

## **Attachment I-6: Quarterly Meeting Summaries**

(Meeting enclosures such as handouts and presentations are located on the project website, <http://bit.ly/LowerSusquehannaRiver>)

## **Attachment I-6: Quarterly Meeting Summaries**

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November 29, 2011

**Memorandum for the Record**

**Subject:** Lower Susquehanna River Watershed Assessment (LSRWA) Kick-Off Team Meeting

**Location:** MDE, Montgomery Park Building, Aqua Conference Room

**Date:** November 2, 2011

**Attendees:**

Agency	Name	Email	Phone
USEPA	Gary Shenk	GShenk@chesapeakebay.net	410 267 5745
MDE	Herb Sachs	hsachs@mde.state.md.us	410-537-4499
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MDNR	Shawn Seaman	sseaman@dnr.state.md.us	410-260-8662
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SRBC	Dave Ladd	dladd@srbc.net	717-238-0425x204
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TNC	Kathy Boomer	Kboomer@tnc.org	607-280-3720
TNC	Mark Bryer	mbryer@tnc.org	301-897-8570
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USACE	Bob Blama	Robert.N.Blama@usace.army.mil	410-962-6068
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USACE-ERDC	Steve Scott	Steve.H.Scott@usace.army.mil	601-634-2371
USGS	Mike Langland	langland@usgs.gov	717-730-6953

## Action Items:

- A. Claire will email the team the “Roles and Responsibilities” spreadsheet to get input; compile and send out to team once completed.
- B. Anna will send the LSRWA Team email distribution list to all team members.
- C. Shawn Seaman will contact Michael Helfrich to notify him of quarterly meetings to see if he can attend.
- D. Bruce Michael will have the lead in coordinating with SRBC, MDE, and MGS to set up a website where any products of the assessment can be kept to keep stakeholders informed.
- E. Anna will prepare a brief public involvement plan to layout how the LSRWA will be coordinated with stakeholders and will send out the team for review.
- F. Anna will update PowerPoint slides after each quarterly meeting to be utilized by anyone on the team providing updates to other Chesapeake Bay groups.
- G. Anna will send out an update to via the large email distribution list that started with the original Sediment Task Force (includes academia, general public, federal, non-government organization (NGO), and state and counties representatives) notifying the group of LSRWA kick-off meeting and study start and will periodically update this group as the LSRWA progresses.
- H. Anna will send out revised goals to the team for one final review and team approval.
- I. Steve will coordinate with Bruce to obtain digitized maps of SAV data in the Susquehanna flats area.
- J. Bruce will share results of the suspended sediment sampling taken at Conowingo outfall (taken during high flow events this year) with the team.
- K. Mark and Anna will coordinate to conduct a literature search providing info on best management practices around the nation and world for reservoir sedimentation.
- L. Matt will keep team informed on Innovative re-use committee findings to potentially incorporate ideas/innovative techniques into LSRWA strategies.
- M. Claire will follow up with individual team members to develop a schedule for work to be conducted this year.
- N. Shawn will provide a summary of Exelon study findings.

## Discussion:

1. Opening Remarks Secretary Summers welcomed the group and discussed the impacts of Tropical Storm Lee on the Chesapeake Bay and that this time we had a close call in regards to not seeing the same extreme impacts similar to that of what we saw with Tropical Storm Agnes. He also thanked Herb for his efforts in executing an agreement to initiate this effort. Robert Pace noted that the Chesapeake Bay Community is concerned and energized in regards to managing sediments in the Chesapeake Bay due to the Total Maximum Daily Load (TMDL) process that has been ongoing in the watershed. USACE HQ is very tuned into the LSRWA and there is Assistant Secretary of the Army-level commitment as well due to the Chesapeake Bay executive order. Herb mentioned that there are a lot of efforts going on around the Bay that we can incorporate into the LSRWA such as the hydrologic studies going on below Harrisburg, fractured rock studies, and FERC Conowingo Dam relicensing studies. Study needs to consider NY and PA TMDLs.

2. Finalization of Cost-Sharing Agreement/Study Name Change Claire noted that a legal cost-sharing agreement was executed in September between USACE and MDE. MDE will have sub-agreements with SRBC, TNC, MD DNR, and MGS which are all contributing funds as in-kind services (tasks) to the assessment. The study received \$250K in federal funding which can be used in Fiscal Year (FY) 12 even though it was received in FY11. Claire noted that FY12 funding is still uncertain. If Congress passes a USACE appropriations bill then the project is not expected to get additional funding. However, if USACE is under continuing resolution for the entire year, then additional funding may be forthcoming. The FY13 budget is currently being prepared and will be released in the first week of February. In order to receive more funding in the future, it is imperative that the team make good progress and expend any Federal funds that are received in a timely manner. Bruce noted that the state will be matching the federal funds received this year as in-kind services (25%) in line with the cost-sharing agreement (75 federal/25 non-federal). Claire mentioned that it is acceptable for the state to be spending at a faster or slower rate than the Federal funds are expended, as long as at the end of the assessment the 75-25 cost-sharing is maintained. Claire will be tracking this closely with Herb to ensure that the match does not get inordinately out of balance. .

Anna noted that during the review process of the legal cost-sharing agreement and the project management plan for the study the name of the study changed to the Lower Susquehanna River Watershed Assessment in order to reflect that the study is a more holistic, comprehensive evaluation of sediment management within the lower Susquehanna River watershed.

3. Roles and Responsibilities This is a large team with many agencies involved, conducting activities for the assessment. In order to aid in communication so everyone has a good understanding of the roles and responsibilities of each person/agency, Claire prepared a spreadsheet which will be filled out by all team members. Claire will provide the spreadsheet electronically to the team after the meeting and all team members will provide their role/responsibility; Claire will compile and send out to the whole team.
4. Communication The team agreed to meet on a quarterly basis. Smaller meetings will be coordinated on a more frequent basis as needed depending on the need as tasks are underway for the assessment. Anna will send out the an email distribution list which includes all team members of the entire assessment team so anyone on the team can initiate a meeting outside of the quarterly time frame or communicate questions, concerns, etc.

There was much discussion on public involvement/communicating to stakeholders outside of the team. Since no formal National Environmental Protection Act (NEPA) is being conducted for the LSRWA because no specific (implementation) actions will be recommended; public involvement is more flexible and can be less formal. The consensus was that getting input early and often from all stakeholders was very important to the LSWRA in order to have buy-in and have a good understanding of the public concerns of proposed strategies to manage sediments in the lower Susquehanna River.

However, it is important to have internal meetings as well when results and decisions are not quite ready to be vetted by the public and still need team consensus. Ideas included:

- Coordinating with Michael Helfrich (lower Susquehanna Riverkeeper) to attend quarterly meetings as he is very tuned into public view points on this issue.
- Inviting public/stakeholders to quarterly meetings.
- Setting up public meetings/workshops at appropriate times during the Assessment.
- Coordinating with other Chesapeake Bay groups that meet regularly to be included on the agenda to provide updates and get feedback on the assessment. Depending on the type of meeting, the most appropriate assessment team member (i.e., the assessment team member who is already attending or a part of that particular Chesapeake Bay group, etc.) could provide the update. Herb mentioned presenting to the House Environmental Matters Committee and Dave mentioned presenting updates at the SRBC quarterly meetings. PowerPoint slides will be updated after each assessment quarterly meeting to be utilized by anyone on the team providing updates to another Chesapeake Bay group.
- Utilizing the large email distribution list that started with the original Sediment Task Force (includes academia, general public, federal, NGO and state and counties representatives) that SRBC headed up in 1999 and 2000. Anna has been updating this list since 2009 with people requesting to be updated on this issue.
- Setting up a website where any products (factsheets, meeting summaries, reports, etc) of the Assessment and meeting summaries can be posted. MDNR will look into whether they can do this as an in-kind service. Chris noted that Baltimore District is not well suited to this task due to stringent department of defense security rules with website. John noted that SRBC could potentially take this task on as well.

All of these ideas will be summarized into a brief public involvement plan that will be vetted and refined by the team.

5. Review Assessment Goals The team revisited the goals that were developed for the study early on in the scoping process of the LSRWA in order to refine these goals. The purpose of the goals are to create bounds and focus for the team on what will be accomplished with the LSRWA and to communicate to stakeholders what the LSRWA will accomplish. Below are the goals the team worked up at the meeting which will be finalized after the meeting following one more team review.

1. **Evaluate strategies to manage sediment and associated nutrient delivery to the Chesapeake Bay.**
  - Strategies will incorporate input from Maryland, New York, and Pennsylvania Total Maximum Daily Load Watershed Implementation Plans
  - Strategies will incorporate evaluations of sediment storage capacity at the four hydroelectric dams on the Lower Susquehanna River.
  - Strategies will evaluate types of sediment delivery and associated impacts to Chesapeake Bay
2. **Evaluate strategies to manage sediment and associated nutrients available for transport during high flow storm events; to reduce impacts to the Chesapeake Bay.**
3. **Determine the effects to the Chesapeake Bay from the loss of sediment and nutrient storage from behind the hydroelectric dams on the Lower Susquehanna River.**

6. Conowingo Dam Relicensing Status Shawn provided an update to the group on the Federal Energy Regulatory Commission (FERC) relicensing process that the Conowingo Dam is undergoing as it relates to the LSRWA. The new license is required by 2014. In order to obtain the license, Exelon, the owner and operator of the dam, must undertake a variety of studies as requested by state and federal resource agencies to get an understanding of impacts of the dam. Several of the requested studies deal with sediment transport and accumulation in the dam system which relates to LSWRA efforts. At this time, most of the relicensing studies dealing with sediment transport and accumulation undertaken by Exelon are simply a compilation of existing literature and data. Their study findings were that 400,000 cfs (cubic feet per second) is not the threshold where sediments are scoured from behind the Conowingo Dam and that overall Tropical Storm Agnes did not scour sediments but ended up depositing more sediment behind Conowingo Dam. Mike said that this latter finding is not supported by USGS at this time.

Comments on the studies from the resource agencies are due in the Feb-March 2012 timeframe and in the April-May 2012 time frame; FERC will make a decision if further sediments studies are warranted by Exelon in order to obtain a new license. In order for Conowingo Dam to be relicensed, all study findings must be approved FERC along with USFWS, and MDE must issue a Section 401 water quality certification.

7. New Data (Susquehanna Flats)/Potential Cost Savings Steve noted that upon review of Exelon data and reports for their FERC relicensing process of Conowingo Dam, he found that Exelon had already conducted bathymetric surveys of Conowingo Reservoir after Tropical Storm Lee, so this effort would not need to be conducted under the LSRWA scope. Mike will be reviewing that bathymetric data as it relates to the LSRWA under his scope of work. Steve noted that Exelon has also conducted bathymetry in the flats area below the Conowingo Dam; therefore, with the Exelon survey data and the NOAA depth chart data, conducting bathymetric surveys below the dam in the flats area is no longer required for LSRWA.

In regards to the potential need for a three-dimensional (3D) model Steve noted that a desktop analysis could be performed instead of conducting model runs to get an understanding of 3D effects, resulting in a cost savings of approximately \$20K for the

pertinent LSRWA task. During the 2D/3D study, Steve will also begin building the mesh for the models; this will save time and be a cost savings in the long run.

These adjustments to scope produce approximately \$100K in savings.

8. SRBC Related Efforts John and Andrew updated the group on efforts that SRBC is undertaking that could be integrated with the LSRWA efforts.

- FERC Relicensing activities – SRBC reviewed the Conowingo initial study report - *Sediment Introduction and Transport* and will provide comments to partners in advance of ultimate Feb/Mar 2012 comment deadline.
- Conowingo Pond Management Plan – SRBC conducted a drought exercise, in cooperation with modeling contractor (Hydrologics) and stakeholders (power facilities, water suppliers, resource agencies, etc.), on October 3, 2011 in accordance with annual recommendations in this plan. This near real-time gaming exercise simulates evolving drought conditions and interactive operational scenarios to evaluate low flow management in the Conowingo Pond.
- Susquehanna River Flow Management Project – This effort has several objectives related to the LSRWA including forming a stakeholder group (power facilities, water suppliers, resource agencies, etc.) with interest in flow-related issues in the lower Susquehanna River. In cooperation with a modeling contractor, the project aims to develop an hourly time step component of the existing OASIS hydrologic model for the entire lower 55-mile reach of the Susquehanna (Conowingo Dam to the Three Mile Island intake). Through the stakeholder process, SRBC will use the model to simulate alternatives for balancing environmental flow performance factors with operational constraints to develop flow recommendations for the lower 55-mile reach of the Susquehanna. Recommendations will be used by SRBC, 401 certification agencies, etc. in making recommendations to FERC as part of relicensing process. The project will be initiated once the modeling contractor has been secured.
- Lower Susquehanna River Mainstem Monitoring Project – SRBC is currently designing a pilot monitoring study for the lower mainstem, which will assist with determining locations/methods for establishing an annual monitoring program to be paired with the annual monitoring conducted on the free-flowing portions of the Susquehanna River above Harrisburg (Large Rivers Project). Currently SRBC is considering an approach that assesses the free-flowing portion of the river as it approaches, and transitions into, a pool behind one of the dams with detailed data collection to be conducted in the pool as well. Data to be collected may include water quality (continuous and grab samples), fish/macroinvertebrates, habitat, periphyton/diatoms/algae, etc.



- Susquehanna River Basin Early Warning System – SRBC is upgrading the real-time monitoring stations on the Lower Susquehanna River with a goal of having a new web tool up and running in the first half of 2012.
  - Lower Susquehanna Source Water Protection Partnership – SRBC in coordination with PADEP, are looking to convene a meeting in February 2012, to start building a framework for a sustainable workgroup that covers drinking water issues in the lower Susquehanna region. SRBC and PADEP have held a number of county-level meetings with a range of stakeholders over the past year dealing with local water quality issues of concern related to drinking water (sedimentation is high on the list).
  - TMDL Data Collection and Development – As part of a contract with PADEP, SRBC is collecting data and modeling conditions in a number of watersheds in the lower Susquehanna basin for the development of local waterbody TMDLs (Conestoga, West Conewago, Octoraro, several urban watersheds, etc.). TMDLs cover a range of sources/causes, such as nutrient and sediment impairments from agricultural and urban pollution.
9. Tropical Storm Lee Impacts The team discussed the impacts of Tropical Storm Lee which scoured sediments, and what the impacts would be to the LSRWA scope.

Mike Langland of USGS noted that Tropical Storm Lee scoured approximately 4 to 5 million tons out of Conowingo Dam into the Chesapeake Bay which is approximately 2 years of sediment/nutrient storage capacity. Mike reiterated that Exelon's consultant resurveyed bathymetry after the storm event behind Conowingo Dam. They utilized the same technique that USGS would have utilized and took measurements of velocity as well as refined bathymetry transects. Mike expects to obtain these datasets soon; as part of his scope, he will review these datasets to look for changes in bathymetry compared to the last time the reservoir was surveyed in 2008.

Mike noted in the past, USGS utilized a 1D HEC-6 model to assess sediment deposition and transport in the entire reservoir system including sediments from the watersheds. Mike noted that there were shortcomings to this model. As part of his LSRWA efforts, Mike will construct and calibrate an updated 1D HEC-RAS model that will route inflowing sediment through the reservoirs, accounting for both sediment deposition and erosion in the upper reservoirs. The output of this model will provide boundary conditions for the 2D model simulations that Steve will be conducting as part of his scope in the Conowingo Reservoir.

Gary Shenk will be conducting model runs utilizing the Chesapeake Bay Program's watershed model (CBP WSM), which will take into account watershed loads (same model utilized for TMDLs). He noted that he had concerns about the connections of the models (1D HEC-RAS, 2D, EPA WSM) in that there could be varying sediment rating curves and varying boundary conditions meaning potential differences in sediment loads that these models predict. Communication of this issue will be important in case the two

models (1D HEC-RAS and EPA WSM) have varying results; differences in models will need to be communicated (input data, purposes, methodology, etc.). Steve offered that he could run both boundary conditions (1D HECRAS and EPA WSM) when he conducts his 2D model simulations to see how the Conowingo bed reacts. Gary suggested that the relative difference in sediment load estimated by scenarios from the CBP WSM be applied to the rating curve rather than using two different models of sediment delivery to force the reservoir models.

Mike noted that there is not much data on sediment transported between the four reservoirs (some data was collected in the 1950's). Additional samples may need to be collected during a high-flow event to better understand flow versus particle size.

Bruce noted that there was minimal scouring during the spring 2011 high flow events. However, this was the worst year on record for hypoxia and second highest flow on record. High mortality has been seen in oysters.

Jeff noted that scouring occurred during Tropical Storm Lee from behind the Conowingo dam; these sediments appeared to bypass the upper Bay and accumulated more in the middle Bay. The approach channels to the C&D Canal were scoured according to Philadelphia District, and there did not appear to be significant burial of organisms since sediment was widely dispersed.

Steve noted that he needs some sediment (bottom) samples below the dam in areas where bedrock has sediment buried on top of it, rather than just where bedrock is exposed (bedrock is exposed for quite a ways downstream). Steve asked if submerged aquatic vegetation (SAV) data is available in the Susquehanna flats area which he needs in order to account for SAV impacts when he models sediment transport and deposition in this area. Bruce noted that annual SAV areal flyovers are done every year and digitized; however, due to poor water clarity in the upper Bay, areal flyovers this year have been delayed. Field observations have noted that some SAV beds in the flats area have been ripped along edges; however, overall the beds are still intact. The group discussed that SAV beds are highly dynamic from year to year, so modeling should utilize SAV data appropriate to the time period being modeled.

Carl asked if sediment sampling occurred at the Conowingo Dam that involved size fractionation and chemical analyses (this is a task scoped under the LSRWA that is a supplement to the regular sampling USGS conducts at the Conowingo outfall funded by MDNR). Bruce noted that this sampling occurred during the March-April high flow events, as well as during the Tropical Storm Lee event. Bruce noted that the results of this sampling would be available in 2-3 weeks and that he would share results with the team.

Bob Blama asked if sediment sampling had been done behind Conowingo Dam to determine chemical constituents of sediments. This is important if we are going to be evaluating placement or re-use of these sediments and to communicate to stakeholders. Jeff and Mike explained that sampling was done in 2001 to determine physical/chemical constituents with a finalized report of data available in 2006. The assumption in the

scope for the LSWRA is that this data would be adequate for the level of analyses (broader) that is being undertaken in this effort. Any future detailed investigation of dredging/construction alternatives would probably include bottom sampling.

There was discussion on the literature search task for this study. Mark noted that TNC has been involved with various groups looking at best management practices for dealing with reservoir sedimentation and sediment management around the world. Anna noted that it will be important to review literature compiled from the Sediment Task Force (1999-2000), as well as more recent literature dealing with sediment management practices and incorporate those ideas into the LSRWA; this was a task scoped in the LSRWA and USACE currently has the lead. The consensus was that USACE will still have the lead in preparing a literature search, however, TNC would supplement this task with information they obtain from best management practices around the world.

Matt noted that reaching out to MPA would be good as they head up the innovative re-use committee that looks at innovative dredging method and re-use of dredged material. Since Matt is a committee member, he will keep the LSRWA team informed on this group's findings.

10. Prioritize Tasks and Schedule The team was provided handouts of the study approach, schedule, map, and modeling scenarios that were developed during scoping process. Claire noted that with the limited study funding, it is important to layout what tasks will be accomplished this year and to put dates on these tasks. The consensus was:

Federally funded tasks (totaling \$220K):

- Mike Langland – (1) conduct QA / QC of Exelon 2011 Conowingo Pond survey; (2) build HEC-RAS model; and (3) compile data to support study modeling efforts.
- Carl Cerco – assemble water quality data.
- Steve Scott – (1) conduct 2D / 3D study; (2) initial numerical mesh construction; and (3) 2D AdH data assembly and initial hydrodynamic simulation.
- ERDC team (coordinated by Steve Scott) – conduct SEDflume field data collection and analysis.

Non-Federally funded tasks (no \$ specified):

- Bruce (MDNR) – fund USGS to conduct suspended sampling monitoring at Conowingo Dam.
- Jeff – sediment sampling below Conowingo Dam in flats area.
- Shawn – summary of Exelon findings.

Claire will work with team members individually to schedule out these tasks and provide schedule to entire team for review.

11. Wrap Up The next meeting will be 23 January 2012.

Anna Compton  
Study Manager

February 16, 2012

**Memorandum for the Record**

**Subject:** Lower Susquehanna River Watershed Assessment (LSRWA)  
Quarterly Team Meeting  
**Location:** MDE, Montgomery Park Building, Aqua Conference Room  
**Date:** January 23, 2012

**Attendees:**

Agency	Name	Email	Phone
Bay Journal	Tom Horton	<a href="mailto:swanfull@gmail.com">swanfull@gmail.com</a>	410-726-7282
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MDNR	Bruce Michael	<a href="mailto:bmichael@dnr.state.md.us">bmichael@dnr.state.md.us</a>	410-260-8627
MDNR	Shawn Seaman	<a href="mailto:sseaman@dnr.state.md.us">sseaman@dnr.state.md.us</a>	410-260-8662
MGS	Jeff Halka	<a href="mailto:jhalka@dnr.state.md.us">jhalka@dnr.state.md.us</a>	410-554-5503
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USACE-ERDC	Steve Scott	Steve.H.Scott@usace.army.mil	601-634-2371
USGS	Mike Langland	langland@usgs.gov	717-730-6953

The meeting agenda is provided as an enclosure to this memorandum.

**Action Items:**

- A. Bruce will integrate comments from the team to refine the LSRWA (public) website.
- B. Steve will coordinate with Bruce to obtain digitized maps of SAV data in the Susquehanna flats area.
- C. Bruce will share results of the suspended sediment sampling taken at Conowingo outfall (taken during high flow events this year) with the team. [Update: MDNR provided the data to Carl Cerco]
- D. Anna will update the map in the LSRWA PowerPoint presentation to remove the York Haven Dam.
- E. Bruce will send the LSRWA website link to the team.
- F. Bruce will update the LSRWA website with recommended changes from the team.
- G. The team will send Bruce documents and links that should be posted on the LSRWA website.
- H. The MDE FTP website will be utilized to share internal draft documents within the team; Matt will be the point of contact for this FTP site.
- I. Dave will send a hyperlink to the SRBC publication 239 (the 2006 sediment analysis report) to the team. [Update: Link sent January 24, 2012]
- J. Claire will coordinate monthly conference calls to discuss modeling activities.
- K. Shawn will notify team when most recent Exelon study reports are released.
- L. Claire will work with Mike Langland to execute funding for USGS for LSRWA efforts.

*Ongoing Action Items*

- A. Anna will update PowerPoint slides after each quarterly meeting to be utilized by anyone on the team providing updates to other Chesapeake Bay groups.
- B. Anna will send out an update via the large email distribution list that started with the original Sediment Task Force (includes academia, general public, federal, non-government organization (NGO), and state and counties representatives) notifying the group of updates from the quarterly meeting.
- C. Mark and Anna will coordinate to conduct a literature search providing info on best management practices around the nation and world for reservoir sedimentation.
- D. Matt will keep team informed on Innovative re-use committee findings to potentially incorporate ideas/innovative techniques into LSRWA strategies.

## Discussion:

### 1. Welcome and Opening Remarks:

Herb Sachs welcomed the group. He noted that after the press release (September 2011) announcing that the study has started, feedback has been positive and there has been a lot of interest. The name of the study changed to the Lower Susquehanna River Watershed Assessment in order to communicate more effectively that this study is a more comprehensive evaluation of sediment management within the lower Susquehanna River watershed versus just a Conowingo reservoir sediment study. There have been questions in regard to how this effort, looking at the issue of sedimentation, the dams, and the Chesapeake Bay, will be different this time around. Herb said that his response to this question is that the atmosphere is different this time around because of the ongoing regulatory actions being taken through the total maximum daily load (TMDL) process and all of the other ongoing efforts and investments being made in Chesapeake Bay restoration. More recently there has not been much interest or inquiry in regard to the LSRWA and it is important (for future funding and support of this study's recommendations) that we continue to communicate our efforts to all stakeholders and get feedback.

Herb provided a copy of the latest issue of the *Chesapeake Bay Quarterly* which has two articles discussing sedimentation, the Conowingo Dam, implications to the Chesapeake Bay and the LSRWA effort.

Discussion ensued about the status of federal funding for this study. Claire summarized that we should know if the study received funding for FY12 by mid-February. [**Update:** \$300,000 received in February 2012.] The FY13 budget will be coming out in a few weeks and then we will know if there if there will be funding available for next FY. [**Update:** This project is not in the president's FY13 budget.]

### 2. Review of Action Items from November 2011 Meeting:

The team reviewed action items from the last quarterly meeting:

- A. Claire will email the team the "Roles and Responsibilities" spreadsheet to get input; compile and send out to team once completed.

*Status Complete- Spreadsheet is finalized and can be posted to website.*

- B. Anna will send the LSRWA Team email distribution list to all team members.

*Status Complete.*

- C. Shawn Seaman will contact Michael Helfrich to notify him of quarterly meetings to see if he can attend.

*Status Complete. Michael will be added to the distribution list so he will automatically be invited to future quarterly meetings.*

- D. Bruce Michael will have the lead in coordinating with SRBC, MDE, and MGS to set up a website where any products of the assessment can be kept to keep stakeholders informed.

*Status Ongoing. The website has been set up at the following address: <http://bit.ly/LowerSusquehannaRiver>. See discussion on website in meeting summary below.*

- E. Anna will prepare a brief public involvement plan to layout how the LSRWA will be coordinated with stakeholders and will send out the team for review.

*Status Ongoing. See discussion on public involvement plan in meeting summary below.*

- F. Anna will send out revised goals to the team for one final review and team approval.

*Status Complete. Goals have been finalized and can be posted to website.*

- G. Steve will coordinate with Bruce to obtain digitized maps of SAV data in the Susquehanna flats area.

*Status Ongoing. SAV mapping was not done until November 2011 due to sediment plumes that obstructed visibility from the large storms that occurred earlier in 2011. Maps should be available for download from the “Eyes on the Bay” website by the end of February. Anecdotal evidence shows that SAV beds are still intact and were not damaged from storm events.*

- H. Bruce will share results of the suspended sediment sampling taken at Conowingo outfall (taken during high flow events this year) with the team.

*Status Ongoing. The data is being reviewed and formatted by USGS. Data should be available by mid-February.*

- I. Claire will follow up with individual team members to develop a schedule for work to be conducted this year.

*Status Complete. The team has provided input on schedule. As tasks are completed and progress on the study continues the schedule will be updated. See discussion on schedule in meeting summary below.*

- J. Shawn will provide a summary of Exelon study findings.

*Status Complete. Exelon was able to attend meeting so they provided an update at the quarterly meeting. See discussion on Exelon study findings in meeting summary below.*

### 3. Communication and Coordination:

#### A. Public Involvement Plan

At the previous quarterly meeting there was much discussion on public involvement/communicating to stakeholders outside of the team. Based on this discussion, Anna drafted a public involvement plan to capture how the LSRWA team would engage the public and agencies. The team reviewed the plan and provided the following comments:

- Add a general timeline of when the team anticipates public meetings;



- The terms “public” and “stakeholders” should be clearly defined;
- Funding sources for recommendations that are developed during the assessment should be added as a public concern;
- NY, PA, and MD state offices should be added to the list of groups likely to be interested in project;
- The final public involvement plan document should be added to the LSRWA website; and
- Clearly define how the public involvement will be documented in the LSRWA report (lay out a chronology of all activities).

Dave added that it is important as we finalize the watershed assessment that we make sure refer back to the public outreach plan, and follow what we have laid out to engage the public in the LSRWA.

Tom Horton commented that with the 40-year anniversary of Tropical Storm Agnes occurring this year, the media would most likely be interested in running a story on that storm event and the current efforts going on now. This represents a good opportunity for the assessment to get some publicity.

Herb mentioned that he, Secretary Summers (MDE) and Paul Swartz (executive director of SRBC) met with the Maryland delegation from the Eastern Shore. He noted that feedback from these meetings was that there is a lot of interest in water quality in the Bay; farmers feel like they are being picked on (it will be important to engage agriculture groups in study); and the costs of the implementation of the TMDL and the proposed “flush tax” to cover the cost of implementation of TMDL.

Bruce noted that the MD legislature is in session now (through April 9, 2012) and there will be many opportunities to present where we are in this study to MD legislators.

#### B. LSRWA Presentation Feedback from Recent Meetings

Jeff presented an update of the study to the Chesapeake Bay Program (CBP) Modeling Subcommittee on November 30, 2011. No specific feedback was received. Jeff noted that this is a good group to stay in touch with and they were very receptive to the study. Jeff also presented at the Citizens Advisory Committee for the Dredged Material Management Program as well.

Bruce presented an update of the study at the CBP Scientific and Technical Advisory quarterly committee meeting in January 2012. The group wants to be kept informed. Also a copy of the LSRWA PowerPoint presentation was sent to Ann Swanson of the Chesapeake Bay Commission for her use.

There was discussion on the map in the presentation showing the study area for the LSRWA. There is a system of four hydroelectric dams on the lower Susquehanna River. The northernmost dam is the York Haven Dam which is not included in the modeling scopes for the assessment due to the fact that it is a “run of the river” dam that does not trap sediments in any significant way. The consensus was to remove this dam from the map in the presentation to clarify this point. However, in background discussion in the

LSRWA report, this dam should be mentioned and the reason why it is not included in the study/area scope of the assessment.

#### C. Public MDNR Website Demo

Bruce pulled up the newly developed website for the LSRWA and requested feedback from the team. Below are team recommendations for website:

- Shorten the URL address;  
    [Update: Address is now <http://bit.ly/LowerSusquehannaRiver>]
- Add legal cost-sharing agreement;
- Add project management plan;
- Add a link to MDNR's "Eyes on the Bay" website;
- Add a link to the historical Sediment Task Force website
- Add a link to historical Sediment Task Force documents (but add caveat noting evolution of thought on sediment management and that these are "historic"; ;
- Add links to specific related efforts going on in the Bay (i.e. TMDL, SRBC WQ efforts, etc.);
- Add LSRWA PowerPoint presentation;
- Add LSRWA team roles and responsibilities spreadsheet;
- Add LSRWA goals and objectives;
- Add media articles/press releases discussing LSRWA;
- Add calendar of events;
- Add all quarterly meeting agendas and meeting minutes;
- Add stakeholder outreach plan; and
- Add a tab for technical reports

All appropriate materials (in list above) will be sent to Bruce by the LSRWA team to be uploaded onto website.

#### D. Need for Internal Website for Sharing

Claire mentioned that the primary purpose of the LSRWA website is to share information with the public. She asked the team if there is a need to have an internal website to share draft documents and information that are not ready to be posted on the public website but are too large to email to team members. Matt noted that MDE has an ftp website that can be used for this purpose; he will send a link out for the team's use.

#### 4. Summary of Exelon Studies

Shawn explained to the group that the Conowingo Dam has been undergoing the 5-year Federal Energy Regulatory Commission (FERC) relicensing process. Out of this relicensing process, Exelon (owner and operator of Conowingo Dam) was required to conduct several studies that relate to sediment accumulation and transport. Year 2 study reports are due by January 23, 2012. Several contractors of Exelon attended the quarterly meeting and provided results of these studies to the LSRWA team.

Marjie from URS explained that the objective of the sediment transport and accumulation study they conducted was to provide data that will be useful in the future development of an overall sediment management strategy for the Susquehanna River and Chesapeake Bay.

Three tasks conducted to meet this objective were: (1) review and compile existing information; (2) quantitatively assess sediment-related impacts of Conowingo dam on downstream habitat; and (3) evaluate options to manage sediment at Conowingo (completed, but not discussed at this meeting).

Under Task 1, Exelon determined that the underlying assumptions of previous studies which warrant reevaluation were: (1) that flood events of 400,000 cubic feet per second (cfs) trigger scour in the lower Susquehanna reservoirs; (2) that Lake Clarke and Lake Aldred are at steady-state equilibrium with respect to sediment trapping; and (3) Tropical Storm Agnes was associated with major scour event in Conowingo reservoir.

Under Task 2, a HEC-6 analysis of scour (and trapping efficiency) during major storm events was conducted. Findings were that the Conowingo and Clarke reservoirs trap sand received from upstream; Lake Aldred passes sand received from two major tributaries down to the Conowing Pond; silt/clay passes through the reservoir system; and minor scour occurs in Lakes Aldred and Clarke. Conclusions drawn from this HEC-6 analysis were: (1) the Exelon findings do not support the conclusions in scientific literature that the catastrophic impact to Chesapeake Bay from Agnes was due to scour from Conowingo reservoir; (2) Lake Clarke is not in equilibrium (i.e., it is still trapping sediment), though Lake Aldred is in equilibrium; and (3) the Exelon analysis contradicts the scour regression model which utilizes a 400,000-cfs scour threshold.

Mike Langland noted that in general he concurred with the findings of the second conclusion in that in the short term these upper reservoirs are not at steady state (year to year). However, in the long term (20 years), they are at steady state (trapping of sediments is negligible). It is still important to incorporate the upper two reservoirs into the modeling and ensure that the time frame (long term or short term) is well communicated. Tom noted that public perception is important in regards to short-term, episodic events.

Michael Helfrich added that the HEC-6 model utilized by Exelon in the analysis has shortfalls (recognized by USGS in their own reports). These shortfalls are important to keep in mind when using HEC-6 as a tool and extrapolating results to sedimentation within this system. Mike Langland added that as part of this study, the HEC-6 model will be updated and calibrated with better data to allow for more accurate predictions for the watershed assessment.

Marjie added that it is important to think about the sedimentary record when conducting sediment analysis and accumulation studies; for example, are the large quantities of reservoir bottom scour recognized as a source of suspended sediment at Conowingo Dam by grain size distribution?

Gary went over the findings from the recent bathymetric surveys that were conducted in the Conowingo Reservoir. The objectives of these surveys were: (1) create a thorough bed elevation map of Conowingo Pond; (2) determine where and to what extent Conowingo Pond's sediment/bathymetric profile has changed since the 2008 USGS survey; and (3)

establish a physical “baseline” benchmark to better inform future sediment management decisions.

Bathymetric and water velocity data were collected in Conowingo Pond in October 2011 (< 6 weeks after flows receded from Tropical Storm Lee). The same (26) transects surveyed by past USGS surveys were utilized as well as 33 additional transects and 5 longitudinal profiles. This 2011 data was plotted against 2008 data (most recent USGS bathymetric survey) for each transect.

