Dredging & Excavation Plan

Revision: 6

October 27, 2024

LOWER DUWAMISH WATERWAY

Upper Reach Remedial Action

Contract KC001065

Prepared By:

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1.0 Introduction

This submittal outlines the detailed dredging and excavation plan according to the specifications in Sections 35 20 23 and 31 05 10. It includes the requirements for remedial dredging, dredge debris, identified debris, barge dewatering, in-water transportation, and sediment management for Sediment Management Area (SMA) 5 Bank Construction. The LDW Project is not a typical dredging and disposal operation, its primary purpose is to implement the cleanup remedy for contaminated sediment (referred to herein as Dredge Material) in a Superfund site. The Dredge Material within the Work Site will be located in areas with difficult access, is contaminated with various chemicals of concern, and will contain Dredge Debris and Identified Debris.

PPM will exercise extra care to conduct its work in a manner suitable for environmental cleanup, rather than typical production dredging or excavation methods. The work will be performed with a focus on minimizing, to the greatest extent practicable, the resuspension and redistribution of contaminated sediment. This Project is conducted under the jurisdiction of U.S. Environmental Protection Agency (EPA) Region 10. Work for this Project will be performed in accordance with the project specifications and drawings.

2.0 Proposed Equipment

Below is a detailed list of equipment to be used for dredging operations, information regarding engine tier and hours can be found in the Green Remediation Plan and cut sheets of equipment can be found in the Appendices of the RAWP. All excavators that are planned to be used for dredging are made by HITACHI construction company. Instead of referring to the manufacturer, each time the equipment is discussed the model number will be used instead. Instead of using the full model number a shortened model number will be referenced (eg HITACHI ZX470LC-6 excavator will be referred to as 470). For haul routes for these pieces of equipment please refer to Vessel Management Plan in Appendix S.

2.1 Construction Barges & Excavators

CONSTRUCTION BARGES

Lash 4

For dredging operations in SMAs 3, 4, 6, 7, 9, 11, 14, 15, 16, 17, and 18 PPM anticipates using the “Lash 4” barge. The Lash 4 barge is 160’ long x 50’ wide x 12’ deep. It is a load lined barge and is equipped with 2ea 24” diameter spuds that can be raised and lowered to allow the barge to be securely positioned. The Lash is also equipped with a 4-point anchoring system that can be utilized in areas where spuds are ineffective or not allowed (ENR/AC pilot areas, completed Engineered Caps). The HITACHI EX1200-6 excavator (1200-6) will be located on Lash 4.

FlexiFloat

For SMAs 1, 2, and 14C dredging and debris removal the “FlexiFloat” barge will be utilized. The FlexiFloat barge consists of 16ea 20’ x 10’ x 7’ floats, which are combined to make a single float measuring 80’ x 40’ x 7’It is outfitted with two spuds for anchoring and stability once in its desired location. The FlexiFloat will have the 470 Excavator on the deck for dredging and debris removal operations.

WEB

For dredging operations in SMA 12, PPM anticipates using the “WEB” barge. The WEB barge consists of a 142-foot-long x 58-foot wide x 11-foot-deep scow. It is outfitted with two heavy-duty 24” diameter spuds for anchoring and stability once in its desired location. The spuds on

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the WEB are 80-feet long, allowing it to anchor itself in 60+ feet of water. The WEB does not have a secondary anchoring system. The HITACHI EX1200-5 excavator (1200-5) will be located on the deck of the WEB.

DREDGE EXCAVATORS

HITACHI EX1200-5 Excavator

A HITACHI EX1200-5 excavator (1200-5) is anticipated to be used to perform the dredging in SMA 12 due to the schedule restraints (15 day testing, tribal standbys, etc) requiring concurrent work in Season 2. The 1200-5 was built in 2006, has an operating weight of 238,099lbs and is rated to lift 6 tons. It will be outfitted with 30' dredge arm and is powered by a 684hp Cummins QSK23478 diesel engine, with a reach of 33' ft below waterline. The hydraulic system on the excavator uses Clarity, a low toxicity biodegradable hydraulic fluid, made with zinc-free mineral oil (SDS will be available on all construction barges). To facilitate precise spatial tracking, the excavator will be equipped with inclinometers on the boom, stick and bucket, as well as heading sensors on the body of the excavator. The inclinometers will be used in conjunction with a RTK GPS system that uses HYPACK'S DREDGEPACK 2023 software to facilitate positioning within the dredge prism. The 1200-5 excavator will be equipped with eTrac servos on the boom, stick and clamshell bucket, an inertial sensor, as well as on-board monitors and computer operating HYPACK'S DREDGEPACK 2023 software. These sensors will allow bucket position to be continually monitored, in real-time to approximately +/- 3-inch accuracy, through HYPACK'S DREDGEPACK.

