COMPREHENSIVE FEASIBILITY STUDY REPORT FOR THE PROPOSED COX CREEK EXPANDED DREDGED MATERIAL CONTAINMENT FACILITY – STAGE I

FINAL

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A COPY OF THE FULL REPORT IS AVAILABLE UPON REQUEST

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List of Acronyms and Abbreviations

AST	Aboveground Storage Tank
ACM	Asbestos-Containing Material
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CCRC	Cox Creek Refining Company
CAC	Critical Areas Commission
DRO	Diesel Range Organics
DPT	Direct Push Technology
DMCF	Dredged Material Containment Facility
DMMP	Dredged Material Management Program
EDR	Environmental Data Resources
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Environmental Site Assessment
FS	Factor of Safety
ft	Feet
GRO	Gasoline Range Organics
GPR	Ground Penetrating Radar
HMI	Hart-Miller Island
HTRW	Hazardous, Toxic, or Radioactive Waste
IR	Innovative Reuse
IDA	Intensely Developed Area
KCI	KCI Technologies, Inc.
LDA	Limited Development Area
MD	Maryland
MDE	Maryland Department of the Environment
MD DNR	Maryland Department of Natural Resources
MERLIN	Marylandôs Environmental Resources and Land Information Network
MES	Maryland Environmental Service
MGS	Maryland Geologic Survey
MHT	Maryland Historical Trust
MPA	Maryland Port Administration
MLLW	Mean Lower Low Water
ε g/kg	Micrograms per Kilogram
M	Million
mcy	Million Cubic Yards
NHPA	National Historic Preservation Act
NPL	National Priority List
NRCS	Natural Resources Conservation Service
NFRAP	No Further Remedial Action Planned

PEM1/SS1Cx	Palustrine, Emergent, Persistent/ Scrub-Shrub, Broad-leaved deciduous, Seasonally flooded, Excavated
PEM1C	Palustrine, Emergent, Persistent, Seasonally Flooded
PEM1Ch	Palustrine, Emergent, Persistent, Seasonally Flooded, Diked/Impounded
PEM5F	Palustrine, Emergent, Phragmites australis, Semi-permanently Flooded
PUBKhs	Palustrine, Unconsolidated Bottom, Artificially Flooded, Diked/Impounded, Spoil
PUBHx	Palustrine, Unconsolidated Bottom, Permanently Flooded, Excavated
PUBFx	Palustrine, Unconsolidated Bottom, Semipermanently Flooded, Excavated
PM_x	Particulate Matter
ppm	Parts per Million
PID	Photoionization Detector
PCB	Polychlorinated Biphenyls
PAH	Polycyclic Aromatic Hydrocarbon
Kp	Potomac Group
PSDDF	Primary Consolidation, Secondary Compression and Desiccation of Dredged Fill
PPL	Priority Pollutant List
CORRACTS	RCRA Corrective Action Sites
RACM	Regulated Asbestos-Containing Material
RCA	Resource Conservation Act
RCRA	Resource Conservation and Recovery Act
RCRA-CESQG	Resource Conservation and Recovery Act Conditionally Exempt Small Quantity Generator
RCRA-LQG	Resource Conservation and Recovery Act Large Quantity Generator
RCRA-SQG	Resource Conservation and Recovery Act Small Quantity Generator
SVOC	Semi-volatile Organic Compound
SHWS	State Hazardous Waste Site
TMP	Temporary Groundwater Monitoring Well
tpy	Tons per Year
TPH	Total Petroleum Hydrocarbons
TSCA	Toxic Substances Control Act
UoB	Udorthents loam (0-5% Slope)
UoD	Udorthents loam (5-15% Slope)
UST	Underground Storage Tank
U.S.	United States
Uz	Urban Land
USACE	U.S. Army Corps of Engineers
VOC	Volatile Organic Compounds

EXECUTIVE SUMMARY

The Port of Baltimore is an economic engine for the State of Maryland, generating millions in state, county, and municipal taxes and billions in job revenue. The demand for placement of sediment dredged from Baltimore Harbor (Harbor) is critical to maintain ship navigation safety. There is currently an annual shortfall for Harbor Material of about 0.5 million cubic yards (mcy) of dredged material placement capacity since the closure of Hart-Miller Island (HMI) Dredged Material Containment Facility (DMCF) in December 2009. HMI was Maryland Port Administrationôs (MPA) first and largest DMCF for Harbor dredged material placement.