In general, findings of this survey are: (1) upstream areas of Conowingo reservoir are in dynamic equilibrium; (2) in downstream areas of Conowingo Reservoir, deposition outweighed scour; (3) average cross-section depths generally decreased by 1 foot to 3.5 feet; (4) deposition occurred around banks/edges and scour occurred in the main channel; (5) the river appeared to shift toward the dam’s spillway in the farthest downstream cross-sections; (6) Conowingo Reservoir accumulated approximately 5,870 acre-ft of sediment between the fall 2008 survey and the 2011 survey; and (7) net sediment deposition between the 2008 and 2011 surveys was 8.67 million tons. This net sediment deposition translates to approximately 2.9 million tons of deposition per year; historic deposition rates have ranged from 3.1 million tons/yr from 1929-1958, to 2.5 million tons/yr from 1958-1993, to 1.5 million tons/yr from 1996-2008 (Langland 2009). **[Update:** Exelon has since identified some QA-QC changes that alter the total water volume deposition changes. The revised numbers will be released in a memo to the LRWSA group and Exelon relicensing stakeholders in the near future. The updated numbers resulted in less deposition than previously estimated, but did not change the conclusion that there was net deposition between 2008 and 2011.]

Bruce added that Tropical Storm Lee scoured approximately 4 million tons of sediments. If this event had not occurred then deposition measured in these surveys would have been much higher this year.

## 5. LSRWA Technical Analysis Updates

### A. Chesapeake Bay Program Partnership Model (Chesapeake Bay Environmental Modeling Package – CBEMP)

Carl gave a briefing on data assembly for the CBEMP application to the Bay downstream of Conowingo Dam. Carl explained that he was searching primarily for data that would help with the water quality modeling effort as this is the primary application of this model to the LSRWA. He described several datasets he has located and several known datasets that are missing; a summary of his findings was handed out at the meeting (enclosure 2). The largest missing piece is the data collected in 2011 (suspended solids flowing over Conowingo Dam, sampled for particulate nitrogen and phosphorus). Bruce noted that data was collected by USGS, and is currently being reviewed and formatted. It will be available by the end of the January.

Dave mentioned the SRBC publication 239, a 2006 report, which contains a full physical examination and chemical analyses of the sediments behind three dams on the lower

Susquehanna River in 2000. Dave noted that he would be sure to get a link for the report to the team.

B. Sediment Transport Modeling Update

Steve noted that the his scope for the LSRWA currently lays out a plan to utilize a 2D adaptive hydrodynamic (ADH) model to model the Conowingo Reservoir and Susquehanna flats. One of his first tasks is to conduct a desktop analysis to determine if there are any significant 3D effects in the system, which would require the need for a 3D model. He has started this analysis. He is also building the mesh for the models which will include a hydrodynamics component and a sediment transport model. Another task that will commence soon (May 2012) is the SedFlume analysis which will consist of a team going out and collecting data (sediment bed samples) from the Conowingo Reservoir. This analysis will determine the erodability of the sediments in this area. Due to limited initial funding, approximately half of the planned samples will be collected (\$60K vs. \$120K worth of effort) unless further funds are provided this fiscal year.

C. HEC-RAS Modeling Update

Mike Langland provided an update on his efforts which include constructing and calibrating an updated 1D HEC-RAS model that will route inflowing sediment through the reservoirs, accounting for both sediment deposition and erosion. The output of this model will provide boundary conditions for the 2D model simulations that Steve will be conducting as part of his scope in the Conowingo Reservoir.

The HEC-6 model was constructed and utilized in 1990 to model the lower Susquehanna reservoirs. The model was used to estimate 1987 annual and monthly sediment loads and trap efficiency and the model was also used to simulate sediment transport during the June 1972 storm event (Tropical Storm Agnes). The model was calibrated and performed poorly in both scenarios.

For the LSRWA effort, a HEC-RAS model will need to calibrate transport of sediment and sediment size classes to a base year and also will need to simulate transport of sediment and sediment size classes over high-flow event hydrograph(s) and sediment reduction scenarios, incorporating total maximum daily load data from the watershed implementation plan.

The original HEC-6 model had 13 sediment size classes. Based on review of particle size results, this new model will simulate 1 sand, 2 silt and 2 clay sizes. There is very little sand movement so there is no need to simulate sand transport at a very refined level.

In the literature, there is no documentation on the selection of sediment computation algorithms. Thus, algorithm selection will need to be revisited in this effort to simulate high-flow event transport functions.

Mike noted that he has looked at the feasibility of using data for the new HEC-RAS model. Geometric data (e.g., channel cross-sections 2008 and 2011) will likely be used.

The 2011 data has greater resolution. Sediment particle size distribution and transport data collected since 1990 will also be utilized.

In coordination with Steve and his modeling efforts the HEC-RAS output will be an hourly time step, which suits the needs of the 2D ADH model. This effort will model all three reservoirs (Aldred, Clarke, and Conowingo) and the simulation period will cover the September 2011 high flow event and yet-to-be specified period(s) for annual loads.

In regards to reservoir sediment, Mike has pulled all historical sediment concentrations, loads and particle size data from Harrisburg, Marietta, Conestoga Creek, Pequea Creek, and Conowingo. The data will be used to build the QC model input files. He is also building a geospatial data base that will contain the locational data and results of sediment cores analyzed by USGS.

Tom Sullivan asked how this HEC-RAS modeling effort will improve upon the HEC-6 effort done in the past. Mike explained that we will have new data with the bathymetric surveys and updated algorithms. Steve added that the models will all be validated and we are working in relative changes (relative effects over time of increasing capacity) vs. absolute change at one point in time. Tom noted that it will be important to communicate the calibration process.

Claire said that with all the modeling efforts going on it will be important for modelers to communicate often to keep on task. She will coordinate monthly (teleconference) meetings to discuss modeling activities.

6. Review Schedule for 2012

Claire provided a handout of the most updated schedule for the study. Prior to the meeting she received input from the team in order to update the schedule. A few of the activities were revised based on meeting discussions; enclosure 3 represents the project schedule as of the team meeting.

7. Wrap Up The next meeting will be April 30, 2012, 10-12:30, at MDE.

Anna Compton

Study Manager

- Enclosures:
1. Meeting Agenda
  2. Summary of Water Quality Data
  3. Project Schedule dated 23 January 2012

**LOWER SUSQUEHANNA RIVER WATERSHED ASSESSMENT  
QUARTERLY TEAM MEETING**

**MDE, Montgomery Park Building, Aqua Conference Room  
January 23, 2012**

**Meeting Agenda**

**Lead**

10:00	Welcome and Opening Remarks.....	Sachs
10:05	Introductions.....	All
10:10	Review of Action Items from November Meeting.....	O'Neill
10:30	Communication and Coordination	
	Public Involvement Plan.....	Compton
	PowerPoint Presentation – Feedback from Recent Meetings.....	Halka, Michael
	Public MDNR Website Demo.....	Michael
	Include PowerPoint presentation, goals and objectives, roles and responsibilities, meeting notes?	
	Need for Internal Website for Sharing.....	O'Neill
11:00	Summary of Exelon Study.....	Seaman/Exelon
11:10	LSRWA Technical Analyses	
(10 min)	CBEMP Modeling Update.....	Cerco
(15 min)	Sediment Transport Modeling Update.....	Scott
(10 min)	HEC-RAS Modeling Update.....	Langland
11:45	Review Schedule for 2012.....	O'Neill
11:55	Wrap Up.....	Compton
	Action Items/Summary	
	Next Meeting	

**Call-In Information:** (410) 537- 4281 (no password required)

**Expected Attendees:**

MDE: Herb Sachs; Matt Rowe, Tim Fox, Adam Rettig  
MDNR: Bruce Michael, Shawn Seaman  
MGS: Jeff Halka  
SRBC: John Balay, David Ladd, Andrew Gavin  
USACE: Anna Compton, Bob Blama, Carey Nagoda, Chris Spaur, Claire O'Neill, Dan Bierly  
ERDC: Carl Cerco, Steve Scott  
USEPA: Gary Shenk  
USGS: Mike Langland, Ed Koerkle

Exelon: Gary LeMay, Mary Helen Marsh, Robert Matty, Margie Zeff  
Lower Susquehanna Riverkeeper: Michael Helfrich

Unable to attend = TNC

### **Action Items from November Meeting:**

- A. Claire will email the team the “Roles and Responsibilities” spreadsheet to get input; compile and send out to team once completed.
- B. Anna will send the LSRWA Team email distribution list to all team members.
- C. Shawn Seaman will contact Michael Helfrich to notify him of quarterly meetings to see if he can attend.
- D. Bruce Michael will have the lead in coordinating with SRBC, MDE, and MGS to set up a website where any products of the assessment can be kept to keep stakeholders informed.
- E. Anna will prepare a brief public involvement plan to layout how the LSRWA will be coordinated with stakeholders and will send out the team for review.
- F. Anna will update PowerPoint slides after each quarterly meeting to be utilized by anyone on the team providing updates to other Chesapeake Bay groups.
- G. Anna will send out an update to via the large email distribution list that started with the original Sediment Task Force (includes academia, general public, federal, non-government organization (NGO), and state and counties representatives) notifying the group of LSRWA kick-off meeting and study start and will periodically update this group as the LSRWA progresses.
- H. Anna will send out revised goals to the team for one final review and team approval.
- I. Steve will coordinate with Bruce to obtain digitized maps of SAV data in the Susquehanna flats area.
- J. Bruce will share results of the suspended sediment sampling taken at Conowingo outfall (taken during high flow events this year) with the team.
- K. Mark and Anna will coordinate to conduct a literature search providing info on best management practices around the nation and world for reservoir sedimentation.
- L. Matt will keep team informed on Innovative re-use committee findings to potentially incorporate ideas/innovative techniques into LSRWA strategies.
- M. Claire will follow up with individual team members to develop a schedule for work to be conducted this year.
- N. Shawn will provide a summary of Exelon study findings.



## MEMORANDUM FOR THE RECORD

**SUBJECT:** Lower Susquehanna River Watershed Assessment  
Quarterly Team Meeting, 30 April 2012

1. On 30 April 2012, agency team members met to discuss ongoing and completed activities for the Lower Susquehanna River Watershed Assessment (LSRWA). The meeting was hosted by the Maryland Department of the Environment (MDE) in their Aqua Conference Room at the Montgomery Park Building in Baltimore, Maryland. The meeting started at 10:10 am and continued through 12:30 pm. The meeting attendees are listed in the table below.

Agency	Name	Email Address	Phone
Exelon Generation	Bob Matty	robert.matty@exeloncorp.com	610-765-5514
Exelon -- Gomez and Sullivan	Gary Lemay	glemay@gomezandsullivan.com	603-428-4960
Exelon -- URS Corp.	Marjorie Zeff	marjorie.zeff@urs.com	215-367-2549
Lower Susquehanna Riverkeeper	Michael Helfrich	LowSusRiver@hotmail.com	717-779-7915
MDE	Herb Sachs	hsachs@mde.state.md.us	410-537-4499
MDE	John Smith	jsmith@mde.state.md.us	410-537-4109
MDE	Tim Fox	tfox@mde.state.md.us	410-537-3958
MDNR	Bruce Michael	bmichael@dnr.state.md.us	410-260-8627
MGS	Jeff Halka	jhalka@dnr.state.md.us	410-554-5503
NOAA-NMFS	John Nichols	john.nichols@noaa.gov	410-267-5675
SRBC	David Ladd	dladd@srbc.net	717-238-0425x204
SRBC	John Balay	jbalay@srbc.net	717-238-0423 x217
TNC	Kathy Boomer	kboomer@tnc.org	
USACE	Andrea Takash	andrea.m.takash@usace.army.mil	410-962-2626
USACE	Carey Nagoda	carey.m.nagoda@usace.army.mil	410-962-6761
USACE	Chris Spaur	christopher.c.spaur@usace.army.mil	410-962-6134
USACE	Claire O'Neill	claire.d.o'neill@usace.army.mil	410-962-0876
USACE	Dan Bierly	daniel.m.bierly@usace.army.mil	410-962-6139
USGS	Mike Langland	langland@usgs.gov	717-730-6953

In addition, a number of team members listened in via the conference line; those listening were:

Agency	Name	Email Address	Phone
PADEP	Patricia Buckley	pbuckley@pa.gov	717-772-1675
PADEP	Ted Tesler	thtesler@pa.gov	717-772-5621
PA DCNR	Ray Zomok	rzomok@pa.gov	
SRBC	Andrew Gavin	agavin@srbc.net	717-238-0423x107
TNC	Mark Bryer	mbryer@tnc.org	301-897-8570
USACE-ERDC	Carl Cerco	carl.f.cerco@erd.c.usace.army.mil	601-634-4207
USACE-ERDC	Steve Scott	steve.h.scott@usace.army.mil	601-634-2371
USGS	Ed Koerkle	ekoerkle@usgs.gov	

The meeting agenda is provided as enclosure 1 to this memorandum.

2. Welcome and Opening Remarks – After a brief introduction of the meeting attendees, Herb Sachs welcomed the LSRWA agency group. Herb noted the low flow conditions in the Susquehanna River.

3. Review of Action Items from January 2012 Meeting – For the first meeting discussion, the team reviewed the January 2012 action items as well as the ongoing action items.

#### **Action Items from January Meeting:**

- A. Bruce will integrate comments from the team to refine the LSRWA (public) website.  
*Status – Completed.*
- B. Steve will coordinate with Bruce to obtain digitized maps of SAV data in the Susquehanna flats area.  
*Status – Maps have been provided; Steve Scott still needs to download them and will do so shortly.*
- C. Bruce will share results of the suspended sediment sampling taken at Conowingo outfall (taken during high flow events this year) with the team. [**Update:** MDNR provided the data to Carl Cerco]  
*Status – Completed.*
- D. Anna will update the map in the LSRWA PowerPoint presentation to remove the York Haven Dam.  
*Status – Completed.*
- E. Bruce will send the LSRWA website link to the team.  
*Status – Completed.*
- F. Bruce will update the LSRWA website with recommended changes from the team.  
*Status – Completed.*
- G. The team will send Bruce documents and links that should be posted on the LSRWA website.  
*Status – Ongoing; future documents and links should be sent to Bruce Michael.*
- H. The MDE FTP website will be utilized to share internal draft documents within the team; Matt will be the point of contact for this FTP site.  
*Status – Ongoing; sharing of future documents will go through the MDE ftp website.*
- I. Dave will send a hyperlink to the SRBC publication 239 (the 2006 sediment analysis report) to the team. [**Update:** Link sent January 24, 2012]  
*Status – Completed.*
- J. Claire will coordinate monthly conference calls to discuss modeling activities.  
*Status – Completed.*
- K. Shawn will notify team when most recent Exelon study reports are released.  
*Status – Recent report was sent out to team; ongoing action.*
- L. Claire will work with Mike Langland to execute funding for USGS for LSRWA efforts.  
*Status – Paperwork is completed on the USGS end and is on its way to USACE [Update: Completed documents were delivered on April 30<sup>th</sup>.]*

#### **Ongoing Action Items**

- A. Anna will update PowerPoint slides after each quarterly meeting to be utilized by anyone on the team providing updates to other Chesapeake Bay groups.
- B. Anna will send out an update via the large email distribution list that started with the original Sediment Task Force (includes academia, general public, federal, non-government

organization (NGO), and state and counties representatives) notifying the group of updates from the quarterly meeting.

- C. Mark and Anna will coordinate to conduct a literature search providing info on best management practices around the nation and world for reservoir sedimentation.
- D. Matt will keep team informed on innovative re-use committee findings to potentially incorporate ideas/innovative techniques into LSRWA strategies.

4. Communication and Coordination – Claire mentioned that USACE had sent out standard USACE study coordination letters to various Federal and state environmental resource agencies in February 2012. These letters had been coordinated with Bruce and Herb in advance. As a result of this coordination, we have added several new agency team members, some of whom attended or listened into the quarterly team meeting. In particular, we have several new representatives from Pennsylvania, as well as the National Marine Fisheries Service.

Since the last quarterly meeting, there have been no official presentations of the project PowerPoint slides. Herb mentioned that Tim Fox will be attending the 1 May 2012 meeting of the innovative re-use committee.

Herb asked about the status of the Federal funding for the watershed assessment. Claire indicated that the assessment has received funding to cover the activities through FY12, with some funds (roughly \$50,000) for the first part of FY13. The project is not in the president's budget that was released in February 2012. However, for this fiscal year, the study received funds from a general pot of money and it is hoped that the same result will happen in FY13; the allocation of these funds is determined by USACE Headquarters staff. Herb and Michael Helfrich asked what they could do to help with the budget situation. Claire explained that while in the past Congressional earmarks were an avenue to funding for non-budgeted studies, earmarks are not acceptable to Congress this fiscal year [**Action** = Claire will discuss funding needs for FY13 with Herb].

Recently, there was a workshop on the short-term impacts of Tropical Storms Irene and Lee. Bob Hirsch from USGS reported on significant load of sediments and nutrients from high-flow events and that impacts will be more severe in the future. Subsequently, the window for action is closing. There will be a follow-up workshop in the fall. Bruce indicated that we will send the workshop information to the LSRWA agency group [**Note:** The link to the April 19, 2012 CBP Storm Effects Topical Meeting has been added to the LSRWA website]. Mike Langland reminded the group that Bob Hirsch will be invited to the next quarterly meeting to make a presentation on his findings [**Action** = Mike to invite Bob; update: Bob has put us on his schedule for August 7<sup>th</sup>].

5. LSRWA Technical Analyses – The various modeling leads provided updates on their technical analyses.

A. CBEMP Modeling Update and Data Report – Carl's data report was sent out for comment in early April. So far, comments have been received from SRBC and Chris Spaur (USACE). Marjorie Zeff mentioned that she would be sending a suggestion for improving the report on 30 April. Carl noted that he would need 2 weeks to finalize the report.

Carl's analysis shows that as the flow over Conowingo gets larger, the composition of the transported materials starts to resemble the reservoir bed material. His work indicates that we have sufficient data to characterize material coming over the spillway, and that it is a good dataset for water quality modeling.

B. Sediment Transport Modeling – Steve Scott updated the agency LSWRA team on his sediment transport modeling using the PowerPoint presentation in enclosure 2. Two separate models were developed, one for Conowingo and one for the Susquehanna Flats. Steve used the 2008 and 2011 bathymetric surveys of Conowingo Pond extensively in his analysis. NOAA nautical charts were used for the Susquehanna Flats area. All data was converted to NGVD (National Geodetic Vertical Datum) 1929.

To date, Steve has completed an evaluation of the importance of three-dimensional effects in Conowingo sedimentation. Three-dimensional effects can result from density-gradient currents, wind-generated currents, and reservoir discharges at multiple depths. These effects are important when the reservoir inflows are low, when flow velocities are low since turbulence and mixing are at a minimum, and when there are a high reservoir residence times. Steve's approach to the analysis was to evaluate sediment availability to the reservoir when the three-dimensional impacts may be significant. Since flows greater than 30,000 cubic feet per second (cfs) have a very low retention time (5 days or less), it can be assumed that there is sufficient mixing at these flow levels.

In addition, Steve looked at the total sediment load coming into Conowingo Pond. Of about 4.28 million tons of annual sediment inflow, only 0.22 million tons happens during flows of less than 30,000 cfs. So, the bottom line is that Conowingo Pond is exposed to only 5 percent of the total annual sediment load during low flow conditions. Steve concluded that although three-dimensional effects do occur, they are negligible. Hence, for the flow levels that we are interested in, a three-dimensional model is not warranted. Steve mentioned that the 30,000-cfs cut-off value could have been as low as 20,000 cfs.

Steve then described the development of the two-dimensional models. There are 11,432 nodes in the Conowingo Pond model with the density of nodes increasing closer to the dam. The model includes routines for the power plant operations as well as the flood gates. Flows less than 86,000 cfs are routed through the power plant, while the flood gates open at higher flows. When flows reach as high as 400,000 cfs, the power plant no longer functions for flow passage. Steve's presentation included several slides showing the 2008 bathymetry, water depths and velocities at a flow of 700,000 cfs, and velocities at two lower levels of discharge. Steve showed a short movie showing how the velocities in the reservoir change with high flow operations.

The Susquehanna Flats two-dimensional model has 8,587 nodes in it, with the density of nodes increasing as you go up the river toward the Conowingo Dam. Steve's presentation included several slides showing the model bathymetry, as well as water depth and velocity at a flow of 100,000 cfs. The submerged aquatic vegetation patch at the mouth of the river was quite evident in these slides (large roughly circular area in red, showing as deflecting flow). The SAV bed is modeled with 3 feet of grass plus 2 feet of water. Bruce Michael mentioned that the SAV area is roughly 12,000 acres in size, and is the largest contiguous SAV bed in the Chesapeake Bay. This bed has been steadily growing, although it took a hit with Tropical Storms Irene and Lee. Jeff Halka asked

whether Steve could decrease the SAV canopy height seasonally. Steve noted that yes, they can. Bruce indicated that Lee Karrh from his staff would have information on the SAV winter dieback.

Steve mentioned that the two-dimensional models can be run on a PC although he will be using a supercomputer for added speed of turnaround time. Steve also reported that the ERDC field crew returned from the sediment core sampling recently. Lots of good data were collected; Steve has started the SEDflume data analysis.

C. HEC-RAS Modeling – USGS’s Mike Langland and Ed Koerkle shared the status of their HEC-RAS modeling work using the PowerPoint presentation in enclosure 3. The HEC-RAS model extends from the Marietta gage at the upstream end to Conowingo Pond at the downstream end. Within this reach, there are two major flow inputs, the Conestoga River and Pequea Creek. To date, the USGS work has focused on evaluating the sediment input data, model geometry and hydraulics, and modeling sediment transport.

Using sediment input and instantaneous discharge data, Mike developed four transport curves (Marietta, Conestoga River, Pequea Creek, and Conowingo). The curves were developed by ranking the flow values and then showing the associated sediment concentration values. The resultant curves had R<sup>2</sup> values ranging from 0.65 to 0.70. Mike also summarized the particle size transport data for Conowingo. This data included 391 samples of sand/fines and 16 samples of sand/silt/clays. Mike noted that he would prefer to have more particle size data for this analysis.

While there was a HEC-6 model done in the mid-1990’s, it didn’t perform well so USGS started the HEC-RAS model from scratch. The model uses LIDAR data from Maryland and Pennsylvania, as well as recent bathymetry data (1996 and 2008 datasets). Ed is also using some flood insurance data to fill in where bathymetry data wasn’t available (the alternative would have been assuming a trapezoidal channel). In some cases, this results in “mixed” data; however, these areas are primarily in areas where Ed doesn’t expect much problems. Ed tried to use some supplemental data from Gomez and Sullivan; unfortunately, there were significant elevation discrepancies with other data, so the supplemental data was not used. The only remaining area with potential issues is the Washington Borough flats. The HEC-RAS model is expected to be operational in June 2012.

D. MGS Data Collection – Jeff Halka noted that the MGS survey crew hoped to be out sampling surficial sediments for grain sizes this week. The crew is squeezing it in between two other major jobs. Consequently, if they can’t make it this week, there may be a delay in collecting the samples [Update: The MGS crew made it out on 2 May and Jeff began the lab work on 3 May]. Once the samples are collected, it will take about 4 weeks to complete the follow-on analyses.

E. Exelon Activities – Gary Lemay from Gomez and Sullivan (an Exelon contractor) brought the group up to date on some recent corrections to their sediment calculations presented at the January 2012 quarterly meeting. Specific numbers that were revised are bolded below:

- (1) the accumulation of **3,434** acre-feet of sediment in Conowingo Pond between fall 2008 and fall 2011 surveys;
- (2) the 3,434 acre-feet is equivalent to **5.07** million tons (using an assumed density of 67.8 pounds per cubic feet);
- (3) the 3,434 acre-feet is equivalent to an average of **1.69** million tons of deposition per year; and

- (4) assuming Conowingo Pond's steady-state volume is 142,000 acre-feet, there is approximately **21,800** acre-feet of remaining sediment capacity.

Gary showed a longitudinal profile of the Conowingo Pond and the difference in average depth between the 2008 and 2011 (post-Lee) surveys. The profile showed some slight scouring in the upper end of the reservoir, and significant deposition in the lower 3 miles. Gary's presentation also included a graph of time versus the remaining sediment capacity. This graph indicates that the Conowingo Pond is approaching a sediment volume equilibrium value, and is acting less effectively as a sediment trap. Currently, the reservoir is in a pattern of net deposition, with periodic sediment re-suspension occurring during high flows. As the reservoir fills, re-suspension may occur at a lower flow, theoretically. Gary and Marjie noted that while there is likely less sediment being trapped than the previously suggested "linear filling" hypothesis would predict, Conowingo Pond will continue to trap this reduced amount well into the future.

As a follow-on to the Exelon presentation, there was significant discussion among the meeting attendees about the meaning of the results. One attendee postulated that meeting the TMDL (total maximum daily load) targets will become more difficult. Another suggested that prior to this analysis, scientists thought that there was 10 to 15 more years before Conowingo reached this point, but it is becoming clearer that Conowingo's time as an effective sediment trap is running out. The agency group agreed that a statement on these findings and the repercussions, needs to be developed this summer to get out a consistent message to policymakers, the public, and media [**Action** = Herb and Bruce to draft preliminary statement]. Part of this effort will include some additional checking of storm flow and scour events. One suggestion was to make a presentation at the December 2012 Susquehanna River Basin Commission meeting.

6. Review of Schedule for 2012 – Claire provided a handout of the most recent schedule for the assessment, and reviewed the activities coming up in the next 3 to 4 months. Steve Scott noted that the 2D-3D comparison report will be combined with the SEDflume data report and should be completed by 1 June. Carl Cerco expects to finalize the CBEMP data report 2 weeks ahead of schedule by 15 May. Based on the meeting discussions and follow-up conversations, all other tasks are on schedule, as noted in the project schedule dated 16 April (enclosure 5).
7. Wrap Up – Claire will draft up notes for the group's review. Following this, the notes and presentations will be posted to the project website. The next meeting will be held August 7, 2012, 10-12:30, at MDE. Bob Hirsch from USGS has been invited to make a presentation. The next modeling conference call will be on June 7, 2012, starting at 2:00 pm (EDT, 1:00 pm CDT).

Claire D. O'Neill, P.E.  
Project Manager

- Enclosures:
1. Meeting Agenda
  2. Steve Scott Presentation
  3. Mike Langland/Ed Koerkle Presentation
  4. Gary Lemay Presentation
  5. Project Schedule dated 16 April 2012

**LOWER SUSQUEHANNA RIVER WATERSHED ASSESSMENT  
QUARTERLY TEAM MEETING**

**MDE, Montgomery Park Building, Aqua Conference Room  
April 30, 2012**

**Meeting Agenda**

	<b><u>Lead</u></b>
10:00	Welcome and Opening Remarks..... Sachs
10:05	Introductions ..... All
10:10	Review of Action Items from January Meeting..... O'Neill
10:20	Communication and Coordination
	USACE Agency Coordination Letters .....O'Neill/Bierly
	PowerPoint Presentation – Feedback from Recent Meetings..... All
	Project Website Update..... Michael
10:30	LSRWA Technical Analyses
(10 min)	CBEMP Modeling Update.....Cerco
(5 min)	Data Report – Major Comments? ..... All
(30 min)	Sediment Transport Modeling Update ..... Scott
(20 min)	HEC-RAS Modeling Update..... Langland/Koerkle
(5 min)	MGS Data Collection..... Halka
(5 min)	Exelon Activities ..... LeMay
11:45	Review of Schedule for 2012..... O'Neill
11:55	Wrap Up..... O'Neill
	Action Items/Summary
	Next Meeting

**Call-In Information:** (410) 537- 4281 (no password required)

**Expected Attendees:**

MDE: Herb Sachs; Tim Fox, Adam Rettig  
MDNR: Bruce Michael, Shawn Seaman  
MGS: Jeff Halka  
SRBC: John Balay, David Ladd, Andrew Gavin  
USACE: Bob Blama, Carey Nagoda, Chris Spaur, Claire O'Neill, Dan Bierly  
ERDC: Carl Cerco, Steve Scott  
TNC: Mary Bryer, Kathy Boomer  
USEPA: Gary Shenk  
USGS: Mike Langland, Ed Koerkle

Exelon: Gary LeMay, Robert Matty  
Lower Susquehanna Riverkeeper: Michael Helfrich  
PA Agencies: Patricia Buckley, Raymond Zomok

**MEMORANDUM FOR THE RECORD**

**SUBJECT:** Lower Susquehanna River Watershed Assessment  
 Quarterly Team Meeting, 7 August 2012

1. On 7 August 2012, agency team members met to discuss ongoing and completed activities for the Lower Susquehanna River Watershed Assessment (LSRWA). The meeting was hosted by the Maryland Department of the Environment (MDE) in their Terra Conference Room at the Montgomery Park Building in Baltimore, Maryland. The meeting started at 10:30 am and continued through 1:00 pm. The meeting attendees are listed in the table below.

2.

<b>Team Meeting Sign-In Sheet</b>			
<b>07 August 2012</b>			
<b>Agency</b>	<b>Name</b>	<b>Email Address</b>	<b>Phone</b>
Exelon -- Gomez and Sullivan	Gary Lemay	glemay@gomezandsullivan.com	603-428-4960
Exelon -- URS Corp.	Marjorie Zeff	marjorie.zeff@urs.com	215-367-2549
Lower Susquehanna Riverkeeper	Michael Helfrich	LowSusRiver@hotmail.com	717-779-7915
MDE	Herb Sachs	hsachs@mde.state.md.us	410-537-4499
MDE	John Smith	jsmith@mde.state.md.us	410-537-4109
MDE	Matt Rowe	mrowe@mde.state.md.us	410-537-3578
MDE	Tim Fox	tfox@mde.state.md.us	410-537-3958
MDNR	Bruce Michael	bmichael@dnr.state.md.us	410-260-8627
MGS	Jeff Halka	jhalka@dnr.state.md.us	410-554-5503
SRBC	David Ladd	dladd@srbc.net	717-238-0425x204
SRBC	John Balay	jbalay@srbc.net	717-238-0423 x217
TNC	Kathy Boomer	kboomer@tnc.org	
TNC	Mark Bryer	mbryer@tnc.org	301-897-8570
USACE	Andrea Takash	andrea.m.takash@usace.army.mil	410-962-2626
USACE	Anna Compton	anna.m.compton@usace.army.mil	410-962-4633
USACE	Tom Lazco	thomas.d.lazco@usace.army.mil	410-962-6773
USACE	Chris Spaur	christopher.c.spaur@usace.army.mil	410-962-6134
USACE	Claire O'Neill	claire.d.o'neill@usace.army.mil	410-962-0876
USGS	Bob Hirsch	rhirsch@usgs.gov	703-648-5888
USGS	Mike Langland	langland@usgs.gov	717-730-6953
MDE	Maria Schuler	mschuler@mde.state.md.us	410-262-6160
Chesapeake Conservancy	Jeff Allenby	jallenby@chesapeakeconservancy.org	443-321-3160
USACE	Robert Pace	robert.s.pace@usace.army.mil	410-962-4900
Baltimore Sun	Tim Wheeler	tim.wheeler@baltsun.com	410-260-8002
The Conservation Fund	Bill Crouch	bcrouch@conservationfund.org	410-274-8427
DNR	Josh Davidsburg	jdavidsburg@dnr.state.md.us	410-260-8002
Exelon	Mary Helen Marsh	maryhelen.marsh@exeloncorp.com	610-765-5572
Exelon-Gomez and Sullivan	Tom Sullivan	tsullivan@gomezandsullivan.com	603-428-4960
Exelon	Kimberly Long	kimberly.long@exeloncorp.com	717-629-4198

In addition, a number of team members listened in via the conference line; those listening were:



Agency	Name	Email Address	Phone
PADEP	Patricia Buckley	pbuckley@pa.gov	717-772-1675
PADEP	Ted Tesler	thtesler@pa.gov	717-772-5621
SRBC	Andrew Gavin	agavin@srbc.net	717-238-0423x107
USACE-ERDC	Carl Cerco	carl.f.cerco@erdc.usace.army.mil	601-634-4207
USACE-ERDC	Steve Scott	steve.h.scott@usace.army.mil	601-634-2371
EPA	Lew Linker	LLinker@chesapeakebay.net	410-267-5714
NMFS	John Nichols	john.nichols@noaa.gov	410-267-5675

The meeting agenda is provided as enclosure 1 to this memorandum.

Action Items –

- a. Anna will email out the draft mission statement to the team and the team will provide any further comments to the statement.
  - b. Anna will revise goals and objectives to state “three” vs. “four” hydroelectric dams to accurately reflect the study area of the assessment.
  - c. Mike will resolve issues with HEC-RAS modeling and will have a workable boundary condition file by the end of August.
  - d. Bruce will invite Harbor Rock to the September sediment management strategy brainstorming meeting.
  - e. Bob Hirsch will share draft press release on recent TS Lee study findings by USGS with selected agencies for review and input.
  - f. Claire will coordinate a sediment management strategy brainstorming meeting for September.
  - g. Claire will coordinate the next quarterly meeting for sometime in late October/early November.
  - h. Herb and Bruce to draft preliminary statement regarding Conowingo’s time as an effective sediment trap running out to be reviewed by LSRWA team and posted to project website.
3. Welcome and Opening Remarks – After a brief introduction of the meeting attendees, Herb Sachs welcomed the LSRWA agency group. He noted that he would be retiring but would still be involved on the periphery as a volunteer, on an as-needed basis. Matt Rowe will now fill in as Herb’s role on the LSRWA team. Herb discussed the recent interest in our study and a sense of urgency because of USGS findings coming out in regards to the Conowingo Dam filling sooner than expected. Herb explained that the governor of MD is up to speed on the latest findings and wants to make sure that the LSRWA moves forward.
  4. Review of Action Items from April 2012 Meeting – For the first meeting discussion, the team reviewed the April 2012 action items as well as the ongoing action items.