In addition to the above sensors, two GPS antennas mounted on the rear of the excavator will provide positioning and directional data.

HITACHI EX1200-6 Excavator

PPM anticipates utilizing a HITACHI EX1200-6 excavator (1200-6) for dredging SMAs 3, 4, 6, 7, 9, 11, 14, 15, 16, 17, and 18. The excavator is a 2015 with a Net Power 760 Horsepower and Operating Weight of 265,000 lbs. It is equipped with a custom boom from Jewell capable of digging 70-feet below the excavator or 43-feet below waterline. The hydraulic system on the excavator uses Clarity, a low toxicity biodegradable hydraulic fluid, made with zinc-free mineral oil (SDS will be available on all construction barges). The 1200-6 excavator is equipped with eTrac servos on the boom and clamshell bucket, as well as on-board monitors and computer operating HYPACK'S DREDGEPACK 2023 software. These sensors will allow bucket position to be continually monitored, in real-time to a +/-3-inch accuracy, through HYPACK'S DREDGEPACK including bucket orientation, rotation and open/close position. In addition to the eTrac servos sensors, two GPS antennas mounted on the rear of the excavator will provide positioning and directional data.

HITACHI 470

A HIATCHI ZX470LC-6 excavator (470) will be used to dredge SMAs 1, 2, and 14C. The 470 excavator will be operated from the deck of the FlexiFloat barge. It has a 37' dredge arm with a 24'ft reach below waterline, and is powered by a 450 horsepower diesel engine. The 470 was built in 2005, weighs 108,952lbs. The hydraulic system on the excavator uses Clarity, a low toxicity biodegradable hydraulic fluid, made with zinc-free mineral oil (SDS will be available on all construction barges). The 470 excavator is equipped with eTrac servos on the boom and clamshell bucket, as well as on-board monitors and computer operating HYPACK'S DREDGEPACK 2023 software. These sensors will allow bucket position to be continually monitored, in real-

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time to a +/-3-inch accuracy, through HYPACK'S DREDGEPACK including bucket orientation, rotation and open/close position. In addition to the eTrac servos sensors, two GPS antennas mounted on the rear of the excavator will provide positioning and directional data.

2.2 Tugboats & Workboats

Halle H. Tugboat

The Halle H. tugboat will be used to transport the barges to and from the jobsite to the Waste Management transload facility (DRF) located at 7400 8th Ave S, Seattle, WA 98108 as well as move the dredge barges from each SMA. Boyer Towing owns and will operate the Halle H. The Halle H. is an 800-horsepower tug that is 63-feet long by 22-feet wide with a 7.5-foot draft. Boyer Towing will use as the Jennifer H. as needed to assist with barge movements or transfers.

Jennifer H Tugboat

The Jennifer H. Tugboat will be used to transport the barges to and from the jobsite to the Waste Management transload facility (DRF) located at 7400 8th Ave S, Seattle, WA 98108 as well as move the dredge barges from each SMA.. Boyer Towing owns and will operator the Jennifer H. The Jennifer H. measures 64 feet in length, 22 feet in breadth, and 7.4 feet in depth. This robust towing vessel has a gross and net tonnage of 87 and is powered by an 800-horsepower engine with a twin-screw propulsion, she is well-suited for various towing tasks along the coastlines of Puget Sound, Alaska, and the Pacific Coast. Registered under USCG Doc. No. 1022583 and with the call sign WDC3573, the Jennifer H. offers coastwise unrestricted towing services and is based in Ketchikan, AK.

Fog Dog Survey Boat

The Fog Dog survey boat will be used to perform bathymetric surveying. Additional details regarding the boat and survey procedures can be found in the Survey and Positioning Control Plan in Appendix H of the RAWP. This plan, like many others in the RAWP, must be approved prior to initiating operations.

Workboat Skiffs

Two to three small metal work skiffs ranging from 16' to 21' in length with outboard motors (50-100 horsepower). These skiffs will be used to transport personnel and supplies, as well as maintain turbidity curtains and assist barge movements.