In 2002, the Executive Committee of Marylandôs Dredged Material Management Program (DMMP) determined that additional options for managing Harbor dredged material are needed to meet both the short- and long-term Harbor dredging needs. Based on the DMMP decision, the Harbor Team, whose mission is to pursue solutions to the Harbor dredged material placement shortfall and recommend options and locations for further study, re-evaluated available real estate in and around the Harbor, identified areas with the potential for DMCF construction, and initiated efforts to include community representatives in the planning for a new facility.

The Harbor Teamôs highest priority recommendation for a dredged material placement option was the Coke Point site in 2003; however, due to continued delays from property negotiations, MPA requested and received Harbor Team agreement to proceed with development of the Masonville site, to compensate for the loss of placement capacity when Hart-Miller Island closed in 2009. The Masonville DMCF became operational in 2010. MPA also requested investigation of backup options in late 2010. The Harbor Team identified a number of options, and the preferred recommendation was to examine the feasibility of expanding the existing Cox Creek DMCF. The MPA-owned Cox Creek site is located in northern Anne Arundel County, Maryland, on the western bank of the Patapsco River. The site includes the 144-acre Cox Creek DMCF, a 93-acre upland area (Cox Creek Upland), and the 11-acre Swan Creek Mitigation Wetland area.

To move forward with the examination of expanding the Cox Creek DMCF, MPA funded two separate studies in 2014 to provide feasibility-level investigations of both the existing Cox Creek DMCF and the Cox Creek Upland. The studies included:

- *Feasibility Geotechnical Engineering Report (Revised) for Cox Creek Expanded Dredged Material Containment Facility, Anne Arundel County, Maryland* (E2CR, 2015) ï A geotechnical study that expanded upon the *Reconnaissance Level Geotechnical Engineering Report* (E2CR, 2012) evaluations, by further examining the suitability of Cox Creek Upland soil for use as borrow material for dike construction, and the feasibility of raising the existing Cox Creek DMCF dike from present elevation of +36 feet (ft) mean lower low water (MLLW) to +60 ft MLLW and subsequently to +80 ft MLLW.

- *Phase II Environmental Site Assessment (ESA) Report of the Former Cox Creek Refining Company Property Located on Uplands Adjacent to the Cox Creek Dredged Material Containment Facility, Baltimore, Maryland* (EA, 2015) ï An environmental assessment that included comprehensive soil and groundwater sampling in the Cox Creek Upland. Supplemental sampling was also conducted, and reported under separate cover, in order

to further delineate the extent of contamination in focused areas identified during the initial Phase II ESA sampling effort.

The purpose of this Stage I Feasibility Study Report is to provide a clear overview of the environmental, geotechnical, and cost information from the above studies, the outreach information collected from public meetings, and the conclusions provided in the *Consolidated Reconnaissance Report for the Proposed Cox Creek Expanded Dredged Material Containment Facility* (MES, 2013b). This information will enable MPA to make an informed decision regarding moving forward with expansion of the existing Cox Creek DMCF.

Seven alignments were evaluated in the initial *Site Engineering and Design Reconnaissance Study* (GBA, 2013) of the Cox Creek Expanded project, including the adjacent Cox Creek Upland and Cristal USA properties, all of which have final dike elevation options of both +60 ft MLLW and +80 ft MLLW. Based on the projected schedule for additional dredged material placement capacity accessibility needs, only two alignments (Alignment 1 and Alignment 2) from the Consolidated Reconnaissance Report were advanced for feasibility-level evaluation. Alignment 1 includes dike construction in the Cox Creek Upland only. Alignment 2 includes dike construction in the Cox Creek Upland and raising the existing DMCF dikes. The feasibility of constructing a DMCF on the Cristal USA property, if acquired by MPA, would be evaluated as Stage II of the Cox Creek Expanded project.

MPA conducted extensive outreach efforts to the public and project stakeholders to determine if there was potential opposition to raising the existing DMCF dikes from present elevation of +36 ft MLLW to +80 ft MLLW. Public outreach efforts indicated minimal opposition to the project; therefore, Alignment 2 for the expansion of the Cox Creek DMCF was advanced for further feasibility-level evaluation, as this alignment provides the maximum additional dredged material placement capacity.