**Action Items from April Meeting:**

- A. Claire will discuss funding needs for FY13 with Herb.  
*Status-Ongoing; USACE does not know if federal funding for FY13 will be received for this study. The project is not in the President's budget that was released in February 2012. However, for this fiscal year, the study received funds from a general USACE pot of money, and it is hoped that the same action will happen in FY13. The allocation of these funds is determined by Headquarters USACE staff. These funding discussions will continue.*
- B. Mike will invite Bob Hirsch to attend August quarterly meeting to give presentation on his findings.-*Status-Complete; Bob attended the meeting and presented his findings.*
- C. Herb and Bruce to draft preliminary statement regarding Conowingo's time as an effective sediment trap running out, with the intent that we have a consistent message to policymakers, the public, and media. *Status ongoing; Bruce and Herb needed further input from the team so this is an agenda item for today's meeting.*

**Ongoing Action Items from Previous Meetings:**

- D. The MDE FTP website will be utilized to share internal draft documents within the team; Matt will be the point of contact for this FTP site.  
*Status – Ongoing; FTP is set up and any future draft documents will go through the MDE ftp website.*
- E. Shawn will notify team when most recent Exelon study reports are released. *Status – Recent report was sent out to team; ongoing action. Shawn was not in attendance so Tom let the group know that the Exelon application for the Conowingo dam license will be filed with FERC at the end of August and all required studies will be completed by the end of September with the exception of two fish studies.*
- F. Anna will update PowerPoint slides after each quarterly meeting to be utilized by anyone on the team providing updates to other Chesapeake Bay groups. *Status – Ongoing.*
- G. Anna will send out an update via the large email distribution list that started with the original Sediment Task Force (includes academia, general public, federal, non-government organization (NGO), and state and counties representatives) notifying the group of updates from the quarterly meeting. *Status – Ongoing.*
- H. Mark and Anna will coordinate to conduct a literature search providing info on best management practices around the nation and world for reservoir sedimentation. *Status – Ongoing; Anna and Mark will present findings at the next LSRWA meeting.*
- I. Matt will keep team informed on innovative re-use committee findings to potentially incorporate ideas/innovative techniques into LSRWA strategies. *Status – Ongoing. One company, Harbor Rock has presented ideas for beneficial re-use of dredged material. Their concepts may be technically feasible, but the financing may be difficult. This is a group that could present to the LSRWA team.*
- J. The team will send Bruce documents and links that should be posted on the LSRWA website. *Status – Ongoing*

5. Communication and Coordination –Since the last quarterly meeting, there have been no official presentations of the project PowerPoint slides. Michael noted that the slides are up on the Lower Susquehanna Riverkeeper website.

***Project Website Update*** – Bruce noted that all presentations that have been presented to this group at quarterly meetings, meeting summaries and applicable website links have been uploaded to the project website. The USGS report on Tropical Storm Lee will not be uploaded to the website until it is finalized.

***Mission Statement Review*** – Anna noted that the group had worked up specific goals and objectives for the study; however, there was an interest in working up a mission statement as well. This would be an over-arching statement to communicate the purpose of the study to the public. This statement would go on the project website. The team commented on the draft statement and the following is what was developed at the meeting:

“To comprehensively forecast and evaluate sediment and associated nutrient loads into and from the system of hydroelectric dams located on the Lower Susquehanna River above the Chesapeake Bay and consider structural and non-structural strategies to manage these loads to protect water quality and aquatic life in the Chesapeake Bay.”

Determine the effects to the Chesapeake Bay due to the loss of sediment and nutrient storage behind the hydroelectric dams on the Lower Susquehanna River

The team will provide any further comments to the draft mission statement after the meeting in order to finalize the statement.

Jeff noted that the goals and objectives contained the statement “four hydroelectric dams” when it should be “three” due to the fact that the LSRWA modeling only encompasses three hydroelectric dams on the Susquehanna. Anna will make this change to the goals and objectives.

Herb noted that we needed to be clear on the expectations of this study. This study is evaluating options and presenting them, but it will not lead directly to construction to maintain Conowingo’s sediment/nutrient trapping capacity which may disappoint some people. Efforts will need to occur after this study to implement any solution developed from this study along with additional resources. Herb noted that the TMDL goal is that sediment load allocations will be met by 2025. However these loads are based on Conowingo Dam still trapping a portion of the sediments entering the Bay, but we now know the Conowingo Reservoir will most likely not continue to trap sediments through 2025. Bruce noted that there is no one single agency or group that will have the ability to address this problem.

***Review Plan*** – Anna noted that a review plan has been prepared by USACE for LSRWA to lay out the scope and level of review for the study. The draft report will need to undergo agency technical review (ATR) before it is released to the public for review. ATR involves review by USACE senior staff that are outside of the Baltimore District. USACE will be responsible for coordinating with the ATR team and consolidating responses to ATR comments; however, the whole LSRWA team will

be responsible for working up responses to comments. ATR will occur on the draft document and public review comments. ATR will occur on the final document only if there are significant public comments. ATR is a cost-shared component of the study. The review plan is currently at USACE's division office for final approval but we do not anticipate any changes to the review plan. Anna will let everyone know when the review plan has been approved by USACE's North Atlantic Division.

6. USGS Presentation on the Susquehanna River and the Impacts of Tropical Storm Lee – Bob Hirsch from USGS presented to the group “Nitrogen, phosphorus, and suspended sediment fluxes from the Susquehanna River to the Bay in Tropical Storm (TS) Lee 2011– results and implications.”

Bob Hirsch's presentation is provided as enclosure 2 to this memorandum.

Bob noted that the reservoirs initially had high trap efficiency. Eventually, steady state will occur (sediment output will equal input). What we see now is evidence that we are reaching a 100-percent full asymptote. Original prediction by Langland and Hanly in 1997 was that the reservoirs would be “full” in 17-20 years (all other things being equal). Once the reservoirs are full, it is predicted that we would see a total nitrogen (TN) flux increase of 2 percent; total phosphorus (TP) flux increase of 70 percent, and a suspended sediment (SS) flux increase of 250 percent.

Findings of this study were that TS Lee wasn't an unusual event even though it was a large rain event. Bob does not see any historical change in the frequency of high flow events but the behavior of the reservoir system has changed in response to these high flow events. There is a lower scour threshold as the reservoir fills up. Conowingo filling up is a current issue, not a future issue.

TN concentrations are continuing to decline at most discharges; however, at very high flows, they are showing some increase. Flow-normalized flux continues to fall (down about 16 percent since its high in 1987). Year to year variability in actual TN flux is increasing (standard deviation about double for 2002-2011 vs. 1978-2001). TS Lee TN flux was about 42,000 tons compared to the 2011 water year of 135,000 tons of TN, while the past decade average was 79,000 tons/year and the past 34-year average was 71,000 tons/year. TN flux change since 1996 was -3.2 percent.

Since 1996, TP increases were observed at high discharges for all seasons but particularly the tropical storm season. Small increases in TP at moderate discharges (April – July) were observed while small decreases were observed at moderate to low discharges other parts of the year. At the Marietta, PA gage, decreasing levels of TP were observed which can be correlated to management measures in the watershed. TP concentrations are relatively stable at moderate and low flows but at very high flows they have increased greatly in the past 15 years. Flux continues to rise and is becoming more and more episodic. These changes are almost certainly related to the decreasing capacity of Conowingo Reservoir. TS Lee flux for TP was about 10,600 tons. The 2011 water year flux for TP was 17,400 tons. The past decade average for TP was 4,800 tons/year. The past 34-year average was 3,300 tons/year.

For SS, little to no change in flux at most discharges and times of year. However large increases were observed for events above 100,000 cubic feet per second (cfs). SS was observed to be highest in Hurricane Ivan, TS Lee was second highest. TS Lee SS flux was estimated at about 19.0 million tons. The 2011 water year was 24.3 million tons for SS. The past decade average was 4.8 million tons.

The past 34-year average was 2.5 million tons. Flow-normalized flux is rising very steeply and variability is increasing.

Based on their findings the USGS hypothesis is that as the reservoirs fill, for any given discharge, there is less cross-sectional area, resulting in greater velocity. This leads to a decrease in the scour threshold (and thus, more frequent scouring) as well as leading to a decrease in the amount of deposition at lower discharges. The 1997 predictions (TN flux increase of 2 percent; TP flux increase of 70 percent, SS flux increase of 250 percent) in comparison to predictions with observed changes in flux since 1996 from this recent study are now, TN flux decrease of 3.2 percent, TP flux increase of 55 percent, and a SS flux increase of 97 percent.

The trapping of TP and SS by the reservoir system is decreasing. Scour is becoming more frequent and larger. There is an increasing role of high flow events for TN, TP, and SS inputs to the Bay. The “filling” of the reservoirs is asymptotic and stochastic. Findings are that the system is in transition to “full.” Over the coming decades, the state of the reservoirs may be the main driver of TP and SS inputs to the Bay.

Bob noted that these findings are still considered draft. The final report will be released by USGS in the next few weeks. USGS will be putting out a news release when the report is published (the report will be posted electronically). They will decide who to include in the review process of this news release. They may want quotes from various agencies. They may also include a link to the LSRWA website and a statement about the study.

Lew mentioned that the decrease in TN could be related to the decreased amount of TN available from atmospheric deposition.

Bruce noted that SAV beds in the Bay weathered TS Lee better than TS Agnes, most likely because of the robustness of the existing bed now compared to when Agnes hit. Dissolved oxygen levels were good this year as well. DNR is evaluating the health of SAV in the Susquehanna flats to determine if there are any lingering effects from TS Lee.

Carl commented that he suspects that a lot of the nutrients going over from Conowingo aren't biologically available. We need to have more research to understand what percentage of the nutrients entering the bay from the reservoirs is biologically available.

7. Coordinated Message based on USGS Presentation-Brainstorming – There was discussion on drafting a statement regarding Conowingo's time as an effective sediment trap running out, based on USGS recent findings, with the intent that the LSRWA team has a consistent message to policymakers, the public, and media.

The following comments were offered in regards to messaging:

- The USGS study shows that the system is dynamic and complex.
- With these findings do we have a way to accelerate study? It appears we don't have the luxury of waiting?
- We need to understand the problem and should not jump to conclusions about what will happen if the Conowingo is no longer trapping sediments.

- We need to be cautious in how we communicate results as there could be impacts to the Bay TMDL.
- The USGS work shows the importance of the watershed assessment and we should not predict now what will happen to the Bay
- A lot is riding on this study efforts; we need to get it right.

Pat noted that any public message that Pennsylvania is a part of would need to go through their press office

Herb and Bruce agreed to draft a preliminary statement that would be reviewed by the LSRWA team. USGS is doing a formal news release; therefore, the LSRWA team statement would not be a news release, but instead would be posted on the LSRWA website and distributed via email to stakeholders.

Michael Helfrich asked about the trapping efficiency of the dam and if that would be determined based on new data. Mike Langland noted that we know the filling rate so we can show the remaining capacity and discuss in terms of the lack of capacity. We can assume that where trapping is going away, scouring is occurring.

8. LSRWA Technical Analyses – The various team members provided updates on their technical analyses.

***MGS Data Collection*** – Jeff Halka noted that the crew made it out on 2 May to collect sediment samples in the Susquehanna flats. Analyses were completed and distributed to the group. Marji asked about sea-level rise evidence. Jeff noted that there is not a lot of historical grain-size and bathymetry data for the flats. Not much sand goes into the center. Water quality is good. If flats get deeper from storm scouring, we will see impacts to SAV.

***HEC-RAS Modeling*** – USGS’s Mike Langland shared the status of their HEC-RAS modeling work. The HEC-RAS model has three main components: (1) geometry, (2) hydraulics, and (3) sediment transport.

To account for geometry in the system, there were three options. The first option was to adapt the HEC-6 model constructed by USGS in the mid-1990’s. This option was ruled out early because this model did not perform well. The second alternative was to convert the HEC-2 model to a HEC-RAS model. This option was ruled out because only 75 percent of the study area from Marietta to Conowingo had coverage, missing about half of Conowingo Reservoir to the dam. The third and selected option was to construct a new HEC-RAS model using LIDAR data from Maryland and Pennsylvania, as well as recent bathymetry data (1996 and 2008 datasets) and flood insurance data to fill in where bathymetry data wasn’t available.

To account for hydraulics in the system, daily mean stream flows were pulled from four sites (Marietta, Conestoga, Pequea, and Conowingo) from 1996-2011. Gates were added for each of the reservoirs to help the flow simulation. Steady-state runs were made for annual mean flow, 300,000 cfs, 400,000 cfs, and 750,000 cfs. The model performed reasonably well at Safe Harbor and Conowingo, but there were problems at Holtwood. The simulations used pool elevations as

boundary conditions. Unsteady state (varying stream flow) has been less successful due to the fact that Mike does not have daily operational data for the turbine and spillway gates. This data would need to be obtained from power companies to incorporate in the model.

To account for sediment transport, Mike performed a series of tasks: (1) computed daily sediment loads for the four sites which will serve as one of the boundary files; (2) compiled estimated daily temperature data (temperature effects sediment settling); (3) built bed composition files; (4) input shear stress and erosion rates of sediments from sedflume data) for each reservoir; and (5) constructed sediment distribution with changing loads. First model runs indicate low velocities and high shear stress resulting from an overestimation of deposition.

Mike identified two issues for resolution – unsteady state flow modeling and overestimation of deposition. He will talk with Stan Gibson about the sediment simulations using quasi-steady state and gate operations. He anticipates having a workable boundary condition file to ERDC for the 2D ADH efforts by the end of August, and will continue work on documenting the model. He will have more detailed info at the next quarterly meeting.

***CBEMP Modeling Update and Data Report*** – Carl is in a holding pattern right now for his efforts on the study. He has been working with EPA and they have determined four modeling runs that can be done with the CBP WSM model.

***Sediment Transport Modeling*** – Steve Scott updated the agency LSWRA team on his sediment transport modeling using the PowerPoint presentation in enclosure 3.

Steve discussed his SedFlume field activities and data analysis, and provided preliminary sediment transport results with SedFlume data.

SedFlume is a portable laboratory flume that evaluates erosion rate and critical shear of cohesive sediments. Samples (sediment cores) were collected from eight locations in Conowingo Reservoir. The entire core was analyzed; erosion rate coefficients, exponents, and critical shear stress for erosion along with bulk density and particle size distribution, were determined.

Based on the results of the SedFlume data analysis, the sediment transport model domain was divided into areas using the change in sediment properties (average sediment size fractions) as determined by the collected data.

A preliminary sediment transport simulation was run to evaluate the 2008-2011 Susquehanna River flows (run included the period-of-record TS Lee event). Sediment inflows were estimated from previous HEC-6 modeling.

Steve simulated sediment load in and out of Conowingo Reservoir from 2008-2011 using assumptions on critical shear stress and erosion from the SedFlume analysis. His findings were that total sediments into reservoir during this time period were approximately 12 million tons, and sediments out of the reservoir were 16.6 million tons. Net scour was 4.6 million tons. Steve noted that scour occurred at >350,000 cfs flows and that his results of sediment transport parallel Bob Hirsch's results. When Conowingo is at capacity the dam will fill, scour, fill, scour.

Gary asked if Steve planned to compare the 2008-2011 data results to the 2011 bathymetry data that Exelon collected; Steve explained that this data was indeed included in the his analysis.

***Exelon Activities*** – Claire noted that she sent out the Exelon Conowingo Pond Bathymetric Survey Analysis report for review to the LSRWA team for review and will consolidate comments to provide to Exelon.

Tom let the group know that the Exelon license application for Conowingo dam will be filed with FERC at the end of August and all required studies will be completed by the end of September with the exception of two fish studies.

***Literature Search Update*** – Anna, Mark, and Kathy are working on the literature search. Findings will be presented at the next meeting in September which will be a brainstorming session to begin developing strategies to manage sediments in the Lower Susquehanna River watershed. Anna reminded the group that a draft outline of the report was distributed via email for comment. This outline will be discussed at the next quarterly meeting. The team needs to determine what sections will go in the report and leads for each section. There is no time in the schedule for report writing, only review of the report so we need to start writing now.

9. Wrap Up – Anna will draft up notes for the group’s review. Following this, the notes and presentations will be posted to the project website. The next quarterly meeting date will be coordinated by Claire for sometime in late October/early November. The next modeling conference call will be on September 6<sup>th</sup>, starting at 2:00 pm (EDT, 1:00 pm CDT). Claire will coordinate a sediment management strategy brainstorming meeting for sometime in September.

Anna Compton,  
Study Manager

Enclosures:   1. Meeting Agenda  
                  2. Bob Hirsch Presentation  
                  3. Steve Scott Presentation



**LOWER SUSQUEHANNA RIVER WATERSHED ASSESSMENT  
QUARTERLY TEAM MEETING**

**MDE, Montgomery Park Building, Aqua Conference Room  
August 7, 2012**

**Meeting Agenda**

		<b><u>Lead</u></b>
10:00	Welcome and Opening Remarks .....	Sachs
10:05	Introductions .....	All
10:10	Review of Action Items from April Meeting.....	O'Neill
10:20	Communication and Coordination	
	PowerPoint Presentation – Feedback from Recent Meetings.....	All
	Project Website Update.....	Michael
	Mission Statement Review.....	Compton
	USACE Review Plan .....	Compton
10:30	USGS Presentation on the Susquehanna River and the Impacts of Tropical Storm Lee High Flow Events .....	Bob Hirsch
11:15	Coordinated Message based on USGS Presentation – Brainstorming .....	Michael/O'Neill
	What is Message?	
	How Should Message Be Distributed?	
11:30	LSRWA Technical Analyses	
(3-5 min)	MGS Data Collection.....	Halka
(3-5 min)	CBEMP Modeling Update .....	Cerro
(30 min)	Sediment Transport Modeling Update – SEDFlume Presentation.....	Scott
(3-5 min)	HEC-RAS Modeling Update.....	Langland
(5 min)	Exelon Activities – Conowingo Relicensing Update.....	LeMay/Seaman
(3-5 min)	Literature Search Update .....	Compton
12:20	Review of Schedule for 2012 .....	O'Neill
	Funding Priorities for Fall-Winter 2012 .....	O'Neill
	Report Preparation.....	Compton
12:40	Wrap Up.....	O'Neill
	Action Items/Summary	
	Next Meeting	

**Call-In Information:** (410) 537- 4281 (no password required)

**Expected Attendees:**

MDE: Herb Sachs; Tim Fox, Matt Rowe, John Smith  
MDNR: Bruce Michael, Shawn Seaman  
MGS: Jeff Halka  
SRBC: John Balay, David Ladd, Andrew Gavin  
USACE: Chris Spaur, Claire O'Neill, Andrea Takash, Robert Pace, Tom Laczo  
ERDC: Carl Cerco, Steve Scott  
TNC: Mark Bryer, Kathy Boomer  
USEPA: Gary Shenk  
USGS: Mike Langland, Bob Hirsch

Exelon: Gary LeMay, Kimberly Long, Tom Sullivan, Marjorie Zeff  
Lower Susquehanna Riverkeeper: Michael Helfrich  
PA Agencies: Patricia Buckley, Raymond Zomok

**Action Items from April Meeting:**

- A. Claire will discuss funding needs for FY13 with Herb.
- B. Mike will invite Bob Hirsch to attend August quarterly meeting to give presentation on his findings.
- C. Herb and Bruce to draft preliminary statement regarding Conowingo's time as an effective sediment trap running out, with the intent that we have a consistent message to policymakers, the public, and media.

**Ongoing Action Items from Previous Meetings:**

- D. The MDE FTP website will be utilized to share internal draft documents within the team; Matt will be the point of contact for this FTP site.  
*Status – Ongoing; sharing of future documents will go through the MDE ftp website.*
- E. Shawn will notify team when most recent Exelon study reports are released.  
*Status – Recent report was sent out to team; ongoing action.*
- F. Anna will update PowerPoint slides after each quarterly meeting to be utilized by anyone on the team providing updates to other Chesapeake Bay groups.
- G. Anna will send out an update via the large email distribution list that started with the original Sediment Task Force (includes academia, general public, federal, non-government organization (NGO), and state and counties representatives) notifying the group of updates from the quarterly meeting.
- H. Mark and Anna will coordinate to conduct a literature search providing info on best management practices around the nation and world for reservoir sedimentation.
- I. Matt will keep team informed on innovative re-use committee findings to potentially incorporate ideas/innovative techniques into LSRWA strategies.

**MEMORANDUM FOR THE RECORD**

**SUBJECT:** Lower Susquehanna River Watershed Assessment  
Brainstorming Meeting, 24 September 2012

1. On September 24, 2012 agency team members met to discuss and brainstorm ideas for potential sediment management strategies for the Lower Susquehanna River Watershed Assessment (LSRWA). The meeting was hosted by the Maryland Department of the Environment (MDE) at the Montgomery Park Building in Baltimore, Maryland. The meeting attendees are listed below.

2.

Team Meeting Sign-In Sheet			
24 September 2012			
Agency	Name	Email Address	Phone
Exelon -- URS Corp.	Marjorie Zeff	marjorie.zeff@urs.com	215-367-2549
Lower Susquehanna Riverkeeper	Michael Helfrich	LowSusRiver@hotmail.com	717-779-7915
MDE	Herb Sachs	sachsh@verizon.net	
MDE	John Smith	jsmith@mde.state.md.us	410-537-4109
MDE	Matt Rowe	mrowe@mde.state.md.us	410-537-3578
MDE	Tim Fox	tfox@mde.state.md.us	410-537-3958
MGS	Jeff Halka	jhalka@dnr.state.md.us	410-554-5503
SRBC	John Balay	jbalay@srbc.net	717-238-0423 x217
TNC	Kathy Boomer	kboomer@tnc.org	
USACE	Anna Compton	anna.m.compton@usace.army.mil	410-962-4633
USACE	Tom Lazco	thomas.d.lazco@usace.army.mil	410-962-6773
USACE	Chris Spaur	christopher.c.spaur@usace.army.mil	410-962-6134
USACE	Claire O'Neill	claire.d.o'neill@usace.army.mil	410-962-0876
USGS	Mike Langland	langland@usgs.gov	717-730-6953
Chesapeake Conservancy	Jeff Allenby	jallenby@chesapeakeconservancy.org	443-321-3160
The Conservation Fund	Bill Crouch	bcrouch@conservationfund.org	410-274-8427
Exelon	Mary Helen Marsh	maryhelen.marsh@exeloncorp.com	610-765-5572
Exelon	Kimberly Long	kimberly.long@exeloncorp.com	717-629-4198
USACE-ERDC	Carl Cerco	carl.f.cerco@erd.c.usace.army.mil	601-634-4207
USACE-ERDC	Steve Scott	steve.h.scott@usace.army.mil	601-634-2371
NOAA-NMFS	John Nichols	john.nichols@noaa.gov	410-267-5675
PADEP	Patricia Buckley	pbuckley@pa.gov	717-772-1675
Gomez and Sullivan	Kirk Smith	ksmith@gomezandsullivan.com	
Pat Noonan	Conservation Fund	P.noonan@conservationfund.org	
Fran Flanigan	Consultant-MPA	frances.flanigan@verizon.net	
Jeff Otto	HarborRock	info@HarborRock.com	
Danielle Aloisio	USACE	danielle.m.aloisio@usace.army.mil	
Harry Kleiser	Terranear	hkleiser@terranearpmc.com	
Lake Savers	John Tucci	jtucci@lake-savers.com	269-383-3400
Brinjac	Steve Zeller	szeller@brinjac.com	717-233-4502
Clean Flo	Brian Kling	bklng@clean-flo.com	1-800-328-6656
Loon Landing, LLC	Jeri Epstein	jepstein@loonlandingadvisors.com	202-467-4832

The meeting agenda is provided as enclosure 1 to this memorandum.

Action Items –

- a. Matt Rowe will compare the results from the analysis of sediment cores taken from behind the Conowingo dam in 2006 to the decision framework criteria laid out in the 2007 IRC report to help the team better understand the suitability of the sediments in the lower Susquehanna river watershed for innovative reuse options.
  - b. Claire will compile questions from the group on floating islands, post-meeting and she will transmit to Brinjac Engineering to respond. [Note: Carl Cerco was the only one who sent questions in for Brinjac; those questions were forwarded to Steve Zeller on 25 September, and Steve responded directly back to Carl.]
  - c. Anna noted that the group needs to begin making decisions on what sediment management strategies we want to focus on for this effort. She will create a spreadsheet of compiled sediment management strategies so this group can begin evaluating and screening sediment management strategies in more detail at the next meeting.
3. Welcome – After a brief introduction of the meeting attendees, Claire O’Neill welcomed the LSRWA agency group and noted that the purpose of the meeting was to hear about potential sediment strategies that could be applied to the Lower Susquehanna River watershed and brainstorm ideas.
4. Results of Literature Search – Anna noted that a literature search was conducted on managing watershed/reservoir sedimentation. Findings and lessons learned from the literature will be incorporated into refining sediment/nutrient management strategies for the study. Anna noted that this search is considered “preliminary” due to the fact that as the study moves forwards certain strategies may warrant further research if there is an interest in evaluating the strategy in more detail.

The Sediment Task Force (original group that convened in 1999-2001 to investigate this issue) findings were summarized. The task force primarily recommended sediment management strategies in the watershed (BMPs, etc.) however the group did recommend a dredging feasibility study to deal with the large amounts of sediments existing behind the dams on the Susquehanna. The sediment task force ruled out bypassing because this would result in a base load condition that exceeds the current base load into the Bay which is counter to the currently accepted goal of reducing sediment input to the Bay. The sediment task force also ruled out modifying dam operations because of potential impacts to their primary purpose of hydropower and because it was unclear if modified operation could accomplish anything in the interest of sediment management other than as a form of bypassing.

Anna noted that a database literature search was also done. In general, sediment management strategies fell into three categories: (1) reducing sediment yield from the watershed (reducing sediment inflow from upstream of reservoirs); (2) minimizing sediment deposition (routing sediments around or through storage); and (3) increasing or recovering volume (recover, increase

or reallocate storage volume of reservoir.) Common factors that sediment management managers around the world look at when evaluating and implementing sediment management solutions are the goals, what is in the sediment, effectiveness of strategies, capital costs and maintenance costs, how to optimize sediment management strategies, environmental impacts, implementation sequence (short- and long-term solutions), benefits, and combining strategies to be successful.

The sediment management strategy of dredging has been implemented. However it is often seen a last resort, because dredging is expensive and often creates new social and environmental problems.

The technology to bypass and transport sediments has been developed and has many pros and cons, and there are a variety of methods available. Normally, an upper limit of sediment concentration (that would be bypassed) is defined by managers to account for ecological aspects (how much sediment can the receiving water body tolerate) and operational aspects (how much sediment can the bypassing system handle moving). Anna noted that we should keep the goals and objectives in mind to frame how we evaluate sediment management strategies and determine which ones we ultimately recommend.

The presentation of literature search findings is included as enclosure 2 to this memorandum.

5. Harbor Rock, Presentation and Q&A – Jeff Otto provided a presentation on a potential sediment management solution: innovative reuse of dredged material. Specifically dredging sediments from behind the dams on the lower Susquehanna River and converting the material to lightweight aggregate (LWA) to be sold commercially as construction material. After Jeff's presentation, there was much discussion and questions.

Jeff noted that during the processing of dredged material to LWA (firing in a kiln at high temperatures) the organic content of the sediment is vaporized while metal content remains bound to the aggregate (below amounts deemed harmful to the environment); therefore, the costs of disposal of unusable material is essentially zero. In the lower Susquehanna River, it is estimated that 3 million tons of sediment travel down the Susquehanna annually and their estimate is that this could be converted into 2.7 million tons of LWA (the difference would be organic material that is vaporized – a 10-percent loss). Costs are estimated to be \$60-75 million a year which includes capital repayment. A facility to process the dredged material can vary in size based on the amount of material that managers want to process. Jeff noted that bigger is often better because regardless of the amount of material, you would need the same amount of operators working at the processing facility. A demonstration project at the Cox Creek dredged material containment facility (DMCF), has been up and running since 2007. It would take approximately 4-5 years to permit and build a Susquehanna sediment management facility. There was also discussion on the legal aspect of the government subsidizing a commercial operation and if this would be cause for concern.

The HarborRock presentation is included as enclosure 3 to this memorandum.

6. Brinjac Engineering, Biological Dredging and Floating Islands, Presentation and Q&A - Stephen Zeller provided a presentation on the concept of Biological Dredging to augment/optimize any dredging sediment management strategy that is implemented. This technology would

complement a dredging solution, if implemented. Once installed this system could provide impacts to the sediment in 9-15 months. The biological dredging system can be installed in approximately 6-9 months to begin impacting sediments through reduction and compaction. The cost estimate is a capital investment of about \$18 million and annual operations and maintenance cost of \$1.011 million. There is potential for nutrient credits of about \$1 million which could assist in offsetting annual operations and maintenance and/or capital costs.

The concept involves a three-fold approach: floating and submerged coral islands, laminar-flow diffusers and bacterial augmentation. Total area impacted would be 2 square miles with diffusers and 1 square mile with diffusers and floating wetlands/coral. The biological dredging system (coral/diffusers/bacteria) would be anchored to the river bottom along with large floating islands placed on the surface near dredging operations and this system would biologically dredge the sediments to uptake nutrients and pollutants reducing and compacting organic sediments to reduce the release of these constituents into the water column. This system would thereby reduce the impacts of dredging, by acting as an in-situ water quality treatment system and provide a compaction and reduction to the sediment layer, before dredging, so that dredging is ultimately more efficient and cost-effective.

The islands utilize an artificial wetland matrix made of inert recycled plastic that supports/allows biofilm growth and this along with the diffusers would support the establishment of biofilm and periphyton growth which benefits aquatic life. This biological dredging system can effectively reduce sediment overflows by compacting the sediment layer and potentially reducing the organic sediment layer making sediments less likely to move during storm events (notwithstanding extreme storm events like Hurricanes Lee and Sandy). The primary benefit of this technology is during non-storm flow periods and the reduction of the sediment layer pre-and-post storm events to reduce overall sediment movement to the Bay.

The islands would require regular harvesting and the diffusers would require annual maintenance along with annual bacteria dosing to stimulate periphyton growth all of which incurs an annual operations and maintenance cost. A heavily laden storm flow with silt in it would overwhelm this system as the entire river itself is laden with silt.

Carl had several questions in regards to what data is available on the floating island technology and its impacts on nutrients/sedimentation in the water column.

Discussion ensued on the size/amount of islands that would be required for the amount of sediments that could potentially be dredged from this large river system (6000 acres or 250 Million sq ft of wetlands coral and 12,500 ft<sup>2</sup> of Leviathan Floating Wetlands) for the Conowingo Dam is estimated.

Steve noted that the biggest concern is not the size of the river but the flow. High velocities could impact the anchors of the floating islands (hydraulic analysis for this component is included in the estimated capital costs). As far as potential areas where islands could be placed, it could be anywhere in the lower Susquehanna River system, not just behind Conowingo dam. The benefits of biological dredging also include restoration of major fisheries, reduced water treatment costs for

major water utilities on the river by improving water quality, reducing pollutants in the river, reducing TSS/TDS and increasing DO in the water column.

Claire noted that due to time, anyone with specific questions on the floating islands should be sent to her and she will work up a list of questions to transmit to Brinjac Engineering.

The Brinjac Engineering presentation is too large to include as an enclosure to this memorandum, however, it is posted on the LSRWA website at the following location: <http://mddnr.chesapeakebay.net/LSRWA/Docs/Brinjac%20presentation%20092412%20and%20more.pdf>

Data on nutrient removal capabilities of this technology and engineering studies to support the efficacy of this technology are included in the Brinjac Engineering presentation. A factsheet with additional information is included as enclosure 4 to this memorandum.

Additionally, a published article on floating islands entitled, "The ability of vegetated floating islands to improve water quality in natural and constructed wetlands: a review" and can be found at the following location: [www.iwaponline.com](http://www.iwaponline.com)

7. Innovative Reuse Committee (IRC) Update - Fran Flanigan noted that she is a consultant for the MPA and facilitates the Innovative Reuse Committee (IRC) which is a group that meets to evaluate ways to innovatively reuse dredged material from the shipping channels in Chesapeake Bay. She noted that in 2001, the MD legislature enacted a law banning open water placement of dredged material after 2010. Any material from the Baltimore Harbor is considered "contaminated" and must be treated as such when dealing with disposal and use of dredged material. Approximately 500,000 cubic yards of material needs to be managed annually. MPA is required to have 20 years of placement lined up.

Fran noted that HarborRock is first in line for innovative reuse implementation to process dredged material. A demonstration project has been set up at Cox Creek DMCF (as discussed in Section 5.) No major technical issues have arisen yet. Toxin levels look good and a minor air quality permit would be required.

Fran noted that there is a report available, *Independent Technical Review Team (2009). Sediment in Baltimore Harbor: Quality and Suitability for Innovative Reuse. An Independent Technical Review*, which the IRC uses as a guide. This effort involved a national team of independent experts examining historical data for levels of metals and organic contamination in sediments that may be dredged from Baltimore Harbor shipping channels, including off-channel sites and harbor approach channels in the Chesapeake Bay. Summarizing this data helps authorities as they manage large amounts of sediment taken from these channels. This independent team evaluated the suitability of dredged sediments for innovative reuse to provide managers with a scientifically sound basis for determining potential innovative reuse options, the team assembled data and information to construct a frame for risk analysis and decision-making. The document has been uploaded to the LSRWA website located here:

[http://mddnr.chesapeakebay.net/LSRWA/Docs/Dredge\\_ReportandAppendices\\_Print.pdf](http://mddnr.chesapeakebay.net/LSRWA/Docs/Dredge_ReportandAppendices_Print.pdf)

There was discussion that the results from the analysis of sediment cores taken from behind the Conowingo dam in 2006 need to be compared to the decision framework criteria laid out by this

2007 IRC report. This way the suitability of the sediments in the lower Susquehanna River watershed for innovative reuse options could be better understood (i.e., do sediments behind dams meet beneficial reuse standards?). Matt Rowe said that he could do this comparison between the results of the two reports.

Discussion ensued on sediment management options that could be evaluated including agricultural applications and landfill cover. There was also consensus that the entire lower Susquehanna River watershed including areas further upstream need to be focused on when thinking about where and how to manage sediments. The group agreed that bypassing needs to be evaluated in more detail as well as island restoration in the Bay or island expansion within Conowingo Reservoir. Fran noted that MD legislation limits this concept to the restoration of historic islands not the creation of new islands. A diversified/combination approach for sediment management should be evaluated. Agitation dredging and tactical dredging were also mentioned as potentially viable strategies.

Anna noted that the group needs to begin making decisions on what sediment management strategies we want to focus on for this effort. She will create a spreadsheet of sediment management strategies compiled from the literature search and discussion today so that this group can begin evaluating and screening sediment management strategies in more detail at the next meeting.

8. Wrap Up – Anna will draft up notes for the group’s review. Following this, the notes and presentations will be posted to the project website. The next quarterly meeting date will be coordinated by Claire for sometime in November.