2.4 Contaminated Sediment Barges

KP- 1 through KP-4

Contaminated sediment barges used for the dredge spoils will consist of four identical barges each 180-foot long by 50-foot wide by 12-foot deep, with two being used per HITACHI1200 that is operating during that particular season (eg 2 KPs in Season 1, 4 KPs in Season 2). The barges are equipped with concrete wear decks and 4-foot high steel fences around the perimeter that will be sealed to capture all dredge water for collection and dewatering avoiding an overflow situation. Please reference the Water Quality Control and Water Management Plan for details

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regarding dredge water collection, dewatering, and treatment. The barges can hold approximately 2,000 tons of material. Approximately 1,200 tons of material will be generated before the barge is transported to DRF and offloaded. This will give the barge 24 inches of freeboard to top of barge deck to minimize spillage during transport to the transload facility. Material will be stacked in such a way as to ensure that material cannot be lost from the barge during transport. During Season 1 and Season 3 two of the KP barges will be utilized. During Season 2 all four barges will be utilized. The particular KP barges to be used each season will be determined by September 1 of each year.

Porpoise

The Porpoise will be utilized as a contaminated sediment barge in SMA 1A, 1B, 2A, and 2B in rotation with the P2 Hopper barge. The Porpoise barge dimensions are 140 feet long by 35 feet wide by 8.5 feet deep. The barge is equipped with a concrete wear deck and 4-foot high steel fence around the perimeter, which will be sealed to capture all dredge water for collection and dewatering, thereby avoiding overflow situations. Please refer to the Water Quality Control and Water Management Plan for details regarding dredge water collection, dewatering, and treatment. This barge can hold approximately 530 tons of material, with about 250 tons generated before the material is transloaded on to the KP barge. This will provide the barge with 24 inches of freeboard above the deck, minimizing the risk of spillage during transport to the transload location. Material will be stacked to ensure that it cannot be lost from the barge during transport.

Poseidon P2 Hopper Barge

For SMA 1, 2, and 14C the Poseidon P2 Hopper barge will be used for contaminated sediment storage and transport. The barge is 40’ x 20’ wide and consists of two 40’ Long x 10’ Wide x 8’ 5-3/4” Tall modular barges pinned together. The barge has two hoppers, one on each 40x10 unit. The hopper is set inside of the hull of the barge, it is 26’x 8’ x 8.5’ and capable of holding 50cubic yards. The hopper box has a 1.5’ tall fence extending above the deck of the barge to mitigate spillage during transport. With both units pinned together the 40’x20’ barge is capable of hauling 100 cubic yards per load. This will be the only barge used in SMA 1 which will require 2-3 trips per day under the 98th St Bridge. The tidal conditions will need to be at an approximate +4 elevation for the barge to pass through the channel in a loaded condition. Updated bathymetry will be needed to make final determinations on tidal windows for full/empty transition conditions of the barge.

2.5 SMA 5 Equipment

Below is the approximate equipment to be utilized for SMA 5 excavation activities. Additional details will be provided in June of 2026 prior to the 2026-27 construction season.

- 50 ton +/- 70’ reach long reach excavator with digging and smooth lip buckets.
- 50 ton +/- Standard front excavator with digging and smooth lip buckets.
- 20 ton +/- standard front excavator with digging and smooth lip buckets.
- 5 cy bucket wheel loader.
- On-highway truck and trailers or side dump for offsite disposal

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2.6 In-water Dredging Buckets

All buckets listed below are considered environmental buckets due to their closed top design and ability to seal when closed. PPM has utilized the manufacturers model nomenclature in the description of these buckets to match the product data sheets.

Young Model RS Bucket

The Young 5-yard RS clamshell bucket is engineered for high-precision dredging operations, particularly suited for environmentally sensitive projects. This closed clamshell bucket minimizes sediment resuspension and turbidity, essential for reducing environmental impact during dredging activities. Fabricated from high-strength, corrosion-resistant steel, the bucket features a watertight seal ensuring accurate containment of dredged materials. Its volumetric capacity of 5 cubic yards allows for substantial material handling while its design facilitates controlled dredging, maintaining specified grade lines and preventing over-excavation. The mechanism ensures smooth opening and closing actions, crucial for minimizing spillage and ensuring precise dredging operations. The bucket is also equipped with venting snorkels on each corner allowing for sediment to be pushed through the snorkel and to mitigate excess water in the bucket. This bucket will be utilized for all material types at SMAs 4-18 and will be interchanged between the 1200-5 and 1200-6 excavators.

