Virginia Coastal Resilience Technical Advisory (TAC)
RDI Subcommittee

Subject	TAC Resource Data & Innovation (RDI) Subcommittee Meeting -Q2	**Date**	08/22/23
Chair	Evan Branosky, Virginia Department of Environmental Quality (DEQ)	**Time – START/ADJOURN**	1:00pm/3:00pm
Location	Virginia Department of Environmental Quality 3rd Floor Conference Room 111 E Broad St, Richmond, VA	**Scribe**	Sarah Jackson, VCU CPP

Name	**Title, Organization**	**Attended?**
Evan Branosky, Chair [Dave Davis]	Chief Stormwater Policy Advisor [Manager of the Office of Wetlands and Stream Protection] Virginia Department of Environmental Quality (DEQ)	Y [Y]
Michael Fitch	Acting Director Virginia Transportation Research Council (VTRC)	Y
Norm Goulet [Rebecca Murphy]	Director of NVRC's Environment and Resiliency Planning [Coastal Zone Program Manager] Northern Virginia Regional Commission (NVRC)	 [V]
Jamie Green [Randy Owen] [Rachael Peabody] [Zach Widgeon]	Commissioner [Chief of Habitat Management] [Director of Coastal Policy, Restoration and Resilience] [Public Information Officer] Virginia Marine Resources Commission (VMRC)	 [V]
Dr. Troy Hartley	Director Virginia Sea Grant (Sea Grant)	Y
Whitney Katchmark [Ben McFarlane]	Principal Water Resources Engineer [Senior Regional Planner] Hampton Roads Planning District Commission (HRPDC)	 [Y]
Dr. Mark Luckenbach	Associate Dean for Research and Advisory Services Virginia Institute of Marine Science (VIMS)	Y
Karen McGlathery	Director of the Environmental Institute University of Virginia (UVA)	N
Mary-Carson Stiff	Executive Director [Policy Director] Wetlands Watch	V
Dr. Robert Weiss [Dr. Wendy Stout]	Director of the Center for Coastal Studies [Coastal Resilience Extension Specialist, CRES] Virginia Tech (VT)	 [Y]

Dr. Jessica Whitehead [Carol Considine]	Director of the Institute for Coastal Adaptation and Resilience [Director of Applied Projects, CCrFR] Old Dominion University (ODU)	V

TAC Staff		
Name	**Title (Organization Abbreviation)**	**Attended? V = Virtual**
Matt Dalon	Resilience Program Manager, Virginia Department of Conservation and Recreation (DCR)	Y
Carolyn Heaps-Pecaro	Resilience Program Coordination, Virginia Department of Conservation and Recreation (DCR)	Y
Andrew Smith	Assistant Deputy Director, DCR	Y
Sarah Jackson	Center for Public Policy (VCU)	Y
Wheeler Wood	Center for Public Policy (VCU)	Y

Scheduled Speakers	
Name	**Title, Organization**
Matt Dalon	Resilience Program Manager, DCR
Seth Lawler	Consultant, Dewberry

Reference Links	
Item	**Link**
Meeting Agenda	https://www.dcr.virginia.gov/crmp/meeting/document/20230822-tac-rdi-subcommittee-agenda.pdf
Meeting Handouts/Presentation Slides	https://www.dcr.virginia.gov/crmp/meeting/document/20230822-rdi-presentation.pdf
Video Recording of the Meeting	[To be provided in final minutes]

