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The Honorable Spencer Wetmore  
South Carolina House District 115  
E-mail: [spencer@spencerwetmore.com](mailto:spencer@spencerwetmore.com)  
Tel: (843) 693-8292

Dear Representative Wetmore,

It was a great honor to speak with you on Thursday, October 1. I am writing to you in order to summarize my concerns and recommendations regarding the AECOM drainage study entitled “Technical Memorandum Subject: Evaluations and Recommendations for Central Park Project Area.” I am listing my concerns and recommendations in order of priority (A = highest priority):

**A. The 42” stormwater outfall pipe at EME Apartments needs to be unsealed.**

According to the AECOM drainage study, “Improvements at the most downstream end of the watershed are considered highest priority. These include improving the flow capacity of the conveyance system upstream and to the [east] of Riley Road, adding a flow-variable (“muted”) check valve to the culverts under Riley Road, and replacing circular culverts with box culverts. These improvements increase the capacity of the stormwater conveyance system and will reduce flooding in the upstream areas of the watershed. The entire Central Park watershed drains through the Priority 1 improvement features. Improvements in upstream areas of the watershed will not be effective if the stormwater assets in the downstream reaches of the watershed are deficient. Priority 1 improvements to a large extent replicate and are in accordance with recommendations in the 1984 Master Plan.”

Upstream and to the east of Riley Road is the drainage box at EME Apartments. The drainage box is drained by two stormwater outfall pipes with diameters 42” and 48”. The 42” outfall pipe is currently sealed with rocks and needs to be unsealed.

The following sequence of events has occurred this year:

- 1) On April 26, Jimmy Maczyk (former Charleston police officer and retired firefighter) discovered the 42” pipe open at the upstream end and covered with rocks at the downstream end.
- 2) On April 28, Matt Fountain, Director of the Department of Stormwater Management, said that it was irrelevant whether that particular 42” stormwater pipe was or was not blocked. According to Matt Fountain, “We did have AECOM evaluate upsizing or reconstructing this pipe [the blocked 42” pipe] in our current model to determine if it has



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any benefit on reducing flooding. The drainage model shows that there are a number of upstream constrictions that also need to be improved before upsizing this pipe would reduce flooding in the area. For example, the pipes under Central Park Road are a 42” pipe and a 36” pipe, and between Central Park and this drainage box are another pair of 42” pipes, all of which already have less capacity than this downstream 48” pipe.”

- 3) On September 17, I sent a memo to Matt Fountain pointing out that two parallel pipes with diameters 42” and 36” have a combined flow capacity greater than a single 48” pipe. On that basis, the restriction is at the drainage box at EME Apartments, not farther upstream.
- 4) After I sent the first memo, Jimmy Mazcyk sent me videos showing that the drainage box at EME Apartments was fed not only by a 42” pipe and a 36” pipe from the north (under Central Park Road), but also by a 36” pipe from the east and an 18” pipe from the south.
- 5) On September 27, I sent a follow-up memo to Matt Fountain pointing out that four pipes with diameters 18”, 36”, 36” and 42” have the combined flow capacity of a 60” pipe. On that basis, it is even more true that the restriction is at the drainage box at EME Apartments, not farther upstream. In fact, if the sealed 42” pipe were unsealed, the combined 42” and 48” outfall pipes would have the same flow capacity as a single 60” pipe, so that the flow rates into and out of the drainage box would be equal.
- 6) On September 30, Matt Fountain told Sen. Sandy Senn that it would cost \$150,000 to unseal the pipe.
- 7) On October 1, Matt Fountain informed a virtual neighborhood meeting on the AECOM drainage study that it would cost \$250,000 to unseal the pipe.

I have the following concerns regarding the preceding sequence of events:

- 1) I do not understand why removing the rocks that block a pipe would cost \$250,000. I do not understand why this could not be done by two or three city workers with jackhammers or a backhoe.
- 2) I am concerned about the accuracy of the AECOM stormwater model if it cannot predict that, for example, two 42” pipes flowing in parallel have a greater flow capacity than a single 48” pipe.
- 3) I am concerned about the thoroughness of the fieldwork in the AECOM drainage study if it was unable to discover that a 42” outfall pipe was sealed with rocks.