Jewell Rehandle Bucket

The Jewell 4- cubic yard rehandle clamshell bucket is a specialized tool engineered for high-efficiency dredging operations, capable of handling bulk materials with precision and reliability. Constructed from high-strength, wear-resistant steel, this bucket is designed to withstand the rigors of dredging operations. Its volumetric capacity of 4 cubic yards is optimized for substantial material throughput, enhancing productivity and reducing cycle times. The bucket's structural integrity is reinforced with side plates and a closed design, ensuring smooth, controlled dredging and minimizing spillage. This precision is critical for maintaining specified grade lines and ensuring compliance with project specifications. This bucket will be utilized for all material types and for SMAs 4-18, and it will be interchanged between the 1200-5 and 1200-6 excavators.

Young Heavy Duty Digging Bucket

The Young 3-cubic yard heavy duty digging clamshell bucket is engineered for high-efficiency dredging operations, combining robust construction with precision handling. Fabricated from high-strength alloy steel, the bucket features reinforced wear edges and heavy-duty side plates. Its volumetric capacity of 3 cubic yards is optimized for substantial material handling, reducing cycle times and increasing operational efficiency. The interior design of the bucket is contoured to minimize material adherence and facilitate smooth unloading, thereby reducing spillage and wastage. The cutting edge is precision-machined for superior ground penetration and scooping efficiency, contributing to accurate and clean dredging profiles. This bucket is a closed design similar to an environmental bucket but does not have relief snorkels at the corners. It will be utilized on the 470 Excavator only and will be employed exclusively for dredging operations in SMAs 1-3.

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3.0 Work Sequence

The sequence and timing of the dredging and excavation activities will be coordinated to align with other major project elements and must be approved by the Project Representative before construction begins, in accordance with the specifications. This section will reference the Draft Project Schedule and outline operational hours and the estimated duration for each activity. For SMA 5, dredging/excavation activities will need to be conducted in the dry per project requirements which will require low tide hours, which are approximately 6pm to 6am during the winter months. The Project Representative will be notified in advance about nighttime SMA-5 activities.

Dredging will not begin until the following have occurred:

1) the Project Representative has completed its review and accepted the Dredging and Excavation Plan
2) the Construction Season Pre-Construction Survey has been completed by PPM and accepted by the Project Representative (PR) per Section 02 21 00 (Site Surveys and Positioning Control)
3) The Pre-Construction Structural Condition Inspection of existing structures and facilities has been completed by PPM and accepted by the PR.
4) The PR has given explicit acceptance to begin work

Dredging activities for the SMAs will be sequenced as follows:

- Large debris identified in drawings and the pre-construction hydrographic survey will be removed.
- SMA will be dredged to the required dredge elevation or thickness per drawings/plan sheets.
- Post-construction survey
- Review of survey and removal of high spots and, if necessary, additional required dredging after the post- construction survey
- The PR accepts the survey and agrees that the dredge depth has been met.
- Mobilization of dredge equipment to the next scheduled downstream SMA and proceed with initial dredging activities in new SMA.
- 15 working day sampling (performed by King County) and testing period (i.e., Contingency Re-Dredging Decision Duration)
- After test and sample period return to initial SMA for contingency re-dredge and subsequent/additional surveying/sampling if necessary or proceed with material placement activities as determined by the Project Representative. Please refer to Appendix L for details regarding material placement activities.

Below are the preliminary ESTIMATED dredging durations for each in-water SMA. Production rates will be adjusted to address environmental factors and ensure compliance with CWA Section 401. Please review the baseline schedule for initial dates and sequencing of dredging and afterwards the 3-week look ahead schedule as the baseline schedule dates are subject to changes based on factors such as need for contingency redredging. During Season 1 and Season 2, two construction barges will operate simultaneously resulting in daily contaminated sediment removal rates of 1,300 cy/day to 1,800cy/day.

