

**SUMMARY OF THE DREDGED MATERIAL MANAGEMENT PROGRAM
COMBINED INNOVATIVE REUSE AND CITIZENS' ADVISORY COMMITTEE MEETING
May 23, 2023, at 6:00 PM – Hybrid Meeting
Cox Creek Operations and Maintenance Building – 1000 Kembo Road, Baltimore, 21226**

Attendees:

Angie Ashley Consulting: Angie Ashley
Anchor QEA: Billie-Jo Gauley
Baltimore County Department of Environmental Protection and Sustainability: David Riter
Belden-Eco Products, LLC: Robert Ittmann
Baltimore Port Alliance (BPA): Rupert Denney
Central Sod Farms, Inc: Jack Warpinski
Chesapeake Bay Foundation: Doug Myers, Maya Koehn-Wu
Concrete Consulting Group: Stacy Kinchen, Barri Manning
Cox Creek Citizens Oversight Committee (CC COC) Chair: Gary Gakenheimer
CSI Environmental: Craig Stevens
EA Engineering, Science and Technology, Inc: Erin McNally
EcoLogix: Steve Pattison
Fort Howard Community Association: Scott Pappas
Full Circle Mushroom Compost: Lisa Van Houten
Harbor Rock Holdings: Gregory Otto
Harford Industrial Minerals and Suscon Products: Miguel Lambert
Hart Miller Island Citizens Oversight Committee: Paul Brylske
Living Classrooms Foundation: Lorraine Warnick
Maryland Environmental Service (MES): Dallas Henson, Robert Natarian, Claire Spears
Maryland Port Administration (MPA): Dave Bibo, Danielle Fisher, Rachael Gilde, Katrina Jones, Holly Miller, Joseph Ross, Darren Swift
Maryland Department of Natural Resources: Paul Petzrick
Maryland Pilots: John Kinlein
Masonville Citizens Advisory Committee: Anita Kestel
Mountain Materials: John Tilson
National Aquarium: Laura Bankey
North Point Peninsula Council: Fran Taylor
Patapsco and Back Rivers Tributary Team: Stuart Stainman
Public: Tim Layne, Benson Peretti
Rummel Klepper & Kahl (RK&K): Sari Rothrock, Ed Tinney
Sustainable Energy and Climate Action Plan: Russell Donnelly
Stancills: Chris Siciliano
State Highway Administration: Intikhab Haider
The Bulldog Group: Rick Nash, Eric Baker
The Terrapin Institute: Marguerite Whilden
Tradepoint Atlantic (TPA): Pete Haid
The Nature Conservancy: Austin Bamford
University of Maryland Center for Environmental Science (UMCES): Lisa Hunt, Elizabeth Price
Waterfront Partnership of Baltimore: Adam Lindquist

Action Items:

- Ms. Ashley will send an email to the Citizens' Advisory Committee (CAC) regarding the August field trip. (complete)

1.0 Introductory and Welcoming Remarks

*Sari Rothrock, RK&K
Angie Ashley, AAC
Darren Swift, MPA*

Ms. Rothrock, Ms. Ashley, and Mr. Swift introduced themselves and welcomed attendees to the joint Innovative Reuse Committee (IRC) and Citizens' Advisory Committee (CAC) meeting. Mr. Swift explained that the IRC is a dredged material management program committee that provides advice on the development of strategies for recycling and reusing dredged material from the Baltimore Harbor.

All meeting materials can be found at the following link: [CAC 2023 - Google Drive](#)

3.0 CAC Comments and Updates

Adam Lindquist, Chair

Mr. Lindquist requested a motion to approve the February 2023 CAC meeting summary. Mr. Kinlein motioned to approve, and Mr. Ritter seconded. The February 8, 2023, meeting summary was approved.

4.0 Results from Research and Development Projects – FasTrak Express

*Lisa Van Houten, Full Circle Mushroom Compost
Jack Warpinski, Central Sod of Maryland
John Tilson, Mountain Materials*

Mr. Swift introduced the presenters from Fastrak Express Inc. (Fastrak), Suscon Products (Suscon), and Harford Industrial Minerals (HIM). MPA advertised the request for research and development projects in November 2019. Thus far, MPA has awarded seven contracts including concrete products, permeable brick pavers, blending dredged material and other materials to create vegetated earth berms, and using vegetated geotubes to provide shoreline protection during flooding events. Three of the groups were invited to the combined IRC/CAC meeting to present their respective projects. The Fastrak project includes reengineering topsoil to create a sod product and Suscon and HIM created a lightweight aggregate (LWA) and concrete materials using dredged material.

