisha Mulkey: It does answer the question. I think I am trying to digest your answer and also think about it in the context of a state fertilizer bucket now. I don't know if that satisfies me in terms of a state creating a WIP and a management plan. The thing I can control for from a BMP is promoting nutrient management. I'm still trying to think if that's going to satisfy where Maryland sits going into a Phase 7/WIP 4 analogy. So, let me keep thinking about it, Jess, and I may take this offline with you. Since it's not decisional today, I won't hold up the conversation.
Jess Rigelman: I can speak to that a little bit, but that's where nutrient management comes into play a little bit. We don't need to belabor this, but if your overall crop need was 110% and now we've moved it to 105%, then obviously we are applying less manure and/or fertilizer. Remember, load isn't the amount of manure and fertilizer. It's the change in the input from what it was over the calibration. So, as your nutrient management increases and your pounds per acre

decrease because of nutrient management, you should see a decrease in load. I'm not saying I don't understand your concern, but that is the thought behind how this was supposed to work.
Alisha Mulkey: Thanks, Jess. I am just digesting if the full benefit of the management strategy is there, but I appreciate your answer.
Jess Rigelman: Understood.
James Martin: I'm going to circle back to the previous answer from Jess that we apply all of the BMPs then we determine how much fertilizer goes to each county. If we do that in the context of this manure treatment technology, we are, in effect, backfilling the manure that's removed from the system with additional fertilizer. So, I wonder if we should explore pulling out those manure treatment technology BMPs. So, wherever there's a county with manure treatment technology reported, we would want to limit fertilizer that goes to that county based on the condition before that manure treatment is applied. So, I don't know if that makes sense, but it seems to me that if that BMP manure treatment is reducing the manure as shown on this graphic right now, even with a state bucket, because we distribute the state bucket to the county based on plant need, after the BMPs we are doing exactly what's shown in this graphic. We are piling up more fertilizer into that county because there's less manure available in that county. If, instead, we figure out how much fertilizer is needed in that county with the manure in place and then if the manure treatment technology is applied and lowers that manure availability, you don't bring in more fertilizer from other places in the state from other counties to bring that county back up to the same level. I wonder if perhaps we're under crediting the benefit of manure transport.
Scott Heidel (in chat): In order to communicate this up my chain of command, I am going to need a visualization of the entire process just described so that things like MTT can be understood and especially to alleviate the concern of TN increases following MTT, which is simply illogical but what you see currently in the model. Thank you
Ken Staver: I think that the point James made is right where there's a surplus, where you are well above crop need because of manure. You have to keep meeting crop need. So, I agree that you shouldn't maintain a surplus with fertilizer, but you certainly should meet the crop need. I think Jess kind of described it that way with how nutrient management is applied. It's like every county has one big corn with manure and corn without manure field. That's sort of how we do this mathematically. So, if you think of it that way, we're still going to meet crop need. So, you shouldn't bring fertilizer in to maintain a surplus above crop need, but you would bring it in to meet crop need.
James Martin: Good point, Ken. So, alternatively or additionally, there would need to be a cap for whatever fertilizer comes back in not to exceed crop need.
Ken Staver: Right, because the reason you're treating it is to get out of that surplus mode.
James Martin: Agreed.
Robert Sabo (in chat): On net, at the state level, MT results in a decline in inputs/surplus?
Alisha Mulkey (in chat): That was the logic @ AMS. The logic was pre-MTT being approved so James brings a good point.
Tom Butler: So, I think that's three people who have independently mentioned the cap. Dave, I will let you go.
Dave Montali: I'm afraid to say this, but couldn't we just trend state fertilizer buckets and yield and kind of just do what we do when we have data? We are trending the land use, right? So, in

2035, we have a different land use than we have in 2025. Why couldn't we just trend the fertilizer sales and yields? Or am I way off base?
Tom Butler: So, project the fertilizer along with whatever we have with yield?
Jess Rigelman: We actually don't project yields. Yields stay constant from the last year we have them, and the choice not to project fertilizer buckets was a choice of the Ag Modeling Subcommittee. Obviously, you are a different group and could make a different decision. I guess I don't really understand why they made that decision, but that was the decision they made. So, we could either hold it constant or project it, but that would be your choice.
Tom Butler: Obviously, that's a partnership decision. So, if we decided to project the fertilizer, that is certainly something that is within our purview to do here. We do likely have reduced latency of fertilizer with the new state information. I think we are around a five or six year delay with the previous AAPFCO only data. So, that is probably less of a concern. I don't know if Denise is on the call today, but in previous discussions I've heard people who talked about the variability of fertilizer and that we're looking at the trend. We're smoothing it. But, that might not be reflected if we projected a trend. If we caught a bad year or a bad three years at the end and we projected based off that, that might not be representative. So, that was just a concern I heard. I'm not going to try and influence anyone either way, but I might call on a data person here if we have one to talk to that variability and if they think that might be a more realistic way than holding the proportion that we have.
Denise Uzupis: My thoughts would be, yes, the fertilizer data is definitely going to vary, if I am thinking about the question correctly. It varies on a lot of different things (sales price, weather, crops, how much is being sold in a particular county). I am a little concerned about projecting what's happening before to future years. Is that what you were kind of getting at there?
Tom Butler: I think you've got it. Dave brought up the point that we have a proportion of crop need being met, why don't we just project fertilizer, so we have an actual amount? The concern that I heard and was raising the question to you was do we feel that if we projected fertilizer, it would be more accurate? Would it be a reasonable thing to do? I've heard that if we caught a bad several year period then our trend at the end would be potentially inaccurate for what' s happening.
Denise Uzupis: I see what you are saying. I think that's fine, I don't see an issue with that.
Tom Butler: I appreciate your response there. Definitely good insight to have so people can digest. I will look through the chat as I look through hands. Scott is asking for a visual. Scott, we may have to touch base with you offline and try and get that worked out to the best communicable format. Robert is asking "on net, at the state level, MT results in a decline in inputs/surplus?" I would need to look at the specifics on that, so I can't answer that off the top of my head. Maybe Jess could. Then Alisha is saying that James has a good point.
Jess Rigelman: I don't know the answer to that.
Tom Butler: That's fair. We can touch base with you on that, Robert, in a separate discussion.
James Martin: Is plant available nitrogen the same as runoff available nitrogen?
Tom Butler: That's a great question. It's not that it is all runoff available. What I mean by that is when you put down total nitrogen, you are not just losing the non plant available portion is runoff. The plant available portion theoretically could run off, but things act on it, so it generally does not.