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- **SMA 1- Season 1: 11 days (20 cy/hr)**
  - Required Dredging: 7 days
  - Contingency Dredging: 2days
- **SMA 2- Season 1: 3 days (30 cy/hr)**
  - Required Dredging: 2 days
  - Contingency Dredging: 1 day
- **SMA 3- Season 1: 3 days (30 cy/hr)**
  - Required Dredging: 2 days
  - Contingency Dredging: 1 day
- **SMA 4- Season 1: 4 days (33 cy/hr)**
  - Required Dredging: 3 days
  - Contingency Dredging: 1 day
- **SMA 6- Season 1: 16 days (92 cy/hr)**
  - Required Dredging: 14 days
  - Contingency Dredging: 2 days
- **SMA 7- Season 1: 5 days (87 cy/hr)**
  - Required Dredging: 4 days
  - Contingency Dredging: 1 day
- **SMA 9- Season 1: 11 days (89 cy/hr)**
  - Required Dredging: 10 days
  - Contingency Dredging: 1 day
- **SMA 11- Season 1: 3 days (90 cy/hr)**
  - Required Dredging: 2 days
  - Contingency Dredging: 1 day
- **SMA 12- Season 2: 28 days (90 cy/hr)**
  - Required Dredging: 27 days
  - Contingency Dredging: 1 day
- **SMA 14- Season 2: 8 days (85 cy/hr)**
  - Required Dredging: 7 days
  - Contingency Dredging: 1 day
- **SMA 15- Season 2: 20 days (90 cy/hr)**
  - Required Dredging: 18 days
  - Contingency Dredging: 2 days
- **SMA 16- Season 2: 20 days (90 cy/hr)**
  - Required Dredging: 18 days
  - Contingency Dredging: 2 days
- **SMA 17- Season 3: 17 days (87 cy/hr)**
  - Required Dredging: 16 days
  - Contingency Dredging: 1 day
- **SMA 18- Season 3: 13 days (91 cy/hr)**
  - Required Dredging: 12 days
  - Contingency Dredging: 1 day

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4.0 Remedial Dredging Methods & Procedures

This section will demonstrate the means and methods for compliance with the specifications and drawings, focusing on the execution of the individual components described in this section.

4.1 Debris Removal

There are two types of debris removal for this project: Identified Debris and Dredge Debris

Identified Debris

Identified Debris is defined as solid waste material resulting from removal of Debris targets shown on the Drawings and will be kept segregated from Dredge Debris at all times.

Debris removal will be accomplished via the use of the clamshell buckets identified in Section 2.6. The operator and superintendent will decide which bucket is most suitable for the identified debris after the results of the hydrographic survey and onsite assessment. Debris will be loaded into the HYPACK's DREDGEPACK positioning software for the operator to more easily identify for removal with offsets of existing structures loaded in as well. The excavator, equipped with a clamshell bucket, will be positioned on the barge, with the operator having clear visibility of the work area. This positioning will facilitate precise maneuvering and debris handling, minimizing disturbance to the surrounding sediment. Identified Debris will be removed in the dry as much as possible to mitigate water quality disturbances but water access and limiting dredging operations to daytime hours limit and/or exclude removal from being entirely in the dry.

The debris removal operation will be executed with careful consideration of both the size and nature of debris, particularly large and monolithic debris piles in SMA 9. The operation will begin by lowering the clamshell bucket to the seabed, and the operator will carefully close the bucket around each piece of debris, ensuring a firm and secure grasp before lifting it slowly to the surface. This approach is designed to accommodate the specific characteristics of large debris and avoid the need for specialized equipment. To ensure the stability of the slopes and prevent undermining, debris will be removed systematically from the top of the slopes to the bottom. The removal process will be closely monitored, with extra care taken to handle larger debris without breaking it apart, which could result in sediment disruption and contamination spread. The exact composition and nature of the debris piles, including monolithic debris, are currently unknown and will require further assessment by the operator and superintendent during an initial exploration phase of the debris removal operation. This exploration will help determine the approach to managing these piles. If the assessment reveals that the debris is larger or more complex than anticipated, revised means and methods will be developed and submitted for review and approval by the Project Representative to ensure the safe and effective handling of monolithic or unusually large debris.

Once lifted, debris will be transferred directly into the contaminated sediment barge without additional handling to further minimize disturbance to the surrounding sediments. Operators will proceed slowly and methodically throughout the operation, paying special attention to the management of larger debris piles, ensuring that removal is completed effectively without unnecessary fragmentation.