In summary, the unsealing of the 42” outfall pipe is an obvious low-cost improvement that is needed whether or not the Central Park development is permitted.



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**B. The AECOM stormwater model needs a plan for quantitative verification.**

It was mentioned above that there are concerns regarding the thoroughness of the fieldwork that went into the development of the AECOM stormwater model. In fact, it can always be asked whether fieldwork was sufficiently thorough.

The solution is that a stormwater model must be verified (also called validated). This means that a previous precipitation event is used as input to the model and is used to make back-predictions that can be compared with observations. Examples of observations could be water levels or flow rates in drainage channels or pipes, watermarks on buildings, or records of the durations and depths of flooding on particular streets. If there is no match between back-predictions and observations, then all of the model inputs (elevation data, configurations of ponds, channels and pipes, etc.) must be re-considered. More typically, there is an imperfect match between back-predictions and observations. In that case, the model is then calibrated, meaning that the components of the stormwater model that were not observed are adjusted (for example, by changing a pipe diameter) until the match between back-predictions and observations is optimized. Many municipal stormwater departments engage in a continuous process of model verification and calibration as new observations become available.

The AECOM drainage study acknowledged that no quantitative model verification and calibration were possible because there were no quantitative observations for comparison with model back-predictions. According to the study, “All models must be calibrated and validated [verified] to ascertain that they represent the observed/measured data. No measured flow or stage data exists in the Central Park Study Area. Therefore, no model calibration for specific rain events was performed.”

However, the AECOM drainage study did carry out some degree of qualitative verification. According to the AECOM study, “However, for the purpose of this study, model validation was performed by comparing model results to anecdotal information obtained through the various sources listed below:

- Flooding complaints from City Portal Website/GIS Database
- General complaints provided at Public Meetings
- Photos/Videos of flooding locations within the watershed provided by residents living within the watershed

Results from the model shows flooding locations matched well with the flooding complaints.”

My concern is that the AECOM drainage study does not recommend any plan for developing a dataset of quantitative observations. Without such a plan, the City of Charleston will be in a permanent state of not knowing whether they are working with an adequate stormwater model.



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My recommendation is to install gages in key locations in channels or pipes to monitor the water level. The key locations would be downstream from the intended improvements. I could help the Department of Stormwater Management with this or they could probably get all the help they need from the U.S. Geological Survey South Atlantic Water Science Center:

<https://www.usgs.gov/centers/sa-water>

The last I heard is that, if the City of Charleston and the U.S. Geological Survey could establish a mutual interest in monitoring a particular channel, the USGS will construct and maintain a stream gaging station if the City of Charleston covered 50% of the cost.

**C. Before stormwater improvements are implemented, there needs to be plan for evaluating the outcomes of those improvements.**

Although the AECOM drainage study recommends drainage improvements, there is no plan for evaluating whether the improvements have reduced flooding. On that basis, the residents and City of Charleston could be in a future situation in which millions of dollars have been spent, but there is no agreement as to whether flooding has or has not been reduced.

My recommendation is to install gages in key locations in channels that will monitor whether, and under what circumstances, the channels overtop their banks. These could be the same locations and gages that could be used for stormwater model verification. As above, I could help with this or the U.S. Geological Survey office could certainly help.

I am concerned about the possibility of a permanent state in which models are verified or improvements are evaluated based upon resident complaints, as was done in the AECOM study. Residents can give up on complaining, which could give an incorrect picture that flooding had reduced. Or there could be a campaign to promote resident complaints (meaning that the same flooding could occur but with more complaints), which could give an incorrect picture that flooding had increased.