Dave Montali: Is that a question regarding the sensitivity of inputs? Like is fertilizer more or less fertilizer lost in relation to manure N?
James Martin: Yeah, that's what I was going for, Dave, and the fact that we use plant available N as the compensation factor for make-up fertilizer. Maybe it shouldn't be based on plant available, but those sensitivities or the runoff availability.
Dave Montali: Isn't our sensitivity for manure N bigger than our sensitivity for fertilizer N?
Tom Butler: Joseph would know that quicker than I would. The manure will runoff less per pound than the fertilizer, but I don't know if that's bigger.
Joseph Delesantro: If we are talking about plant available nitrogen, the sensitivity is higher for fertilizer than for manure. I think, right now, the sensitivity for manure is somewhere like .14-ish and the sensitivity for fertilizer is .19, something like that. So, they're not far off, but fertilizer is more sensitive to runoff export.
Ken Staver: I think the thing you have to keep in this discussion that I didn't see listed in any of your points is that we have this loading factor. So, if you have the same crop yield, and you have the same amount of plant available and applied, the grain without manure acres will have a higher load because of that loading factor, the 1.4. Is that what it is, 1.4 versus 1? If you export a bunch of manure out of a county, you should have less manure acres. So, there should be some acres shifted from that 1.4 category to the 1 category, the way I see it. The worst manure acre we can have for loads is a manure acre that gets one pound of manure and the rest of it is inorganic. If you start putting on more manure and less fertilizer, the lowest loading manure acre will be 100% N supplied by manure and no fertilizer N. But, when you shift from a manure acre to a non-manure acre and it's all met by fertilizer, the load drops. So, that's where we have this disconnect in our modeling. One of the things that should happen is if we move manure out of a county, there should be less grains with manure. So, they should drop from the 1.4 category to the 1 category. I don't know if that's being done or not.
Jess Rigelman: That was not being done in Phase 6. That is now being done in Phase 7 due to that grain split application that was approved months ago. So, that manure transport and all of that is being accounted for. So, that is happening.
Ken Staver: So, you will get benefit for manure transport via that change of acreage categories. It may not look like it the way you see it from the BMP, but there is some reduction happening.
Denise Uzupis (in chat): This may be irrelevant, but is there any factoring of increasing amounts of enhanced efficiency fertilizers being distributed? How would this type of fertilizer affect runoff factor?
Alisha Mulkey (in chat): Denise, MDA would report that under precision NM BMP.
Tom Butler: Based on what Jess said, for everyone else here, we had extensive discussions on loading rate ratios. Those ratios essentially define, based on a reference land use, how loads will come off other land uses. We have one category that loads roughly 40% higher and, theoretically, that could have fertilizer replacing it. So, you would have fertilizer on it, and it would load higher inherently. That happened in Phase 6. In Phase 7, those acres would shift from the potentially higher loading land use to a lower loading land use. It would have a benefit in itself. So, you would have gone from essentially a double negative whammy to changing that. I see Denise has got a question. I don't know, necessarily, about the enhanced fertilizer. I know that, in terms of putting it on, we have all the processes here. I don't know that there's a good breakdown of

enhanced efficiency within the fertilizer itself, because we're working more on the total pounds. I don't know if that's it's own BMP.
Hunter Landis (in chat): Silage w/ manure was the highest LR?
Tom Butler: Hunter, thank you, you've jumped in. I would need to look at the exact table to see which one was the highest. I think the point from Ken was that you would have a shift. So, it would likely be the same for silage with and without.
Jess Rigelman: Silage is not part of the grain curve. That's a 15 to 85% split. I forget which is which, but that is not part of it. It's only grain with or without manure.
Tom Butler: Thank you. Just highlighting that those are high loading land uses. If that's the highest, I would trust you. You've seen that chart as much as I have at this point. Thanks, Jess, for clarifying that there's a different split for those. Denise, I don't necessarily know how that's captured. I can't speak to how that is captured. I don't have an answer for you. Ken, were you good?
Ken Staver: It's unfortunate that it's this complicated because we go from one weed patch back to another. But, these things are all tied together. So, in terms of the total effect, you have to sort of look at the whole thing. So, I guess that's what makes it hard.

Cap
Tom Butler: To circle us back here, I think it's really good to have these discussions, and we're looking at a potential way to address this. I think it's noted as a concern. We have heard about keeping things as simple as we can. There has been mention of a cap not to go into surplus. So, I want to visit that here a little bit. We've heard nutrient management. We've heard a limit of 100%. We've heard potentially trying to break things down off this plant available portion and the effect that that already has. Does anyone here have any input? I know, Hunter, you had kind of brought this up in the question of a cap. Ken and James, you talked about not exceeding 100%. I don't think we have a complete answer today, but we could get discussion going and maybe we could see some examples of what this might look like. Is 100% where people are? Sarah, I know you've got some comments that you made to this at some point. I think you're pretty involved with that. I might go to Hunter to see if you have an opinion, then Sarah and Ken.
Hunter Landis: I think a cap is relevant or necessary. I am kind of debating myself on if it is 100%. Maybe I am thinking about where nutrient management comes in or doesn't come in, but maybe there's a year that fertilizer prices are really low and folks put on 10% extra just for insurance that year. So, it's 110% cap versus 100% of the crop need. Maybe a question for others to debate or input.
Tom Butler: Great question. Sarah, I'd lean on you from Pennsylvania. Maybe you have some perspective on that. I am trying to see who else is on, maybe Alisha. In your experience with looking at this, I know we have that 120% baked into a lot of our curves. Hunter has kind of said maybe 110% from that nutrient management perspective. I think there's the side of it that might be nutrient management won't allow you to go over 100%. From your perspective, what do you think about this insurance fertilizer?
Alisha Mulkey: In Maryland, the bar for nutrient management is going to limit you to that 100%. The plan is going to be written based on what have been documented crop yields and land grant recommendations of that crop need. So, when we are visiting the farm to audit, you are going to be capped at that 100%. So, when the state is reporting compliance to corn nutrient management,

it's based on those audits. So, it would be important for Maryland to be consistent with how our regs are written and how the farmers are bing held to standards and that that's replicated in the model.