Ms. Van Houten introduced herself as the project manager for the Fastrak project, as well as the marketing strategist for Full Circle Mushroom Compost, which is a subsidiary of Fastrak. There were many project partners. Mountain Materials completed the soil reengineering; Central Sod Farms Inc. (Central Sod) was responsible for growing, monitoring, and maintaining the grass; and Anchor QEA acted as a content liaison between all of the involved groups, including MPA. The project objective was to use dredged material that meets the MDE Fill Category 1 criteria for residential unrestricted use to grow sod or grass that could be produced into sod. The project was approved in late 2020; the ingredients were tested, analyzed, and approved in June of 2021; and four test blends were created and analyzed. In July 2021 the samples were tested by Central Sod and in early September 2021 the preferred blend was selected. The preferred blend was then seeded in late September of 2021 and has been routinely monitored, mowed, and fertilized as needed since October 2021. The raw ingredients included in the blend are dredged material, sand, and mushroom compost. Mushroom compost is a byproduct from the mushroom production industry and consists of agricultural waste including horse bedding, straw, hay, corn stover, cotton seed hulls,

poultry litter, brewers spent grains, peat moss, and gypsum. It is used to grow food first and therefore is highly regulated. Once used, it is pasteurized and circulated for new uses as it cannot be reused for growing food.

The idea behind the blends was to utilize as much dredged material as possible. All four test blends consisted of varying ratios of dredged material, mushroom compost, and sand. After creation, the four blends were then sent for analytical and nutrient testing. Root growth in each test blend was vital given that sod is harvested and must be rolled and transferred. The most successful blend with a superior root structure was Blend 4 which was composed of 50% dredged material, 25% mushroom compost, and 25% sand. Test Blend 4 was tested as Category 2, but the final Blend 4 was determined to be Category 1 due to the greater volume of the blend. Mr. Haid asked for clarification regarding the difference between test Blend 4 and final Blend 4. Ms. Van Houten emphasized that, due to a higher volume of dredged material, sand, and compost used in the final blend, and ability to better mix the materials, the final blend tested as Category 1.

There were four plots included in the demonstrations, two control plots and two plots with re-engineered soil using dredged material. One plot with re-engineered soil layered three inches of the material on top of the existing native soil while the other plot with re-engineered soil rototilled three inches of the material into six inches of existing native soil. Each plot was a half-acre in size with the controls located along the edges of the field. The plots were drill seeded to improve soil to seed contact and a Kentucky Bluegrass was used. Fertilizer and fungicides were applied to the plots during monthly monitoring in accordance with a specific nutrient management plan. Ms. Kestel asked where this project took place. Ms. Van Houten responded that the project was completed in Centerville, MD.

Sod samples were taken in October 2022, and while the grass had an overall good appearance, the root structures varied, requiring a longer growing period. Soil core testing was completed to determine the depth and density of the root structure. Sod samples with lower density root bases allowed for the displacement of some soil material. Bermuda grass was observed in the samples, which is not ideal in terms of sale, therefore the test sod could only be sold as Grade 2 sod, which can be used in retention ponds. Approximately 600 cy of reengineered soil was produced using the preferred blend, but due to rock composition the final formulation required screening at 3/8 inches so the sod cutter would not be compromised during harvesting. The screening process resulted in 10 cy of waste.

Mr. Denney asked whether the previously mentioned Bermuda grass was introduced to the soil through the dredged material. Ms. Van Houten stated that the Bermuda grass was most likely introduced during the mixing process or blown in while the source material was in the staging area or during transport. Ms. Kestel asked if there are ways to mitigate the invasion of the Bermuda grass. Mr. Tilson stated that it would depend on how the Bermuda grass was mixed in and whether it was a market concern.