Agenda Item	Minutes
1. Call to Order, Roll Call, Introductions	Dave Davis (DEQ) called the meeting to order at 1:05pm. He welcomed the attendees to the meeting on behalf of the Chair Evan Branosky who joined later in the meeting. Mr. Davis asked the attendees to introduce themselves and note the organization that they represent.
2. Adoption of Meeting Agenda	Matt Dalon (DCR) noted that the first order of business is to adopt the meeting agenda. After the agenda was presented a second motion was made and seconded to approve the meeting agenda.
3. New Business	Matt Dalon (DCR) clarified DCR's roles as staff support to the TAC Subcommittee. He noted that all FOIA requests regarding either TAC or the TAC RDI Subcommittee can be directed to Michael Fletcher, FOIA Officer for DCR. Direct requests should be emailed to Mr. Fletcher (Michael.Fletcher@dcr.virginia.gov) and include DCR Support Staff, Carolyn Heaps-Pecaro and Matt Dalon. Mr. Dalon then presented an overview of the Coastal Resilience Master Plan Phase II that included the plan timeline, deliverables, and key components. He stated that, in alignment with code requirements, Phase II will focus on updating coastal hazard exposure model, impact assessment, and building an inventory of projects. Phase II will not include project prioritization. The Flood Protection Master Plan (FRMP) update will happen concurrently in 2024 with the statewide plan process continuing into the end of 2025. Outreach and engagement will occur throughout the plan's development to help guide content and direction of the deliverables. The following items were noted during the presentation: ● Virginia Coastal Master Plan (CRMP) Phase II is due no later than December 2024. ● Phase II will result in an updated Coastal Resilience Web Explorer with updated flood hazards, impacts, projects, as well as a pdf document that will include an updated impact assessment coming from the Flood Hazard Exposure Model. Other key components include Flood Hazard Risk Assessment, Planned Resilience Actions, quantification of financial need for flood resilience, and any recommendations put forth by the TAC Subcommittees. ● The TAC Research and Data Innovation (RDI) Subcommittee's primary objectives for CRMP Phase II is development of the Flood Hazard Exposure Model and Data Display (CRWE Update). The Plan Development Timeline on slide 6 shows all TAC Subcommittee objectives and their respective timeframes for completion. ● DCR is currently working with Dewberry on the Pluvial Flood Hazard model – results from the pilot study will be discussed during today's meeting. The

fluvial flood exposure data will be made available for the coastal and statewide plan

The following items of "New Business" were brought before the group:

a. Subcommittee Role and Objectives (Matt Dalon, DCR)

Mr. Dalon said the meeting schedule must be in alignment with the delivery of CRMP Phase II. He added that all objectives can be revisited as needed and are open to discussion among this subcommittee. The following items were noted during the presentation:

The TAC RDI Subcommittee has been tasked with the following:

- Informing development of the Flood Exposure Model that will identify where flooding is likely to occur in the future as well as provide compound flooding joint probability analysis advice.
- Informing the inputs to the Flood Hazard Risk Assessment that will help us understand flood exposure and how to best utilize data
- Developing Recommendations for future planning and how to improve the process to achieve better resilience.

Mr. Dalon asked for any changes or suggested revisions to the TAC RDI Subcommittee objectives. No changes were offered.

The group raised the following:

- Dr. Troy Hartley (Sea Gant) asked how considering innovations for future nature-based solutions fits into exposure modeling and other science needs of the subcommittee. Mr. Dalon replied that this can be added to agenda topics and the subcommittee can bring in presenters to help identify potential opportunities. This subcommittee is not just focused on flood hazard only but all research, data, and innovation. While the primary effort is flood hazard, this does not limit the subcommittee work.

b. Subcommittee Advisors (Matt Dalon, DCR)

Mr. Dalon informed members that the TAC Chair, Secretary of Natural and Historic Resources and Chief Resilience Officer Travis Voyles and Alternate Chair Director Matt Wells of DCR can appoint advisors to subcommittees based on recommendations of the subcommittee chairs. He encouraged members to make recommendations to the TAC Chair on subject matter experts who could participate in discussions and meetings as a member of the public body but not serve as a voting member. While DCR is not precluded from consulting individuals informally outside of the TAC Membership, this subcommittee must decide whether an appointed advisor on resilience data is needed.