Anna Compton,  
Study Manager

Enclosures:   1. Meeting Agenda  
                  2. Anna Compton Presentation  
                  3. Jeff Otto Presentation  
                  4. Brinjac Engineering- Biological Dredging Summary



**LOWER SUSQUEHANNA RIVER WATERSHED ASSESSMENT  
ALTERNATIVE BRAINSTORMING MEETING**

**MDE, Montgomery Park Building, Terra Conference Room  
September 24, 2012**

**Meeting Agenda**

	<b><u>Lead</u></b>
10:00	Welcome..... O'Neill
10:05	Results of Literature Search..... Compton/Bryer
10:20	Harbor Rock, Presentation and Q&A ..... Jeff Otto
10:50	Brinjack Engineering, Floating Islands, Presentation and Q&A ..... Stephen Zeller
11:20	Innovative Re-Use Committee Update ..... Flanigan/Blazer
11:30	Brainstorming ..... All
12:30	Next Steps..... O'Neill
12:45	Wrap Up..... O'Neill Action Items/Summary Next Meeting

**Call-In Information:** (410) 537- 4281 (no password required)

**Expected Attendees:**

MDE: Herb Sachs; Tim Fox, Matt Rowe, John Smith  
MDNR: Bruce Michael, Shawn Seaman  
MGS: Jeff Halka  
SRBC: John Balay, Andrew Gavin  
USACE: Chris Spaur, Claire O'Neill, Anna Compton, Tom Laczko, Dan Bierly, Danielle Aloisio  
ERDC: Carl Cerco, Steve Scott  
TNC: Mark Bryer, Kathy Boomer  
USEPA:  
USGS: Mike Langland

Exelon: Gary LeMay, Kimberly Long, Tom Sullivan, Marjorie Zeff  
Lower Susquehanna Riverkeeper: Michael Helfrich  
PA Agencies: Patricia Buckley  
Alliance for the Chesapeake Bay: Fran Flanigan  
MPA: Dave Blazer  
Harbor Rock: Jeff Otto

**MEMORANDUM FOR THE RECORD**

**SUBJECT:** Lower Susquehanna River Watershed Assessment  
Quarterly Meeting, November 19, 2012

1. On November 19, 2012 agency team members met to discuss ongoing and completed activities for the Lower Susquehanna River Watershed Assessment (LSRWA). The meeting was hosted by the Maryland Department of the Environment (MDE) in their Terra Conference Room at the Montgomery Park Building in Baltimore, Maryland. The meeting started at 10:00 am and continued through 1:00 pm. The meeting attendees are listed in the table below.

2.

Lower Susquehanna River Watershed Assessment Team Meeting Sign-In Sheet			
November 19, 2012			
Agency	Name	Email Address	Phone
Exelon -- Gomez and Sullivan	Gary Lemay	glemay@gomezandsullivan.com	603-428-4960
Exelon -- URS Corp.	Marjorie Zeff	marjorie.zeff@urs.com	215-367-2549
Lower Susquehanna Riverkeeper	Michael Helfrich	LowSusRiver@hotmail.com	717-779-7915
MDE	Herb Sachs	sachsh@verizon.net	
MDE	John Smith	jsmith@mde.state.md.us	410-537-4109
MDE	Matt Rowe	mrowe@mde.state.md.us	410-537-3578
MDE	Tim Fox	tfox@mde.state.md.us	410-537-3958
MDNR	Bruce Michael	bmichael@dnr.state.md.us	410-260-8627
MDNR	Shawn Seaman	sseaman@dnr.state.md.us	410-260-8662
MGS	Jeff Halka	jhalka@dnr.state.md.us	410-554-5503
SRBC	John Balay	jbalay@srbc.net	717-238-0423 x217
TNC	Kathy Boomer	kboomer@tnc.org	607-280-3720
USACE	Anna Compton	anna.m.compton@usace.army.mil	410-962-4633
USACE	Tom Lazco	thomas.d.lazco@usace.army.mil	410-962-6773
USACE	Chris Spaur	christopher.c.spaur@usace.army.mil	410-962-6134
USACE	Claire O'Neill	claire.d.o'neill@usace.army.mil	410-962-0876
USACE	Ashley Williams	ashley.a.williams@usace.army.mil	410-962-6139
USACE-ERDC	Carl Cerco	carl.f.cerco@erdc.usace.army.mil	601-634-4207
USACE-ERDC	Steve Scott	steve.h.scott@usace.army.mil	601-634-2371
USGS	Mike Langland	langland@usgs.gov	717-730-6953
The Conservation Fund	Bill Crouch	bcrouch@conservationfund.org	410-274-8427
DNR	Bob Sadzinski	bsadzinski@dnr.state.md.us	
Exelon	Mary Helen Marsh	maryhelen.marsh@exeloncorp.com	610-765-5572
Exelon-Gomez and Sullivan	Tom Sullivan	tsullivan@gomezandsullivan.com	603-428-4960
USACE-ERDC	Carl Cerco	carl.f.cerco@erdc.usace.army.mil	601-634-4207
USACE-ERDC	Steve Scott	steve.h.scott@usace.army.mil	601-634-2371
NOAA-NMFS	John Nichols	john.nichols@noaa.gov	410-267-5675
PADEP	Patricia Buckley	pbuckley@pa.gov	717-772-1675
EPA, Chesapeake Bay Program	Lew Linker	llinker@chesapeakebay.net	
NMFS	John Nichols	john.nichols@noaa.gov	410-267-5675
Chesapeake Bay Commission	Bevin Buchheister	bevinb@chesbay.us	410-730-9030

The meeting agenda is provided as enclosure 1 to this memorandum.

Action Items from August Quarterly Meeting:

- A. Anna will email out the draft mission statement to the team and the team will provide any further comments to the statement. *Status: Complete.*
- B. Anna will revise goals and objectives to state “three” vs. “four” hydroelectric dams to accurately reflect the study area of the assessment. *Status: Complete.*
- C. Mike will resolve issues with HEC-RAS modeling and will have a workable boundary condition file by the end of August. *Status: Complete. Mike gave a presentation with results at today’s meeting which is included as Enclosure 2 to this memorandum.*
- D. Bruce will invite Harbor Rock to the September sediment management strategy brainstorming meeting. *Status: Complete.*
- E. Bob Hirsch will share draft press release on recent TS Lee study findings by USGS with selected agencies for review and input. *Status: Complete. Press release was published in September 2012.*
- F. Claire will coordinate a sediment management strategy brainstorming meeting for September. *Status: Complete. Brainstorm meeting was held on September 24, 2012.*
- G. Claire will coordinate the next quarterly meeting for sometime in late October/early November. *Status: Complete.*
- H. Herb and Bruce to draft preliminary statement regarding Conowingo’s time as an effective sediment trap running out to be reviewed by LSRWA team and posted to project website. *Status: Complete. Statement located on project website: <http://mddnr.chesapeakebay.net/LSRWA/agendas.cfm> under the “News” header.*

Action Items from September (Brainstorming) Meeting:

- A. Matt Rowe will compare the results from the analysis of sediment cores taken from behind the Conowingo dam in 2006 to the decision framework criteria laid out in the 2007 IRC report to help the team better understand the suitability of the sediments in the lower Susquehanna river watershed for innovative reuse options. *Status: Complete. Tim gave a presentation with results which is included as Enclosure 6 to this memorandum.*
- B. Claire will compile questions from the group on floating islands, post-meeting and she will transmit to Brinjac Engineering to respond. *Status: Complete. Carl Cerco was the only one who sent questions in for Brinjac; those questions were forwarded to Steve Zeller on 25 September, and Steve responded directly back to Carl.*
- C. Anna will create a spreadsheet of compiled sediment management strategies so this group can begin evaluating and screening sediment management strategies in more detail at the next meeting. *Status: Complete. Spreadsheet was distributed to all stakeholders via email and input was requested by November 29, 2012.*

### Ongoing Action Items from Previous Meetings:

- A. The MDE FTP website will be utilized to share internal draft documents within the team; Matt will be the point of contact for this FTP site. *Status: Ongoing. Sharing of future documents will go through the MDE ftp website.*
- B. Shawn will notify team when most recent Exelon study reports are released. *Status: Ongoing.*
- C. Anna will update PowerPoint slides after each quarterly meeting to be utilized by anyone on the team providing updates to other Chesapeake Bay groups. *Status: Ongoing.*
- D. Anna will send out an update via the large email distribution list that started with the original Sediment Task Force (includes academia, general public, federal, non-government organization (NGO), and state and counties representatives) notifying the group of updates from the quarterly meeting. *Status: Ongoing.*
- E. Matt will keep team informed on innovative re-use committee findings to potentially incorporate ideas/innovative techniques into LSRWA strategies. *Status: Ongoing.*

### Action Items –

- a. Michael Helfrich will coordinate with MD, CBP and the MD county coalition to set up a meeting to present dam implications to TMDL to MD counties.
  - b. Mike Langland will let Claire know if his final report will be a stand- alone document or if it will be written collaboratively with Steve Scott to be included with the ADH modeling report.
  - c. Carl Cerco will have CBP WSM modeling runs of existing/baseline conditions completed by mid-December.
  - d. UMCES report entitled “Effect of Timing of Extreme Storms on Chesapeake Bay Submerged aquatic vegetation” will be saved on LSRWA website. *Status: Complete. Document saved here: <http://mddnr.chesapeakebay.net/LSRWA/Docs/Wang%20and%20Linker.pdf>*
3. Welcome – After a brief introduction of the meeting attendees, Claire O’Neill welcomed the LSRWA agency group and noted that the purpose of the meeting was to provide updates on recent activities within the LSRWA. Herb noted that communication of what study activities to all stakeholders is very important especially as we enter the legislative session in January. The more progress and information we provide, the more we will be able to garner public/political support. Bruce added that our study along with Bay-wide TMDL and FERC relicensing of Conowingo dam has a lot of interest. The LSRWA website has proven to be an effective tool to keep the public informed. Many state and regional groups as well as well as the governor of Maryland wants to know what can be done to accelerate this study’s efforts.

There was discussion on local government outreach. Michael Helfrich noted that there are several MD counties forming a coalition with lawyers out of concern about the sediments behind the dams on the lower Susquehanna River and whether the efforts required by the Maryland counties under the Maryland County WIPs will be effective due to increased scouring and loads from the Susquehanna. Currently the law firm Funk and Bolton is proposing and accepting money from counties for a study to be conducted by this law firm on Bay TMDL.

Michael added that there has been concern raised by this coalition that MD has county WIPs while PA does not. Pat Buckley noted that PA has "WIP planning targets" in lieu of "county WIPs," Bruce added that for the 2017 CBP Mid Point Assessment of the Bay TMDL, the CBP Water Quality Goal Implementation Team (WQGIT) has recognized/prioritized Conowingo filling impacts as one of the top issues to be addressed by the 2017 Mid Point Assessment. Michael noted that he attended the Cecil County Commissioners' meeting and they requested to be educated on dam implications to TMDL and WIPs. Bruce noted that he, or other Maryland state agency representatives, could participate in a meeting with the counties. Michael will determine who from this Maryland county coalition should be contacted to coordinate a meeting and will let Bruce know. In addition to this, Michael will contact CBP to determine if CBP wishes to follow through on reaching out to the counties.

4. HEC-RAS Modeling Update – Mike Langland provided a presentation on building a HEC-RAS model to simulate sediment transport through the three lower Susquehanna River reservoirs. Mike's presentation is included as enclosure 2 to this memorandum.

Mike noted that Conowingo Dam was constructed in 1929 and since then the Conowingo reservoir has been filling with sediment and has 10 to 15 percent storage capacity remaining. Overall sediment from the watershed has been decreasing (about 2/3 less).

The objectives of his efforts were to construct, calibrate, and validate a 1-D sediment model for the entire Reservoir system (~33 miles). The goal is to simulate the loads in and out of reservoirs, show bed-form change, and particle size distribution. Ultimately the outputs of this modeling effort will produce input boundary condition files for Conowingo Reservoir for the USACE 2-D ADH model

There are two models, one showing long-term depositional changes and one showing short-term scouring. The two models provide a range of uncertainty in the boundary condition files. Mike noted that there is more sand upstream and silts and clays are more prevalent closer to the dam for all three reservoirs. Also during TS Lee, scour occurred in all three reservoirs. Both models indicate that the upper two reservoirs still play a "role" in sediment transport. The estimated total sediment transport from the modeling was most likely underestimated but reasonable.

Mike was trying to calibrate the scour model to TS Lee and the depositional model to Bob Hirsch's modeling/USGS estimator. There is still some fundamental things wrong with the predictions of the model. HEC-RAS is not simulating silts and clays well and it does not show interaction with the bed well. Overall, he couldn't get the model to deposit enough sediment generally, and couldn't get enough scour from TS Lee. Additionally, the HEC-RAS model is not sensitive to gate operations. More specifically:

- 2008-2011 bathymetry data indicates both deposition and scour in the same cross section, however the model simulates only one occurrence;
- silts and clay were modeled about two times lower (lack of deposition) than expected based on the literature values and the 2-D model, and could not adjust values;
- the model only allows one critical shear stress (force of water acting on the channel sides and bed required to mobilize sediments), SEDFLUME data (collected earlier this year by ERDC) indicates wide variability (8x); and finally,

- the model shows that increasing the critical shear results in an increase in scour which is a contradictory effect.

The model is 99% built and Mike continues to work with the HEC group to work out bugs. Right now this is the product we have to work with.

Mike noted he is preparing the report (the presentation he gave is an overview of what report will include) and that he and Steve might prepare a joint report for their modeling efforts. He will let Claire know the format of the final report.

5. 2D ADH Modeling Update– Steve Scott provided a presentation on his 2D ADH modeling efforts. Recent tasks have focused on model validation to ensure that the model can adequately replicate sediment transport characteristics representative of the lower Susquehanna River system. Steve’s presentation is included as enclosure 3 to this memorandum.

The validation criteria he used were USGS’ studies on the Conowingo Reservoir (annual load and scour predictions); measured suspended sediment concentrations out of Conowingo; and trap efficiency calculations.

The simulations he ran to validate the model included (1) 2008 – 2011 simulation of flows through Conowingo Reservoir and (2) inflowing sediment concentrations provided by USGS (HEC-RAS) output. Two HEC-RAS simulations were run: (1) minimum scour load from upper two reservoirs and (2) maximum scour load from upper two reservoirs.

The USGS validation criteria included (1) an estimation of 3 – 4 million tons of scour for TS Lee (2) an estimation of 1.5 million tons of sediment deposited per year and (3) a trap efficiency range of 50 to 70%.

For the first simulation AdH results for sediment inflow /outflow predicted a total inflow of 22 million tons, 50 percent from TS Lee. The AdH results for sediment storage predicted a total of 1.5 million tons/year, deposition up to 3.7 years, scour at 3.5 million tons during the TS Lee event and deposition of 3 million tons. The AdH results for trap efficiency predicted a total of 60 percent trap efficiency during depositional flows. The AdH results for maximum critical shear stress was 1.4 million tons/year, deposition up to 3.7 year, scour 2 million tons (Lee Event), and deposition of 3.5 million tons.

For the second simulations AdH results for sediment inflow /outflow predicted a total inflow of 25 million tons, 50 percent from TS Lee. The AdH results for sediment storage predicted a total of 1.7 million tons/year; deposition up to 3.7 years; scour at 3.5 million tons during TS Lee event and deposition of 4 million tons. The AdH results predicted a total of 60 percent trap efficiency during depositional flows.

In conclusion, USGS predictions included scour: of 3.0 to 4.0 million tons, a deposition rate at 1.5 million tons per year while the AdH results identified a scour of 2.0 -3.5 million tons; deposition rate at 1.4 to 1.7 tons per year and a trap efficiency at approximately 60 percent.

Steve noted that the bottom line is that at this time, the 2D ADH model is up and running and is an accurate representation of the system. He noted that he has considered input loads that will be provided to him from Mike Langland's work (HEC-RAS); despite the bugs that Mike mentioned, simulations will provide an accurate representation of relative changes to the system.

6. CBEMP Modeling Update – Carl Cerco provided a presentation on the estimated effects of Conowingo infill on the current conditions in Chesapeake Bay utilizing the CBP Watershed Model (WSM). This effort is establishing existing conditions and future conditions to assist in answering the question of what will happen to Chesapeake Bay when reservoirs are full and no longer trapping solids? Carl noted that it is a very preliminary look and any results should be shared with discretion in that results are still very rough. Carl's presentation is included as enclosure 4 to this memorandum.

Carl found through his efforts that in general on any day, outflow volume, solids concentration, and solids load can be greater or less than inflow. On average, outflow exceeds inflow by 18 m<sup>3</sup>/s; inflowing solids concentration exceeds outflow by 3.3 mg/L; and 711 tonnes/day (260,000 tonnes/year) solids are retained by Conowingo reservoir (Note that 1 tonne= 1 metric ton=1,000 kilograms= 2,204.6 pounds). The variation in outflow vs. inflow occurs at flows less than 3,000 m<sup>3</sup>/s. At higher flows, the relationship is 1-to-1. Overall, the inflowing solids concentration is approximately 33 percent greater than the out-flowing concentration, meaning that the Conowingo Reservoir is still retaining solids. The inflowing solids load is approximately 20 percent larger than the out -flowing load. The difference between inflowing and out-flowing concentrations is unrelated to flow. At this stage of WSM calibration, scouring does not occur. Few scouring events (flow > 400,000 ft<sup>3</sup>/s) are expected during the model application period, in any event."

The basic assumptions that were used for scenarios run with the model include (1) no scouring occurs in the model (2) limited scouring during the application period (1991-2000 hydrology) is expected in any event; (3) the reservoir acting as a sink for solids (and nutrients in solid form); (4) the first approach to examining the effect of Conowingo infill is to eliminate it from the WSM system; and (5) the water quality model (WQM) receives loads directly from the Susquehanna River as it enters Conowingo.

Conditions that were used for this modeling run (future once Conowingo is no longer trapping solids) were: (1) ten years of hydrology, 1991-2000; (2) base conditions from the 2010 CBP progress run (land use, point sources, atmospheric loads etc.); (3) phase 5.3.2 Watershed Model (same phase of the WSM and same calibration status of the WQM as used for TMDL determination); and (4) Conowingo Reservoir eliminated (direct loads to Conowingo also eliminated).

Taking those assumptions and conditions into account Carl ran the model and examined the effects of key water quality constituents (SAV, DO, chlorophyll, light extinction) at four mainstem stations.

After running the model and analyzing results, Carl reported that CB1 (segment of Northern Bay just below Conowingo Dam) showed the greatest impact on chlorophyll (increases up to 4 to 5 µg/L during summer). CB2 showed a lot of fluctuations but, on first impression, little net change. Carl concluded that light limitation is the dominant factor here. CB3 and CB4 show less chlorophyll in spring, possibly indicating increased light limitation. Increases of approximately 0.5 µg/L characterize these stations in summer. In general, as you travel down the Bay the loads disperse and impacts to light decrease.

Carl noted that he observed decreases in bottom dissolved oxygen of 0.1-0.2 mg/L at CB2.2, CB3.3C and CB4.2C. Larger decreases occur in CB1.1, but this station in general, exhibited few DO problems. Station CB3 is by the Chesapeake Bay Bridge; this is currently the worst place for DO in the Bay. Any drop in DO at this location is a serious problem.

Increases in light attenuation are “flashy” reflecting loading events. Increases range over two orders of magnitude. Range is  $10 \text{ m}^{-1}$  in CB1 (uncommon) to  $0.1 \text{ m}^{-1}$  at CB4.2.

Results revealed that SAV at CB-1 in particular, showed a loss of 4 sq km or 7percent (losses are largely confined to this region) and system-wide the modeling predicted a loss of 5.7 sq km or 1percent.

Carl noted that the next steps for his modeling efforts are: (1) to conduct a complete examination of 2010 CBP Progress Run scenario (re-run with direct loads to Conowingo reservoir); (2) run TMDL scenario with Conowingo storage eliminated (i.e., once WIPs are implemented how will this impact Conowingo infill and Chesapeake Bay); (3) to run results of the TMDL scenario through the CBP processor which examines water quality standards; (4) to perform one or two scenarios with a storm event during SAV growing season; and (5) time and resources permitting, to examine scour and deposition using ADH (bathymetry circa 1991 – 2000, present bathymetry, reservoir full).

There was discussion on the impacts of reservoir operations on loading. Lew Linker noted that WSM should show some scouring. The WSM has a “good to excellent” calibration of sediment over the entire range of observed loading from 1985 to 2005; achieving this is due to user-specified model parameters for both scour and deposition, and M, the erosion rate for scour. So on the few occasions when we do have very high flows, we see in the observed data and in the simulation that the TSS loads are higher at Conowingo than they are for all the inputs to the Conowingo Reservoir; this is evidence that scour is occurring in the simulation. Carl explained that indeed WSM is applied over the period 1985-2005. For this project, we are looking at 1991-2000 hydrology. During this shorter period, there is only one instance, of a few days duration, when flows are high enough to generate scour. Carl did not see evidence of scour during this 3 or 4 day event although scour may be present during high-flow intervals outside the 1991-2000 period. In summary, Carl did not see evidence of scour in the WSM loads during the 1991-2000 interval, nor was significant scour expected.

Michael Helfrich expressed concern over using 260,000 tons per year solids being retained by Conowingo. Is this too conservative? Carl noted that the CBP WSM has a crude representation of scour/deposition. Michael expressed concern that if we only have money for a few more model runs by CBP, they must be done using the 1.5 million tons per year of current sediment trapping. This figure does not need to be calculated in a model, it should be easily extrapolated from the bathymetric measurements. He respects the efforts to build models that represent reality so that we can input BMP's for evaluation, but he is concerned about limited funds being used to run models using figures that do not represent reality. He also raised concerns about this information being shared publicly, as misinformation of this type can easily be confused and misused by members of the public. Anna/Claire noted that any material posted on the website will have draft/preliminary clearly stated so that the public knows these are still working numbers. Also Carl's presentation will be an enclosure to this memorandum and won't be a stand-alone document distributed publicly.

Carl noted that CBP is revisiting Conowingo scour. Carl noted that the WSM is providing us a sense of magnitude and is an initial run. He will have more runs completed by mid-December.



There was discussion on the volatile suspended solids (organic/living or previously living solids) that the CBP WSM modeling run predicted. Carl noted that VSS are produced in the reservoir itself under low-flow conditions because of long water residence time facilitating this. We can assume that the quantity of VSS produced is reduced if there is no reservoir. With reduced residence time, there's less time to form VSS. Michael noted that the system will never really be full due to scouring so there will always be time for VSS to form.

7. Review of Modeling Scenarios – Claire O'Neill provided a modeling scenario handout to the group which is included as enclosure 5 to this memorandum. Claire noted that due to limited funds and time there has been much discussion on which modeling scenarios should be prioritized and run first, and how those scenarios would be run. This handout lays out team discussion on the various modeling input options and resolution. After reviewing the options, it was agreed that using the CBP WSM input would provide a big picture or macro view of the problem right now. This input can be done relatively simply and in a short timeframe. The primary focus of this work is to assess the sediment impacts on the upper Bay area. The four scenarios to run by Carl are as follows:

1. 2010 land uses with 1991-2000 flow values and 1991-2000 Conowingo capacity;
2. Watershed implementation plans (WIPs) in place with 1991-2000 flow values and 1991-2000 Conowingo capacity;
3. 2010 land uses with 1991-2000 flow values and Conowingo storage full; and
4. WIPs in place with 1991-2000 flow values and Conowingo storage full

For the purposes of evaluating the effectiveness of alternatives, the HEC-RAS/AdH input is required (i.e., micro view). The HEC-RAS/AdH input is focused on 2008-2011 flow values and current bathymetry so it is a more accurate representation of the existing conditions. Using this input will result in more detailed information about the geographic distribution of sediments as well as the impacts to the upper Bay area.

8. Sediment Core Composition – Tim Fox provided a presentation on Susquehanna River sediment and metals screening thresholds. Tim's presentation is included as enclosure 6 to this memorandum.

At the last LSRWA meeting there was discussion on the 2009 report, *Sediment in Baltimore Harbor: Quality and Suitability for Innovative Reuse. An Independent Technical Review*. This effort involved a national team of independent experts examining historical data for levels of metals and organic contamination in sediments that may be dredged from Baltimore Harbor shipping channels, including off-channel sites and harbor approach channels in the Chesapeake Bay. Summarizing this data helps the regional agencies as they manage large amounts of sediment taken from these channels. This independent team evaluated the suitability of dredged sediments for innovative reuse to provide managers with a scientifically sound basis for determining potential innovative reuse options. In this evaluation, the team assembled data and information to construct a framework for risk analysis and decision-making.

There was discussion at the last LSRWA meeting that the results from the analysis of sediment cores taken from behind the Conowingo dam in 2006 need to be compared to the decision framework criteria laid out by this 2009 IRC report. This way the suitability of the sediments in the lower Susquehanna River watershed for innovative reuse options could be better understood (i.e., do sediments behind dams meet beneficial reuse standards?).

Tim noted that MDE conducted a comparison between the results of the two reports. The assumptions they made were that they did not take depth into account and if any core exceeded a use threshold at any depth, then the site did not meet that use threshold (i.e., this analysis was very conservative).

MDE's analysis revealed that most metals in the sediment cores were below MD residential reuse thresholds which include uses such as upland reclamation and manufactured topsoil for landscaping. There were some instances where arsenic, chromium and cadmium were above MD residential reuse thresholds meaning that some of the sediments from behind Conowingo would not be acceptable for this kind of reuse. MDE's findings were similar to the IRC (2009) report in that site specific assessments may be needed for sediment reuse potential and there could be some regulatory issues.

There was not much time for discussion results will be discussed further in future meetings.

9. Strategy for Alternative Development- Anna noted a spreadsheet of compiled sediment management strategies was developed so this group can begin evaluating and screening sediment management strategies in more detail at the next meeting. This spreadsheet is included as enclosure 7 to this memorandum.

This spreadsheet was distributed to all stakeholders via email and input was requested by November 29, 2012. The LSRWA team will use this document as a starting point to develop, evaluate, compare and screen sediment management strategies.

Once we know baseline conditions and future conditions if no action is taken, we can begin to screen strategies. Management strategies are organized into three categories: watershed (e.g. BMP's); routing sediments (e.g., by-passing/reservoir operations); and recovering volume (e.g., dredging).

The team will need to determine the viable options through a screening process; then the viable options will need to be modeled and compared. Collaboration on these strategies is critical. Strategies ultimately will have costs identified and recommendations for implementation as well as entities to implement. Currently, the strategies listed in this spreadsheet are very generic. It will take time to create more specific strategies.

There was discussion about by-passing during less critical times, such as during the winter. We know that Tropical Storm Agnes had big, negative impacts on SAV because the storm hit during the SAV growing season. However the 1996 winter event and the more recent Tropical Storm Lee event which were outside of the SAV growing season, did not appear to have the same negative impacts. Lew noted that the Bay TMDL water quality standards trump TMDL load requirements so even though loads added during the winter would contradict Bay TMDL they would positively impact water quality standards (in comparison to loads entering system during spring/summer). Bruce mentioned a report done by UMCES entitled "*Effect of Timing of Extreme Storms on Chesapeake Bay Submerged Aquatic Vegetation*" which discussed storm impacts on SAV. It is on the LSRWA website here: <http://mddnr.chesapeakebay.net/LSRWA/Docs/Wang%20and%20Linker.pdf>

Wrap Up – Anna will draft up notes for the group’s review. Following this, the notes and presentations will be posted to the project website. The next quarterly meeting date will be February 11, 2013.

Anna Compton,  
Study Manager

- Enclosures:
1. Meeting Agenda
  2. Mike Langland Presentation
  3. Steve Scott Presentation
  4. Carl Cerco Presentation
  5. Modeling scenario summary
  6. Tim Fox presentation
  7. Sediment Management Strategy Spreadsheet

**LOWER SUSQUEHANNA RIVER WATERSHED ASSESSMENT  
QUARTERLY TEAM MEETING**

**MDE, Montgomery Park Building, Terra Conference Room  
November 19, 2012**

**Meeting Agenda**

**Lead**

10:00	Welcome and Introductions.....	All
10:05	Review of Action Items from August/September Meetings .....	O'Neill
<u>LSRWA Technical Analyses</u>		
10:15	HEC-RAS Modeling Update.....	Langland
10:45	Sediment Transport Modeling Update .....	Scott
11:15	CBEMP Modeling Update .....	Cerco
12:15	Review of Modeling Scenarios.....	O'Neill
12:25	Sediment Core Comparison .....	Rowe
12:35	Strategy for Alternative Development.....	Compton
12:45	Communication and Coordination Updates.....	Compton
12:50	Review of Schedule/Budget for 2012-13.....	O'Neill
12:55	Wrap Up.....	O'Neill
	Action Items/Summary	
	Next Meeting	

**Call-In Information:** (410) 537- 4281 (no password required)

**Expected Attendees:**

MDE: Herb Sachs; Tim Fox, Matt Rowe, John Smith (phone)  
MDNR: Bruce Michael, Shawn Seaman  
MGS: Jeff Halka  
SRBC: John Balay, Andrew Gavin  
USACE: Anna Compton, Bob Blama, Chris Spaur, Claire O'Neill, Ashley Williams, Danielle Aloisio, Tom Laczko  
ERDC: Carl Cerco, Steve Scott  
TNC: Mark Bryer, Kathy Boomer  
USEPA: Gary Shenk, Lewis Linker  
USGS: Mike Langland

Exelon: Mary Helen Marsh, Kimberly Long, Bob Matty  
Lower Susquehanna Riverkeeper: Michael Helfrich  
PA Agencies: Patricia Buckley, Raymond Zomok

### **Action Items from August Meeting:**

- A. Anna will email out the draft mission statement to the team and the team will provide any further comments to the statement.
- B. Anna will revise goals and objectives to state “three” vs. “four” hydroelectric dams to accurately reflect the study area of the assessment.
- C. Mike will resolve issues with HEC-RAS modeling and will have a workable boundary condition file by the end of August.
- D. Bruce will invite Harbor Rock to the September sediment management strategy brainstorming meeting.
- E. Bob Hirsch will share draft press release on recent TS Lee study findings by USGS with selected agencies for review and input.
- F. Claire will coordinate a sediment management strategy brainstorming meeting for September.
- G. Claire will coordinate the next quarterly meeting for sometime in late October/early November.
- H. Herb and Bruce to draft preliminary statement regarding Conowingo’s time as an effective sediment trap running out to be reviewed by LSRWA team and posted to project website.

### **Action Items from September Meeting:**

- A. Matt Rowe will compare the results from the analysis of sediment cores taken from behind the Conowingo dam in 2006 to the decision framework criteria laid out in the 2007 IRC report to help the team better understand the suitability of the sediments in the lower Susquehanna river watershed for innovative reuse options.
- B. Claire will compile questions from the group on floating islands, post-meeting and she will transmit to Brinjac Engineering to respond. [Note: Carl Cerco was the only one who sent questions in for Brinjac; those questions were forwarded to Steve Zeller on 25 September, and Steve responded directly back to Carl.]
- C. Anna noted that the group needs to begin making decisions on what sediment management strategies we want to focus on for this effort. She will create a spreadsheet of compiled sediment management strategies so this group can begin evaluating and screening sediment management strategies in more detail at the next meeting.

### **Ongoing Action Items from Previous Meetings:**

- A. The MDE FTP website will be utilized to share internal draft documents within the team; Matt will be the point of contact for this FTP site.  
*Status – Ongoing; sharing of future documents will go through the MDE ftp website.*
- B. Shawn will notify team when most recent Exelon study reports are released.  
*Status – Recent report was sent out to team; ongoing action.*
- C. Anna will update PowerPoint slides after each quarterly meeting to be utilized by anyone on the team providing updates to other Chesapeake Bay groups.
- D. Anna will send out an update via the large email distribution list that started with the original Sediment Task Force (includes academia, general public, federal, non-government organization (NGO), and state and counties representatives) notifying the group of updates from the quarterly meeting.
- E. Matt will keep team informed on innovative re-use committee findings to potentially incorporate ideas/innovative techniques into LSRWA strategies.

## **MEMORANDUM FOR THE RECORD**

**SUBJECT:** Lower Susquehanna River Watershed Assessment  
Quarterly Meeting, February 11, 2013

1. On February 11 2013 agency team members met to discuss ongoing and completed activities for the Lower Susquehanna River Watershed Assessment (LSRWA). The meeting was hosted by the Chesapeake Bay Program, in their Fish Shack, Conference Room in Annapolis, Maryland. The meeting started at 10:00 am and continued through 1:00 pm. The meeting attendees are listed in the table below.

2.

**Lower Susquehanna River Watershed Assessment  
Team Meeting Sign-In Sheet**

**February 11, 2013**

<b>Agency</b>	<b>Name</b>	<b>Email Address</b>	<b>Phone</b>
Baltimore City Res.Nat.Resources	Kelly Spencer	kspencer@baltimorecity.gov	410-795-6151
Chesapeake Bay Commission	Ann Swanson	aswanson@chesbay.us	410-263-3420
Chesapeake Bay Foundation	Beth McGee	bmcgee@cbf.org	443-482-2157
Chesapeake Conservancy	Jeff Allenby	jallenby@chesapeakeconservancy.org	443-321-3160
Chesapeake Research Consortium	Amanda Pruzinsky	apruzinsky@chesapeakebay.net	410-267-5766
EPA, Chesapeake Bay Program	Gary Shenk	GShenk@chesapeakebay.net	410-267-5745
EPA, Chesapeake Bay Program	Lew Linker	llinker@chesapeakebay.net	410-267-5741
Exelon	Kimberly Long	kimberly.long@exeloncorp.com	610-756-5572
Exelon	Mary Helen Marsh	maryhelen.marsh@exeloncorp.com	610-765-5572
Exelon - Gomez and Sullivan	Gary Lemay	glemay@gomezandsullivan.com	603-428-4960
Exelon - URS Corp.	Marjorie Zeff	marjorie.zeff@urs.com	215-367-2549
Exelon-Gomez and Sullivan	Tom Sullivan	tsullivan@gomezandsullivan.com	603-428-4960
Lower Susquehanna Riverkeeper	Michael Helfrich	LowSusRiver@hotmail.com	717-779-7915
MDE	Herb Sachs	sachsh@verizon.net	
MDE	Matt Rowe	mrowe@mde.state.md.us	410-537-3578
MDE	Stacy Boyles	sboyles@mde.state.md.us	410-537-3583
MDE	Tim Fox	tfox@mde.state.md.us	410-537-3958
MDNR	Bob Sadzinski	bsadzinski@dnr.state.md.us	
MDNR	Bruce Michael	bmichael@dnr.state.md.us	410-260-8627
MGS	Jeff Halka	jhalka@dnr.state.md.us	410-554-5503
NOAA-NMFS	John Nichols	john.nichols@noaa.gov	410-267-5675
PA DCNR	Ray Zomok	rzomok@pa.gov	
PADEP	Patricia Buckley	pbuckley@pa.gov	717-772-1675
PADEP	Ted Tesler	htesler@pa.gov	717-772-5621
SRBC	Andrew Gavin	agavin@srbc.net	717-238-0423x107
SRBC	David Ladd	dladd@srbc.net	717-238-0425x204
SRBC	John Balay	jbalay@srbc.net	717-238-0423 x217
TNC	Kathy Boomer	kboomer@tnc.org	607-280-3720
TNC	Mark Bryer	mbryer@tnc.org	301-897-8570
UMCES	Bill Dennison	dennison@umces.edu	410-221-2004
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USACE-ERDC	Carl Cerco	carl.f.cerco@erd.c.usace.army.mil	601-634-4207
USACE-ERDC	Steve Scott	steve.h.scott@usace.army.mil	601-634-2371
USGS	Mike Langland	langland@usgs.gov	717-730-6953

The meeting agenda is provided as enclosure 1 to this memorandum.