Sarah Xenophon: On paper, we do have nutrient management regulations that reference, kind of like Maryland, the Land Grant University recommendations for expected yield. But, in practice, usually farmers are hedging their bets. If I was a farmer, I would hedge my bets. So, often times, they're not putting on less. Often times if they're allowed to put on a certain amount, they're probably inching up towards that amount if they have the manure and are pushing their yields. So, it's kind of a balance. You do have farmers who are trying to reduce inputs just due to costs and that sort of thing. But, I think the majority of farmers hedge their bets when they're considering nutrient application.

Tom Butler: That's very helpful, because I think I'm hearing that there's kind of the planning and the legality side and then there's some room as there are with most things. So, we might want to toe that line. Ken, I'd value your perspective.

Ken Staver: We kind of have this transition from the way we dealt with things before. Now that we've gone to fertilizer sales data, we have what we have. We can keep moving it somewhere else, but sooner or later it has to go somewhere. So, we can't really say because we have nutrient management it can't be this, unless we just say we aren't going to use fertilizer sales data because that data is what it is. We're stuck with it. If everybody does what they would like to do, do we end up using all our nitrogen or are we stuck with this big pile somewhere that everybody says goes no place except we have it based on the sales data. So, that's kind of my question about how we handle this. The animal manure is what it is, too. So, those two buckets are fixed buckets. As we go down to the state level, it's actually fixed for a smaller area. So, it gets harder and harder to move it around as you make the area that's fixed smaller. So, the one bucket that is in play is that legume fixation. So, that's why whether or not we put manure on legumes is important because it does potentially reduce a bucket where those other two buckets can't be reduced, if I understand what we are doing. But, the fixation bucket, depending on how we apply manure, we could have it wrong. We could have it right. If we have it wrong, then we're ending up with a surplus of nitrogen because we're overestimating fixation. Those other buckets- sooner or later, they have to go somewhere.

Robert Sabo (in chat): Arbitrary caps at 100% will complicate accounting.... I like what Ken says that we have the state sales data.

Zach Easton (in chat): Fixed buckets with high uncertainty.

Scott Heidel (in chat): Agree with Ken, but that is why we are pushing MTT to truly reduce nutrients on an industrial scale.

Jess Rigelman: I think we need to make this clear in that we are talking about when we're in scenario mode, not actually in calibration mode. We do have fixed buckets. So, when we're setting up the years 1985 through the calibration 2024, they will be fixed buckets. All of that manure and all of that fertilizer will go down. What we're talking about is in scenario mode in 2025. If for some reason you were at 110% in 2024 then you all of a sudden you have more manure transport, should all of that manure, now that it's newly transported, be replaced with fertilizer? So, when we're talking about these caps, we are only really talking about scenario mode. So, when we have manure and fertilizer data during the calibration and we're not in

scenario mode, we will be emptying those buckets and then using that to set up our fraction of crop need met to use in scenario mode.
Ken Staver: Well, I withdraw most of what I said for that situation. Thanks.
James Martin: I was on the same page with Zach in the chat. He says "fixed buckets with high uncertainty". I agree. Not just is there uncertainty with animal numbers/animal concentrations and, therefore, manure nutrients, there is also uncertainty in fertilizer data. There's also uncertainty in the land use. There's also uncertainty in the crop breakdown (how we distribute those cropland acres to various crops). So, I feel like the uncertainty comes at us from lots of different directions. So, it's difficult to do that.
Tom Butler: Thanks, James, that's good input. Always remembering that the data is certainly uncertain.
Sarah Xenophon: To me, having one variable at the state level (Nitrogen purchases) and then another variable that's at the county scale makes it challenging on the programmatic side. If we know there is way more N being purchased than a county could apply reasonably for the yields they expect, is there any way that we could try to get that data on the same scale? More granular would be better for the program side, if we could get purchases by county. I realize you are going to have farmers who are purchasing in one county who may be applying in others, but you also have farmers generating manure in one county who might be applying in another. Whether we are capturing that perfectly, there's uncertainty everywhere. To me, if we've got certain counties that are glowing red, they're purchasing tons and tons of fertilizer, and we see that they can't possibly manage it properly for the crop yield that we expect in that area, that would be an opportunity for action on the downstream side, once it's been modeled and we're seeing those trends. So, just trying to keep that objective in mind. From my perspective, the model is what it is. There's a lot of uncertainty. There's a lot of assumptions. There has to be. But, to put it to use in action and working with farmers, that's something where I would be interested in seeing more granular data or handling it closer to the ground level.
Tom Butler: I appreciate that, Sarah, and that's really good insight to have. I'm not trying to be dismissive of anything, and I certainly understand that perspective. We have tried to have discussions about whether we should go to county scale with sales or not. The data is more certain at the state scale. There is a lot that isn't reported on the county level that does kind of get aggregated. There are a lot of concerns as to how things might operate with outliers or if the county had one thing when you're the other. The kind of group agreement was that that was not possible on the watershed level with all the different jurisdictions. It's not to say that anyone's doing anything good or bad. Some of the jurisdictions don't have any sales data. So, being able to project that to the county scale was leading to a concern there. So, I absolutely understand your perspective. I am not trying to say we should or we shouldn't. I think that's why we've fallen on what we've fallen on. I think that's kind of, in my mind, a little bit where we are stuck. It would certainly be great if we had finer scale information that all matched. I agree with you on that, though. That is a very good point. I see that Scott had made a comment. He's agreeing with Ken and that's why they're pushing for treatment technology to reduce nutrients. Definitely appreciate that, Scott. With this discussion here, I think we have a recognition that there is effective nutrient management. So, for those scenario modes when we don't have a fixed stock, it's that proportion, perhaps putting in a cap of 100% would be a good idea. Would people be interested in pursuing