It was determined that certain aspects need to be considered for future projects to be successful. The soil needs to be screened, the weather must be taken into consideration for transport, transportation should be less than fifty miles from the DMCF to be cost effective, soluble salts had no impact on sod growth, but the clay content did, however overall sod can be grown from reengineered soil from dredged material. Full scale considerations include screening, transportation, and mixing. If the buyer can screen the material onsite, reduce transportation, and conduct any blending at the end use site, it will be the most cost-effective solution. There are also other possible uses for the reengineered soil such as capping material, roadside restoration, wildlife habitat, or residential and sports fields where both Category 1 and 2 materials are approved.

Mr. Denney asked for clarification on which site blending should take place. Ms. Van Houten clarified that blending should take place at the end use site. Mr. Denney then asked how much excess material was removed after screening took place. Ms. Van Houten stated that there was an excess of 10 cy, which is not a lot of material in reference to the 600 cy which was screened. Mr. Tilson stated that, depending on the way the soil is transported and mixed, screening may not even be necessary. Mr. Haid asked how long it would take to grow the sod, since the grass continued to grow after the initial test. On average, it takes about 12-18 months for the grass to grow, and the dredged material plots seemed to grow about two months slower than the controls, which could be due to the clay under the plots. Mr. Haid asked if the sod had less root integrity, which led to displaced dirt and if the sod was still serviceable. Mr. Tilson responded that the soil displacement could be mitigated by allowing the sod more time to grow. Mr. Stainman asked how some of the test blends not containing sand were able to achieve Category 1, while some other test blends containing sand achieved Category 2. Mr. Tilson stated the sand used was virgin sand and had no contaminants. Ms. Van Houten stated that the difference in these results could be because the samples were small, about 3 cy, and the volume may have influenced the ability to fully blend the material and therefore the categorization. Mr. Myers asked if the nutrient content of the soil mixes were analyzed in advance of implementing the nutrient management plan in order to know how much fertilizer to apply. Mr. Tilson stated fertilized efforts were combined into the larger 50-acre field that was seeded at the same time. In a full-scale project, this would be a legitimate concern due to the mushroom compost nutrient content.

Ms. Whilden asked if the dredged material used was of the same quality as that at Pail S. Sarbanes Ecosystem Restoration Project at Poplar Island (Poplar Island). Mr. Swift stated that the material used in the project was from the Cox Creek DMCF and therefore is harbor dredged material, which has slightly different characteristics than material from the Chesapeake Bay and used at Poplar Island but overall, they are similar. Ms. Whilden asked which material is better or worse. Mr. Swift stated there is no material that is better or worse than the other, both are about the same and from the same general area. Mr. Donnelly asked where the polychlorinated biphenyls (PCBs) and hexavalent chromium came from in the test results. Ms. Van Houten stated that the source is unclear and could possibly come from the mushroom compost given that compost criteria is typically characterized and tested differently than other soil sources and fill criteria were applied in this situation. Mr. Kay asked if there was analysis on whether the dredged material mixed and leached into the neighboring areas to which Ms. Van Houten answered no.

Ms. Kestel asked about the moisture content of the dredged material used in the project. Mr. Tilson stated that the dredged material had a 25% moisture content. Ms. Kestel followed up asking if that would impact the re-engineered material. Mr. Warpinski stated that a material with a lower moisture content would aid with transport and blending. Mr. Swift stated that MPA is investigating effective drying processes, specifically on the new property recently purchased adjacent to the Cox Creek DMCF. Mr. Kinlein asked for the average liquid limit of dredged material. Mr. Swift stated it is approximately 30-35%. Mr. Denney asked about dredged material quality control concerns given it is not homogeneous. Mr. Tilson stated that it is dependent on the regions and constituents, however MPA tests and monitors the dredged material so, while it may vary, it is still quality material. Mr. Denney asked if there was a sense in how much dredged material could be used in a full-scale project. Ms. Van Houten stated that 600 cy were collected from the pilot project which included 50% dredged material, so a larger plot could use a lot of dredged material. However, harvesting could keep a large-scale version of this project from being successful. Mr. Layne asked if there were other types of toxicology tests completed on the dredged material. Ms. Van Houten stated that there was not, but that the required tests were completed based on the guidance document. Mr. Swift added that the dredged material did not exceed Category 2.