Status of Action Items from November Quarterly Meeting:

A. Michael Helfrich will coordinate with MD, Chesapeake Bay Program (CBP) and the MD county coalition to set up a meeting to present dam implications to total maximum daily loads (TMDL) to MD counties. *Status: Ongoing. Michael Helfrich coordinated this task with Bruce Michael; Bruce has reported LSRWA activities to multiple groups and counties over the last 6 weeks. His message to counties was to keep in perspective that they still need to do their work regarding sedimentation from the watershed (meeting TMDLs) while the issue of sediments and nutrients trapped behind the dams and how to manage them are still being dealt with. Bruce noted that Bob Summers, MDE Secretary, has made presentations to the MD legislative committees as well.*

B. Mike Langland will let Claire know if his final report will be a stand-alone document or if it will be written collaboratively with Steve Scott to be included with the ADH modeling report. *Status: Complete. There will be one report with results from both models; USACE will include the report as an appendix to the LSRWA report.*

C. Carl Cerco will have CBP WSM modeling runs of existing/baseline conditions completed by mid-December. *Status: Complete. The following scenarios have been run: (1) What is the system's current condition? (2) What is the system's condition if the WIPs are in full effect? and (3) What is the system's condition if a large scour event occurs?*

#### Ongoing Action Items from Previous Meetings:

A. The MDE FTP website will be utilized to share internal draft documents within the team; Matt will be the point of contact for this FTP site. *Status: Ongoing. Sharing of future documents will go through the MDE ftp website.*

B. Shawn will notify team when most recent Exelon study reports are released. *Status: Ongoing. Tom Sullivan, a contractor of Exelon noted that the Exelon has filed the license for Conowingo Dam with FERC.*

C. Anna will update PowerPoint slides after each quarterly meeting to be utilized by anyone on the team providing updates to other Chesapeake Bay groups. *Status: Ongoing.*

D. Anna will send out an update via the large email distribution list that started with the original Sediment Task Force (includes academia, general public, federal, non-government organization (NGO), and state and counties representatives) notifying the group of updates from the quarterly meeting. *Status: Ongoing.*

E. Matt will keep team informed on innovative re-use committee findings to potentially incorporate ideas/innovative techniques into LSRWA strategies. *Status: Ongoing.*

#### Action Items from this (February 11) Quarterly meeting –

- a. Claire will coordinate the next quarterly meeting for May.
- b. Anna will send out the spreadsheet tracking all stakeholder coordination to the group. Anyone making a presentation on LSRWA should let her know so the spreadsheet can be kept up to date; if any specific comments/concerns are raised, this should be noted as well.



- c. John Nichols will submit written comments on behalf of NMFS addressing his agency's concerns over sediment bypassing management strategy.
- d. Danielle will add Blackwater Wildlife Refuge as a potential placement option to evaluate.
- e. Bruce will work with Gary on potential "no-till" acres available in the watershed and evaluate impacts to sediment loads if all no-till acres were implemented in the watershed via modeling.
- f. Carl will complete runs for the following scenarios: What happens when the reservoir fills? What happens when the reservoir fills and WIPs are in full effect? What is the system's condition if a large scour event occurs in spring, summer or fall? These are the final existing and future without project conditions scenarios.
- g. Carl, Steve and Lewis will work together to determine where nutrients are scoured from in the reservoir (at what depths) and will conduct a sensitivity analysis looking at bioavailability of nutrients in various forms (species) by Berner activity class or other means).
- h. Michael and Carl will have a follow-up phone call to discuss the estimated loads that Carl is using for his modeling efforts that will be entering the Bay once Conowingo is full and will report back to the group if these estimated loads will be revised at all.
- i. Modeling efforts cannot predict impacts to SAV from physical burial by sediments. These impacts should be considered and described by other means, perhaps qualitatively, by the LSRWA agency group.
- j. Matt will check in with MDE to see how sediment bypassing (for open water placement or allowing sediments to relocate to sediment-starved areas) would be permitted and the stance of his agency on permitting for such activities.
- k. Pat will determine and report back to the group what the PA department of Environmental Protection (DEP) stance is on sediment criteria for landfills ("clean" vs. "waste"). More specifically, we have data from 2000, is this too old? If so, what are expectations of the agency regarding data to determine appropriateness of sediment at a landfill?
- l. The concept of a permanent pipeline should be investigated further and examples around the country should be looked at by the LSRWA agency group.
- m. Michael will forward info to Danielle on Funkhauser Quarry.
- n. Michael will forward Danielle the questions he had about some of the reservoir sediment management options that were presented but could not be addressed at the meeting due to time limitations.

- o. The LSRWA agency group needs to determine next steps for developing reservoir sediment management options.
  - p. John Balay will look further into agitation dredging (coupled with electric generation releases) of fine material; it is expected this would be done outside of ecologically critical time periods.
  - q. The LSRWA agency group should quantify any habitat restored or enhanced downstream in Bay or elsewhere (e.g. terrestrial) as a project benefit; considerations should be given on how to do this.
3. Welcome – After a brief introduction of the meeting attendees, Claire O’Neill welcomed the LSRWA agency group and noted that the purpose of the meeting was to provide updates on recent activities within the LSRWA.
4. Review of Modeling Scenarios and Schedule –

Claire went over the modeling run scenarios. The focus of modeling up to this point has been to forecast existing/baseline conditions, as well as future-without-project conditions. Getting an understanding of the conditions of the system if no action is taken will be used to compare sediment management strategies developed by the group.

Enclosure 2 provides a summary of modeling scenarios.

The following scenarios have been run:

- What is the system’s current condition? (2010 land uses with 1991-2000 flow values and 1991-2000 Conowingo capacity);
- What is the system’s condition if the WIPs are in full effect? (Watershed implementation plans (WIPs) in place with 1991-2000 flow values and 1991-2000 Conowingo capacity); and
- What is the system’s condition if a large scour event occurs? WIPs in place with Jan 1996 scour event flow values and Conowingo storage full.

The following scenarios are projected to be completed by the end of February in time for a smaller team meeting in March:

- What happens when the reservoir fills? (2010 land uses with 1991-2000 flow values and Conowingo storage full)
- What happens when the reservoir fills and WIPs are in full effect? (WIPs in place with 1991-2000 flow values and Conowingo storage full)

- What is the system's condition if a large scour event occurs in spring, summer or fall? (WIPs in place with Jan 96 scour event flow values in spring summer and fall and Conowingo storage full.

These scenarios represent all of the existing/baseline conditions and future-without-project conditions that were planned for the LSRWA effort.

#### 5. CBEMP Modeling update–

Carl Cerco provided a presentation on the estimated effects of scouring event on the Chesapeake Bay. Carl's presentation is included as enclosure 3 to this memorandum. It is important to note that at this time all modeling results are considered Draft/Preliminary and may be revised in future runs.

Carl noted that his previous efforts involved running modeling scenarios that removed Conowingo from the system to understand what it would look like with all sediments flowing into the bay and no longer being trapped by Conowingo. With this latest simulation, Carl looked at what the system would look like (i.e., impacts on water quality) if there were a scouring event. More specifically, he took the system's current condition (Conowingo still trapping) with WIPs in place, using bathymetry from after the 1996 scour event.

His modeling predicted that after storm event nutrients continue to have effects on the Bay for years. Conversely, solids (not including nutrients they contain) from scour events are inert after deposition. Solids are materials like sand, silt, and clay. Although they are subject to some resuspension, once they are deposited on the bottom, the effect on mineral sediments (solids) on the Bay essentially ceases. After deposition, biological processes transform particulate nutrients, and nutrients adsorbed to sediments into dissolved forms which diffuse into the overlying water and are bioavailable and affect Bay water quality. Nutrients take years to undergo burial to a depth where they are no longer an influence on surface waters. His modeling predicts that as the years go by, the impacts to water quality decrease after a scouring event. Carl explained that when comparing predicted changes to water quality it appears that a full dam (no longer trapping sediments and most sediments/nutrients going over dam) is WORSE than a storm-scouring event.

Draft/Preliminary Modeling predictions show that:

- Scour contributes substantial quantities of solids, nitrogen, and phosphorus relative to storm loads descending through the watershed.
- The effects of solids scoured during a winter storm pass quickly and are barely visible by the following summer.
- The effects of scoured nutrients persist for years due to deposition in bottom sediments and subsequent recycling. The effects diminish over time.
- Maximum summer-average effects of a winter scour event on TMDL conditions are  $\approx 0.3$   $\mu\text{g/L}$ . Chlorophyll a, 0.05 mg/L Dissolved oxygen, 0.01 /m.
- A winter scour event has no computed impact on SAV (Effects such as burial or physical damage are not computable with Carl's model). These findings are consistent with studies of impacts of previous large-storm events obtained by CBP.

Carl described two potential patterns for the future. One is a filled reservoir in the absence of scour events. Deposition is minimized, and solids and nutrients flow continuously to the bay causing chronic environmental problems. A second pattern involves one or more scour events. The impact of the scour event diminishes with time. Scour events are self-mitigating. Scour from a subsequent storm is diminished following a major event which scours the reservoir and increases volume. However, the increased volume has little effect on solids retention during non-storm periods.

Upcoming modeling activities include 2D ADH runs by Steve Scott to predict loads from a full reservoir. These predicted loads will tell us about overflow from a filled reservoir and about scour of a filled reservoir. Concurrently, CBP has modified HSPF to produce storm scour consistent with the latest USGS estimates. Also, CBP has produced hydrodynamics and watershed model (WSM) runs that move the 1996 storm to different months (spring and summer). The following runs are planned in addition to a run with scour from the January 1996 storm: (1) no winter storm; (2) storm moved to June; and (3) storm moved to October.

Bill Dennison noted that Carl's findings resonate with his findings and observations. He asked if there have been any efforts to evaluate the legacy of nutrients coming across the dams and their impacts. There was discussion on particulate nitrogen and phosphorus. Carl noted that particulate nitrogen is all organic (labeled inert and slow refractory). If nutrients are scoured off the bottom of the reservoir, they are labeled as either refractory or inert; this is done empirically. If CBP has time, it would be beneficial to have a sensitivity analysis looking at assumed ratios of nutrients (refractory, labile, or inert). Bill Dennison asked if these assigned ratios could change over time as the reservoir fills. Lewis Linker noted that greater than 10-cm (centimeter) depth of sediment is assumed to be inert. We can extrapolate at what depth we scour and where. Carl noted that Steve Scott's 2D ADH modeling could give us this information by telling us at what depth sediments are scouring.

Michael Helfrich asked if Carl's model has been re-run using 1.5-2 million tons per year of current sediment trapping per the latest USGS and Exelon estimates (from 2008 and 2011 bathymetry surveys) vs. 260,000 tons per year that Carl presented last time. His concern was that we are underestimating water quality impacts. Carl noted that he has not adjusted his model using these higher loads estimated from bathymetry surveys. He and Michael will have a follow-up phone call to discuss this in more detail, so as to come to an understanding of the most appropriate loads to use for modeling purposes.

Carl noted that his modeling efforts predict impacts to water quality parameters; it cannot predict impacts to SAV from physical burial by sediments. He noted that these impacts should be considered and described but cannot be determined quantitatively.

#### 6. Conowingo and Hurricane Sandy Rapid Assessment –

Bill Dennison provided a presentation entitled “Responding to Major Storm Impacts: Ecological Impacts of Hurricane Sandy on Chesapeake & Delmarva Coastal Bays”. Bill's presentation is included as enclosure 4 to this memorandum.

Bill noted that the National Fish and Wildlife Foundation established a Hurricane Sandy Wildlife Response Fund, and that UMCES and MDNR partnered to conduct a rapid assessment of impacts of Sandy on the Chesapeake and Delmarva coastal bays. A report was developed and finalized; it can be found at the following link: [http://www.mdcoastalbays.org/files/pdfs\\_pdf/HurricaneSandyAssessment-Final-1.pdf](http://www.mdcoastalbays.org/files/pdfs_pdf/HurricaneSandyAssessment-Final-1.pdf)

A link to the report will also be provided on the LSRWA website. Bill noted that Hurricane Sandy (October 2012), unlike Tropical Storm Lee (September 2011), was essentially a non-event due to the position, duration and timing of the storm. There was less wind with Sandy so less storm surge. Sandy occurred later in the “eco-calendar,” so there were less ecological impacts. During Hurricane Sandy, the intense precipitation was limited to the Maryland portion of the Susquehanna watershed, while nearly the entire Susquehanna watershed experienced high levels of rainfall during the Lee event. As a result, the sediment plume from Lee was quite extensive; with Sandy, this was not the case. The Sandy plume appears to have been restricted to the mainstem of Chesapeake Bay (based on photographs and collected data) versus extending into tributaries. Bill noted that in light of this evidence, the opinion of UMCES is that counties still need to do their work with TMDLs and reduce the sediment impacts from the watershed to the tributaries. Bill noted that the timing of storm impacts affects phosphorus deposits downstream of dams; phosphorus is released back into the system, thus impacting water quality. Also, in light of the USGS report (Hirsch report) which indicates that the dam is getting closer to filling, there will be higher suspended sediment input and new scour thresholds for storm events. The Susquehanna flats act as a filter or trap. Sandy legacy sediments (including trapped fines and silts in the flats) were observed to be resuspended from subsequent wind events after Sandy. After Sandy, there were some observed barren areas in the SAV bed.

Bill observed that because of climate change, there will be more frequent and larger storm events. The LSRWA group should incorporate climate changes into its analysis of sediment management strategies. Bill also recommended that because of additional scouring from future storm events due to the Conowingo becoming full, the LSRWA group should investigate sediment bypassing and dredging options to maintain capacity of Conowingo Dam.

#### 7. Update on Reservoir Sediment Management Scenarios –

Danielle Aloisio provided a presentation on USACE analysis of reservoir sediment management scenarios. Additionally, she provided a handout which lays out placement options for dredged material that were evaluated. Danielle’s presentation is included as enclosure 5, and the handout is included as enclosure 6 to this memorandum.

Danielle explained that her team was the lead at looking specifically at “in-reservoir” sediment management strategies (versus watershed strategies). Recent activities included conducting an initial investigation to identify sediment removal and placement options for sediments behind the three dams on the lower Susquehanna River and providing recommendations based on this initial investigation.

She and her team conducted a desktop analysis of the study area (approximately a 100-mile radius); this analysis included calling potential placement site owners and conducting site visits. As far as dredging options, there are two options: (1) mechanical and (2) hydraulic. The pros of mechanical dredging are lessening the need for dewatering and the ability to access tight spots. The cons are double-handling of material which would incur extra costs. Once material is removed from behind the reservoirs, it would need to be placed somewhere. Options for placement include: (1) beneficial re-use (construction materials, island creation, fringe wetland creation, etc.); (2) open water (release downstream, pump downstream, ocean placement, etc.); and (3) upland placement (quarries, landfills, purchased land).

Pumping downstream or bypassing along with ocean water placement could have regulatory (i.e. permitting) issues. One option for island restoration is teardrop islands within the Susquehanna River and upper bay. Regarding placement sites, most places want the material dry. For the landfill placement option, Pennsylvania DEP has limits on what sediment can be placed in landfills. Sediment is either clean or waste based on certain criteria; if material is considered waste, there is special handling which adds more cost.

Fringe wetlands can accept non-sandy material (i.e., silts and clays) and sandy materials. If sandy materials were to be used containment would be minimal. If silts or clays were used then materials such as coir logs, hay bales, etc would need to be implemented as well to ensure the wetlands would be contained. IF the non-sandy materials were not contained they would erode away due to flow. .

Costs for removal and placement of sediment are based on the quantity of sediment you are looking to move and the distance you are looking to go for placement. Very rough costs for mechanical dredging with trucking is (\$40 to \$70/cubic yard (cy)); hydraulic pumping downstream, \$6-\$18/cy; hydraulic pumping up to 5 miles, \$15-\$25/cy; and tipping fee, \$4-\$35/cy.

Danielle noted that based on their preliminary findings, quarries appear to be the best option due to: (1) the fact that they can accept wet or dry material; (2) large quantities could be placed; and (3) there are several quarries nearby that can have material pumped in directly from Conowingo Reservoir. Landfills are still an acceptable option; however, they have many qualifiers including cost, transportation, quantity limitations, and environmental regulations. Island restoration has many environmental regulations that could add costs; transportation costs to purchased land could be high.

Before any of these concepts are implemented, the following would need to be considered: (1) more up-to-date chemical analysis; (2) state environmental standards that need to be met and approved; (3) grain size of the material; (4) accessibility and distance to placement sites; and (5) tipping fees.

Danielle noted there are several questions that need to be answered by the LSRWA agency group in order to further consider reservoir placement options:

- How much material is planned to be removed?
- How often will material be removed?
- When would removal begin?

The handout of “placement” options provides details on placement capacity, pumping distance, tipping fees and limitations. A pumping distance of 5 miles or less is considered “acceptable.” Longer distances than that require electric boosters, etc, which would add costs.

There was discussion on the idea of a permanent pipeline. Is there data around the country about a permanent pipeline, safety, costs, etc? Mississippi has permanent pipelines that move sediments into river deltas; this should be investigated. *Some research after the meeting was done and there is a Louisiana state funded dredging project that is pumping sand long distance (22 miles) to Scofield Island, west of the Mississippi River's mouth, so the technology is there. The dredge pipe runs six miles upriver from the dredge before crossing the levee, cutting under two roadways and a small canal. The project is estimated to cost around 100 million dollars.*

Bob noted that there is no permanent pipeline anywhere in Chesapeake Bay. He estimated that you could move 2,000 cubic yards per day with a 16- top 18-inch pipe. Factors like the size of the pump, time of year restrictions and type of sediments you are pumping affect how much sediment you can remove. Dave Ladd asked about dredges and floating pipelines in the reservoir and where access would be? Bob explained that you could get a dredge in there and you could move it; however, the farther you go from placement site, the more costly these activities become.

There was discussion on Blackwater Wildlife Refuge as a potential placement site. Bill Dennison noted that Blackwater is really losing area and needs material. Bob said that there would be many issues to deal with (costs, regulatory, etc). Chris noted that while this would be expensive and challenging, it could provide great ecological benefits. Preliminary studies looking into this were conducted under the DMMP and Chesapeake Marshlands studies. However, it was agreed that Blackwater should be added to the list to be investigated. Bruce noted that there most likely will be multiple solutions, and the key will be finding partners to pay for options.

Michael asked about Funkhauser quarry as a potential placement site. Danielle noted that they could not find information on this quarry perhaps ownership has changed or they have the wrong address. Michael agreed to provide the contact information as a follow-up to the meeting.

#### 8. Update on Reservoir Operational Strategies –

John Balay provided the group an update on reservoir operational strategies. More specifically, these are sediment management strategies that would alter the way the reservoirs are operated to manage sediment. For example, opening crest gates and sluicing sediment to allow it to flow past the dam could be one strategy. The handout John provided is included as enclosure 7 to this memorandum.

John's analysis focused only on Conowingo Dam. It also only focused on altering the operations of the dam, not the structure. He provided data on the existing operations and infrastructure of the dam. He noted that because of the various user groups (hydroelectric, nuclear, public water supply and recreational), the reservoir elevation is maintained within a specified range throughout the year so as not to conflict with minimum elevation requirements to meet the needs of these user groups. Maintaining the reservoir above these minimum elevations to meet user group needs is a constraint on altering the operations of the reservoir to management sediment.

The sediment task force (original group that met in 1999-2001) recommendations dropped modifying dam operations as an alternative noting that it would impact the primary purpose of electric generation and the potential benefits would be limited. Also there is limited hydraulic and storage capacity associated with the dam. There is no intermediate setting on the crest gates; they are either open or closed (using a gate will only impact a bit more than a 38-foot section of the channel, which is the gate width, but will use up to 4,000 cfs (cubic feet per second) of flow). You cannot use all the gates to pass sediment unless flows are extremely high. The bottom line is that there are very limited options for sediment management through altering the dam operations since it is a run-of-river facility at flows greater than 86,000 cfs. John concluded that they will look further into agitation dredging (coupled with electric generation releases) of fine material outside of ecologically critical time periods. Chris asked whether physical modification of the dam should be

considered because we'd be seeking to have the dam do something it wasn't designed/constructed for.

There was discussion of the effects of passing sediments downstream. Michael Helfrich noted that bypassing in winter (i.e., non-ecologically critical months) would impact TMDL loads. Would bypassing be considered open water placement? Are dam releases considered releases of pollutants? Mark Bryer noted that we should quantify the habitat being provided downstream along with terrestrial benefits of land use. John Nichols said it was important to think about impacts to the already existing habitat such as the SAV beds, etc. We want to reduce impacts to existing habitat such as spawning fish habitat. John will provide written comments on today's proceedings about creating habitat downstream. He has migratory fish concerns. We want to restore and enhance spawning habitat in the upper bay. Chris Spaur noted that the status and trends of existing habitat should impact our decisions; at its simplest it's important to remember that the Bay is growing by hundreds of acres per year. As far as Chris knows, there is no trend information on shallow water habitat, but presumably it's increasing in area as Bay grows. Bill Dennison noted that impacts to SAV species are nuanced; freshwater species are resilient to temperature while saltwater species are not. SAV is doing well wetland marshes are not.

#### 9. Update on Watershed Sediment Management Strategies-

Bruce Michael provided the group an update on watershed sediment management strategies. He provided a handout which compares best management practices (BMP) and efficiencies developed by CBP; this handout is included as enclosure 8 to this memorandum.

Bruce noted that when it comes to watershed sediment management strategies, the most cost-effective BMP according to CBP is "no till" agriculture. More emphasis should be placed on the counties doing this option. Chris Spaur asked if herbicide-resistant weeds had been considered at all in the analysis thus far; herbicide resistant pigweed is a growing problem in the southeast. Bruce said they had not. Pat Buckley noted that the PA WIPs already rely heavily on agricultural BMPs. Bruce noted that what we are investigating BMPs for is to go above and beyond what states are doing with WIPs to meet TMDL. Exelon relicensing could add funding to implement agricultural BMPs in the watershed. There was discussion on how much acreage was available to implement no-till BMPs and with varying funding scenarios what amount of nutrient reduction that would get us (CBP modeling runs would need to be done to get an understanding of this).

#### 10. Budget Update and Wrap Up –

Claire noted that there is no FY13 federal budget yet. USACE was able to reprogram some funding to the study and MD also provided some direct cash funds. At this time we have enough funds to get us through approximately April-May to complete modeling scenarios 1-5:

1. What is the system's current condition?
2. What is the system's condition if the WIPs are in full effect?
3. What happens when the reservoir fills?
4. What happens when the reservoir fills and WIPs are in full effect?
5. What is the system's condition if a large scour event occurs in spring, summer, or fall?



Anna will draft up notes for the group's review. Following this, the notes and presentations will be posted to the project website. Claire will set up a doodle poll to determine the date for next quarterly meeting which will sometime in May.

Anna Compton,  
Study Manager

Enclosures:   1. Meeting Agenda  
                  2. Modeling scenario summary  
                  3. Carl Cerco Presentation  
                  4. Bill Dennison Presentation  
                  5. Danielle Aloisio Presentation  
                  6. Lower Susquehanna Placement Options Handout  
                  7. Update on Reservoir Operational Strategies Handout  
                  8. Non-Point Source Best Management Practices and Efficiencies Handout

**LOWER SUSQUEHANNA RIVER WATERSHED ASSESSMENT  
QUARTERLY TEAM MEETING**

**CBP, Fish Shack, Annapolis/Eastport, Maryland  
February 11, 2013**

**Meeting Agenda**

	<b><u>Lead</u></b>
10:00	Welcome and Introductions..... All
10:05	Review of Action Items from Prior Meetings ..... O'Neill Communication and Coordination Updates for Situational Awareness
<b><u>LSRWA Technical Analyses</u></b>	
10:15	Review of Modeling Scenarios and Schedule ..... O'Neill
10:20	CBEMP Modeling Update ..... Cerco
11:00	Conowingo and Hurricane Sandy Rapid Assessment ..... Dennison
11:15	Update on Reservoir Sediment Management Strategies ..... Aloisio
12:00	Update on Reservoir Operational Strategies..... Balay
12:10	Update on Watershed Sediment Management Strategies ..... Rowe/Michael
12:20	Budget Update..... O'Neill
12:25	Wrap Up..... O'Neill Action Items/Summary Next Meeting

**Call-In Information:** (877) 336-139, access code = 6452843#, security code = 1234#

**Expected Attendees:**

MDE: Herb Sachs; Tim Fox, Matt Rowe, Stacy Boyles  
MDNR: Bruce Michael, Bob Sadzinski  
MGS: Jeff Halka  
SRBC: John Balay, Andrew Gavin, Dave Ladd  
USACE: Anna Compton, Bob Blama, Chris Spaur, Claire O'Neill, Ashley Williams, Danielle Aloisio, Tom Laczko, Dan Bierly  
ERDC: Carl Cerco, Steve Scott  
TNC: Mark Bryer, Kathy Boomer  
USEPA: Gary Shenk, Lewis Linker  
USGS: Mike Langland, Joel Blomquist

Exelon: Mary Helen Marsh, Kimberly Long, Bob Matty, Gary LeMay  
Lower Susquehanna Riverkeeper: Michael Helfrich  
PA Agencies: Patricia Buckley, Raymond Zomok

Action Items from November Quarterly Meeting:

- A. Michael Helfrich will coordinate with MD, CBP and the MD county coalition to set up a meeting to present dam implications to TMDL to MD counties. *Status:*
- B. Mike Langland will let Claire know if his final report will be a stand- alone document or if it will be written collaboratively with Steve Scott to be included with the ADH modeling report. *Status:*
- C. Carl Cerco will have CBP WSM modeling runs of existing/baseline conditions completed by mid-December. *Status:*
- D. UMCES report entitled *Effect of Timing of Extreme Storms on Chesapeake Bay Submerged Aquatic Vegetation* will be saved on LSRWA website. *Status: Complete.* Document saved at: <http://mddnr.chesapeakebay.net/LSRWA/Docs/Wang%20and%20Linker.pdf>

Ongoing Action Items from Previous Meetings:

- A. The MDE FTP website will be utilized to share internal draft documents within the team; Matt will be the point of contact for this FTP site. *Status: Ongoing. Sharing of future documents will go through the MDE ftp website.*
- B. Shawn will notify team when most recent Exelon study reports are released. *Status: Ongoing.*
- C. Anna will update PowerPoint slides after each quarterly meeting to be utilized by anyone on the team providing updates to other Chesapeake Bay groups. *Status: Ongoing.*
- D. Anna will send out an update via the large email distribution list that started with the original Sediment Task Force (includes academia, general public, federal, non-government organization (NGO), and state and counties representatives) notifying the group of updates from the quarterly meeting. *Status: Ongoing.*
- E. Matt will keep team informed on innovative re-use committee findings to potentially incorporate ideas/innovative techniques into LSRWA strategies. *Status: Ongoing.*

Action Items –

- a. Michael Helfrich will coordinate with MD, CBP and the MD county coalition to set up a meeting to present dam implications to TMDL to MD counties.
- b. Mike Langland will let Claire know if his final report will be a stand- alone document or if it will be written collaboratively with Steve Scott to be included with the ADH modeling report.
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- d. UMCES report entitled “Effect of Timing of Extreme Storms on Chesapeake Bay Submerged aquatic vegetation” will be saved on LSRWA website. *Status: Complete.*  
*Document saved here:*  
<http://mddnr.chesapeakebay.net/LSRWA/Docs/Wang%20and%20Linker.pdf>

## **MEMORANDUM FOR THE RECORD**

**SUBJECT:** Lower Susquehanna River Watershed Assessment  
Quarterly Meeting, May 13, 2013

1. On May 13, 2013 agency team members met to discuss ongoing and completed activities for the Lower Susquehanna River Watershed Assessment (LSRWA). The meeting was hosted by the Maryland Department of the Environment (MDE) in their Terra Conference Room at the Montgomery Park Building in Baltimore, Maryland. The meeting started at 10:00 am and continued through 1:00 pm. The meeting attendees are listed in the table below.

2.

**Lower Susquehanna River Watershed Assessment  
Team Meeting Sign-In Sheet**

**May 13, 2013**

<b>Agency</b>	<b>Name</b>	<b>Email Address</b>	<b>Phone</b>
American Geophysical Union	Harry Furukawa	hfurukawa@agu.org	202-777-7430
American Geophysical Union	Julia Galkiewicz	jgalkiewicz@agu.org	202-777-7488
City of Baltimore, DPW	Prakash Mistry	Prakash.Mistry@baltimorecity.gov	410-396-0732
City of Baltimore, DPW	Clark Howells	clark.howells@baltimorecity.gov	410-396-1586
City of Baltimore, DPW	James Price	James.Price@baltimorecity.gov	410-396-0539
Chesapeake Bay Commission	Manel Raub	mraub@chesbay.us	
Chesapeake Bay Foundation	Beth McGee	bmcgee@cbf.org	443-482-2157
Chesapeake Conservancy	Jeff Allenby	jallenby@chesapeakeconservancy.org	443-321-3160
EPA, Chesapeake Bay Program	Lew Linker	llinker@chesapeakebay.net	410-267-5741
Exelon	Anne Linder	anne.linder@exeloncorp.com	410-470-4540
Exelon	Kimberly Long	kimberly.long@exeloncorp.com	610-756-5572
Exelon	Mary Helen Marsh	maryhelen.marsh@exeloncorp.com	610-765-5572
Exelon - Gomez and Sullivan	Gary Lemay	glemay@gomezandsullivan.com	603-428-4960
Exelon - URS Corp.	Marjorie Zeff	marjorie.zeff@urs.com	215-367-2549
Exelon-Gomez and Sullivan	Tom Sullivan	tsullivan@gomezandsullivan.com	603-428-4960
Lower Susquehanna Riverkeeper	Michael Helfrich	LowSusRiver@hotmail.com	717-779-7915
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Versar	Steve Schreiner		

The meeting agenda is provided as enclosure 1 to this memorandum.

Status of Action Items from February Quarterly Meeting:

- a. Claire O'Neill will coordinate the next quarterly meeting for February. *Status: Done. Meeting occurring today.*
- b. John Nichols will submit written comments on behalf of NMFS addressing his agency's concerns over sediment bypassing management strategy. *Status: Done. Anna Compton will distribute letter to group and have it posted on website. Bottom line of letter is that NMFS has substantial concerns about the impacts of any sediment bypassing or release options to shallow and open water habitats, including SAV and spawning grounds for fsh. Chris Spaur noted that it is important to consider natural and anthropogenic status and trends of habitats and environmental conditions. Chesapeake Bay is naturally growing by hundreds of acres per year as a consequence of sea-level rise and shoreline erosion; this should be factored into considerations over impacts to shallow water and open water habitats.*
- c. Danielle Aloisio will add Blackwater Wildlife Refuge as a potential placement option to evaluate. *Status: Done. See Enclosure 5.*
- d. Carl Cerco will complete runs for the following scenarios: What happens when the reservoir fills? What happens when the reservoir fills and WIPs are in full effect? What is the system's condition if a large scour event occurs in spring, summer or fall? These are the final existing and future without project conditions scenarios. *Status: Complete. Carl presented this information at this meeting. See Enclosures 2 and 3 and discussion under #6.*
- e. Michael Helfrich and Carl Cerco will have a follow-up phone call to discuss the estimated loads that Carl is using for his modeling efforts that will be entering the Bay once Conowingo is full and will report back to the group if these estimated loads will be revised at all. *Status: Complete. There is now agreement on estimated loads being used for modeling efforts.*
- f. Matt Rowe will check in with MDE to see how sediment bypassing (for open water placement or allowing sediments to relocate to sediment-starved areas) would be permitted and the stance of his agency on permitting for such activities. *Status: Complete. Based on discussions with MDE permitting folks, they explained that if sediment bypassing were done as passive transport (e.g., via flushing, sluicing or agitation dredging instead of through a pipeline) a permit may not be required. If bypassing were actively transported via a pipeline or through a tunnel, then a permit would be required. To make any conclusive permitting decisions, more details would be required. For planning purposes for this an Assessment, we can use the assumptions laid out by MDE permitting folks. A water quality certificate and perhaps tidal wetlands permit/ authorization would be required for the placement site of the material if it ended up being used as fill in the water (island, wetlands, etc.). Chris Spaur noted that USACE does not require permit for water releases from its reservoirs done as part of normal operation/ maintenance activities.*

- g. Pat Buckley will determine and report back to the group what the PA Department of Environmental Protection (DEP) stance is on sediment criteria for landfills (“clean” vs. “waste”). More specifically, we have data from 2000, is this too old? If so, what are expectations of the agency regarding data to determine appropriateness of sediment at a landfill? *Status: Complete. Pat provided a point of contact (Steve Socash) within PA DEP. The bottom line is that sediments from a river the size of Susquehanna can be considered, “clean” or “regulated” fill or “other waste.” Per PA DEP’s management of fill policy, they generally do not require chemical analysis of soils/sediments where there has not been evidence of a spill or release (i.e., these sediments could then be used in an unrestricted manner as clean fill). However, with large rivers like the Susquehanna, this would qualify as being subject to a spill or release, requiring chemical analysis to determine if clean fill requirements had been met. The 2000 sediment sampling data (averages) were compared to the concentration limits that PA DEP uses for clean fill standards: The sampled sediments meet clean fill limits for all organics and inorganics. A few parameters were not tested for in 2000 that PA DEP requires. For planning purposes, we can assume that the sediments behind the dams can be considered “clean fill” appropriate for landfill placement; however, sampling would most likely be required in the future if this option were to be implemented.*
- b. The concept of a permanent pipeline should be investigated further and examples around the country should be looked at by the LSRWA agency group. *Status: Complete. Permanent pipelines are included in the LSRWA analysis. No permanent pipelines exist in Chesapeake Bay but there are examples in places like Louisiana.*
- i. Michael Helfrich will forward info to Danielle Aloisio on Funkhauser Quarry. *Status: Ongoing. Bob Blama is now taking over for Danielle. Funkhauser Quarry is not on the placement option list yet. Resolution is for Bob to call the quarry.*
- j. Michael Helfrich will forward Danielle Aloisio the questions he had about some of the reservoir sediment management options that were presented but could not be addressed at the meeting due to time limitations. *Status Complete.*
- k. John Balay will look further into agitation dredging (coupled with electric generation releases) of fine material; it is expected this would be done outside of ecologically critical time periods. *Status Complete. See Enclosure 9 and Discussion #9.*

Ongoing Action Items from Previous Meetings:

- A. The MDE FTP website will be utilized to share internal draft documents within the team; Matt will be the point of contact for this FTP site. *Status: Ongoing. Sharing of future documents will go through the MDE ftp website.*
- B. Shawn will notify team when most recent Exelon study reports are released. *Status: Ongoing. Tom Sullivan, a contractor of Exelon noted that the Exelon has filed the license for Conowingo Dam with FERC.*
- C. Anna will update PowerPoint slides after each quarterly meeting to be utilized by anyone on the team providing updates to other Chesapeake Bay groups. *Status: Ongoing.*

D. Anna will send out an update via the large email distribution list that started with the original Sediment Task Force (includes academia, general public, federal, non-government organization (NGO), and state and counties representatives) notifying the group of updates from the quarterly meeting. *Status: Ongoing.*

E. Matt will keep team informed on innovative re-use committee findings to potentially incorporate ideas/innovative techniques into LSRWA strategies. *Status: Ongoing.*

F. Anna will send out the spreadsheet tracking all stakeholder coordination to the group. Anyone making a presentation on LSRWA should let her know so the spreadsheet can be kept up to date; if any specific comments/concerns are raised, this should be noted as well. *Status: Ongoing*

G. Bruce Michael will work with CBP on potential “no-till” acres available in the watershed and evaluate impacts to sediment loads if all no-till acres were implemented in the watershed via modeling as well as develop costs. *Status: Ongoing. See discussion under #10.*

H. Carl Cerco, Steve Scott and Lewis Linker will work together to determine where nutrients are scoured from in the reservoir (at what depths) and will conduct a sensitivity analysis looking at bioavailability of nutrients in various forms (species) by Berner activity class or other means). *Status: Ongoing.*

I. Modeling efforts cannot predict impacts to SAV from physical burial by sediments. These impacts should be considered and described by other means, perhaps qualitatively, by the LSRWA agency group. *Status: Ongoing. Bruce Michael has provided the UMCES (Mike Kemp) SAV historical mapping and trends over last 10 years in Susquehanna Flats. This information will need to be incorporated into to the assessment to provide a qualitative discussion of impacts.*

J. The LSRWA agency group needs to determine next steps for developing reservoir sediment management options. *Status: Ongoing.*

K. The LSRWA agency group should quantify any habitat restored or enhanced downstream in the Bay or elsewhere (e.g., terrestrial) as a project benefit; considerations should be given on how to do this. *Status: Ongoing.*

L. Bruce Michael and Claire O’Neill will keep the LSRWA agency group updated on the Susquehanna policy group put together by Governor O’Malley. *Status: Ongoing.*

Action Items from this (May 13) Quarterly meeting –

- a. Claire will coordinate the next quarterly meeting for August 2013.
- b. Anna will distribute NMFS agency letter discussing concerns over sediment bypassing management strategy to group and have it posted on website.