that? Maybe we could see an example of what that looked like next month and try and make a decision on it.
Scott Heidel (in chat): Yes.
Robert Sabo: Great discussion so far. The one thing that I think could be illustrative, in addition to that 100% cap analysis is also to just carry this out at the state level just so folks can fully understand. Certain counties might get a lot of fertilizer allocated to it, but at the state level on the net basis, manure transport has an overall benefit for the state's cleanup effort. These are just accounting questions with your assumed nutrient use efficiency across counties. So, if it's straight forward, we could also do similar graphics to which you showed earlier, just at the state level with the effect of manure transport. I also just want to point out to the group that even though the fertilizer increases, if I am interpreting that graphic correctly, that's approaching 100% nutrient use efficiency still for that county that had the increase in fertilizer use. So, there are laugh tests we can do as well. At first, it might seem problematic that the fertilizer increased in a county, but farmers do need to sustain those crops. So, I just wanted to point that out that when I looked at that graphic, that did not raise alarm bells for me.
Dave Montali: With manure transport, it has always been a phosphorous thing, in our state anyways. The big need was because of the chickens and needing to remove phosphorous, and the concept was if you are really focusing on that, the people moving the chicken litter for the sake of phosphorous are not going to put down more phosphorous. It's in the soils. That's not the same as nitrogen, I don't think. The concept of needing nitrogen to grow plants, that's real. Doing things in plant available nitrogen, that's real. So, if there are problem situations in scenario mode where we are blowing it out of the water by replacement, then that is what we should look at in our next example. If there's not too much nitrogen there, then that replacement is kind of real and shouldn't really be a problem. But, like somebody said, we can't see the forest through the trees. There's so many moving parts here. I would benefit from an example of a cap aimed at not making really bad projections in scenario mode.
Tom Butler: Thank you, Dave, I appreciate that. I don't think it's that we are destroying anything. I think it's that this is potentially inaccurate, not wildly inaccurate. I think it's that it's a concern where people use these technologies in scenarios that they're not necessarily seeing the most accurate result. That's not saying we're just destroying it. Perhaps a little inaccurate, but it's not like the end of everything it is just awful. I want to make sure that point was made.
Robert Sabo (in chat): For scenario mode, can a user designate a particular state fertilizer sales target when assessing these MT effects at county and state level, Jess?
Jess Rigelman (in chat): No.
Alisha Mulkey (in chat): Jess, could we provide you a short list of counties to look at this closer? I had forgotten the acreage change for GWM and GOM with MTT
Jess Rigelman (in chat): Sure
Scott Heidel: Thank you very much. To maybe tie some of these points together, Robert gave a really good presentation on Tuesday at the Modeling Workgroup, specifically about trying to use less phosphorous so that we use some of the stored phosphorous within the soils. I think if we look at putting a cap on this, we should take that into account as well. Maybe I'll pass it to Robert to get his thoughts on that.
Robert Sabo: I'll have to think about that a little bit more, but that sounds like a pretty intriguing idea. I'm not exactly sure how that will be implemented.

Scott Heidel: I think your presentation was great, and I really appreciated it. It did show that if you put less phosphorous, there's already stored phosphorous in the soil that we're also trying to reduce. But, if we set the cap at 100%, we're not going to be able to model that if it's being put into practice. So, I just wanted to try and connect those dots with that, too.
Robert Sabo: Especially in some of these more cropland dominated areas, there are nutrient use efficiencies values of 100/130%, so they are actually removing pretty large amounts of phosphorous out of the soils. So, it'd be important to try and capture that dynamic.
Ken Staver: I was thinking about this manure thing and phosphorous. Someone made the comment, and that's really right. The main reason we've been moving manure is for dealing with phosphorous. There's a few places where we have too much nitrogen, but most of the time it's strictly a phosphorous excess that is really holding us back on manure applications. So, at what point do we look at those manure curves and say we can't do that in Maryland? We can never go to those high percentage N applications. You've had manure where you've always had manure, mostly. Sometimes you get new sources, but the counties that have been high have been high for a long time, and they have high soil P levels. In Maryland, you could never come anywhere close to meeting 100% of your crop N need with manure. I know we are talking about scenarios now, but I guess I'm falling back to the fundamentals. We could never go anywhere near 100% of meeting crop N need because of phosphorous restrictions, because those areas have high soil P levels because of historic use of manure to meet crop N. CAST says we've been pulling down phosphorous for the last decade. We're in the negative on our balance sheet for phosphorous. So, that's in the CAST data pretty much watershed wide.
James Martin (in chat): When we set crop need, do we account for the intrinsic nutrient use efficiency of the crops? in other words does the crop need account for the crop not being able to actually using 100% of plant available nutrients?
Alisha Mulkey: I think we are getting a point of where it sounds like you will be bringing some examples. Presumably that would fall back to Jess or Joseph. So, I'm suggesting that maybe states know which handful of counties some of these scenarios will apply. I'm thinking of a Somerset in Maryland versus a Queen Anne's County, where we can look at how this is playing out. Could we pre-define a short list so that, between now and the next meeting, if this needs to be decisional, that the states tell you which counties we want to go deeper on and try and tease out these different elements that are complicating an easy answer?
Tom Butler: I'd appreciate a list. Jess might as well.
James Martin: I think it makes sense to look at it at a couple of high and low manure counties. But, I also think we'll need to look at this at the state scale because with the state fertilizer bucket, we're still allowing fertilizer to shift between counties based on some of these actions. So, you may not see the benefit in the county where you implement the manure treatment technology, but you might see it overall at the state level, which I think is what Robert was getting to in his earlier question, that MTT is ultimately valuable at the state level by overall reducing the available nutrients. State fertilizer bucket is unaffected by it, but the county manure bucket is. So, it can still shift. I'd be worried that if we look just at the counties, we may not see the effect that we're having at the state level.
Robert Sabo (in chat): You communicated it much better, James, thank you!

