



FACT SHEET: LIGHTWEIGHT AGGREGATE

Background

In 2010, the US Environmental Protection Agency (EPA) established a total maximum daily load (TMDL) for the Chesapeake Bay. The TMDL identifies the level of pollutants (nitrogen, phosphorus, and sediment) that the Bay can assimilate and still maintain water quality standards. Significant reductions in these pollutants are required to be made by 2025 to restore the health of the Bay.

The Conowingo Dam on the Susquehanna River has been trapping sediments since its completion in 1928. The sediments behind the dam have been identified as a major concern. The reservoir behind the dam is expected to reach its capacity for trapped sediments within the decade. With the sediments so high and deep behind the dam, large storms – such as Hurricane Agnes and Tropical Storm Lee – have scoured the sediment, sending it past the dam and into the Chesapeake Bay. The amount of pollutants sent into the Bay by one storm has the potential to negate millions of dollars worth of pollution reduction activities throughout the Chesapeake Bay watershed.

Use in This Context

State and federal agencies have been studying options for addressing this issue for several years. The option has been raised of dredging the materials behind the dam and reusing the materials to create lightweight aggregate (LWA) for construction materials.

Dredging behind the dam would be a not be a one-time project. After the initial dredging of the material, the material would have to be removed continuously for maintenance. A facility to process the dredge materials into LWA does not exist nearby. It would need to be constructed and the dredge materials transported for processing.

Lightweight Aggregate Description

EPA defines LWA as “a type of coarse aggregate that is used in the production of lightweight concrete products such as concrete block, structural concrete, and pavement. Most LWA is produced from materials such as clay, shale, or slate. Blast furnace slag, natural pumice, vermiculite, and perlite can be used as substitutes, however. To produce LWA, the raw material (excluding pumice) is expanded to about twice the original volume of the raw material. The expanded material has properties similar to

*(Baltimore Sun
Photo by David
Hobby)*



LIGHTWEIGHT AGGREGATE FACT SHEET

natural aggregate but is less dense and therefore yields a lighter concrete product.” [USEPA. 1993. *Emissions Factor Documentation for AP-42, §11.20*]

In this context, LWA is created using a thermal processing technology. Dredged materials, whether from the Baltimore Harbor/Port or behind the Conowingo Dam, are screened and dewatered, and then the extruded pellets are sent through a thermal processing rotary kiln at temperatures over 2,000 degrees Fahrenheit. The heat causes the pellets to “pop,” creating pockets of air. The resulting pellets, or aggregate, is a very lightweight product, yet retains strength. According to Harbor Rock, this product has been proven to meet industry standards for a marketable product at the demonstration scale.

Relevance to Carroll County

The majority of Carroll County drains to the Potomac, Gunpowder, and Patapsco watersheds. However, a small portion of the Conowago watershed (~3,364 acres), which drains to the Susquehanna watershed, is located in northern Carroll County.

The larger relevance to Carroll County is interest in the potential for many jurisdictions to focus efforts and resources on a measure that could have significant impact compared to individual efforts.

If local governments would get credit for their contribution toward Bay restoration efforts, they may be interested in directing local funds toward addressing the material behind the Conowingo Dam.

EAC Process

At the January 20, 2016, joint meeting of the Carroll County Environmental Advisory Council (EAC) and the Board, Commissioners Weaver and Rothschild requested the EAC research LWA as a beneficial re-use of dredge materials from sediment deposition behind the Conowingo Dam.

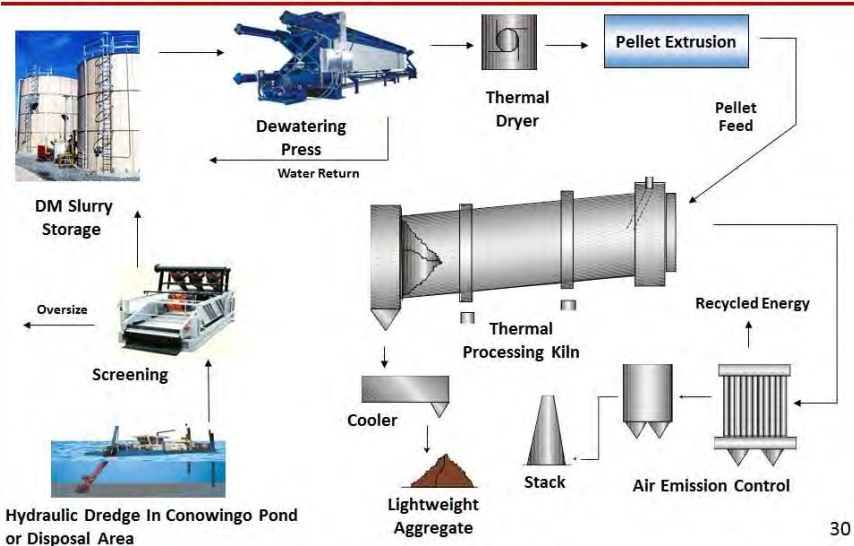
While the EAC is not equipped to advise the Board on the scientific merits of the prospect, the EAC researched the topic from a policy perspective.

At the invitation of the EAC, Jeff Otto, President of Harbor Rock, presented

information on July 20, 2016, regarding the LWA process as it relates to dredging of the sediment behind the Conowingo Dam. Harbor Rock is a company that developed a process for manufacturing LWA from dredged materials.