- c. Bob Blama will call the Funkhauser Quarry to get more information on utilizing this as a placement option.
  - d. Michael Helfrich will touch base with Jeff Cornwell (UMCES) to get his opinion on phosphorus bioavailability in sediments as it relates to the LSRWA study.
  - f. The group will review the baseline and future conditions summary spreadsheet (Enclosure 3) and provide comments back to Anna Compton and Carl Cerco.
  - g. Lewis Linker and Carl Cerco will work with CBP partners to integrate the CBP's assessment procedure ("Stoplight plots") into the LSRWA key modeling scenarios to provide a means to communicate/explain impacts to Chesapeake Bay from the various full reservoir and storm scouring scenarios.
  - h. The LSRWA agency group will develop a screening process for reservoir sediment management options that are worth developing further.
  - i. The LSRWA agency group will direct any questions on sediment bypass tunneling to Kathy Boomer.
  - j. Kathy Boomer will write up a section on sediment bypass tunneling for the LSRWA report.
  - k. Exelon will review and provide comments on SRBC's write-up of altering reservoir operations as a sediment management strategy (Enclosure 9). Exelon will comment on the write-up to make sure dam operations are adequately covered.
3. Welcome – After a brief introduction of the meeting attendees, Claire O'Neill welcomed the LSRWA agency group and noted that the purpose of the meeting was to provide updates on recent activities within the LSRWA.
  4. Funding Update – Claire O'Neill noted that there is no FY13 federal budget yet. The Office of Management and Budget (OMB) has not released funding yet. At this time we are still using non-federal money to keep the study moving. If we don't get expected funding, we cannot complete study on time.
  5. Communication and Coordination Updates – Bruce Michael let the group know that Governor O'Malley put together a high-level Susquehanna policy group with various federal and non-federal agencies. The purpose of this non-technical group is to review sediment management scenarios provided by the LSRWA group and look at funding scenarios for implementation of these scenarios. Chris Spaur asked whether this would effectively constitute a parallel effort that we need to then incorporate consideration of in the LSRWA study. Bruce said that would not be the case; the policy group would utilize what we produce.
  6. Summary of Existing and Future Conditions – Carl Cerco provided a presentation on the estimated effects of scouring event on the Chesapeake Bay. Carl's presentation is included as enclosure 2 to this memorandum. It is important to note that at this time all modeling results are considered draft/preliminary and may be revised in future runs. These scenarios represent the final runs to complete all of the existing/baseline conditions and future-without-project conditions that were planned for the LSRWA effort.

The following conditions were presented:

- (1) What happens when the reservoir fills?
- (2) What happens when the reservoir fills and WIPs are in full effect?
- (3) What is the system's condition if a large scour event occurs in spring, summer, or fall?

Utilizing ADH loads (computes sediment erosion, deposition, and transport in Conowingo Reservoir) from the application period of 2008–2011, there were two erosion (scouring) events: Tropical Storm Lee and a small event in March 2011. There are three ADH runs based on 2008–2011 hydrology:

- (1) existing (2011) bathymetry,
- (2) projected “reservoir full” bathymetry, and
- (3) bathymetry surveyed following 1996 scour event.

Carl used scour computed by ADH 2008–2011 to estimate scour during the January 1996 storm which falls in the Chesapeake Bay Environmental Model Package (CBEMP) application period, 1991–2000.

Carl noted that as of 2011, the reservoir is virtually full. However, even when the reservoir is full, it still appears to be depositing under non-scouring flows. Under normal hydrologic conditions (non-scouring), sediment that flows into reservoir system does not necessarily leave the reservoir system and flow into Chesapeake Bay. What we see are events. Erosion events are becoming more frequent with more material. The reservoir tends to mitigate itself. When a scour event happens, more room is made available in the reservoir for deposition.

Carl discussed the water quality implications next. His modeling predicts what happens in the Bay if watershed implementation plans (WIPS) are in place, reservoir is full and there is a storm event. As in past modeling runs, monitoring station CB3.3C is where he looks at water quality impacts. This site is used because it sits at the head of the deep trench that runs up the center of most of the bay. It is a critical location for water quality conditions. In particular, the bottom is virtually anoxic in summer. The Total maximum daily loads (TMDLs) hinge on meeting DO standards in bottom waters in the vicinity of CB3.3C. Consequently, changes in DO at this location are critical compared to changes to other monitoring stations closer to Conowingo where DO is usually in excess of standards. In addition to DO concerns, CB3.3C has elevated chlorophyll concentrations and is just downstream of the turbidity maximum so it is a good station to characterize the upper bay water quality. He noted that as a storm goes by, they produce an enormous temporary spike in solids in the water column (solids are materials like sand, silt, and clay) but they are inert after deposition on the bottom and don't cause further water quality impacts. Light attenuation impacts are short-lived. Nutrients from the scouring event are recycled and there impacts persist for years. Lewis Linker asked about nutrient loads. Carl noted that he evaluated nutrients based on Tropical Storm Lee (2011). The 1996 storm event nutrient composition was different than Tropical Storm Lee (i.e., percentages of nutrients associated with solids varied). Carl noted that implications of this are that we may be overestimating nutrient loads from 1996 event by a factor of 2. We will need to acknowledge this level of uncertainty in the LSRWA report.

Carl then went over modeling results looking at the timing of a storm event. The Chesapeake Bay Program (CBP) modified the Hydrological Simulation Program--Fortran (HSPF) to produce storm scour consistent with the latest USGS estimates. Also, CBP has produced hydrodynamics and watershed model (WSM) runs that move the 1996 storm to different months (spring and summer). Utilizing HSPF and CBP WSM allows Carl to look at runoff and scour. Carl made runs using the scour conditions from the January 1996 storm: (1) winter storm; (2) storm moved to June; and (3) storm moved to October. Carl noted that he looked at the impacts of the entire storm event, not just scouring. What you see is a pulse (the impact of the storm passing). There is a big pulse in January but the impact on light is negligible. An October storm appeared to have minimal impacts. Even in June long-term impacts appeared negligible; impacts appeared short-lived. A June event has the most observed effects.

Lew Linker noted that the results may not represent effects on SAV; a period of reduced light could really impact SAV. Carl noted that for the final report these final outputs need to be remedied. There is an interesting spatial extent of chlorophyll; during a January event, impacts are seen all the way to the mouth of Potomac; in June, the spatial extent goes further south to the mouth of the Rappahannock. There was discussion on nitrogen (N) and phosphorus (P) loads. We have N loads delivered from the storm runoff, minimal from scour of bottom sediment in Conowingo Pond. We don't have information on the specific N and P amounts, just a percent of the total loads. Bioavailability of these nutrients is important information. There was discussion that Jeff Cornwell (UMCES) has some numbers on P and bioavailability. Michael Helfrich noted that he has had discussion with Jeff Cornwell and will discuss with him further his opinion and what data he has readily available that we may be able to use to allow us to make some assumptions to refine amount of phosphorus that are bioavailable in sediments. Chris Spaur noted that collecting biogeochemical data to fill information voids was considered during study scoping, but eliminated in order to control overall study costs.

Anna Compton passed out a spreadsheet that recaps all six baseline and future conditions modeling runs that Carl Cerco has evaluated. This spreadsheet is included as enclosure 3 to this memorandum. For each condition, modeling runs were made based on varied land use, hydrology, bathymetry and scouring, and the effects to water quality as well changes to sediment and nutrient loads that were observed. There was not much time to go over the spreadsheet so the group needs to review and provide written comments back to Anna and Carl Cerco. There was discussion on Condition 3 (system condition when WIPs are in full effect, reservoirs are still trapping and a scour event occurs) in comparison to Condition 5 (system condition when WIPs are in full effect, reservoirs are full and a scour event occurs). It appears that these conditions have similar effects to water quality and sediment nutrient loading. There was discussion on benefit versus cost. Based on what was presented, it appears from the modeling that there is not much difference in effects whether the reservoir is completely full or in its current nearly full condition. Does this lead us to the conclusion that if we try to increase capacity by minor amounts, we will not see much benefit? What about maintaining status quo? Is it worth the investment? What are we going to get for reducing sediment volume?

To further understand modeling predictions and their impacts, there was discussion on stoplight plots that the CBP has developed. This is a CBP assessment procedure that analyzes the impacts of load scenarios on water quality of a Bay segments and whether they reach attainment or not (meeting TMDLs). Lewis Linker noted that we would probably want to run all of our key LSRWA

scenarios (conditions) using the stoplight plots to show the effects to water quality by bay segment with the predictions of Carl's model.

Michael Helfrich noted that Carl's modeling is using the 4th biggest event we have on record to show storm scouring (the 1996 winter storm event). What about the storms that have occurred on record that were larger than this event? Also the loads (nutrient and solids) shown in Condition 6 (scour event in summer, fall, and winter) are less than loads in Conditions 3-5, which all included a simulation of the same storm event; why is this? Carl explained that Condition 6 used HSPF and CBP WSM model (which can take into account sediments from the watershed as well) while Conditions 3-5 used the ADH model, so results vary and should not be compared directly. Condition 6 sheds light on impact of the timing of event while Conditions 2-5 show impacts of a full reservoir, WIPs in place, and a storm event.

There was discussion about Condition #2 (What is the system's condition if the WIPs are in full effect and reservoirs are still trapping) in that the loads on Carl's spreadsheet appear smaller than the loads full implementation of the PA WIPS (per TMDL) will obtain. For example Carl predicts the average solids load over the 10-yr period) is 2,307 metric ton/d but the TMDL is 2,417 metric tons/day; Carl predicts the average nitrogen load is 46.1 metric ton/d, while TMDL is 93.2 metric tons/day; Carl predicts phosphorus is 3.9 metric tons/d, while TMDL is 4.25 metric tons/day Carl will check spreadsheet/loads to clarify modeling predictions..

Herb has concerns about communicating this information to the general public. Up until now, the public information has been that the dam is trapping and it will eventually fill, but once it fills we will see more nutrients and sediment in Chesapeake Bay. We need to be clear on what the models are predicting. There was discussion on the concept model Carl presented (slide 5 of Enclosure 2), showing that scouring of reservoirs is negative to water quality in Chesapeake Bay; however, scouring does create capacity behind the dams to keep sediments and nutrients out of Chesapeake Bay for a period of time.

#### 7. Update on Reservoir Sediment Management Scenarios –

Bob Blama provided a presentation on USACE's analysis of reservoir sediment management scenarios. This was a follow-up to what was presented at the February quarterly meeting. Tom Laczó provided a handout which lays out the placement options for dredged material that have been evaluated thus far. This was also an update to what was presented at the February quarterly meeting. Bob's presentation is included as enclosure 4, and the placement options handout is included as enclosure 5 to this memorandum. Bob also provided two handouts, one describing hydraulic and mechanical dredging, and the other describing the process of drying dredged material for placement (i.e., dewatering). These are included as enclosures 6 and 7 to this memorandum.

Tom noted that placement options have been organized into three categories: (1) beneficial use, (2) open water, and (3) upland. Every placement option has pros and cons which are listed in the table in regards to feasibility, environmental impacts and costs.

Bob walked the group through the various placement site possibilities for sediments behind the dams and the differences between hydraulic and mechanical dredging. He noted that he did not recommend island creation (tear drop islands) and fringe wetland creation in the Susquehanna River because they would not be able to use the volume of sediments we are looking at for placement. To pump downstream, we would need to pump for several months to remove material. In discussions

with abandoned mine owners, there was not an interest in the material because of limitations on their mining permits. In doing an informal screening, not many placement options are left. Quarries seem to be feasible. We also need to think about a placement site to dewater the material. If you need to hydraulically pump material more than 5 miles, you will need a booster which adds to the project cost. When transporting material, considerations such as topography of the land come into play; for example, material is easier to pipe over flat versus hilly land. At Conowingo, the topography out of reservoir is uphill.

There was discussion on the large number of reservoir sediment management scenarios/alternatives we have. We need to work on screening these.

#### 8. Sediment Bypass (Tunneling) Strategies

Kathy Boomer provided the group an overview of sediment bypass (tunneling) strategies. Her presentation is included as enclosure 8 to this memorandum.

This technology has been implemented in places like Japan and Switzerland, in the form of bypassing sediments downstream or to a placement site, via a tunnel. With this technology, there is a lot of control on the size of material that you are targeting to move. There are yearly maintenance costs to repair these tunnels. Advantages are that it is a long-term sediment management solution to extend the storage capacity of reservoirs. Disadvantages are that it does not provide a solution for already stored sediments (it moves sediments that have not deposited yet), the technology is still in development, and it appears very costly. However, it is difficult to fully estimate costs due to the limited use of this technology.

The use of bypass tunnels depends on your goals. For example, entities that have looked at implementing or have implemented bypassing tunnels, normally have a goal of extending the life of water storage capacity in the reservoir, protecting turbines or restoring sediment supply for downstream habitat value. For the LSRWA study, the goal is protection of downstream water quality. In the short-term, bypass tunnels do not offer much in meeting our goals. Scour events are still likely to occur. A sediment bypass tunnel system likely will not offer much more benefit from “run-of-river” equilibrium conditions. After a scour event, however, a long-term management strategy could be implemented with a sediment bypass tunnel with delivery of a more desired sediment composition to the downstream area.

For the LSRWA report, Kathy Boomer will write up the section on sediment bypass tunneling.

#### 9. Update on Reservoir Operational Strategies-

John Balay provided the group an update on reservoir operational sediment management strategies. He provided a handout with a write-up describing and summarizing implementation considerations and constraints, and conclusions regarding the utilization of reservoir operations to manage sediment in the lower Susquehanna River which is included as enclosure 9 to this memorandum.

John analyzed altering the structure of the three hydroelectric dams on the lower Susquehanna River to meet the LSRWA sediment management goals. None of the three hydroelectric dams currently contain outlet works that would permit sediment releases during favorable hydrologic conditions.

He explained that release of sediment through the turbines, in excess of what is transported normally during generation operations at higher streamflows could cause significant damage to the existing structure (Note that following the quarterly meeting, Exelon representatives indicated that the potential for turbine damage may not be that significant). Existing gates at Safe Harbor and Conowingo are designed for flood operations and, as such, provide little opportunity for sediment management. Retrofitting the existing dam structures with sluice gates or other bottom outlet works would be difficult without compromising the dams' structural integrity.

Many of the sediment management strategies that alter operations would significantly impact power generation and water supply operations.

Of the various methods to manage sediments via altering the operations of the reservoir, agitation dredging garnered the most discussion. This type of dredging includes the removal of bottom material from a selected area by using equipment to raise it temporarily in the water column and currents to carry it away. Agitation dredging could be considered an operational alternative when conducted in conjunction with typical or modified dam operations. This particular operation would focus on fine sediments typically concentrated in downstream portions of each of the lower Susquehanna River reservoirs. The bulk of agitated suspended bed sediment would be in the lower half of the water column. To transport the suspended material, hydropower intakes would need to be open at the highest flow possible, which is 86,000 cfs (cubic feet per second) at Conowingo. At this hydraulic capacity, it is unlikely that there would be adequate flow velocity in the lower portions of the reservoirs to transport agitated sediment. Also, there was discussion on dredging being dangerous if we agitate during high flows.

The cumulative effect of competing water uses, operational limitations, and structural constraints make altering reservoir operations very difficult, for sediment management. That coupled with the limited spatial and volumetric effects of sediment movement do not justify the significant implementation costs required. John concluded that the combination of these factors warrant that reservoir operations alternatives be dropped from further consideration.

Any further comments to these operational strategies should be sent to John. In particular, Exelon the owner and operator of Conowingo will comment on the write-up to make sure that the dam operations are adequately covered.

#### 10. Update on Watershed Sediment Management Strategies-

Bruce Michael provided the group an update on the development of watershed sediment management strategies. Bruce noted that when it comes to watershed sediment management strategies, the most cost-effective best management practice (BMP) according to CBP is "no till" agriculture. Bruce noted that he is continuing to investigate this BMP for the LSRWA effort. The idea is to go above and beyond what the states are doing with WIPs to meet the TMDLs. The specific scenario he is investigating is the "maximum feasible" scenario in the watershed, that is, what is the maximum feasible amount of acres that could be implemented, what would it cost, and what would the impacts be to sediments. An analysis needs to be done on cost and acres available in the watershed to implement this type of strategy. Bruce noted that implementation costs won't be released until next winter by CBP. He could work with CBP to get preliminary numbers for inclusion in the LSRWA analysis. BMP efficiency numbers already exist. For LSRWA effort we would focus on the most efficient BMP to reduce sediment. There was a discussion on population

growth (i.e., acres available now may not be available years down the road due to development). This analysis includes acres available right now. Claire noted that we need costs and acres developed in the next few weeks. In June we are scheduled to develop and decided what sediment management modeling scenarios what we want to run for LSRWA effort.

#### 11. WIP Scenarios and Nutrient Loads –

Lewis Linker provided the group an update on WIP scenarios and nutrient loads that CBP is working on. He provided a presentation which is included as enclosure 10 to this memorandum. Lewis noted that the sediment loads predicted from CBP modeling are changing all the time but do have long-term trends. He discussed loads from the watershed model (WSM) version 5.3.2 and discussed four scenarios. The 1985 “High Historical Load Scenario” uses 1985 land uses, animal numbers, atmospheric deposition, point source loads and a 10-year (1991–2000) hydrology. This scenario has the highest historical delivered load estimates of nutrients and sediment to the Bay. The “2011 Progress Scenario” uses 2011 land uses, animal numbers, atmospheric deposition, point source loads and the 10-year, 1991–2000 hydrology. The “2010 WIP” scenario estimates the nutrient and sediment loads with 2010 WIPs throughout the Chesapeake Bay watershed. The scenario included accounting for all the WIP BMPs based on a 2010 land use, permitted loads and atmospheric deposition. The “All Forest Scenario” uses an all-forest land use and current estimated atmospheric deposition loads for the 1991–2000 period and represents estimated loads with maximum reductions on the land. This scenario has loads greater than a pristine scenario, which would have reduced atmospheric deposition loads.

Lew presented loads (total phosphorus, total nitrogen, and total suspended solids) from each of these scenarios at the Conowingo and Marietta monitoring stations. The 1985 scenario had the highest predicted loads for all three parameters, followed by the 2011 progress scenario, the 2010 WIP scenario and finally the all forest scenario.

#### 12. Alternatives Framework

Claire provided a handout which is a flowchart that lays out a framework of sediment management alternatives to assist the LSRWA team with organizing the large amount of sediment management alternatives involved in this study. This handout is included as enclosure 11 to this memorandum. Ideally each representative sediment management alternative would have a cost associated with it as well as volume of sediment that could be removed/moved (\$/cubic yard).

#### 13. Wrap Up –

Anna will draft up notes for the group’s review. Following this, the notes and presentations will be posted to the project website. Claire will set up a doodle poll to determine the date for next quarterly meeting which will be sometime in August.

Anna Compton,  
Study Manager/Biologist

Enclosures: 1. Meeting Agenda  
2. Summary of Existing and Future Conditions- Carl Cerco Presentation

3. Baseline and Future Conditions spreadsheet.
4. Reservoir Sediment Management Options – Bob Blama Presentation
5. Lower Susquehanna Placement Options Handout
6. Dredging Handout
7. Dewatering/Drying Handout
8. Sediment By-pass tunnels–Kathy Boomer Presentation
9. Altering Reservoir operations handout
10. WIP Scenarios and Nutrient Loading -Lewis Linker Presentation
11. Sediment Management Alternatives Framework



**LOWER SUSQUEHANNA RIVER WATERSHED ASSESSMENT  
QUARTERLY TEAM MEETING**

**MDE Aqua Conference Room, Baltimore, Maryland  
May 13, 2013**

**Meeting Agenda**

**Lead**

- 10:00 Welcome and Introductions ..... All
- 10:05 Review of Action Items from Prior Meetings ..... O'Neill  
Funding Update  
Communication and Coordination Updates for Situational Awareness  
Conowingo Policy Group Meeting on 22 April 2013

**LSRWA Technical Analyses**

- 10:20 Summary of Existing and Future Conditions ..... Cerco/Compton
- 10:50 Update on Reservoir Sediment Management Strategies ..... Blama/Laczo
- 11:20 Sediment Bypass Strategies ..... Boomer
- 11:35 Update on Reservoir Operational Strategies ..... Balay
- 11:45 No-Till Acreage Strategy ..... Michael
- 11:55 WIP Scenarios and Nutrient Loads ..... Linker
- 12:15 Alternatives Framework ..... Compton/O'Neill
- 12:25 Meeting Wrap-Up ..... O'Neill  
Action Items/Summary/Schedule Ahead  
Next Meeting

**Call-In Information:** (877) 336-139, access code = 6452843#, security code = 1234#

**Expected Attendees:**

- MDE: Herb Sachs; Tim Fox, Matt Rowe  
MDNR: Bruce Michael, Bob Sadzinski, Shawn Seaman  
MGS: Jeff Halka  
SRBC: John Balay, Andrew Gavin, Dave Ladd  
USACE: Anna Compton, Bob Blama, Chris Spaur, Claire O'Neill, Tom Laczo, Dan Bierly  
ERDC: Carl Cerco, Steve Scott  
TNC: Mark Bryer, Kathy Boomer  
USEPA: Gary Shenk, Lewis Linker  
USGS: Mike Langland, Joel Blomquist
- Exelon: Mary Helen Marsh, Kimberly Long, Gary LeMay  
Lower Susquehanna Riverkeeper: Michael Helfrich  
PA Agencies: Patricia Buckley, Raymond Zomok

Action Items from February 2013 Quarterly Meeting:

- a. Claire will coordinate the next quarterly meeting for May.
- b. Anna will send out the spreadsheet tracking all stakeholder coordination to the group. Anyone making a presentation on LSRWA should let her know so the spreadsheet can be kept up to date; if any specific comments/concerns are raised, this should be noted as well.
- c. John Nichols will submit written comments on behalf of NMFS addressing his agency's concerns over sediment bypassing management strategy.
- d. Danielle will add Blackwater Wildlife Refuge as a potential placement option to evaluate.
- e. Bruce will work with Gary on potential "no-till" acres available in the watershed and evaluate impacts to sediment loads if all no-till acres were implemented in the watershed via modeling.
- f. Carl will complete runs for the following scenarios: What happens when the reservoir fills? What happens when the reservoir fills and WIPs are in full effect? What is the system's condition if a large scour event occurs in spring, summer or fall? These are the final existing and future without project conditions scenarios.
- g. Carl, Steve and Lewis will work together to determine where nutrients are scoured from in the reservoir (at what depths) and will conduct a sensitivity analysis looking at bioavailability of nutrients in various forms (species) by Berner activity class or other means).
- h. Michael and Carl will have a follow-up phone call to discuss the estimated loads that Carl is using for his modeling efforts that will be entering the Bay once Conowingo is full and will report back to the group if these estimated loads will be revised at all.
- i. Modeling efforts cannot predict impacts to SAV from physical burial by sediments. These impacts should be considered and described by other means, perhaps qualitatively, by the LSRWA agency group.
- j. Matt will check in with MDE to see how sediment bypassing (for open water placement or allowing sediments to relocate to sediment-starved areas) would be permitted and the stance of his agency on permitting for such activities.
- k. Pat will determine and report back to the group what the PA department of Environmental Protection (DEP) stance is on sediment criteria for landfills ("clean" vs. "waste"). More specifically, we have data from 2000, is this too old? If so, what are expectations of the agency regarding data to determine appropriateness of sediment at a landfill?
- l. The concept of a permanent pipeline should be investigated further and examples around the country should be looked at by the LSRWA agency group.
- m. Michael will forward info to Danielle on Funkhauser Quarry.

- n. Michael will forward Danielle the questions he had about some of the reservoir sediment management options that were presented but could not be addressed at the meeting due to time limitations.
- o. The LSRWA agency group needs to determine next steps for developing reservoir sediment management options.
- p. John Balay will look further into agitation dredging (coupled with electric generation releases) of fine material; it is expected this would be done outside of ecologically critical time periods.
- q. The LSRWA agency group should quantify any habitat restored or enhanced downstream in Bay or elsewhere (e.g. terrestrial) as a project benefit; considerations should be given on how to do this.

Ongoing/Action Items from Previous Meetings:

- a. The MDE FTP website will be utilized to share internal draft documents within the team; Matt will be the point of contact for this FTP site. *Status: Ongoing. Sharing of future documents will go through the MDE ftp website.*
- b. Shawn will notify team when most recent Exelon study reports are released. *Status: Ongoing. Tom Sullivan, a contractor of Exelon noted that the Exelon has filed the license for Conowingo Dam with FERC.*
- c. Anna will update PowerPoint slides after each quarterly meeting to be utilized by anyone on the team providing updates to other Chesapeake Bay groups. *Status: Ongoing.*
- d. Anna will send out an update via the large email distribution list that started with the original Sediment Task Force (includes academia, general public, federal, non-government organization (NGO), and state and counties representatives) notifying the group of updates from the quarterly meeting. *Status: Ongoing.*
- e. Matt will keep team informed on innovative re-use committee findings to potentially incorporate ideas/innovative techniques into LSRWA strategies. *Status: Ongoing.*
- f. Michael Helfrich will coordinate with MD, Chesapeake Bay Program (CBP) and the MD county coalition to set up a meeting to present dam implications to total maximum daily loads (TMDL) to MD counties. *Status: Ongoing. Michael Helfrich coordinated this task with Bruce Michael; Bruce has reported LSRWA activities to multiple groups and counties over the last 6 weeks. His message to counties was to keep in perspective that they still need to do their work regarding sedimentation from the watershed (meeting TMDLs) while the issue of sediments and nutrients trapped behind the dams and how to manage them are still being dealt with. Bruce noted that Bob Summers, MDE Secretary, has made presentations to the MD legislative committees as well.*

## MEMORANDUM FOR THE RECORD

**SUBJECT:** Lower Susquehanna River Watershed Assessment  
Quarterly Meeting, August 15, 2013

1. On August 15, 2013 agency team members met to discuss ongoing and completed activities for the Lower Susquehanna River Watershed Assessment (LSRWA). The meeting was hosted by the Maryland Department of the Environment (MDE) in their Terra Conference Room at the Montgomery Park Building in Baltimore, Maryland. The meeting started at 10:00 am and continued through 2:00 pm. The meeting attendees are listed in the table below.

2.

Lower Susquehanna River Watershed Assessment Team Meeting Sign-In Sheet			
August 15, 2013			
Agency	Name	Email Address	Phone
American Geophysical Union	Harry Furukawa	<a href="mailto:hfurukawa@agu.org">hfurukawa@agu.org</a>	202-777-7430
City of Baltimore, DPW	Prakash Mistry	<a href="mailto:Prakash.Mistry@baltimorecity.gov">Prakash.Mistry@baltimorecity.gov</a>	410-396-0732
City of Baltimore, DPW	Clark Howells	<a href="mailto:clark.howells@baltimorecity.gov">clark.howells@baltimorecity.gov</a>	410-795-6151
City of Baltimore, DPW	James Price	<a href="mailto:James.Price@baltimorecity.gov">James.Price@baltimorecity.gov</a>	410-396-0539
Chesapeake Bay Commission	Ann Swanson	<a href="mailto:aswanson@chesbay.us">aswanson@chesbay.us</a>	410-263-3420
Chesapeake Bay Foundation	Beth McGee	<a href="mailto:bmcgee@cbf.org">bmcgee@cbf.org</a>	443-482-2157
EPA, Chesapeake Bay Program	Lew Linker	<a href="mailto:linker@chesapeakebay.net">linker@chesapeakebay.net</a>	410-267-5741
Exelon	Kimberly Long	<a href="mailto:kimberly.long@exeloncorp.com">kimberly.long@exeloncorp.com</a>	610-756-5572
Gomez and Sullivan	Kirk Smith		
Exelon - Gomez and Sullivan	Gary Lemay	<a href="mailto:glemay@gomezandsullivan.com">glemay@gomezandsullivan.com</a>	603-428-4960
Exelon - URS Corp.	Marjorie Zeff	<a href="mailto:marjorie.zeff@urs.com">marjorie.zeff@urs.com</a>	215-367-2549
Exelon-Gomez and Sullivan	Tom Sullivan	<a href="mailto:tsullivan@gomezandsullivan.com">tsullivan@gomezandsullivan.com</a>	603-428-4960
Lower Susquehanna Riverkeeper	Michael Helfrich	<a href="mailto:LowSusRiver@hotmail.com">LowSusRiver@hotmail.com</a>	717-779-7915
MDE	Herb Sachs	<a href="mailto:sachsh@verizon.net">sachsh@verizon.net</a>	410-537-4499
MDE	John Smith	<a href="mailto:jsmith@mde.state.md.us">jsmith@mde.state.md.us</a>	410-537-4109
MDE	Matt Rowe	<a href="mailto:mrowe@mde.state.md.us">mrowe@mde.state.md.us</a>	410-537-3578
MDE	Tim Fox	<a href="mailto:ffox@mde.state.md.us">ffox@mde.state.md.us</a>	410-537-3958
MDE	Lee Currey	<a href="mailto:lee.currey@maryland.gov">lee.currey@maryland.gov</a>	410-537-3913
MDNR	Bob Sadzinski	<a href="mailto:bsadzinski@dnr.state.md.us">bsadzinski@dnr.state.md.us</a>	
MDNR	Bruce Michael	<a href="mailto:bmichael@dnr.state.md.us">bmichael@dnr.state.md.us</a>	410-260-8627
MDNR	Shawn Seaman	<a href="mailto:ssseaman@dnr.state.md.us">ssseaman@dnr.state.md.us</a>	410-260-8662
MDAGO	Brent Bolea	<a href="mailto:bbolea@energy.state.md.us">bbolea@energy.state.md.us</a>	410-260-7578
MPA	David Blazer	<a href="mailto:dblazer@marylandports.com">dblazer@marylandports.com</a>	410-726-2235
NOAA-NMFS	Christopher Boelke	<a href="mailto:christopher.boelke@noaa.gov">christopher.boelke@noaa.gov</a>	
PADEP	Patricia Buckley	<a href="mailto:pbuckley@pa.gov">pbuckley@pa.gov</a>	717-772-1675
PADEP	Ted Tesler	<a href="mailto:htesler@pa.gov">htesler@pa.gov</a>	717-772-5621
SRBC	David Ladd	<a href="mailto:dladd@srbc.net">dladd@srbc.net</a>	717-238-0425x204
SRBC	John Balay	<a href="mailto:ibalay@srbc.net">ibalay@srbc.net</a>	717-238-0423 x217
TNC	Kathy Boomer	<a href="mailto:kboomer@tnc.org">kboomer@tnc.org</a>	607-280-3720
USFWS	George Ruddy	<a href="mailto:george_ruddy@fws.gov">george_ruddy@fws.gov</a>	410-573-4528
USFWS	Robbie Callahan	<a href="mailto:Carl.Callahan@fws.gov">Carl.Callahan@fws.gov</a>	410-573-4524
USFWS	Genevieve LaRouche	<a href="mailto:genevieve_larouche@fws.gov">genevieve_larouche@fws.gov</a>	202-341-5882
USACE	Anna Compton	<a href="mailto:anna.m.compton@usace.army.mil">anna.m.compton@usace.army.mil</a>	410-962-4633
USACE	Dan Bierly	<a href="mailto:daniel.m.bierly@usace.army.mil">daniel.m.bierly@usace.army.mil</a>	410-962-6139
USACE	Bob Blama	<a href="mailto:robert.n.blama@usace.army.mil">robert.n.blama@usace.army.mil</a>	410-962-6068
USACE	Chris Spaur	<a href="mailto:christopher.c.spaur@usace.army.mil">christopher.c.spaur@usace.army.mil</a>	410-962-6134
USACE	Claire O'Neill	<a href="mailto:claire.d.o'neill@usace.army.mil">claire.d.o'neill@usace.army.mil</a>	410-962-0876
USACE	Tom Lazco	<a href="mailto:thomas.d.lazco@usace.army.mil">thomas.d.lazco@usace.army.mil</a>	410-962-6773
USACE	Steve Flinsky	<a href="mailto:Steve.Flinsky@usace.army.mil">Steve.Flinsky@usace.army.mil</a>	410-962-4503
USACE-ERDC	Carl Cerco	<a href="mailto:carl.f.cerco@erdc.usace.army.mil">carl.f.cerco@erdc.usace.army.mil</a>	601-634-4207
USACE-ERDC	Steve Scott	<a href="mailto:steve.h.scott@usace.army.mil">steve.h.scott@usace.army.mil</a>	601-634-2371
USGS	Mike Langland	<a href="mailto:langland@usgs.gov">langland@usgs.gov</a>	717-730-6953

The meeting agenda is provided as enclosure 1 to this memorandum.