The information presented raised the following questions:

- Dr. Mark Luckenbach (VIMS) asked if he could bring a modeler from the VIMS team to meetings to provide information that is outside of his expertise but beneficial to the subcommittee. Mr. Dalon said he did not know the public body procedures, but that he will look into whether they could join depending on meeting topics.
- Mary-Carson Stiff (Wetlands Watch) stated that inviting experts to participate in the meeting would be helpful. She suggested that if meeting topics are known in advance, the subcommittee could create a cohort to advise on a specific issue rather than go through the advisory designation. Mr. Dalon agreed that this would be valuable and said he will look into the procedures to see what is possible.
- Ben McFarlane (HRPDC) asked whether there was a third-party review of Dewberry's work. Dalon said that Dewberry has a subcontractor conducting a third-party review of the modeling and that results of that review reports will be uploaded to the dashboard so they are available in a public forum.

Mr. Dalon announced that any additional recommendations can be sent to the TAC RDI Subcommittee Chair, Evan Branoksy (DEQ), to be shared with the TAC Chair.

c. CRMP Pluvial Modeling Pilot Study Review (Seth Lawler, Dewberry)

Seth Lawler (Dewberry) presented an overview of the Pluvial Modeling Pilot Study that included the development process, results, and products. A discussion of the climate scenario approach and selection followed the presentation. The key points highlighted in the presentation are as follows:

- There are 439 HUC-12's in study area that are (on average) 40 square miles. Because the HUC-12's are too large to do one single storm, they were broken into smaller basins less than 10 square miles. DCR selected 57 Pilot Models relative basins throughout the study area to represent a combination of different types of regions such as swamp, tidal, rural, urban, and other selective areas. The goal of this pilot study is to learn what changes need to be made before running all 439 HUC-12 models.
- The study used the same terrain that was used for the CRMP Phase I but Dewberry did not want to overlook new terrain. Therefore, they are looking at drainage into watersheds. The study scenarios used 2hr, 6hr, and 12hr duration at years consistent with coastal data. For future conditions, MARISA scenarios were used.
- For the development process, rain was dropped on HUC-12s to see the raw rough response of the watershed. Engineers cut this process into smaller models considering various community factors.
- For Quality Assurance purposes, a model reviewer was created that allowed modelers and reviewers to look at models in the same space and discuss. A

	reviewer looked at every model. When running a single HUC-12, the modeler downloaded the model and then carved it into smaller models that were reviewed by an engineer. This was the review process for partitioning of models. Once approved, the model was run locally and then reviewed again. Once any recommended changes are resolved, three test scenarios were run. A reviewer looked at results from those tests and once approved, ran full models. ● A sensitivity analysis was conducted that looked at each duration to determine the appropriate simulation times and develop necessary parameters. Transportation layers were examined to ensure the right balance of default and to make the process consistent using normal domains and depth. ● The main result is the model itself—a floodplain along with the information used to develop that floodplain which allows you to make changes. ● Depth grids were developed for each simulation. These look at whether we do straight intervals or exact frequency base estimates. One example is that a sensitivity analysis of a single event respective to a future scenario did not show much difference in results. A key result is that bigger increments are needed to see changes in floodplain response for most of the model settings. ● For depth thresholds, one decision point for the subcommittee is to what degree do we map relative to modeling. Flood polygons where every cell gets wet generates lots of data that is difficult to use. Duration grids allow us to know how long the road was overtopped, for wetlands duration and agricultural reasons, and how long it takes for water to recede. These data are difficult to use. While we could extract duration data, exporting for all events will not produce useful data. ● These results could be used to help model incoming storms as modelers can compute new scenarios, change topo or use different land use dataset to look at new developments or changes in geometry of the model. ● One limitation is that discharge frequency of rivers is not shown in these models because they are direct fluvial models. But as this would be a joint event, you could also use the linkage of two models to run fluvial events on their own. ● For anticipated use cases, most of what was done with the CRMP can now be done with pluvial models. The challenge is how to appropriately size these. One example use case in Frederick County, Maryland that could use head grass to compare with the model. This is a good alignment of major areas of concern. ● Limitations of the models in the pilot study include stormwater conveyance, as most communities are unaware of pipes. For mapping of outfalls, we dropped water on the surface and examined spread not including spillover into drains

- Fluvial reaches were cited as another limitation. Dewberry is considering drawing a line along fluvial reaches to determine what should not be included in pluvial modeling. Linking models can create continuous simulation producing quality pluvial results for storm events. While fluvial miles are not used for planning, they do perform well.