5.0 Results from Applied Research and Development Projects - Harford Industrial Materials and Suscon Products

*Miguel Lambert, HIM/Suscon
Stacy Kinchen, Concrete Consultants Group*

Mr. Swift introduced the next presentation from HIM and Suscon presented by Mr. Lambert and Mr. Kinchen.

Mr. Lambert stated that Suscon was founded in 1969 and originally manufactured high intensity heat stacks. The company was restructured and focused on retaining walls, along with cast testing completed at the facility. Suscon's objective in the demonstration project was to determine how to use dredged material in precast to become a sufficient cast and strength to produce a viable product. The goal was to follow MDE guidelines and meet Category 1. HIM was founded in 1965 and supplied material to construction projects in Baltimore County. Mr. Lambert stated that sand is expensive to gather but is an important material. The goal for HIM was to use dredged material to replace the need for sand in LWA. Other LWAs being used are not created in the state of Maryland, and instead must be obtained across state or country lines. Like Suscon Products, the goal for HIM was to achieve Category 1 and meet American Society for Testing Materials (ASTM) standards. Mr. Lambert emphasized that this was a pilot project, so even if the goals are not met it is a good starting point for future work.

Mr. Lambert stated the project team consisted of Repurpose Aggregates, Arc Environmental, Eurofins, Concrete Consultants Group, MPA, Anchor QEA and MDE. This project was labor intensive, including a lot of hand mixing. One of Suscon's goals was to process the dredged material in its original state, no matter how wet or dry. The project took two years, including equipment, labor, and multiple rounds of testing. The dredged material was first characterized and sized in house, by partners, and by third parties to better understand the material. This was important in determining how the material would react, therefore creating a baseline. Thermal testing was completed for weighing purposes and reactivity. Unfortunately, this process showed no change in weight. Mr. Kinchen stated results indicated that most weight loss occurred before 900 degrees Celsius, but the bulk density increased, which means sintering, or melting at high temperatures, has occurred. This data allows the team to be able to set processing temperatures, types of kilns needed, and durations. The material was hand-mixed with water, washed, and sieved to separate the sand/stone, and clay. Up to this point, Suscon and HIM worked collaboratively.

Suscon Products

Mr. Lambert stated that Suscon used the washed and sieved products as a precast. The sand/stone material was dried in a drying oven and sieved again. The focus in the precast included the mid-sized particles. Suscon was successful in creating a blend that met ASTM C33 (concrete sand) to be used in a precast. Mr. Lambert stated that there were many tests to be completed to replace the virgin ASTM C33 sand with the dredged material. Mr. Kinchen stated that this blend would also comply with some of the Maryland Department of Transportation standards. Mr. Lambert shared that the final concrete mix contained cement, #57 coarse aggregate, washed dredged material fine aggregate, water, entrained air, and a reducer. Mr. Tilman asked if the use of pulverized glass over the #57 stone was considered. Mr. Lambert replied that this was not considered as the project focused on dredged material use.

After the mix was created it went through several rounds of testing and molding, including air content tests, unit weight, slump, and cylinder molding. The cylinders went through a lime bath and compression testing. Per ASTM standards, the minimum strength for structural concrete is 3500 pound-force per square

inch (psi). After seven days, the mix passed the minimum at 3710 psi. After 56 days, the mix achieved 5180 psi and as a result, the project was deemed successful. The State Highway Administration (SHA) standards were mostly met, and with a few modifications, all standards can be met. Mr. Lambert stated that 50% of concrete has less than 3500 psi which is used for mostly nonresidential items such as curbs and gutters. This mix far surpasses this standard.

This pilot project shows a positive projection that could potentially reduce the need to mine natural sand. The cement mix had some chromium present, but this was not due to the dredged material. Leech testing was completed and was negative. The final product tested as Category 2. However, due to the leech testing and as the material underwent the bonded precast process, the material cannot impact surrounding waterways. Mr. Haid asked if Suscon completed testing on pulverized materials. Mr. Lambert confirmed that is how Suscon conducted the testing. Mr. Tilson asked about testing, and whether the water passing through the material would change pH. Mr. Lambert stated that those answers were included in the final technical reports. This test was successful and showed dredged material is a viable substitute for sand in precast.