#### Status of Action Items from May Quarterly Meeting:

- Michael Helfrich will forward info to Danielle Aloisio on Funkhauser Quarry. *Status. Complete. No point of contact is available due to abandoned conditions, see response to "d" for more info.*
- Claire will coordinate the next quarterly meeting for August 2013. *Status: Complete. Meeting occurred today.*
- Anna will distribute NMFS agency letter discussing concerns over sediment bypassing management strategy to group and have it posted on website. *Status Complete.*

- d. Bob Blama will call the Funkhauser Quarry to get more information on utilizing this as a sediment placement option. *Status Complete. While no POC was provided (it is an abandoned quarry), USACE did some preliminary calculations; volume is very limited, only 3 million cubic yards (mcy), and access to the quarry is a big concern. Michael Helfrich noted that he thought this would be a good place for a staging area. The LSRWA report/spreadsheets with potential alternatives have been updated with this info.*
- e. Michael Helfrich will touch base with Jeff Cornwell (UMCES) to get his opinion on phosphorus bioavailability in sediments as it relates to the LSRWA study. *Status. Complete. Chris Spaur updated the group on this item. He noted that he will prepare a write up for the report and will run it by Jeff Cornwell for comments. Chris noted that during study scoping in 2010/2011, water column and sediment nutrient-content data needs were discussed and evaluated. Anna and Chris coordinated with Carl Cerco, Steve Scott, Mike Langland, and Joel Bloomquist (USGS) for this purpose. The group determined that data on nutrient (and sediment) in water outflows from Conowingo Pond was inadequate, and collecting data to fill gaps was scoped into the study. It was recognized that it would be useful to have additional information on Conowingo Pond bottom sediment biogeochemistry, particularly with regard to phosphorus. However, it was determined that existing information/data was adequate for study modeling purposes, and it was decided to not undertake such investigations in light of need to control study costs. With regard to (P) phosphorus biogeochemistry, Carl had identified Jordan and others (2008) as presenting a concept applicable to utilize for our situation. P is generally bound to iron in fine-grained sediments in oxygenated freshwater and of limited bioavailability. Under anoxic/hypoxic conditions iron is reduced and P can become more bioavailable. P rebinds to iron in sediments if oxygen is again present. P adsorbed to Conowingo Pond bottom sediments would remain bound to those sediments in the freshwater uppermost Bay. In saltwater, biogeochemical conditions change. Jordan and others (2008) indicate that as salinities increase above about 3-4 ppt/psu (parts per thousand/practical salinity units, P is increasingly released from sediments and becomes mobile and bioavailable to living resources, which is likely due to increased sulfate concentrations in marine water water (e.g., Caraco, N., J. Cole, and G. Likens, 1989. Evidence for Sulphate-controlled Phosphorus Release from Sediments of Aquatic Systems. Nature 341:316–318.). The upper Bay remains generally below salinities of 3 ppt all year south to about the Sassafra River on the Eastern Shore and Bush River on the Western Shore.*

*Chris noted that in the original scoping, the purposeful removal/release of sand from Conowingo Pond into the Bay was considered, but not the current bypassing alternative that could release fine-grained sediments into the upper Bay. The Bay model has determined that a release of Conowingo bottom sediments into the upper Bay in fall/winter would have fewer impacts to Bay water quality than in spring/summer, in part because the microbially-facilitated P release mechanisms occur more slowly in winter months. The winter timing allows for sediment deposition and P burial and long-term storage to occur before warm water conditions enhance P release in suspended and surface sediments. Additionally UMCES work has shown that there are less negative impacts when excessive flows enter the Upper Bay system during late fall/winter months because the life cycles for the species of concern are such that they are less susceptible to degraded water quality at this time. Mike Helfrich asked what depth P would need to be buried and how we would know whether waves would scour bottom. Chris said that MGS (1988) maps the upper Bay and shows that the channel on the west side as depositional so this region is presumably burial. Also, during the SAV growing season, large SAV beds would provide wave protection in the bed vicinity. During non-growing season when non-persistent SAV is absent, this wouldn't be the case though.*

*Chris offered to provide information summarizing 2010/2011 nutrient scoping to anyone that was interested, as well as copies of Jordan and others (2008). MGS report is available online:*

Jordan, T.E., J.C. Cornwell, W.R. Boynton, and J.T. Anderson. 2008. *Changes in phosphorus biogeochemistry along an estuarine salinity gradient: the iron conveyor belt. Limnology and Oceanography, 53(1): 172-184.*

Maryland Geological Survey. 1988. *The surficial sediments of Chesapeake Bay, Maryland: physical characteristics and sediment budget. Report of Investigations No. 48. Maryland Geological Survey.*

Beth asked about what species of phosphorus we are including in the water quality model. Carl said that his model, Chesapeake Bay Environmental Model Package (CBEMP) assumes a split of inorganic and organic P. This split is based on collected historical data. The model assumes that inorganic P is not bioavailable (as long as the water column is oxygenated); and that inorganic P stays bound to sediments. In the upper Bay conditions are oxygenated so this is a good assumption. Organic P gets split into two types: a smaller, more readily mobilized labile type and a refractory type which constitutes most of the organic P which decomposes so slowly it is considered essential unavailable to the biological community. Based on these conditions it is assumed that the the majority of P that comes over Conowingo is not bioavailable.

f. The group will review the baseline and future conditions summary spreadsheet and provide comments back to Anna Compton and Carl Cerco. *Status ongoing. Carl and Anna still are working on updating and finalizing summary spreadsheet. Anna will send out once completed.*

g. Lewis Linker and Carl Cerco will work with CBP partners to integrate the CBP's assessment procedure ("Stoplight plots") into the LSRWA key modeling scenarios to provide a means to communicate/explain impacts to Chesapeake Bay from the various full reservoir and storm scouring scenarios. *Status: Complete. Lew will discuss this analysis; see Section 11.*

h. The LSRWA agency group will develop a screening process for reservoir sediment management options that are worth developing further. *Status Ongoing. Once the team sees modeling results, sediment management screening process can be further refined and lead to recommendations.*

i. The LSRWA agency group will direct any questions on sediment bypass tunneling to Kathy Boomer. *Status Complete.*

j. Kathy Boomer will write up a section on sediment bypass tunneling for the LSRWA report. *Status Complete.*

#### Ongoing Action Items from Previous Meetings:

A. The MDE FTP website will be utilized to share internal draft documents within the team; Matt will be the point of contact for this FTP site. *Status: Ongoing. Sharing of future documents will go through the MDE ftp website.*

B. Shawn Seaman will keep team posted on FERC relicensing of Conowingo dam status. *Status: Ongoing. Shawn noted that currently MD and PA are negotiating with Exelon. August 2nd was last MD meeting. MD and PA will have some joint and also some separate meetings with Exelon in regards to relicensing process and negotiations.*

C. Anna Compton will update PowerPoint slides after each quarterly meeting to be utilized by anyone on the team providing updates to other Chesapeake Bay groups. *Status: Ongoing.*

D. Anna Compton will send out an update via the large email distribution list that started with the original Sediment Task Force (includes academia, general public, federal, non-government organization (NGO), and state and counties representatives) notifying the group of updates from the quarterly meeting. *Status: Ongoing.*

E. Matt Rowe will keep team informed on innovative re-use committee findings to potentially incorporate ideas/innovative techniques into LSRWA strategies. *Status: Ongoing.*

F. Anna Compton will send out the spreadsheet tracking all stakeholder coordination to the group. Anyone making a presentation on LSRWA should let her know so the spreadsheet can be kept up to date; if any specific comments/concerns are raised, this should be noted as well. *Status: Ongoing.*

G. Bruce Michael will work with the Chesapeake Bay Program (CBP) on potential “no-till” acres available in the watershed and evaluate impacts to sediment loads if all no-till acres were implemented in the watershed via modeling as well as develop costs. *Status: Ongoing. See discussion under #6.*

H. Carl Cerco, Steve Scott and Lewis Linker will work together to determine where nutrients are scoured from in the reservoir (at what depths) and will conduct a sensitivity analysis looking at bioavailability of nutrients in various forms (species) by Berner activity class or other means). *Status: Complete. It was determined that this task will not be completed at this time. Investigating the locations and depths from which sediment is eroded will not yield much. The problem is we have little or no information about the reactivity of bottom material. In the Chesapeake Bay modeling package (CBEMP), we partition particulate nutrients carried over the dam into various classes of composition and reactivity based on a combination of observations, experience, and judgment. If we are uncertain about the composition of material eroded from the bottom, we could do some sensitivity runs where we vary the partitioning and/or reactivity of the loads. However we couldn't state with certainty that the "sensitivity loads" would be any more realistic than the loads we are using now, but we could examine the risks involved in our current assumptions. This option is available for the future especially if more data is collected for instance for a feasibility level analysis of implementing some kind of management action.*

I. Modeling efforts cannot predict impacts to SAV from physical burial by sediments. These impacts should be considered and described by other means, perhaps qualitatively, by the LSRWA agency group. *Status: Ongoing. Bruce Michael has provided the UMCES (Mike Kemp) SAV historical mapping and trends over last 10 years in Susquehanna Flats. This information will need to be incorporated into the assessment to provide a qualitative discussion of impacts. Bruce noted that in looking at what happened to SAV during TS Lee, high flows ripped up SAV from the periphery. It appears that there was damage from the physical impacts of the storm versus burial of SAV by scoured sediments. Mike Kemp is looking at other storm examples. Bruce will follow up with Mike Kemp and provide a write-up for report. Chris Spaur reminded the group that we don't have wave energy in our modeling. Chris can email past efforts on characterization of wave energy undertaken during the Chesapeake Bay Shoreline Erosion study.*

J. The LSRWA agency group needs to determine next steps for developing reservoir sediment management options. *Status: Ongoing. Representative alternatives were identified for costs; some alternatives identified for sediment transport/WQ modeling; results discussed in Sections 5, 6, 8, 9, and 10.*



K. The LSRWA agency group should quantify any habitat restored or enhanced downstream in the Bay or elsewhere (e.g., terrestrial) as a project benefit; considerations should be given on how to do this. *Status: Ongoing.*

L. Bruce Michael and Claire O'Neill will keep the LSRWA agency group updated on the Susquehanna policy group put together by Governor O'Malley. *Status: Ongoing. Bruce noted that the Conowingo policy group met in April. There are no more meetings planned until more results from LSRWA are available.*

M. Exelon will review and provide comments on SRBC's write-up of altering reservoir operations as a sediment management strategy. Exelon will comment on the write-up to make sure dam operations are adequately covered. *Status Ongoing. John Balay will follow up with Exelon to ensure they have no further comments on reservoir operations section.*

Action Items from this (August 15) Quarterly meeting –

- a. Chris Spaur will provide information summarizing the 2010/2011 LSRWA nutrient scoping to anyone that is interested, as well as copies of Jordan and others (2008) and a link to MGS report. This info also could be placed on the LSRWA website. Chris will also prepare a write-up on phosphorus biogeochemistry in the Bay for the LSRWA report.
  - b. Claire O'Neill will provide to the group all of the factsheets/ back-up documentation to show how costs were developed for each representative sediment management alternative.
  - c. Matt Rowe will look into Stancills quarry and their existing permits to see if they have any constraints or concerns with groundwater contamination. This may need to be marked as a limitation for this potential placement site.
  - d. Bruce Michael will be providing a write-up that lays out this watershed sediment management scenario in more detail in September.
  - e. Mike Langland will provide data to the group related to grain size and nutrients based on his analysis of the sediment core data.
  - f. Steve Scott will alter his graphs to depict areas of concern in red.
  - g. Carl Cerco will look into the suspended sediment and nutrient loads that Michael Helfrich has provided to determine if the loads need to be revised for his CBEMP modeling runs.
  - h. Anna Compton will work with the modeler's to develop a summary table compiling all sediment management modeling scenarios and results.
  - i. Anna Compton will draft up notes for the group's review and then post to the project website.
  - j. Claire O'Neill will set up a doodle poll to determine the date for next quarterly meeting which will be sometime in November.
3. Introductions - After a brief introduction of the meeting attendees, Claire O'Neill welcomed the LSRWA agency group and noted that the purpose of the meeting was to provide updates on recent activities within the LSRWA.
4. Funding Update – Claire O'Neill noted that FY13 federal budget funding arrived in July. This assessment received \$300,000. While the assessment is still due \$126,000 in Federal funds in FY14 to complete, if those funds are not readily available, the assessment has access to non-Federal funds to complete the analyses.

5. Update on Sediment Management Strategies – Costs - Claire O’Neill provided a handout, laying out a summary of costs for representative sediment management alternatives and an example “factsheet” which provides the back-up documentation to show how costs were developed for each representative sediment management alternative (Enclosure 2).

For the past year, the USACE-Baltimore District staff has been focused on developing concept design and costs for in-reservoir sediment management alternatives. At the February quarterly meeting, Bob Blama and Danielle Aloisio presented a matrix with many in-reservoir options. This matrix summarized field visits and telephone coordination that they had with potential placement sites. From this coordination, it was determined that the majority of potential placement sites that had accessibility and capacity were closer to Conowingo Reservoir. From that matrix, the assessment team selected a set of representative alternatives for the concept-level design and cost development for each of the categories to give us a sense of the costs for each category of alternatives. The alternatives came from four categories: (1) innovative re-use, (2) open water placement, (3) upland placement, and (4) watershed management. At this time, USACE is still waiting for Harbor Rock and MDNR to supply details for categories #1 and #4, so the presentation focused on alternatives in categories #2 and #3.

For the open-water and upland placement representative alternatives, Tom Laczko from the USACE staff compiled the available information and laid out possible logistics and infrastructure investment for three levels of one-time removal: 1 million cubic yards, 3 million cubic yards, and 5 million cubic yard to get a sense of unit costs for the various concepts. Each alternative has a detailed factsheet laying out the logistics. Items that were considered included the type of dredging, transport mechanism, the need for drying and consolidation of the material, type of placement, and real estate required. For example, depending on how you dredge, there is more or less water which impacts the amount of land you might need, time for drying and placement site.

The information was then compiled into a summary spreadsheet (one worksheet for each volume considered). During the meeting, Claire explained parts of the worksheet. Across the top are the four categories of representative alternatives, then under open water placement and upland placement there are individual alternatives. The first section physically describes those alternatives, including the type of dredging, the eventual placement site, and the transport method. Claire noted that for the hydraulic dredging alternatives involving trucking or barging, that large areas for drying the material would be required. Tom explained how rotational drying was considered if it were needed for any of the upland placement sites. For example, a temporary placement site could be divided into cells and while one cell(s) had material drying and consolidating other cells could receive new material while other cells could have material removed and transported to final destination. The concept is that cells would be rotated until the final destination placement site is at capacity. Tom noted that the drying time was aggressive (i.e., in reality, drying could take longer than assumed for this exercise).

The worksheet goes on to lay out some operational assumptions, investment costs, and annual/removal costs. Cost values are presented as a range between a low and high value. Tom Sullivan asked whether contingency was included in the calculations; Claire noted that a specific contingency was not added to the cost calculations but that the USACE staff took that into consideration in the low-high assessment. The worksheet illustrates that the annualized (one-time investment costs (based on a 50-year project life and the Federal project interest rate) are much less

than the operational removal costs if the removal is done a yearly basis. In the lower half of the worksheet, the costs are calculated on a per cubic yard basis and major limitations are described. Claire noted that these limitations are not all encompassing and could be expanded. At the very bottom of the spreadsheet, the major assumptions are outlined. Anna noted that the tipping fees were based on recently collected data and there was discussion that these tipping fees could be negotiated. Claire reiterated that the costs developed are concept-level only, and that a feasibility study would be required to determine more detailed design and cost analyses if an entity was looking to implement any of these alternatives.

For the meeting, the attendees were provided with the summary spreadsheet and a sample detailed worksheet for an open water placement site. After hearing Claire's presentation, the meeting attendees were interested in seeing all of the detailed worksheets, so Claire agreed to follow up and provide those to everyone. Comments on the cost summary spreadsheet and the detailed worksheets were requested to be provided by 6 September 2013.

There was discussion on Stancills quarry as a potential placement site. There was a question if there would be water quality/groundwater issues. Bob Blama said when he talked with them, they said their permits were good. Matt Rowe said he could look into Stancills quarry and their existing permits. This may need to be marked as a limitation for this potential placement site. Matt noted that freshwater dredged material doesn't have the same constraints as saltwater dredged material (i.e., less potential for groundwater contamination).

Dave Ladd asked about combining of alternatives. Claire noted that the project partners will look into this further when they look to develop recommendations.

6. Watershed Sediment Management Strategies - Bruce Michael provided the group an update on the development of watershed sediment management strategies for LSRWA.

He noted that the TMDL process set nutrient (nitrogen and phosphorus) and sediment load allocations for each state, that when implemented by the year 2025, would eventually meet Bay water quality standards for dissolved oxygen, water clarity, and chlorophyll, an indicator of algal biomass. Each state was required to develop watershed implementation plans (WIPs) that provides reasonable assurance to EPA that they will meet their load allocations. The WIP defines specific best management practices (BMP) and how they are to be funded throughout the watershed.

The total sediment load allocation of 6,453.61M lbs/year for the entire watershed is not defined in the state WIPs. For the Susquehanna River watershed, Pennsylvania, New York and Maryland it is anticipated that the specific BMP implementation defined for meeting nitrogen and phosphorus load allocations are expected to exceed the sediment load allocation by 62M lbs/year by 2025 with full WIP implementation. The Chesapeake Bay Program watershed model (WSM) estimates that NY provides 317M/year lbs sediment load, PA 2,200M/year lbs sediment load and MD 68M/year lbs sediment load to the Bay.

An analysis was conducted to compare predicted 2025 WIP BMP levels (of TSS) to the predicted "E3" (everything, everywhere, by everyone) BMP levels (of TSS) in this basin. The analysis found that TSS load reductions (E3 scenario) above and beyond the Susquehanna River WIP BMP levels in the three states are 62M lbs/year. The TSS planning targets are the cap load allocations needed to

meet clarity and SAV goals. Bruce noted that this delta of 62M lbs/year sediment should be considered in the LSRWA sediment management options.

It is estimated that the maximum additional delivered TSS load reduction (beyond the WIPs) is estimated to be 190M lbs/year. This includes the 62M lbs/year not accounted for in the WIPs. The “E3” scenario is a what-if scenario of watershed conditions. There are no cost and few physical limitations to implementing BMPs in “E3” scenario. Generally, “E3” implementation levels and their associated reductions in nutrients and sediment could not be achieved for many practices, programs and control technologies when considering physical limitations and participation levels.

For this analysis, it is assumed that the three states will meet their TMDL target load allocations for nutrients, and therefore, sediments. The EPA Chesapeake Bay Program provided data comparing non-wastewater BMP levels between the 2025 WIPs and a modified “E3” condition. “E3” conditions were primarily applied to the agriculture and forestry sectors since these are generally more cost-effective sectors with respect to TSS load reductions.

The BMP comparison lists implementation by major BMP category as absolute units, e.g., acres and as a percent level of implementation. The percent level of implementation is the cumulative planned acres compared to the total domain of acres available for the BMP. For several BMPs, this level would be 100 percent for the “E3” boundary condition.

For the objective of looking at acres in the lower Susquehanna River watershed beyond WIP implementation that might be available for additional sediment BMP implementation, Bruce and his team considered “upgrading” BMPs – rather than just additional implementation of BMPs specified in the current WIPs. The focus was on agriculture and forestry BMPs (opposed to stormwater) because of the relative cost-effectiveness.

In summary, the theoretical maximum additional delivered TSS load reduction (beyond the WIPs) is estimated to be 190M lbs/year. This is the model-estimated delta in loads between the two BMP scenarios – the 2025 WIPs and the 2025 WIPs with sediment “E3” scenario. Cost estimates for the BMP implementation, for both the 62 M lbs/year and 190 M lbs/year, are still under evaluation. The three states have different BMP cost estimates. As you approach the “E3” scenario, BMP implementation costs will theoretically increase as few acres will be available for implementation and the least expensive BMPs will have been implemented first. MDNR is working on developing a low and high cost range for BMP implementation.

As an initial rough estimate of sediment costs, MDE developed a list of Chesapeake Bay Program-approved BMPs, the load reduction, annual cost, cost efficiency and cost per pound. For each BMP, a low, medium and high cost per pound of sediment reduction was estimated. The low cost of cost per pound estimates (\$3.87) were averaged and the high cost of cost per pound estimates (\$105.72) for delivered sediment loads was utilized. Average costs were used to calculate a range of costs necessary to reduce additional sediment delivered to the Susquehanna River above and beyond WIP implementation using the “E3” scenario estimate of a 190M lbs/year sediment or 95,000 tons sediment/year.

The maximum available sediment per year that could be reduced by additional BMP implementation above and beyond the WIP implementation throughout the lower Susquehanna River Watershed is approximately 95,000 tons/year. This is about an order of magnitude less than what is estimated to

flow over the Conowingo Dam into the Chesapeake Bay on a average annual basis (approximately, 1M tons/year).

Lee Currey noted that this analysis should make sure that the technical assumptions on costs for the period of analysis are consistent. Bruce noted that different BMP's do have different costs.

Bruce will be providing a write-up that lays out this watershed sediment management scenario in more detail in September.

7. Reservoir Transport - Mike Langland provided a presentation on reservoir transport which is included as Enclosure 3 to this memorandum. It is important to note that what was presented should be considered draft and is subject to change.

Mike first discussed his recent data compilation and findings on sediment transport (flood frequencies, sediment transport rates, trapping, and delivery). Overall, historically data there has been declining sediment transport into the Susquehanna river/reservoir system since the 1900's due to changes in sediment management throughout the watershed. He noted that historically as flow increases (i.e. during a storm event) sediment loads increase from the watershed and the loads that are scoured from behind the reservoirs increase as well. In general for the majority of flows, scour of sediments from behind the reservoirs influences about 22-25 percent of the total loads entering the Bay during an event (the rest is from the watershed). Scour from the reservoir occurs only when flows are above 380,000-400,000 cfs which has a reoccurrence interval of (1 in 4 chance or a "25-year storm").

Through time reservoirs have trapped more sediment. As the reservoirs fill with sediment they trap less sediment. Reservoir trapping efficiency has decreased from 75-80 percent to 55-60 percent currently (i.e. the amount of sediment that Conowingo is still currently trapping). In the future trapping efficiency is projected to maintain this 55-60% efficiency because storm scouring will still occur creating room for more trapping to occur on a cyclic basis. Mike noted that Tropical Storm Agnes was a massive change to the norm of trapping and scouring. He noted that this storm (1972) had about 15 million tons entering the reservoir system and those 15 million tons scoured by the storm plus an additional 15 million tons from the watershed entering the system. This is significantly higher loading and scouring than other observed storms.

Mike then discussed information that he collected on particle size distribution and location. He presented coring data collected throughout the reservoirs and focused on Conowingo cores. Through this analysis of data, he was able to determine the particle sizes and spatial distribution of the sediment. He observed that the trend is that there is a higher percentage of sand as you travel away from the reservoir. Fines (silts and clays) are being replaced with sands. For example in the lower portion of the reservoir in 1990, the area had about 5 percent sand; in 2012 it is projected to have about 20 percent sand. There was discussion of the bed armoring over time. Heavier material takes more time to remove (higher storm flows required). Presumably storms remove the silts and clays (easier to transport) leaving behind the heavier sands. For example, it is estimated that fines begin to move out of the reservoir when flows are around 250,000 cfs but sands do not start to move until flows are more like 500,000–700,000 cfs. Approximately, 400,000 cfs is an average of the flow it takes to scour sediment out of the reservoirs when you take into account all particle sizes.

We are not going to see much change in trends as Conowingo enters an equilibrium state. Trapping efficiency (55-60%) won't change and there will not be a whole lot of difference in the amount of loads we see entering the Bay now from the reservoir than we could anticipate in the future.

In summary, long-term sediment transport rates into/out of reservoirs from the watershed are declining due to improvements in sediment/nutrient management in the watershed. Historical data indicates decreasing trapping efficiency over time. Increasing discharge (flows) results in increasing scour (i.e. more sediment scoured and added to total Bay sediment/nutrient loads).

When flows are 400,000-700,000 cfs approximately 23 percent of the total load to Chesapeake Bay is from scouring of sediment from behind the dams; the remainder is from loading from the watershed. Overall sand is moving and displacing fines down-gradient in Conowingo Reservoir. If this trend continues, fewer silts and clays (fines) will be scoured in future events due to a combination of reasons, first, deposition onto the bed may be reduced due to changes in water column settling velocities as the reservoir continues to fill, and second, the state's WIP plans likely will result in less fines transported into the reservoirs in the future. While spatially the areas of Conowingo reservoir where conditions are suitable for fines to be deposited would remain the same as today, the volume deposited could be less. However, fines would be scoured more readily under lower flows (however still fairly infrequent events, 250,000 cfs or greater) thus likely increasing conveyance of fines over the dam under lower flow conditions. Because these lower flow conditions occur more frequently than higher flow conditions (250,000 cfs vs. 400,000 cfs or greater), we'd expect a trend of less volume/mass of fines building up in the reservoir to be available for scour during these higher flow conditions (more infrequent events). Thus, during major scouring events there could be a trend of reduced fines being scoured.

Conowingo Reservoir is in or close to dynamic equilibrium phase (~93 percent filled). Even at 93% full the trapping efficiency still remains at 55-60 percent. Conowingo will never be at 100 percent full due to periodic storm events scouring sediments creating room for more trapping. Consequently, this "dynamic equilibrium" is what state the reservoir is in now and will most likely remain into the future.

There was discussion on the percent of coal that is in these sediments. Mike noted that coal is considered to be either sand or silt in this analysis depending on its particle size; therefore, some of the sand and silt could be coal. There was discussion on the depths of the cores taken. Mike noted that x-ray equipment is utilized to analyze the cores. Mike's analysis methods will be included in his technical report write-up.

There was a question if it was possible to characterize phosphorus trends (associated with grain size). We need to connect this analysis with Bob Hirsch (USGS) findings. Mike will provide data to group related to grain size and nutrients.

Mike presented some additional data looking at estimated scour that the modeling has predicted compared to actual scour that has been observed from collected data before and after storm events, and specifically scour thresholds in the system. Scour threshold is a term that the modelers have been using to describe the average rate of flow required to begin scouring sediments out of the reservoir system. ADH predicts that the scour threshold is between 380,000-400,000 cfs. The USGS scour threshold computation based on data collected from past events, is around 400,000 cfs.

In general fines, start to move around 250,000 cfs but 400,000 cfs is when a real increase in scour and large amounts of sediment loads are observed.

8. Sediment Management Modeling - Steve Scott provided a presentation on sediment transport and various sediment management scenarios which are included as Enclosure 4 and Enclosure 5 to this memorandum. It is important to note that what was presented should be considered draft and is subject to change.

The first modeling scenario that Steve went over was a run on the ADH model looking at the sediment management alternative of agitation dredging. The goal of agitation dredging is to transport bed sediments through the dam (outlet structures) by re-suspending reservoir bed sediments. This procedure requires high pressure water jets or diffusers to re-suspend bed sediments upstream of the dam, and then adequate flow velocity to transport re-suspended sediment through the dam's outlet structures. Sediment-transport ability is a function of sediment particle size and bed shear stress. Steve used the ADH model to compute: bed shear stress for varying flows through Conowingo; shear velocity to evaluate turbulence required to maintain sediment in suspension; computed percentage of sediment remaining in suspension as a function of flow. His findings were that a minimum discharge of 150,000 cfs is required to ensure that sediments are transported through the dam during agitation dredging. He noted that flows greater than 150,000 cfs occur on an average of 12 days per year in this system. Also these high flows come most often in spring when we don't want sediment in the system because that is a critical time of year for living resources.

The next modeling scenario that Steve went over was a dredging sediment management scenario. The goal of dredging is to reduce scour potential (the amount of sediment available to be transported during a storm event) and increase deposition in the reservoir. The analysis methods included using computed sediment transport through Conowingo with 2011 bathymetry and 2008 – 2011 Susquehanna River flows; the removal of 3 million cubic yards from a depositional area 1.0 to 1.5 miles above the Conowingo Dam; then re-computing sediment transport within the dredged area; and finally comparing the results (2011 bathymetry vs. 2011 bathymetry with dredged area). Steve noted that the dredge area was selected because large amounts sediment still naturally deposit at this location. Results of this run were that with dredging there is a 3-percent reduction in scour (2.98 million tons vs. 2.71 million tons) over the 4 year flow record. Also dredging results in a 6-percent increase in sedimentation, i.e., deposition within the reservoir (4.02 to 4.28 million tons).

The next modeling scenario that Steve went over was a sediment by-passing sediment management alternative. Using the ADH model, he evaluated the impacts of sediment bypassing operations (dredging and passing sediment downstream through a pipe around the dam) on water quality below Conowingo Dam. The assumptions for this analysis were one run that included 2.4 million tons bypassed over 3 months time (90 days) and 2.4 million tons bypassed over 9 months time (270 days). Results of this run were that he observed an increase in suspended sediment concentration from 12 to 176 mg/l for the 90-day bypassing operation below the dam and an increase in suspended sediment concentration from 12 to 66 mg/l for the 270-day bypassing operation.

9. Sediment Transport Summary - Steve Scott provided a presentation summarizing ADH modeling findings which is included as Enclosure 6 to this memorandum. It is important to note that what was presented should be considered draft and is subject to change.

Steve has conducted several runs on with varying bathymetries of Conowingo Reservoir (1996, 2008, 2011, full, and 3 mcy removed). Over time the sediment load out of the reservoir (outflow) and scour load have increased while net deposition from the watershed to the reservoir has decreased. The 2011 and “full” bathymetry runs have essentially the same outflow, scour load and net deposition suggesting that the reservoir in its current state is at equilibrium. If the reservoir is dredged, it does have some influence on scour load and sedimentation. Steve noted 31 mcy of sediment (25 million tons) has deposited in Conowingo from 1996 to 2011.

Steve noted that as scour increases, net deposition decreases as bathymetry fills. Storms have a huge influence on the system. For example, Tropical Storm Lee provided 65 percent of the sediment load that year to the bay and 80 percent of that came from the watershed. He noted that the upper two reservoirs will scour and sediments will make their way down the system. He explained that the inflow load is total load that comes in from the watershed and upper two reservoirs. He also confirmed that 3 million tons is a good number to use as long-term average annual for inflow.

His findings were that: (1) scour load in Conowingo increased from 1.8 to 3 million tons from 1996 to 2011; (2) deposition in Conowingo decreased from 6 to 4 million tons from 1996 – 2011; (3) the 2011 bathymetry run compared to “full condition” indicates very little change in sediment transport i.e. the dam in its current state is acting full or at “dynamic equilibrium”; (4) dredging 3 million cubic yards resulted in a bed scour reduction (scoured sediment transported during a storm event) of 10 percent (3 percent per million cubic yards removed); and (5) dredging 3 million cubic yards resulted in a 1.3 percent reduction of outflow load (outflow load is inflowing load from watershed plus bed scour load) to the bay (0.44 percent per million cubic yards removed).

Based on comparisons between the 1996 and 2011 simulations for every million cubic yards dredged, the scour potential is reduced by 3 percent and the deposition potential increases by 6 percent; the net benefit of dredging to the Bay is reduction of scour plus increase in reservoir sedimentation. Dredging the reservoir back to 1996 bathymetry (this equates to a removal of 31 million cubic yards) has a net benefit of 2 million tons or load reduction to the Bay of 9 percent.

There was discussion on the sand deposition and coarsening downstream trend and how that would likely be expected even with a dredging program.

Chris suggested that Steve alter the coloring in his graphs because typically red signifies concern. He recommended that for bathymetry/hydrograph, darker blues should represent deep water and lighter blues represent shallow water, with shade/color of blue changing along gradient correlating to bathymetry. If the issue of concern is scour or currents, then to connote strong current or scour in color should probably follow convention: red means lots of concern, yellow less concern, and green no concern. This green/yellow/red convention can also apply to any other issues of concern that you might depict (excess sedimentation, contaminants, etc.). Strength of currents/scour could also be well-depicted using arrows of different sizes/boldness, etc. Steve will alter graphs to depict areas of concern with red.

10. Water Quality Results – Carl Cerco provided a presentation on his most recent modeling runs (CBEMP) which is included as Enclosure 7 to this memorandum. It is important to note that what was presented should be considered draft and is subject to change.



Carl noted that two dredging scenarios, removing 3 mcy, one time and removing 31 mcy were run to evaluate water quality effects. What remains to be run is a bypassing sediment management scenario of 3 mcy of sediment to predict water quality effects; this run is due to be completed in mid-September.

Carl explained that the CBEMP is run for 1991-2000 hydrologic period with WIPs in place. The model runs include loads from a major scour event (January 1996) which is added to the CBP WSM loads from the watershed. Scour is computed by ADH which utilizes 2008-2011 hydrology including TS Lee, and these loads are provided to Carl for input into the CBEMP model. Nutrient composition of solids (i.e., nutrients associated with sediments) is based on collected data during TS Lee.