The EAC also invited the Maryland Port Administration (MPA) to share information regarding MPA’s experience with LWA. To address the need for disposal of annual

HarborRock - Simplified Process Flowsheet



Source: Otto, Jeff. Harbor Rock. July 20, 2016.

dredge materials from the Baltimore Harbor and access to the port, MPA researched a the manufacture of LWA from dredge materials as an alternative.

Potential Benefits

The benefits of a project like this have not yet been proven at this scale. All existing projects were at a smaller scale. Therefore, there is not enough information to determine if the potential benefits would outweigh the potential costs. The overall benefits compared to costs are speculative at this point.

Challenges

The EAC is not equipped to or comfortable with advising the Board of County Commissioners on the *scientific* merits and challenges of the manufacture of LWA as a means to address the sediment behind the Conowingo Dam. However, several challenges at the policy level were apparent through the EAC's research.

No Track Record

“While it appears that it is technically possible to convert dredged material into LWA on a small-scale basis, the absence of a comparable full-scale project makes it difficult to assess whether conversion is feasible on the order of magnitude required by the State of Maryland... A May 2014 literature review by the Maryland Environmental Service (MES) confirmed that this is still the case and that no other thermal treatment technologies involving the creation of LWA using dredged material and rotary kilns have been scaled up to production levels.” [Maryland Department of Transportation and MPA, *Capacity Recovery at Cox Creek*, Page. 6, September 2014]. With no other projects to manufacture LWA at this scale or specific situation, no evidence exists that the

process of making LWA from dredge materials is sustainable.

The lack of experience to draw upon presents a greater level of risk to the state and local governments that would be responsible for paying for it. Given the level of investment throughout the watershed for nutrient and sediment reductions to achieve the Bay TMDL, government agencies may be hard pressed to invest so much in a result that is surrounded by uncertainty.

Uncertain & Potentially Significant Costs

The MPA indicated that the cost in 2014 proved to be significantly more expensive than traditional methods of dredge removal and disposal, although traditional cost estimates do not take into account the long-term costs of placement options. Since most alternative methods have looked at long-term costs, the cost comparison is, therefore, difficult. MPA has not yet been able to put a cost on avoidance of a new “landfill.”

The LWA manufacturer may absorb some of the costs, such as the upfront capital costs for construction of the manufacturing facility. However, Harbor Rock has indicated that the State would still pay fees for the service. Addressing the material behind the Conowingo Dam will not generate any revenue for the State.

Uncertain Market

The lack of similar experience or comparable product as a basis for decision making also provides no guarantee or level of certainty that market demand will exist or be sustainable for the long term. The inability to guarantee quantity further impacts the potential demand market.

According to MPA, one of the big obstacles to marketability is the perception that the



(Photo By Leca67
- Own work,
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<https://commons.wikimedia.org/w/index.php?curid=7468519>)

material is contaminated. Therefore, market demand is speculative. The public has challenged the MPA's permit many times in the past 30 years, with significant opposition to other uses of the dredge material.

Running Out of Time

Implementation of measures to reduce nutrients and sediment loads to the Bay to achieve the Bay TMDLs are required to be in place by 2025. The process of permitting and constructing the needed facilities would likely not be completed by then to employ this option as a TMDL implementation tool.

Need Agency Agreement and Coordination

The U.S. Army Corps of Engineers (USACE) develops the base standards. The EPA and USACE issued beneficial use guidance, but leave the regulation of it up to the State. State law could require placement elsewhere.

Maryland Department of the Environment (MDE) was comfortable with the LWA product in MPA's pilot project process. However, there is no standard for comparison. It was unclear which MDE agency would actually regulate and approve the use, and no decision was made on this issue.

A report completed by the Lower Susquehanna River Watershed Association in March 2016 indicates that the greatest threat to the Bay is not the sediment trapped behind the dam, but the nutrients coming down the Susquehanna from areas above the dam in the watershed. As members of the group that issued the report, the agencies involved may be more hesitant to invest in the LWA option.

Although the Port generates \$2.2 billion per year in revenue for the State, MPA is still having difficulty getting the other agencies to move forward with a solution.

Potential Contamination

The material behind the Conowingo Dam is very old, has not been touched before, and contains pollutants from agriculture and mining. This increases the hurdle of public perception, as well as the barrier of moving forward to getting a decision by State and federal agencies.

No Silver Bullet

After the Joint Chairmen's Report was issued, MPA decided to move forward with a series of smaller solutions and will have to include public education and outreach.

Given the barriers that need to be overcome, the State will not likely be willing to put all of their eggs in one basket.

Recommendation

In July 2016, Governor Hogan announced that a multi-agency work group would be formed. As part of the larger picture to find solutions to reducing pollutants to the Bay, the work group would determine if dredging and re-using the materials from behind the dam could be done effectively and economically and in the most technically feasible manner possible.

This issue has the Governor's attention, and the Board and other advocates have been successful in raising awareness of the need to address pollutants coming from the watershed above the dam and the sediment behind the dam. The Board of County Commissioners should use this momentum to continue to monitor, and participate in the discussion of, when possible, the issue and to advocate for solutions that will address the materials behind the Conowingo Dam.



(Photo source:
<http://earthobservatory.nasa.gov/IOTD/view.php?id=52169>)