Alisha Mulkey: I would agree. I want to dig into the details on a couple of counties, but I would want the benefit of the full scenario at the state of how that gets displaced. So, thank you for bringing that back around.
Tom Butler: Thanks, all. That sounds like a potential path to go forward on. For this, we are still looking at that 100%, right? I just wanted to clarify that that's where we stood on the cap for this test.
James Martin: I have a hard time wrapping my head around this acreage change piece between grain with manure and without manure resulting from MTT and how that's going to change everything. I didn't realize we made manure treatment technology a land use change BMP, but that's kind of what it sounds like, if we are changing acres. I'm really confused about how that piece fits with everything else. What are you applying the 100% cap to?
Jess Rigelman: Any BMP that effects the amount of manure available is in a land use change BMP in Phase 7, James. So, nutrient management core is a land use change. It's not directly a land use change, but that's the result of your grain splits. At the beginning, in the pre-BMP land use, you have all of your acres in grain with manure and then we go through the grain split process, and we split those into grain with and without manure. So, the 100% split would be once we get into spreading the fertilizer using the fraction of crop need in scenario mode, if the past crop need met was 110%, we would limit that to 100% based on the amount of manure transport that happened.
Alisha Mulkey (in chat): MTT or MT?
Jess Rigelman: To respond to Alisha's question here, manure transport and manure treatment technologies are exactly the same thing. We're transporting manure out of a county and putting it in a county. It can be in the same county for manure treatment technologies. The only difference is that it reduces the amount of nitrogen in the end product. Whereas, with manure transport, we move the same amount of manure nitrogen from one county to another from manure treatment technologies. We remove a larger amount from the county from, and a smaller amount goes into the county too. I didn't mean to conflate the two. James, did you want to respond to what I had said?
James Martin: So, the 100% cap would only be in effect in counties where there is manure treatment technology from, right?
Jess Rigelman: It would be manure treatment technology and/or manure transport.
James Martin: Ok, and the 100% would apply to all of the crops in that county?
Jess Rigelman: I don't think it would necessarily apply to all. I guess it could be up to 100%. We would have to figure out how much manure was transported versus how much we were going to make up with fertilizer to replace that manure transport. So, I think 100% would be the absolute limit that we could replace it. I think I need to better define this, and I can't do it on the fly.
James Martin: That's exactly where I am, too, Jess. Thanks.
Tom Butler: So, maybe we are in agreement that there should be a scenario. Perhaps we take the details of that, work that out, run the scenario, and then we get the data out with those details, so that we can kind of articulate what they are after we see how the interactions occur, and then that becomes what we talk about potentially for that decision in early February, if people are amenable to that.
Ken Staver: Quick question. When we're talking about this cap, are we talking about N or P?
Tom Butler: N.

Ken Staver: Ok, that's what I thought. The P just follows along, basically. It's kind of like a tag along. At least in Maryland, and Alisha knows this better than I do, but I think when you participate in any cost share, reward, transport, it has to be P based. It's a P based nutrient management requirement, not to throw a monkey wrench in the pile of monkey wrenches.
Clint Gill (in chat): In DE as well.
Alisha Mulkey: It's based on your soil FIV, both the exporter and importer have to provide that documentation to the department to make sure that we're controlling for soil phosphorous.
Ken Staver: So, most of the folks exporting have a high FIV and most of the people importing have a low FIV, right?
Alisha Mulkey: Can't be higher than 100 FIV for your receiving operation. The 150 FIV is the trigger to run the PNT.
Dave Montali: In my simple mind, I think P is not a problem. Through whatever mechanisms we're using when we manure transport P out, we're not replacing it in scenario mode.
Tom Butler: Yeah, it's dealt with differently.
Dave Montali: Yes, I know, but the main concept is that we're not really replacing it.
Tom Butler: It would be based off of the last known year. So, you could, theoretically, replace it but you're not going to replace it to over what you have.
Dave Montali: Well, I was trying to say let's not worry about phosphorus.
Scott Heidel (in chat): We have MTT in Berks County. Please use that as the example for PA since Berks only has a small portion in the Bay watershed, so the results should really stand out. I can provide further information for that facility if needed.
Tom Butler: No, that's fine. We won't worry about phosphorous. I am ok with that. Scott says We have MTT in Berks County. Please use that for PA. Ok, we will reach out and try to get everyone's specific counties as well, once we get kind of these specifics. Thank you. We will keep that in mind Scott, and we will probably reach out to you for more.
Robert Sabo: Once again, great discussion. One thing I just want to point out as a bit of a reality check based on farmer survey data from CEAP. What I am curious to find is that they find that farmers that do have manure nutrients available often apply the amount of manure nutrients needed to sustain crops, but then often times put synthetic fertilizers on top of that as well. So, when we are talking about caps and things, I just want to be a little cautious. I think there are some extension opportunities to help farmers better leverage their manure nutrients to cultivate their crops. So, I just want to be cautious about us assuming that the fertilizer that is added back after manure transport has to be capped. That just makes me a little nervous, so I just wanted to point out some of that survey data from USDA CEAP and to go back to accrual farmer practices.
Tom Butler: Thanks, Robert. I might call on Candiss from USDA. Maybe she had some information on some of that or at least a perspective to match up. Not saying anything about what you said was wrong, Robert, but just wanted to try and get a USDA perspective on some of that.
Alisha Mulkey (in chat): Jessica Rigelman For MD, Queen Anne's, Somerset and Frederick counties please.
Candiss Williams: I'm not sure if that was the original report or the national report. But, yes, that was what reported, at least for the national perspective. I would say, for the Chesapeake Bay region in the last CEAP, we weren't able to do a basic specific report like we were able to do in CEAP one because there wasn't enough data or enough participants within the Chesapeake Bay to be able to produce a report.