The group discussed the presentation and raised the following questions:

- Dr. Mark Luckenbach (VIMS) shared concern about the creation of sub-HUC12 basins and whether underlying data are good enough in terms of topography. He asked what is the level of confidence with the way these are being subdivided. Mr. Lawler replied that they are following an approach developed using USGS methods.
- Matt Dalon (DCR) noted that if you have a subbasin with no ridge point, you could be losing some water in that section. He asked whether the models accounted for this. Mr. Lawler replied that they overlap them, pulling over an additional 500 feet and then take the greater of the two. Dewberry developed Standard Operating Procedures for this study but would invite further discussion and input from the TAC RDI Subcommittee.
- Ben McFarlane (HRPDC) asked for guidance on next steps. More specifically, he asked if improvements to the data are needed, what improvements would be most useful. He stated that Hampton Roads could use guidance on where the state should invest in modeling needs, which vary by region.
- Mary-Carson Stiff (Wetlands Watch) asked whether the customization option of these models is for the end user, once phase II is completed, or is it just intended to show TAC members what is possible to complete for Phase II. Mr. Lawler replied that the end-user would have the model and be able to customize it to their use.
- Matt Dalon (DCR) informed the group that all models will be available for download to the public.
- Stu Geiger (Dewberry) added that a Dewberry subcontractor will develop a user guide for end users to show what types of models are possible.
- Matt Dalon (DCR) noted that customizing the outputs and determining what outputs are needed for planning purposes are decisions that can be made at a later date. At this point in CRMP Phase II, this subcommittee needs to determine what changes should be made from the pilot study so Pluvial Modeling can be run across all coastal planning districts.
- Dr. Jess Whitehead (ICAR) asked about the plan for soliciting a representative set of end users to tailor this development. She noted that, while TAC members are important, they do not represent users at the locality level. Mr. Dalon replied that this needs to be included as part of the CRMP Phase II outreach and engagement strategy.

- Dr. Troy Hartley (Sea Grant) asked whether there is a benefit to providing guidance on how these models can come together so end users know how they can be used for planning.
- Ben McFarlane (HRPDC) replied that there is a benefit as the areas where rainfall matters most is where infrastructure has to be incorporated. Mr. Lawler acknowledged that, while addressing uncertainty requires a huge effort, this model will help Dewberry prioritize what areas need additional studies.
- Matt Dalon (DCR) shared that they have received comments on Land Use Cover Data Sensitivity that uses the Atlas 14 approach. He announced that DCR is planning to look at this sensitivity and will report if there are dramatic differences between VBMP imager, 30-meter NLCD, and one-meter VSLCD. DCR will send results out once ready to this subcommittee.
- Dr. Mark Lukenbach (VIMS) asked for clarification as to whether there was as much sensitivity in range and depth when looking at wet versus non-wet. Mr. Lawler replied yes, and that this is an example of a drive product that could be useful to determine what area is most important.
- Evan Branosky (DEQ) asked whether, with an interval approach, equal weight would be given and that this could lead to concern about range under a 24-hour duration scenario. Mr. Lawler confirmed that they are not applying weights other than to assign frequency.

The conversation moved towards a discussion on the benefits and disadvantages of a Climate Scenarios approach to modeling. Matt Dalon (DCR) said that the forthcoming NOAA Atlas 14/15 updates raised questions about shelf-life of data, and that DCR will need to cross-walk each subbasin for a return interval. Because this does not represent the full range of conditions, only the median value, this approach is consistent but limited. Mr. Dalon asked the TAC RDI Subcommittee to make a recommendation on whether to pursue a Climate Scenarios or intensity approach via intervals.