Harford Industrial Materials

Mr. Lambert introduced HIM and stated the goal of the project was to focus on the fines within dredged material to create an LWA. While Suscon took the sand/stone materials, HIM used the air dried and washed dredged material clay and silt. Mr. Myers asked for clarification on the final disposition of the silty waters from the rinsing process previously discussed. Mr. Lambert confirmed that the silty waters were used in the HMI project. Mr. Kinchen stated the process of forming the LWA was manual. The clay was dried, broken up, reconstituted, and then the cakes were rolled up into small spheres. The spheres were heated in a rotary kiln to create the LWA product. The temperature and elevation to dry this material was specifically chosen for optimal sintering and production. Multiple formulations were tested at different temperatures to achieve the best result. The final mix was 82.35% clay from the washed dredged material (dry) and 17.65% water. Mr. Lambert stated the LWA spheres were mixed to create a concrete cylinder which was made of cement, the LWA, water, and entrained air. The resulting weight was 107.41 pounds per cubic foot. The strength test results were not achieved by day 28 but were achieved by day 56. This material can be used as fill in highways, foundations, non-structural building facing, insulating concrete, lightweight precast, and controlled low strength materials. Mr. Denney asked if the material can be used for warehouse walls to which Mr. Lambert confirmed. Mr. Donnelley stated that a previous LWA project had higher strengths due to larger metal quantities and asked if this should be a future consideration. Mr. Lambert stated HIM has a focus on clean products, so the use of a material with larger metal quantities would not be ideal.

The material characterization showed that the LWA balls had a drop in arsenic and went from Category 2 to Category 1. This was a very positive sign, but more time and research are needed. The rolled balls tested negative for leaching. Mr. Tilman asked if this media has been used in skyscrapers. Mr. Kinchen stated that this is a pilot project and therefore has not been used in such an application but there is potential for future use. The main takeaways from the project are that there is potential for development of a successful commercial product, it can reduce the use of virgin materials, the product has many uses, there is a high-water requirement because of mica and porosity, the dredged material #57 concrete strength meets typical concrete mix standards, and low arsenic levels allowed for non-residential cleanup standards. For the lightweight product, a more effective sintering process and binding agents should be studied for an increase in strength and a more effective rolling process are needed to move forward. Full scale considerations include location, processing, planning for direct dredged material acquisition and processing one million tons of wet material, repurposing, land buffers, and employees. Mr. Denney asked

what one million tons of wet materials is in cubic yards. Mr. Baker stated it would be around 714,000+ cy. Mr. Lambert stated that the current HIM facility can process up to 250 tons per hour of dredged material. The 100% repurposed product is made up of 50% water, 30% C33 sand, 57 stone and 2-inch stone, and 20% fines and clay. An 8-to-20-acre plot for a work site can hire up to 25+ employees.

Mr. Lambert emphasized that there are many aspects and moving parts of this project. There are supports from MPA and MDE, along with education and reuse. Material processing includes many different materials and testing at all stages. Sales and distribution require a strong network of retail, education, efficiency, and trucking. Mr. Myers asked if HIM have investigated green roofs, since the roofs require LWA in order to not collapse, and the cost of the aggregate makes it challenging to complete. Mr. Lambert stated that this has not been investigated. Mr. Tilson asked if there was a difference, or variations, in the heating process. Mr. Kinchen stated that there may be some variations within the machinery. Mr. Lambert stated that this would need a lot of experimentation and variations of temperature. Ms. Kestel asked whether, since the presentation talked about replacing sand, whether HIM thought about replicating shoreline projects that use bagged sand to inhibit erosion. Mr. Lambert stated that HIM has done some research into shoreline protection, but not in the same way as sand bagging.

6.0 Round Table Remarks & Open Discussion

Committee Members, MPA

Ms. Miller thanked the presenters for sharing the progress of the innovative reuse projects. Ms. Ashley stated the next IRC meeting will be held on October 17th and the next CAC meeting will be held on November 8th. The CAC will have a field trip in August, and Ms. Ashley will send out an email with more information. Mr. Lindquist shared that the Baltimore Blueway, a network of water trails and access points for paddling in Baltimore Harbor, will release a master plan to improve paddleboard recreation. The Baltimore Blueway Master Plan was presented to the Harbor Safety Committee and gained some valuable insight that will be beneficial to the project. There will be an annual paddling event in the Baltimore Harbor on June 10th, and there are tickets available for sale.