Jess Rigelman: Alisha Mulkey, we'll need to talk. There are so many other questions that need to be answered. And it will be a while. We are not set up to run scenario mode in P7 so that is going to take me some time.
Alisha Mulkey (in chat): Understood.
Tom Butler: Thanks. That's good information to have because that might be relevant on the national scale, Robert, as you said. But then recognizing that there could be wiggle room and that maybe we could fill some of that with information from people on this call who might have that knowledge. So, definitely want to take that into account. Yes, national information, but also what people have here. Thank you, both, Robert and Candiss. Just following in the chat, we have some discussion that we will need to have offline for some of those counties potentially. So, it sounds like we're going to do something, and we will have to have conversations offline to kind of hash out the specifics of it, but that will be looking at a nitrogen-based cap in scenario mode to examine how this impacts the state scale, but then also relevant counties. The details we can hash out afterwards, once we get there. Are people feeling good about this? It looks fairly quiet, so then that's kind of the direction that we're going to head. I will give this topic a rest and we have another topic that I'd like to at least touch on, and we can certainly come back to this as we have time.

III. AMT after February

Lead: Tom Butler, EPA

We discussed how the group should proceed after our February 2026 deadline for making consensus decisions. This included outlining the tentative plan for meeting and the necessary topics to be discussed as Phase 7 is being constructed. Relevant topics included:

- Planned meeting frequency
- Input data trend visualizations
- Plan to review Phase 7 outputs

Actions:

1. Joseph Delesantro and Robert Sabo will follow up to discuss the best options for visualization and analysis of Phase 7 inputs/outputs for AMT review.
2. The AMT generally supported meeting bi-monthly with the option to cancel post-February 2026 to continue their familiarization with source data and eventual review of inputs. An additional calendar invitation will be sent to the group once this meeting frequency has been finalized.

Discussion Notes:

Alisha Mulkey: For the benefit of the group and to your prior thought about the results after calibration, Tom, remind us of that availability and schedule or if that's a Dave question to the Modeling Workgroup.
Tom Butler: Dave probably knows better than I do. Joseph as well. I don't know.
Joseph Delesantro: Sorry, what was the question?
Tom Butler: When will we see results after calibration?

Dave Montali: Well, I tried to ask that question, and I got a wishy-washy answer. I understand it, too, there's a lot of work to be done. I guess it boiled down to maybe we will have one opportunity between now and the end of the year to look at a first beta and make some changes prior to December 31st. That's as detailed as I know about right now.
Joseph Delesantro: I think that's as detailed as I would be comfortable providing. If everything goes perfectly, we might have a beta in October. But, we want to do our own reviews on that as well and, ultimately, I'd have to look to my boss, Lew, to provide the final answer to that question.
Tom Butler: Thank you, both. Sorry, Alisha, we don't have the best answer. There's an answer. There may still be things we want to look at from the input side, but that's, I think, the best work we're going to get for now. Did you have a follow up?
Alisha Mulkey: It seems that's the answer available, so I will take it.
James Martin: I think what I heard there was don't plan on seeing any outputs until beginning of 2027, but maybe you'll get a peak at an early beta before then. My comments are that I think the group should continue meeting. Whether it needs to be monthly or not I think will depend on when input data is available for the group to review, and we ought to review each of the inputs as they become available, to the extent we can. So, as soon as the land use and land use to load source breakdown is ready for review, we should review that. In terms of all of the things that we might want to review, going back to Tom's point that some have been through it and some have not, I think you could look back at those Tableau graphics and visualizations that were available last cycle, and that would be a good indicator of the types of things that we should look at, at a minimum. There may be others that are new that we want to add, but that's a good place to start. The other comment I wanted to add was with the not making decisions part. If we see something on the input side of the house that is completely out of whack, I don't understand why we wouldn't want to make a decision, and we can track it back to why it is out of whack. I don't know why we wouldn't want to make a decision to change that before folks run through the entirety of a calibration, but that's just my perspective. I can understand both sides of it. The calibration has to move forward with the decisions that have been made. But, if you see something in reviewing the inputs that is clearly going to be a problem on the output side or is clearly not representative of what we wanted from our decisions, the sooner we correct that problem, the faster the whole thing gets done. So, those are my thoughts.
Alisha Mulkey (in chat): to be clear, I understand this is dynamic process so appreciate Dave and Joseph's work.
Scott Heidel (in chat): Any chance AMT could be merged into the quarterly Modeling WG meetings?
Jess Rigelman: Inputs will be available starting in the summer, but it's not going to be one of those things where it's kind of piece meal either. I am going to have it ready or not. But, inputs should be available May/June is my thinking and timeline. So, those can be reviewed earlier, and I have shared those Tableaus with Tom and others. So, we are working on at least using those as a basis for moving forward for the Phase 7 review.
Tom Butler: Thanks, Jess, and I certainly appreciate you sending those out. That sounds like definitely a good place to start. I will get working on that so we have a base idea from the Tableau side. James, to your point, I absolutely get where you're coming from that if there's something that's going to light a fire, why wouldn't we put it in, change it, or make a decision to