The feasibility-level geotechnical study determined that the required Factor of Safety for global dike stability required by Maryland Department of the Environment (MDE) Dam Safety Division could be met for the Cox Creek DMCF expansion and concluded that a +80 ft MLLW dike can be constructed in the Cox Creek Upland area and the existing DMCF dikes could be raised to final elevation +80 ft MLLW. The geotechnical study also established that borrow material is available on-site in the Cox Creek Upland for use in dike construction. Based on the geotechnical study findings, Alignment 2 was evaluated for construction of dikes from the existing elevation of +36 ft MLLW to initial elevation +60 ft MLLW and final elevation +80 ft MLLW under two dike slope alternatives. Alternative 1 considers construction of the dikes using a dike slope ratio of 1:1 (Horizontal: Vertical). Alternative 2 considers dike construction using a conventional 3:1 dike slope ratio. Construction to +80 ft MLLW would result in an effective area of 151 acres and 16.4 mcy of additional capacity under Alternative 1 and an effective area of 94 acres and 13.6 mcy of additional capacity under Alternative 2. The total estimated construction, operation, and maintenance costs for Alternatives 1 and 2 constructed to final elevation +80 ft MLLW are $285 million (M) and $294M, respectively.

Environmental analysis of the Cox Creek site was conducted during the *Environmental Conditions Study for Cox Creek Upland and Cristal USA* (MES, 2013a) and reported as part of the Consolidated Reconnaissance Report, and these elements are updated in this Feasibility

Study Report, where appropriate. These elements included: soil quality; groundwater; rare, threatened and endangered species; non-tidal wetlands; avian and terrestrial species habitat; recreational and socioeconomic value; historical and cultural resources; aesthetics and noise; air quality, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) liability; and critical areas.

The results from the 2015 Phase II ESA conducted in support of this Stage I Feasibility Study, indicated minimal isolated locations of elevated concentrations of metals, polychlorinated biphenyls, and diesel range organics in the Cox Creek Upland soil samples. These locations will require coordination with MDE during site construction. Overall, there were no widespread areas of contaminant concern.

Based on groundwater studies of the area, the expansion of the Cox Creek DMCF will not affect flow direction or the quality of the groundwater in the area. According to the 1997 U.S. Army Corps of Engineers (USACE) modeling results, as well as the 2015 Maryland Geological Surveyôs hydrogeologic assessment (Gemperline and Andreasen, 2015), the groundwater in the saturated zone flows in an easterly direction toward the Patapsco River, and there appears to be no mechanism for the development of preferential leachate pathways to the groundwater.

The Maryland Department of Natural Resources, Wildlife and Heritage Service, determined that no state or federal records for rare, threatened, or endangered species exist for the Cox Creek site. The open-water adjacent to the site is a known historic waterfowl concentration area; however, the Cox Creek DMCF expansion project will not have an impact to this area.

In 2011, three non-tidal wetland areas were delineated in the Cox Creek Upland site totaling 8.54 acres (MES, 2013b). The feasibility-level Alignments 1 and 2 for the Cox Creek Expanded project have been designed to completely avoid impacts to all non-tidal wetlands on-site, including a 25-ft non-tidal buffer area. Because portions of the Cox Creek Upland are within the critical area, all plans for construction of the Cox Creek Expanded DMCF ï Stage I will be reviewed by the Critical Area Commission (CAC). The CAC would determine if impacts would require mitigation or monetary offset.

Maryland's Environmental Resources and Land Information Network (MERLIN), the Department of Natural Resources online mapping tool, did not indicate any historic places, properties, or preservation easements within or adjacent to the Cox Creek Upland. The project plans were submitted to the Maryland Historical Trust (MHT) for review, and MHT determined there would be no impact to historic properties by the proposed Cox Creek Expanded project.

Findings from the geotechnical and environmental investigations to-date have determined that it is feasible to raise the existing Cox Creek DMCF dikes and construct dikes in the Cox Creek Upland to final elevation +80 ft MLLW. Based on public outreach, regulatory considerations, and project schedule, design and costs of Alignment 2 dike construction to +80 ft MLLW under Alternative 2 (3:1 dike slope) will be further refined during the Final Design phase of the Cox Creek DMCF expansion project.