**D. There needs to be a version of the AECOM stormwater model that does not include the Central Park development.**

In its current state, the AECOM stormwater model includes the existence of the proposed Central Park development. According to the AECOM study, “Three areas of potential development were identified in the Central Park watershed. They were Central Park Cluster, Fleming Cluster (also known as Marlborough), and the Brisbane Cluster. Out of these three areas, Fleming Cluster has already been fully developed, while Central Park Cluster and Brisbane cluster have been permitted and are about to be developed. All three developments are included in the existing



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conditions model... The CNs [Curve Numbers] were developed for existing conditions apart from the three developments (Central Park Cluster, Fleming Cluster (also known as Marlboro), and the Brisbane Cluster) based on existing soil group and land use category. CNs for those three developments were considered based on the reports and drawings as provided... Three areas of existing and expected development were identified in the Central Park watershed. They are Central Park Cluster, Fleming Cluster (also known as Marlboro), and the Brisbane Cluster. All three areas are modeled in their fully developed condition.”

The AECOM study does not clarify whether the stormwater model would be worthless if the Central Park development were not approved or if it would be constructed in a way that would be different from the development plans that were provided to AECOM. In particular, the AECOM report does not clarify what asset the City of Charleston now has that is called the “AECOM stormwater model.” In other words, it is not clear whether the Department of Stormwater Management would have the ability to replace the Central Park development in the model with the current configuration of forest and wetlands.

Without the ability to create a version of the AECOM stormwater model that does not include the Central Park development, there are many questions that cannot be answered. First, the AECOM stormwater model cannot be used to evaluate the proposed Central Park development in terms of comparing stormwater flow with and without the Central Park development. Second, it is not clear which of the drainage improvements recommended by the study would still be valid if the site of the Central Park development stayed as wetlands. Having said that, I should note that it is very unlikely that Priority #1 (Improvement of James Island Creek Upstream of Riley Road) of the AECOM drainage study would change even if the site of the Central Park development were to be left as forest and wetlands.

It is most important that a stormwater model that has the proposed Central Park development already embedded in it makes it impossible to envision a future without the Central Park development.

For example, Sen. Sandy Senn has asked me the following question three times: There are two neighborhoods for which the drainage needs to be fixed. These neighborhoods should naturally drain into the wetlands that are the site of the proposed Central Park development. How will this happen?

Certainly, the plans for the proposed Central Park development do not include the possibility that the site might receive even more stormwater in the future.

The point is that, if the AECOM stormwater model did not already include the Central Park development, it would be possible to imagine and to model other possible uses for the site.



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The first step would be to ask the Department of Stormwater Management whether they have the ability to modify the AECOM stormwater model so that it does not include the Central Park development.

**E. The City of Charleston needs someone whose job is to engage with residents.**

It is very common for municipalities to have a designated person whose job is to engage with the public on stormwater or other sustainability issues. These people can be a delight to work with because they enjoy working with the public. A notable example for me has been working with the Public Education and Outreach Coordinator for Richmond (Virginia) Stormwater Utility.

I have the greatest respect for the current Director of Stormwater Management for the City of Charleston. I am sure that he is very busy and engaging with the public might not be his most important responsibility. There is also the factor that the City of Charleston is currently involved in a lawsuit with the proponent of the Central Park development. In any event, the current system of sending endless e-mail messages to the Director of Stormwater Management and receiving no response does not seem to be helping anybody.

Please do not hesitate to contact me if I can answer any questions or help in any way.

I have copied Betsy La Force (Communities & Transportation Project Manager, South Carolina Coastal Conservation League) on this memo, since she is my client in Charleston. I have also copied Sara Martinez (Chief Counsel, S.C. Dept. of Health & Environmental Control). Ms. Martinez has been very helpful with communicating with the stormwater staff at SC DHEC.

Best wishes,

Steven H. Emerman

cc: Betsy La Force, Communities & Transportation Project Manager, South Carolina Coastal Conservation League  
Sara Martinez, Chief Counsel, S.C. Dept. of Health & Environmental Control