This question generated the following comments and discussion:

- Ben McFarlane (HRPDC) shared that the selected approach depends on the intended uses of these models. For this use, the Climate Scenarios were recommended as it provides a building block for compound flood modeling that will be used during joint analysis, matching with that end goal.
- Seth Lawler (Dewberry) added that Atlas 14 may lead to over precision. While frequency based statistical models are preferred, running different scenarios is affordable and could produce a better range of events, leading to better shelf-life of data.
- Evan Branosky (DEQ) shared a concern over intensity with the intervals approach and whether moving ahead of NOAA Atlas 14/15 development was a good idea. He mentioned that at the state-level, DEQ is involved in the Atlas 14/15 process and moving beyond this may make Virginia

	inconsistent with what other states are doing. Mr. Lawler replied that this only happens if we go over the Atlas scale, which could happen at 500-year frequency. But using an interval approach could lead to more meaningful use of the Atlas 14/15 and it is possible to qualify that we are within 90% confidence interval. ● Dr. Jess Whitehead (ICAR) said that the MARISA guidance is to not pull median range but pull representative intervals around the median. She recommended this subcommittee consult with Atlas 14/15. She also suggested contacting Celso Ferriera with George Mason University, MARISA affiliate and Ken Kunkel of NOAA. She said that she understands concerns around precision which is why climate scientists say don't just pull the median. She likes that the Climate Scenario approach provides some boundaries. d. FEMA Fluvial Flood Hazard Data (Matt Dalon, DCR) Mr. Dalon shared that Fluvial Maps are being updated regionally and can be expected at the end of April 2024. He added that new datasets will be released but do not meet the coastal or statewide plan goals. However, these data show what we have already but the multifrequency fluvial data still has gaps. For this reason, Mr. Dalon asked the group to consider whether DCR should utilize third-party vendors for data as a stop gap before receiving updated federal data.
4. Subcommittee Members Discussion	**The following discussion occurred regarding the potential use of third-party products:** ● There was some concern among the subcommittee members about third-party products due to issues recently raised by climatologists within the Northeast Regional Climate Center. It was asked whether there would be legal risks if decisions are made based on third-party data that is later called into question. ● It was asked how the state would pay for these products. Mr. Dalon said that it can be more expensive to develop data, leading the state to consider leasing data that someone else has produced to be more informed. As the data input is the same, DCR would use products that have output. ● Texas was cited as an example of a state that has used third-party products as a stop gap while they develop their own baseline data. ● It was asked whether third-party vendors would be selling data that is confirmed to be used or is in the incoming “free” data. Mr. Dalon said that the procurement is needed, and details of a use agreement are needed to share data and combined products with others. Mr. Dalon noted that FEMA utilized third-party vendors for Risk Rating 2.0 data. He suggested it

	would be helpful to hear from the Texas team about their prioritization and selection process in soliciting third-party products. ● State universities were cited as good options and resources for data as their procurement process can be more simplified than the state's process. It was mentioned that DEQ has strong contacts with Virginia Tech. It was determined that additional discussion is needed on the topic of purchasing third-party products.
4. Action Items, Scheduling	Action Items: ● Learn from Texas contacts about experience with third-party products for data. ● Continue to discuss the climate scenario versus interval approach. Matt Dalon (DCR) closed the meeting by announcing that DCR is working on scheduling TAC Quarter 4 subcommittee meetings in mid-December. A survey will be sent out to members to help align schedules. Meeting location is likely to change, as the next meeting could be virtual pending TAC procedures approval. Next TAC Quarterly Meeting is September 19th, from 1-4pm at the Patrick Henry Building in Richmond, VA.
5. Public Comment	No public comment was offered.
6. Adjourn	The meeting was adjourned at 3:05pm.

Voting Records

A motion was made to adopt the meeting agenda. A second motion was made and all members voted in favor to adopt the agenda.

The purpose of these minutes is to record and preserve, to the best of our ability, the major contributors and general topics covered during this meeting. Verbatim transcription is not the intent of this document. If you have any questions, please contact flood.resilience@dcr.virginia.gov

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