Carl first presented a conceptual map of the system that he had developed. He explained that the system is event-oriented. The sedimentation rate of the reservoir system is independent of bathymetry of the reservoir (i.e, how full it is); however scour, (i.e., how much sediment is moved during a storm event) is strongly dependent on bathymetry. With the WIPs in place sediment loads to the system are decreasing as well as deposition of sediment in the reservoirs. Scour events pour sediments and nutrients downstream but also increase depths (thus affecting bathymetry) in the reservoir diminishing subsequent events by making more room for sediments to deposit.

Carl then went over modeling results. He noted that water quality focuses on bioavailable phosphorus. Monitoring station CB3 is important because if the TMDL is met here the Bay will just meet the TMDL threshold.

In general, dredging 3 mcy will improve summer-average bottom DO (dissolved oxygen) in the deep trench of the Bay, Potomac River, and Baltimore Harbor by 0.02 to 0.04 mg/l based on a 1996 scour event. Dredging 31 mcy will improve summer average bottom DO in the deep trench of the bay, Potomac River, and Baltimore Harbor by 0.04 to 0.06 mg/l based on a 1996 scour event. Dredging 3 mcy will reduce SAV growing-season chlorophyll a by 0.02 to 0.05 ugm/l in a large expanse of the bay, extending from Baltimore Harbor past the mouth of the Potomac River, based on a 1996 scour event. The magnitude of chlorophyll a reduction from dredging 31 mcy is comparable to dredging 3 mcy, based on a 1996 scour event. The improvement is more extensive and prolonged, however.

Carl noted that reductions in light extinction, averaged over the SAV growing season, obtained by dredging are limited on the order of 0.01 / m. The primary reason for the minimal impact is the occurrence of the storm in January. By the time the SAV growing season begins, the solids load from the storm has largely settled out. The improvements that do result are primarily downstream of the SAV habitat in Susquehanna Flats. This effect has multiple potential causes. The predominant reason is that the high flows associated with the January storm carry eroded material downstream, past the Flats, and into the turbidity maximum where material is trapped. Reductions in erosion caused by dredging therefore reduce the amount of particles and associated nutrients carried into the turbidity maximum."

There was discussion on why the 1996 storm event was used? There have been several larger flood events on record which would represent a worst case scenario. Carl noted that 1996 was utilized because it is in the hydrologic period that matches the TMDL model runs; also we have made runs and know that a June storm event is the worst case scenario (worst time of year) for an event. Michael Helfrich had concerns of showing this small amount of benefits to the public in light of the fact that the suspended sediment being utilized as input parameters for the model were low compared to data he had seen before (he had provided the source from PA). Carl noted he would look into the loads and data that Michael had provided previously to determine if the loads need to be revised for his modeling runs.

There was discussion on how the modeling runs will tie into the sediment management strategy development and concept costs. Anna and Claire noted that the sediment management strategy development was an exercise to develop unit costs and determine how some of these strategies could be implemented and they became “representative” sediment management alternatives. Many other alternatives or variations of these alternatives could be explored. The modeling runs at this time do not match each of the developed “representative” strategies/alternatives. The modeling predictions inform the managers of the relative changes to the system of implementing some general variation of these strategies to help refine and understand how implementation of these different management actions will affect the Bay. This strategy development process will need to be further refined as more information from the modeling comes in and is understood.

11. What Does This All Mean? Stoplight Plots - Lewis Linker provided a presentation on his most recent modeling runs which is included as Enclosure 8 to this memorandum. It is important to note that what was presented should be considered draft and is subject to change.

Lewis noted that the “stoplight plot” analysis presented utilizes Steve Scott’s ADH modeling predictions on loads from lower Susquehanna River reservoir system and Carl’s recent CBEMP modeling scenarios predictions to assess what the water quality outputs do to meeting TMDL attainment throughout Chesapeake Bay in response to loading from the January 1996 scouring event. The past presentation in April did not utilize loads from the ADH modeling work and represented an increase in TP and TSS loads estimated in Hirsch (2012) for current infill conditions (50 percent TP and 100 percent TSS increase in load from Conowingo Pool).

TMDL allocations (and ultimately achievement of TMDL) for nutrients and sediments for the Bay were developed utilizing an airshed model and the Chesapeake Bay watershed model (WSM) to determine existing nutrient and sediment loads to the Bay as well as loads under different management actions. Outputs from the WSM model were than input into the Water Quality and Sediment Transport Model (WQSTM) of the Bay to determine the influence on Chesapeake Bay water quality from these loads. A criteria assessment procedure was used to evaluate the WQSTM predicted water quality effects to each segment of the Bay to determine if the predicted water quality effects (over space and time) met water quality standards for each segment, and if not how far off that segment was from meeting water quality standards.

Lewis noted that healthy living resource habitats are the base metric in determining what water quality (and associated TMDL allocations) should be. Water quality standards in deep water, deep

channel, open water, and shallow water dissolved oxygen (DO) are key for protection of living resources in the Bay. Chlorophyll and SAV/clarity standards are also designed to protect living resources.

Lewis noted that in this most recent analysis the following scenarios were run:

- (1) TMDL (WIPS implemented);
- (2) TMDL with scour from Tropical Storm Lee, with nutrient levels scoured from January 1996 event;
- (3) TMDL with scour from January 1996 event with nutrients scoured from January 1996;
- (4) No January 1996 scour event;
- (5) TMDL with Tropical Storm Lee levels of scoured nutrients with January event moved to June;
- (6) TMDL with Tropical Storm Lee level of scoured nutrients with January Storm occurring in October;
- (7) TMDL with January 1996 event level of scoured nutrients moved to June;
- (8) TMDL with January 1996 event level of scoured nutrients moved to October.

Lewis evaluated the predictions of these modeling scenarios to see if water quality changes would prevent certain segments of the Bay from being in attainment per TMDL requirements.

When the WSM alone (his analysis in April 2013) is used to represent scour from the completely full state of Conowingo, loads are set at 250 percent (TSS) 100 percent (TP), and 0 percent (TN) above loads that we currently see now. That is, once Conowingo is “full” this is the amount of additional loads we could expect. What we have learned from recent ADH and CBEMP modeling runs is that a more complete estimate of the influence of Conowingo on Chesapeake water quality would fully include the episodic scour that occurs at flows greater than ~400,000 cfs.

Under the April 2013 stoplight analysis several Deep Water and Deep Channel DO segments were “red” i.e. not in attainment. The ADH/CBEMP modeling simulation is an improved representation of the dynamic nature of Conowingo scour/infill system with the simulation of the high flow event of the 1996 scouring event. With this scenario no effects from Conowingo are seen before a 400,000 cfs storm. Then the greatest influence on Chesapeake water quality is estimated during the contiguous 3-year period (1996-1998) immediately after the 1996 scour event and a subdued to no-effect influence is estimated in the subsequent 3 - year period of 1998 - 2000. Estimates with the simulation of the 1996 scour event are less detrimental in time and space than previous April 2013 estimates which represented more frequent loads of sediment and nutrients due to moderate flow events. At the (CB4MH) Deep Channel location the estimated effect of the 400,000 cfs event (January 1996 storm event) was a decrease in DO attainment of about 1% or less for the 3 years following the storm (using the 1996-1998 hydrology).

The No-Storm scenario provides an estimate of the influence high flow scour events like the 1996 storm event have on Chesapeake water quality and generally increase nonattainment of Deep Channel DO standards by about 0.5 to 1.5 percent. The January 1996 event transposed to June is the most detrimental to DO followed in decreasing influence by the January event, the October event, and the No-Storm event scenarios.

In the Deep Water area (CB4MH), no effects from Conowingo are estimated before a 400,000 cfs storm event, with greatest influence on water quality estimated during the contiguous 3-year period containing the storm, and a subdued to no-effect influence in the subsequent 3-year period after the

storm. As in the Deep Channel, estimates with the current scenario method are less detrimental in time and space than previous April 2013 estimates. The estimated effect of the 400,000 cfs event (January 1996 storm event) was a decrease in DO attainment of 0.5% or less for the 3 years following the storm followed by a decrease in DO attainment of about 0.4% in the subsequent 3 year period.

For the Open Water DO water quality standard there is no change in response from Conowingo influence and full attainment of TMDL for all Conowingo scenarios is primarily due to reaeration of the surface waters represented by the Open Water DO standard.

In conclusion, the previous (April 2013) scenarios which assumed that once Conowingo is completely “full” we will see a 70 percent increase in P and a 250 percent increase in TSS and under current infill conditions have an estimated 50 percent increase in TP and a 100 percent increase in TSS (Hirsch, 2012) fail to fully represent the dynamic nature of large storm scour on Chesapeake water quality. The scour of Conowingo reservoir by a high flow event such as the January 1996 scour event under current infill conditions is estimated to have an ephemeral detrimental influence of at most about 1 percent nonattainment for a few years.

12. Future Modeling Scenarios – Anna Compton noted that currently there are no further modeling scenarios planned for Steve Scott (ADH); Carl Cerco (CBEMP) will be running two by-passing scenarios and Lew Linker (stoplight analysis) will be running by-passing and dredging scenarios. The goal is to complete all modeling runs by mid-September.

Anna Compton will be working with the modelers to develop a summary table compiling all sediment management modeling scenarios and results.

13. Wrap Up – Claire O’Neill reviewed the schedule for this effort which is included as Enclosure 9 to this memorandum. Claire noted that overall the study has kept on schedule up to this point. Activities occurring now include modeling sediment management scenarios which is scheduled to be completed in September unless new scenarios are developed. Concurrently sediment management strategies development is scheduled to be completed in September as well. All technical work and technical write-ups are scheduled to be completed by Mid-October and recommendations are to be developed by November. A draft report is scheduled to be compiled by the end of the calendar year with review commencing in January. The report will go through many iterations of review before it can be released publicly. The target date for a draft final report submitted for public review is August 2014. There was a question about peer review of the document. Claire noted that the document is required to go through USACE agency technical review (ATR) which will be various reviewers from outside of USACE Baltimore District. There is another level of peer review USACE has which is called Independent External Peer review (IEPR) which is non-USACE, technical review. This level of review is not required for LSRWA, it is normally required for high dollar decision/implementation documents. However, if a governor requests that a document goes through IEPR than that could prompt this type of review for LSRWA. .

Anna will draft up notes for the group's review. Following this, the notes and presentations will be posted to the project website. Claire will set up a doodle poll to determine the date for next quarterly meeting which will be sometime in November.

Anna Compton,  
Study Manager/Biologist

- Enclosures:
1. Meeting Agenda
  2. Summary of Representative Sediment Management Alternatives.
  3. Reservoir Transport – Mike Langland Presentation
  4. Sediment Management ADH modeling – Steve Scott Presentation
  5. Sediment By-passing ADH modeling- Steve Scott Presentation
  6. Modeling Summary- ADH modeling Steve Scott Presentation
  7. CBEMP modeling results- Carl Cerco Presentation
  8. Stoplight analysis-Lewis Linker Presentation
  9. LSRWA Schedule

**LOWER SUSQUEHANNA RIVER WATERSHED ASSESSMENT  
QUARTERLY TEAM MEETING**

**MDE Aqua Conference Room, Baltimore, Maryland  
August 15, 2013**

**Meeting Agenda**

	<b><u>Lead</u></b>
10:00	Welcome and Introductions ..... All
10:05	Review of Action Items from Prior Meetings ..... O’Neill Funding Update Communication and Coordination Updates for Situational Awareness
10:20	Conowingo Re-licensing Update ..... Michael
<u>LSRWA Technical Analyses</u>	
10:30	Update on Reservoir Sediment Management Strategies – Costs ..... O’Neill/Laczo
10:45	Watershed Sediment Management Strategies ..... Michael
10:55	Reservoir Transport ..... Langland
11:10	Sediment Management Modeling – one-time 3Mcy removal, 26Mcy removal (1996 bathymetry), intermediate removal volume, bypassing
11:10	Sediment Transport Results ..... Scott Sediment Management Bypassing Model Summary
11:40	Water Quality Results ..... Cerco
12:10	What Does All This Mean? Stoplight Plots ..... Linker/Cerco
12:40	Future Modeling Scenarios ..... Compton
12:45	Meeting Wrap-Up ..... O’Neill Schedule Ahead Action Items/Summary Review of Team Calendar Next Meeting

**Call-In Information:** (877) 336-1839, access code = 6452843#, security code = 1234#

### Expected Attendees:

MDE: Herb Sachs; Tim Fox, Matt Rowe  
MDNR: Bruce Michael, Bob Sadzinski, Shawn Seaman  
MGS: Rich Ortt  
SRBC: John Balay, Andrew Gavin, Dave Ladd  
USACE: Anna Compton, Bob Blama, Chris Spaur, Claire O'Neill, Tom Laczko, Dan Bierly  
ERDC: Carl Cerco, Steve Scott  
TNC: Mark Bryer, Kathy Boomer  
USEPA: Gary Shenk, Lewis Linker  
USGS: Mike Langland, Joel Blomquist  
NOAA: Chris Boelke  
Exelon: Mary Helen Marsh, Kimberly Long, Gary LeMay  
Lower Susquehanna Riverkeeper: Michael Helfrich  
PA Agencies: Patricia Buckley, Raymond Zomok

### Action Items from Previous Meetings:

- a. Michael Helfrich will forward info to Danielle Aloisio on Funkhauser Quarry. *Status: Completed.* **No point of contact is available due to abandoned condition, but see response to "d" below.**
- b. Claire will coordinate the next quarterly meeting for August 2013. *Status: Complete. Meeting was scheduled for 15 August 2013.*
- c. Anna will distribute NMFS agency letter discussing concerns over sediment bypassing management strategy to group and have it posted on website. *Status: Complete.*
- d. Bob Blama will call the Funkhauser Quarry to get more information on utilizing this as a placement option. *Status: Completed.* **While no POC was provided, USACE did some preliminary calculations; volume is very limited (only 3 million cubic yards) and access to the quarry is a big concern. Spreadsheet for potential alternatives is being updated.**
- e. Michael Helfrich will touch base with Jeff Cornwell (UMCES) to get his opinion on phosphorus bioavailability in sediments as it relates to the LSRWA study. *Status: Complete.* **Chris Spaur to update the group at the meeting.**
- f. The group will review the baseline and future conditions summary spreadsheet (Enclosure 3) and provide comments back to Anna Compton and Carl Cerco. *Status: Complete.* **Anna Compton to update the group at the meeting.**
- g. Lewis Linker and Carl Cerco will work with CBP partners to integrate the CBP's assessment procedure ("Stoplight plots") into the LSRWA key modeling scenarios to provide a means to communicate/explain impacts to Chesapeake Bay from the various full reservoir and storm scouring scenarios. *Status: Ongoing.* **Discussion item for August meeting.**
- h. The LSRWA agency group will develop a screening process for reservoir sediment management options that are worth developing further. *Status: Ongoing.* **Once we get the modeling outputs, screening process can be further refined and lead to recommendations.**
- i. The LSRWA agency group will direct any questions on sediment bypass tunneling to Kathy Boomer. *Status: Complete.*
- j. Kathy Boomer will write up a section on sediment bypass tunneling for the LSRWA report. *Status: Complete.*
- k. Exelon will review and provide comments on SRBC's write-up of altering reservoir operations as a sediment management strategy (Enclosure 9). Exelon will comment on the write-up to make sure dam operations are adequately covered. *Status: Ongoing.* **SRBC to update at the meeting.**

Ongoing Action Items from Previous Meetings:

- A. The MDE FTP website will be utilized to share internal draft documents within the team; Matt will be the point of contact for this FTP site. *Status: Ongoing. Sharing of future documents will go through the MDE ftp website.*
- B. Shawn will notify team when most recent Exelon study reports are released. *Status: Ongoing. Tom Sullivan, a contractor of Exelon noted that the Exelon has filed the license for Conowingo Dam with FERC.*
- C. Anna will update PowerPoint slides after each quarterly meeting to be utilized by anyone on the team providing updates to other Chesapeake Bay groups. *Status: Ongoing.*
- D. Anna will send out an update via the large email distribution list that started with the original Sediment Task Force (includes academia, general public, federal, non-government organization (NGO), and state and counties representatives) notifying the group of updates from the quarterly meeting. *Status: Ongoing.*
- E. Matt will keep team informed on innovative re-use committee findings to potentially incorporate ideas/innovative techniques into LSRWA strategies. *Status: Ongoing.*
- F. Anna will send out the spreadsheet tracking all stakeholder coordination to the group. Anyone making a presentation on LSRWA should let her know so the spreadsheet can be kept up to date; if any specific comments/concerns are raised, this should be noted as well. *Status: Ongoing*
- G. Bruce Michael will work with CBP on potential “no-till” acres available in the watershed and evaluate impacts to sediment loads if all no-till acres were implemented in the watershed via modeling as well as develop costs. *Status: Ongoing. Bruce Michael to update the group at the meeting.*
- H. Carl Cerco, Steve Scott and Lewis Linker will work together to determine where nutrients are scoured from in the reservoir (at what depths) and will conduct a sensitivity analysis looking at bioavailability of nutrients in various forms (species) by Berner activity class or other means). *Status: Ongoing.*
- I. Modeling efforts cannot predict impacts to SAV from physical burial by sediments. These impacts should be considered and described by other means, perhaps qualitatively, by the LSRWA agency group. *Status: Ongoing. Bruce Michael has provided the UMCES (Mike Kemp) SAV historical mapping and trends over last 10 years in Susquehanna Flats. This information will need to be incorporated into to the assessment to provide a qualitative discussion of impacts.*
- J. The LSRWA agency group needs to determine next steps for developing reservoir sediment management options. *Status: Completed. Representative alternatives identified for costs; some alternatives identified for transport/WQ modeling; results to be discussed at the August meeting.*
- K. The LSRWA agency group should quantify any habitat restored or enhanced downstream in the Bay or elsewhere (e.g., terrestrial) as a project benefit; considerations should be given on how to do this. *Status: Ongoing. But opportunities for quantification are very limited.*
- L. Bruce Michael and Claire O’Neill will keep the LSRWA agency group updated on the Susquehanna policy group put together by Governor O’Malley. *Status: Ongoing.*



## MEMORANDUM FOR THE RECORD

**SUBJECT:** Lower Susquehanna River Watershed Assessment  
Quarterly Meeting, January 16, 2014

1. On January 16, 2014 agency team members met to discuss ongoing and completed activities for the Lower Susquehanna River Watershed Assessment (LSRWA). The meeting was hosted by the Maryland Department of the Environment (MDE) in their Terra Conference Room at the Montgomery Park Building in Baltimore, Maryland. The meeting started at 10:00 am and continued through 1:00 pm. The meeting attendees are listed in the table below.

2.

Lower Susquehanna River Watershed Assessment Team Meeting Sign-In Sheet			
January 16, 2014			
Agency	Name	Email Address	Phone
City of Baltimore, DPW	Prakash Mistry	<a href="mailto:Prakash.Mistry@baltimorecity.gov">Prakash.Mistry@baltimorecity.gov</a>	410-396-0732
City of Baltimore, DPW	Clark Howells	<a href="mailto:clark.howells@baltimorecity.gov">clark.howells@baltimorecity.gov</a>	410-795-6151
Chesapeake Conservancy	Jeff Allenby	<a href="mailto:jallenby@chesapeakeconservancy.org">jallenby@chesapeakeconservancy.org</a>	443-321-3160
EPA, Chesapeake Bay Program	Lew Linker	<a href="mailto:llinker@chesapeakebay.net">llinker@chesapeakebay.net</a>	410-267-5741
Exelon	Kimberly Long	<a href="mailto:kimberly.long@exeloncorp.com">kimberly.long@exeloncorp.com</a>	610-756-5572
Gomez and Sullivan	Kirk Smith		
Exelon - Gomez and Sullivan	Gary Lemay	<a href="mailto:glemay@gomezandsullivan.com">glemay@gomezandsullivan.com</a>	603-428-4960
Exelon - URS Corp.	Marjorie Zeff	<a href="mailto:marjorie.zeff@urs.com">marjorie.zeff@urs.com</a>	215-367-2549
Exelon-Gomez and Sullivan	Tom Sullivan	<a href="mailto:tsullivan@gomezandsullivan.com">tsullivan@gomezandsullivan.com</a>	603-428-4960
Lower Susquehanna Riverkeeper	Michael Helfrich	<a href="mailto:LowSusRiver@hotmail.com">LowSusRiver@hotmail.com</a>	717-779-7915
MES	Jeff Halka	<a href="mailto:jhalka@menv.com">jhalka@menv.com</a>	240-459-5015
MDNR	Shawn Seaman	<a href="mailto:sscaman@dnr.state.md.us">sscaman@dnr.state.md.us</a>	410-260-8662
MDE	Herb Sachs	<a href="mailto:sachsh@verizon.net">sachsh@verizon.net</a>	410-537-4499
MDE	John Smith	<a href="mailto:jsmith@mde.state.md.us">jsmith@mde.state.md.us</a>	410-537-4109
MDE	Matt Rowe	<a href="mailto:mrowe@mde.state.md.us">mrowe@mde.state.md.us</a>	410-537-3578
MDE	Tim Fox	<a href="mailto:tfox@mde.state.md.us">tfox@mde.state.md.us</a>	410-537-3958
MDNR	Bob Sadzinski	<a href="mailto:bsadzinski@dnr.state.md.us">bsadzinski@dnr.state.md.us</a>	
MDNR	Bruce Michael	<a href="mailto:bmichael@dnr.state.md.us">bmichael@dnr.state.md.us</a>	410-260-8627
MDNR	Shawn Seaman	<a href="mailto:sscaman@dnr.state.md.us">sscaman@dnr.state.md.us</a>	410-260-8662
MDAGO	Brent Bolea	<a href="mailto:bbolea@energy.state.md.us">bbolea@energy.state.md.us</a>	410-260-7578
PA DCNR	Ray Zomok	<a href="mailto:rzomok@pa.gov">rzomok@pa.gov</a>	
SRBC	John Balay	<a href="mailto:ibalay@srbc.net">ibalay@srbc.net</a>	717-238-0423 x217
TNC	Kathy Boomer	<a href="mailto:kboomer@tnc.org">kboomer@tnc.org</a>	607-280-3720
TNC	Mark Bryer	<a href="mailto:mbryer@tnc.org">mbryer@tnc.org</a>	301-897-8570
USFWS	George Ruddy	<a href="mailto:george_ruddy@fws.gov">george_ruddy@fws.gov</a>	410-573-4528
USACE	Anna Compton	<a href="mailto:anna.m.compton@usace.army.mil">anna.m.compton@usace.army.mil</a>	410-962-4633
USACE	Ashley Williams	<a href="mailto:ashley.a.williams@usace.army.mil">ashley.a.williams@usace.army.mil</a>	410-962-2809
USACE	Dan Bierly	<a href="mailto:daniel.m.bierly@usace.army.mil">daniel.m.bierly@usace.army.mil</a>	410-962-6139
USACE	Bob Blama	<a href="mailto:robert.n.blama@usace.army.mil">robert.n.blama@usace.army.mil</a>	410-962-6068
USACE	Chris Spaur	<a href="mailto:christopher.c.spaur@usace.army.mil">christopher.c.spaur@usace.army.mil</a>	410-962-6134
USACE	Claire O'Neill	<a href="mailto:claire.d.o'neill@usace.army.mil">claire.d.o'neill@usace.army.mil</a>	410-962-0876
USACE	Kim Gross	<a href="mailto:Kimberly_u.gross@usace.army.mil">Kimberly_u.gross@usace.army.mil</a>	
USACE	Tom Lazco	<a href="mailto:thomas.d.lazco@usace.army.mil">thomas.d.lazco@usace.army.mil</a>	410-962-6773
USACE-ERDC	Carl Cerco	<a href="mailto:carl.f.cerco@erdc.usace.army.mil">carl.f.cerco@erdc.usace.army.mil</a>	601-634-4207
USACE-ERDC	Steve Scott	<a href="mailto:steve.h.scott@usace.army.mil">steve.h.scott@usace.army.mil</a>	601-634-2371
USGS	Mike Langland	<a href="mailto:langland@usgs.gov">langland@usgs.gov</a>	717-730-6953
USGS	Joel Blomqu	<a href="mailto:jdblomqu@usgs.gov">jdblomqu@usgs.gov</a>	
Versar	Steve Schreiner		

The meeting agenda is provided as enclosure 1 to this memorandum.

Action Items from August 15, 2013 Quarterly Meeting –

- a. Chris Spaur will provide information summarizing the 2010/2011 LSRWA nutrient scoping to anyone that is interested, as well as copies of Jordan and others (2008) and a link to MGS report. This info also could be placed on the LSRWA website. Chris will also prepare a write-up on phosphorus biogeochemistry in the Bay for the LSRWA report. *Status: Completed.*
  - b. Claire O'Neill will provide to the group all of the factsheets/ back-up documentation to show how costs were developed for each representative sediment management alternative. *Status: Completed.*
  - c. Matt Rowe will look into Stancills quarry and their existing permits to see if they have any constraints or concerns with groundwater contamination. This may need to be marked as a limitation for this potential placement site. *Completed.*
  - d. Bruce Michael will be providing a write-up that lays out this watershed sediment management scenario in more detail in September. *Completed.*
  - e. Mike Langland will provide data to the group related to grain size and nutrients based on his analysis of the sediment core data. *Completed.*
  - f. Steve Scott will alter his graphs to depict areas of concern in red. *Completed.*
  - g. Carl Cerco will look into the suspended sediment and nutrient loads that Michael Helfrich has provided to determine if the loads need to be revised for his CBEMP modeling runs. *Completed.*
  - h. Anna Compton will work with the modelers to develop a summary table compiling all sediment management modeling scenarios and results. *Status: Mostly complete only updates required are Linker/ stoplight numbers.*
  - i. Anna Compton will draft up notes for the group's review and then post to the project website. *Status Complete.*
  - j. Claire O'Neill will set up a doodle poll to determine the date for next quarterly meeting which will be sometime in November. *Status: Completed. Quarterly meeting scheduled for 16 January 2014.*
3. Introductions - After a brief introduction of the meeting attendees, Claire O'Neill welcomed the LSRWA agency group and noted that the purpose of the meeting was to provide updates on recent activities within the LSRWA. She noted that this is the last planned Quarterly meeting since the study is wrapping up.
  4. Funding Update – Claire O'Neill noted that this study is not in the FY14 federal budget that was just passed. However there is potential for some federal funding to be reprogrammed to the study but that won't be known for one to two more months. There is available federal funding to get through March. If the study does not receive any federal funds there is also non-federal funding available. There should not be any funding problems to complete the assessment unless there are major scope changes.
  5. Update on Conowingo Relicensing – Bruce Michael informed the group that FERC has granted one more extension for filing comments to Exelon's application for a license of Conowingo dam. Comments are now due on January 31, 2014. Bruce noted sediment still remains as the state's

number one concern. Exelon has until January 31, 2014 to submit a 401 water quality certification (WQC) request to MDE. MDE has up to one year to issue/evaluate the 401 WQC request which will include a public notice. FERC is expected to complete an EIS and this process is anticipated to take 10-12 months. The EIS process includes public review. Agencies have requested that FERC include Muddy Run pump facility and York Haven in the EIS to evaluate impacts of these three facilities as a system instead of on an individual basis. The anticipated timeline is that a FERC license for Conowingo will be issued in early 2015.

6. Stoplight Plot/TMDL Analysis – Lewis Linker provided a presentation on his dissolved oxygen (DO) Water Quality Standard Attainment Analysis of the estimated influence of Conowingo infill on Chesapeake DO using linked watershed model, ADH and water quality and sediment transport model simulations. His presentation is included as Enclosure 2 to this memorandum.

Lew noted that this was a time and space assessment to determine what impacts Conowingo has on attainment of TMDL's. He noted that episodic (storm scouring) exceedances are allowed and accounted for in achievement of TMDL's. Attainment is evaluated on a Bay segment by segment curve basis (curve includes variances and decision rules to determine whether a segment is in attainment or not and there are allowable exceedances in space and/or time for nonattainment). In general, decision makers aren't interested in particular time and space attainment they want to know if a segment is in attainment or not. Some segments have different habitat types such as deep water, deep channel, open water, and shallow water. Each of these habitat types have different water quality needs and are key for protection of living resources.

Lew noted that nonattainment of 1% is above allowable criteria and the overall analysis procedure includes 1% uncertainty. Lew discussed the results of the 9 scenarios he and his team ran including sediment management scenarios and scenarios showing no action.

There was a lot of discussion on Lew's work and that some of the concepts and language were difficult to grasp. There was a comment that Lew should present his numbers with at least one significant figure to show variance in results. Also there was a lot of discussion on the hydrologic periods that Lew used to evaluate findings and that he should be sure to explain in his report differences in time periods he used and why. Additionally, it was recommended that the existing condition scenario (LSRWA-4) should show results of all segments that have nonattainment. One last recommendation was to be sure include attainment numbers in report of a scouring event in summer and fall. Right now we know a storm event has more detrimental effects in summer than fall than winter but Lew only provides attainment numbers for a winter event which is the best case scenario and provides the least impact to meeting water quality criteria.

Lew's work concludes that if the WIPs are in effect and there is a storm event in the winter with all dams at a dynamic equilibrium ("full") there are three upper bay segments that will still be in non-attainment.

There was a question about how long nonattainment would last. Lew noted that this depends on things like future rain events, etc., but ultimately effects diminish over time so typically it would last 1-2 years.

Lew noted that sediment management strategies like dredging shows some attainment improvement but strategies like bypassing hurt attainment because of nutrient recycling.

Lew noted that outside of LSRWA effort the Chesapeake Bay Program is looking at scouring events of smaller magnitude (down to 150,000 cfs) as predicted by Hirsch (2012) analysis. LSRWA work focused on scouring events larger 400,000 cfs.

7. Report Discussion – Anna Compton provided a presentation on LSRWA recent and upcoming tasks which is included as Enclosure 3 to this memorandum.

Anna noted that the draft report is under development. Since August the team has wrapped up modeling scenarios and all four modeling reports have been drafted and reviewed by the LSRWA team. The team plans to release a consolidated draft report for the quarterly agency group to review, targeting the end of February. Anna emphasized that this draft report is preliminary and subject to change. The report needs to go through required technical, policy and legal review before official public release but the LSRWA team wanted to get a version out to the quarterly agency group for early feedback on preliminary findings. This draft version of the report will not be put on the LSRWA public website but instead will be put on an FTP site. Access instructions will be out via email to the quarterly group once the draft report is ready for distribution to the group. There will be a main report summarizing all the technical work with multiple appendices providing more details on technical work.

Anna discussed some of the big picture preliminary findings that have come out of the LSRWA efforts thus far. Regarding the current and future state of the reservoirs modeling results have shown that all reservoirs including Conowingo have limited trapping capacity that is greatly reduced from historical trapping and are at a “dynamic equilibrium” state in which the net change in sedimentation (deposition during low flows and scour during floods) will remain relatively constant in the future.

Regarding effects to Chesapeake Bay from the current state of the reservoirs it appears that WIP implementation has a larger influence on the Bay meeting water quality standards in comparison to the influence of the trapping capacity and dynamics of the reservoirs and during storm events the majority of sediments entering the Bay originate from the watershed. However the trapping capacity and dynamics of the reservoirs do influence water quality and it is estimated that with full implementation of WIPs, three regions of the Bay (segments) will NOT be in water quality attainment (i.e., meet standards) for dissolved oxygen due to increased nutrients when the most current state of the reservoir system is taken into account and there is a scour event. Finally the solids from a scour event appear to settle quickly but DO impacts from scour could persist for multiple seasons with diminishing magnitude due to nutrient storage in the scoured bed sediments remaining and recycling between bed sediments and the water column. Nutrients appear to be the most detrimental factor from scour to water quality and need to be further monitored and analyzed.

In regards to solutions (i.e. nutrient and sediment management strategies) bypassing strategies appear to be lower in costs but have high environmental/water quality impacts and additional watershed measures for controllable sediment mitigation beyond the WIPs appear to be higher in cost and ultimately a low influence on reducing amount of sediment available for a storm event.

Increasing or recovering storage volume of reservoirs via dredging or other means appears the most feasible as there are upland sites available with large capacity to place sediments to reduce sediments available for scour during a storm. It appears that when sediment is strategically removed from the reservoirs there is an observed influence on scour load (reduction) and deposition (increase) and an observed reduction in impacts on water quality for a future similar storm event. However any

removal would most likely be required annually to achieve influence on Bay water quality and this influence is minimized due to loads from the watershed during a scour event (i.e., must remove a lot and often to observe an influence).

The estimated cost range for suite of sediment management alternatives evaluated was \$5-89/cubic yard; \$15 - \$267 million annually. This is for removal of 3 million cubic yards (approximate estimate of what is entering system on an annual basis) and includes alternatives like bypassing which as stated earlier are low cost but would most likely not be acceptable due to estimated water quality impacts.

In regards to the modeling tools Anna noted that any mathematical models applied to simulate complex physical processes, will have uncertainties. The team believes that the tools used for this effort represent the best tools currently available for evaluating sediment and nutrient dynamics and management strategies in the lower Susquehanna River watershed and Bay as a system and informing management decisions. The Bay watershed model and the Bay water quality model are the same peer-reviewed models as were used to set the Bay-wide TMDL requirements. Additionally all model documentation will be going through many iterations of review. One final thought about modeling is that major scour events are infrequent and each has unique characteristics. Application of these models to multiple events is desirable and would reduce uncertainty. However, the availability of complete data sets describing additional scour events is limited.

Lastly Anna went over the final section of the report which is intended to layout future needs of the watershed (i.e. recommendations.) This section of the report has not been developed yet. Recommendations could entail additional monitoring, enhanced assessment on nutrient contribution and Bay impacts, or actual implementation recommendations. Developing recommendations and a path forward will be challenging since potential solutions are high cost and long-term, sediments and nutrients originate throughout the watershed and entities that have the resources, abilities, purview to implement will need to be assessed.

8. Wrap Up – Claire O’Neill noted that this is the last LSRWA quarterly agency meeting since study efforts are wrapping up. There will be a public meeting once the draft report is ready for public review and this group would be notified of details of that meeting (once planned). She also noted that she is retired and Kim Gross would be taking over as USACE project manager for the remainder of the effort. Lastly, Anna will draft up notes for the group’s review. Following this, the notes and presentations will be posted to the project website.

Anna Compton,  
Study Manager/Biologist

Enclosures: 1. Meeting Agenda  
2. Stoplight analysis-Lewis Linker Presentation  
9. LSRWA Update-Anna Compton Presentation

Enclosures (handouts and presentations) from the Quarterly Meeting Summaries are available at the following location: <http://bit.ly/LowerSusquehannaRiver>