do that? I think that's above my pay grade. We can bring that discussion to places where maybe it would be relevant. That's a good thing to talk about. I see Scott has suggested putting the AMT into the Modeling Workgroup Quarterlies. Scott, we have, at times, been involved in those. I guess we will be done, so we could do a wrap up presentation at the next one. I'm not exactly sure what month that is. Maybe it's closer to June.
Dave Montali: We have our quarterly the first week of April and the first week of July. But, there have been lines of demarcations. The AMT is part of the GIT and the inputs, and it's kind of separate. So, the MWG doesn't necessarily influence the input decisions of the AMT. Like you said, Tom, there is a lot of interaction between the input side and the work we are doing. So, if there is something that is good informationally to be presented, sure, we could do that. But the idea that the AMT merges with Modeling Workgroup doesn't sound right to me.
Tom Butler: I appreciate that, Dave. Scott, did you have a follow-up on that?
Scott Heidel: That makes a lot of sense. I guess my concern is, following the restructuring, the one overarching goal was to reduce the amount of time and effort we had to put in across these many different workgroups that are very related in my opinion. If it is time to sunset this, I am all about trying to reduce the amount of Workgroups that I am on. So, to keep it somewhat relevant, to give us an opportunity to continue to look at this, to me, it makes a lot of sense to merge it into the Modeling Workgroup.
Tom Butler: I appreciate that, and I may have set this up poorly in that we will come back in full swing once there are outputs. Everyone here will come back. I mean, whoever comes back will come back. But, the idea is that everyone in this group will come back once we have the outputs, because we will have understood what we did, and we will know how to look at what we've done and what might be off. So, the idea has always been that the group will come back. It was more of how to deal with the interim of that period. So, if I framed that incorrectly, that's on me, but I wanted to highlight that.
Scott Heidel (in chat): That was a bit of soul crushing news on a Friday.
Alisha Mulkey: My question was a circle back on the input question and to make sure I am clear both on James' comment and then your response, Tom. So, for example, one of the inputs is defining by animal and by month how much time they are on pasture confinement or in that riparian corridor. We had to set that for Phase 6. We have not revisited those in this group. So, I consider that an input. Are you saying that we could use the coming months to look at those, but would not necessarily be able to change it if folks thought those needed to be reset for a particular situation?
Tom Butler: How things have been described to me is that we have to lock things in at some point so that Jess, Joseph, and the modelers can work and, in order to calibrate things, they have to have a stable set of inputs. So, it's not to say that it couldn't ever change, but it's also to say that we are not, as it has been described to me, able to make those changes for things like that.
Alisha Mulkey: Thanks, and I am not suggesting that those are wrong. I am just using those as a real example of an input. So, thank you for that understanding.
Jess Rigelman: Just so we are clear, when I talk about inputs, I talk about inputs to the watershed model, meaning the process data after I process all that. I consider what you talk about, Alisha, as source data. So, that is just inputs and we can spit that out, time permitting, at any time. What I am talking about is kind of the manure and the fertilizer, the uptake, and the cover, and all that stuff that goes into the calibration of the model.

Alisha Mulkey: But, in this example, the defining of how much time an animal is in confinement versus pasture directly translates into the manure bucket for a county. So, that would affect what you're calling an input.
Jess Rigelman: Yeah, I am not saying it doesn't affect it. I am just saying I consider those to be source data and, in general, they're available and for the most part haven't changed that much since Phase 6. Those can be shared now since they're not dynamic or change per scenario.
James Martin: That makes me think that there's a potential for kind of a three-tiered review. We start with those source data like Alisha was referring to, particularly those that hadn't already been dealt with or looked at it in any way that are still out there and carrying forward from Phase 6. We should at least lay eyes on them and try to think through how they will be affected by the other decisions we've made. Then comes the review of the resulting inputs based on those source data, then a review of the outputs. When I raised my hand, it was during the time where we were talking about what the future of this group was imagined to be and/or will be. Just to remind everybody, it seems to me that that entire landscape is still moving a bit under our feet. As far as I know, there's still uncertainty as to whether there will be an ag workgroup. So, it's hard to say there would absolutely be an AMT. But, in any event, this review of sources, inputs, and outputs is still going to need to happen whether it happens in this group or whether it happens individually by each of the jurisdictional and other representatives that are on this group. That's the question really that is before us. That we don't have the answer to, of course.
Tom Butler: Yeah, that's well put, and I have not brought up with anyone in this group the structure and shifting because I never thought that it would be super relevant. But, as you've hinted at, I have faith in knowing that it is probably the same people in this group and, if it is as the group, that's great. If it's individually, that's probably the same people who are here just in their own desks. But, I appreciate that perspective. Very good to have.
Dave Montali: I raised my hand when Alisha was giving her example, and the first thing that popped into my head was that was a state decision. I've re-reviewed what we did in Phase 6 for our state. But, I guess what I was thinking was if you wanted to look at those fractions and tweak them in some way, you could probably look at that independently by working with the partnership, right? Am I correct in that the way that would go if you wanted to tweak those numbers for Maryland is that you could just do it?
Jess Rigelman: I think the answer is, yes, within reason. So, yes, it needs to be somewhat reasonable, and there needs to be justification for it. State data can be reviewed and done at any time.
Alisha Mulkey: Dave, the only thing I will add is that when we did them the first time as states, where there were counties adjoining state lines, we revisited some of those together to make sure there wasn't a lot of disparity at that state line boundary. Different conversations, but I appreciate your comment.
Dave Montali: That was what I did in my re-review is I look kind of in the highlands of Maryland or Virginia. So, "within reason" was a good part of Jess' response to that. About what this group does, to me, it seems like we ought to be on an every two month [meeting frequency] at least until midsummer until we potentially have some output to look at. But, it would be that two month [meeting frequency] with an ability to cancel. If we don't have things to talk about, then we don't meet, but certainly not monthly after February.

James Martin: I hear you on the state elective source data, Dave. I do think there is value in looking at the results of those state decisions collectively. If one states' data is way out of whack with the others, we want to be able to explain that and be able to explain it in a way other than just, well, that's the data Virginia gave us. So, I do think there is some value in collectively looking at where those state decisions have landed as it relates to the sources.
Dave Montali: Ok, that's fair enough. My mind focused exactly on her example, and I kind of did that. So, it's pretty constant across all the states about the time in different places. But, this may apply to other issues, I guess is what I am saying.
James Martin: I think with the shift to the state fertilizer buckets, some of the impact of those individual state level decisions is less on the other states. But, from a model credibility perspective, I think there's value.
Jess Rigelman: That's kind of what I meant by "within reason", meaning they can't be wildly different than the other states, even if there is justification. Granted, they could, but then at that point, we would have to bring them to the partnership for discussion. So, I think changing something from .5 to .55 is not a big deal, but changing something from 5 to 25 might be a big deal depending on the situation. So, that's kind of what I meant by within reason. If it doesn't fit with the rest of the partnership, then we are going to have to have a larger review.
Robert Sabo: One thing I was thinking, looking at the steps you have on the slide in terms of finding the cause of the issue would be intensive, understanding trends, etc., I am just wondering when Jess has input/output data available if repeating the Chesapeake Bay Nutrient Inventory exercise we did a couple of years ago in terms of calculating the input time series, crop uptake, removal time series, surplus NUE, it could be a nice integrated concise analysis so everyone can look at everything on the same page. If there are issues, then we can dig deeper and say this fertilizer for this county seems off, can we diagnose the problem? So, I just wanted to pitch that to the group. You can imagine a 5-10 page report with some good summary graphics and tables so everyone can get a firm understanding of how have all the decisions made over the last year or two impacted the agricultural sector in terms of the inputs that are going to be powering the Bay Model.
Joseph Delesantro: That's pretty similar to my understanding of what Olivia did last time around looking at her Tableau figures. So, yeah, I am going to follow up with you, Robert, after the meeting, so you can take a look at those and maybe we can talk about where we might sort of merge those two overlapping ideas.
Robert Sabo: That would be fantastic. Of course Tableau is awesome. There could be graphics overload. So, offering some interpretation and highlighting major things could be powerful for the group. So, that would be a great conversation, Joseph. Thank you.
Clint Gill (in chat): The tableau tools were a great way to help review data last time around
Ken Staver: Going from our old watershed wide bucket to the state bucket, everything really changed. I am thinking about the CESR report and that 2009 to 2021 trend and how it was Bay-wide. Now all of the sudden, it's very different state by state. So, I don't know if that kind of review Robert's talking about has ever been done since we changed our approach. So, it seems like there's a lot of stuff that has been floating around and everybody's going back to the same data and they look like different analyses, but when you dig into them, there's all kinds of stuff out there that has used the CAST data and were using the old watershed wide bucket CAST data as opposed to where we are now. So, something like that now might be pretty helpful.

Robert Sabo (in chat): Should be straight forward to replication CB Inventory/CESR stuff with code we have once data is available.
Lisa Duriancik (in chat): I agree Robert's analysis would be very helpful.
Tom Butler: I think that offline discussion will be good to have, and we can figure that one out as we go forward. Thank you for that offer, Robert, and we will make sure we have an idea on how we want to move forward with that. So, we have a couple ways to potentially move forward. It sounds like Tableau is at least the basis for this, and we might have some additional analysis as well or a hybrid of things. So, all good stuff to plan for. So, I am getting the idea that we want to at least meet bi-monthly with the option to cancel things, and we will be able to look at some of what is classified here as source data in that three tier review process and be able to take a look at that until we get some of the inputs, which I understand will be later in the year around the summer time, before we kind of roll into the outputs, at which point we will likely go more to the monthly basis depending on what we see. If people are ok with how that sounds, I think that's a really good path forward. I do see Dave's hand is up, so I will let him talk.
Dave Montali: Out of curiosity, do we realistically have anything to do with broilers in February? Are we going to have something? My understanding is that we were going to try to get new information to characterize the nutrient per animal kind of stuff. But, there's only 45 days left to the end of February practically. Are we going to be able to even look at anything?
Tom Butler: That's a really good question. We are going to be having a meeting with some folks who are related to this project in the next week or so, and I think from there we will have a much better idea. I am not putting anyone on the spot, and I am not making any commitments for that. The plan is that we will. Plans do change, things come up, things happen. As of now, we are still attempting to do that. I think there is still a chance. I wouldn't put percentages on it, but I think that there is a realistic chance that there is something that could come out of that. So, we do plan on putting that forward in the early part of February.
Dave Montali: Ok, thanks.
Tom Butler: If not, you will be made aware. That's not to say we can't touch it ever, but maybe it just floats to a different time. In which case, we still have the things we are talking about now.

IV. Wrap-Up

Lead: Zach Easton, VT

V. Adjourn

Next Meeting:

AMT Meeting: Friday, February 13th from 8:00 - 11:00 am.

Attendees:

Zach Easton, VT
Tom Butler, EPA
Caroline Kleis, CRC
Emily Dekar, USC
Brooke Walls, DDA
Dave Montali, Tetra Tech
Tyler Trostle, PA DEP
Tim Larson, VA DCR
A.K. Leight, MDA
Arianna Johns, VA DEQ

Karl Blankenship, Bay Journal
Hunter Landis, VA DCR
Alisha Mulkey, MDA
Krista Crone, PA DEP
Curtis Dell, USDA ARS
Scott Heidel, PA DEP
Jess Rigelman, J7 LLC/CBPO
Denise Uzupis, PDA
Auston Smith, EPA
Clint Gill, DDA
Seth Mullins, VA DCR
James Martin, VA DCR
John Lancaster, PA DEP
Alex Soroka, USGS
Tad Williams, VA DCR
Sarah Xenophon, PA SCC
Cassie Davis, NYS DEC
Lisa Duriancik, USDA NRCS
Ken Staver, UMD/Wye
Patrick Thompson, Energy Works
Joseph Delesantro, ORISE/CBPO
Candiss Williams, USDA NRCS
Eric Hughes, EPA
Robert Sabo, EPA