Dredge Debris

Dredge Debris is defined as any solid waste materials other than sediment or soil excavated as part of the dredging operations (such as pile stubs, logs, wire, cable, steel, anchors, lumber, trash, rocks, and concrete) that will be encountered. The means and methods for dredge debris

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removal is no different than traditional dredging as it takes place during dredging operations. The only unique process is when debris is sighted in the bucket or felt during the initial closing of the bucket, the operator will use slow, controlled movement to gently lift debris from the water surface tension to avoid scattering or losing sediment or debris. Debris or sediment that is lost will be tracked via DREDGEPACK for removal.

Equipment

PPM will utilize the listed clamshell bucket to remove identified debris. The operator and superintendent will decide which bucket is most suitable for the identified debris after the results of the hydrographic survey and onsite assessment

Management, Sorting, & Disposal

Debris will be placed on the contaminated sediment barge once removed. If the debris is larger than 10' in any dimension it will be segregated to the bow of the material barge. Debris smaller than 10' will be intermingled with the dredge sediment and will be transloaded and disposed of as indicated in the Transload and Disposal Plan. Any debris over 10' will be resized by the excavator onsite prior to being transported to the DRF. Inert material such as piling, concrete rubble, or slag will be broken down by using the clamshell bucket to manipulate the material to shear and fragment it into smaller pieces. This will be done within the fenced area of the barge, near the bow. If unknown material is encountered such as containers of pressured gas, tanks, or transformers, a separate process will need to be developed for Project Representative approval and corresponding HASP and Disposal plans will need to be updated as well. The DRF operator will elect to either intermingle the large debris depending on the dimensional size and weight which could impact the stability or balance of the gondola during transport. Smaller, more uniform debris that can be safely mixed without compromising the integrity of the dredged sediment load will be co-mingled.

4.2 Dredging and Re-Dredging

Dredging

PPM will conduct Required Dredging of Dredge Material within the Work Site to the Required Dredge Elevations and Required Dredge Thickness surfaces, as shown on the Drawings. To initiate dredging, a combination of push tugs and spud anchors on the barge will be used to maneuver the dredge barge. The dredge operator will utilize position software to ensure that spuds are not pulled from contaminated areas and placed into SMAs where Engineered Cap material placement has been completed, or within the Enhanced Natural Recovery (ENR)/Activated Carbon (AC) Pilot Plots, preventing cross-contamination.

Once in place, the dredge barge will deploy its anchoring spuds to secure its position. Anchoring activities will be provided as part of the daily report to the PR. PPM will execute dredging operations on the Lower Duwamish using a systematic approach defined by specific dredge cuts. Each dredge cut represents a three-dimensional volume aimed at achieving a final cut elevation. Depending on the dredge type and operational methods, each cut will encompass only a fraction of the SMA in terms of width and length.

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Dredging operations will proceed in lanes, systematically cutting across the designated area. The dimensions of each dredge cut are influenced by the horizontal and vertical reach of the excavator. The length of each cut will be determined by the placement of anchors or spuds to ensure stability and precision. The barge will typically be positioned parallel to the shoreline, although it could be placed perpendicular to the shoreline bank if necessary to reach central dredge areas or to accommodate vessel traffic.

Daily progress surveys will be performed to ensure the final neat line dredge surface is achieved before moving within an SMA. The removal process will be conducted in layers, with multiple production cuts or passes required to achieve the desired sediment removal thickness and reach the final target cut elevation. This methodical approach ensures accurate and efficient dredging, maintaining compliance with specified dredge elevations and thicknesses.

A series of box cuts or "step cuts" will be used to define a dredge prism for areas with a sloping bottom. In sloping areas, step cuts are formed by sequentially stepping the box cuts downward to follow the desired overall slope.

During each dredge cycle, the excavator's bucket will remove approximately 3 to5 cubic yards of sediment, depending on the bucket being utilized. The sediment material will be compressed as the bucket is closed, reducing the volume of entrained water. The excavator will place dredged material directly into the dredge scow barge. The dredge bucket will capture as much sediment per cycle as possible without over-dredging below the design depth, allowing for easier water quality control and minimizing water content in the dredged material.

PPM will perform progress surveys and associated field data (e.g., bucket maps) to verify that Required Dredge Elevations, Required Dredge Thicknesses, and Side Slopes are being met. PPM will give the Project Representative a 2 working day notice prior to completing the required dredging in a SMA. Once PPM completes the Required Dredging within an SMA, it will conduct, within 1 working day, a Required Dredging Post-Construction Survey, and will submit the survey to the Project Representative within 1 working day after conducting the survey for review and acceptance. PPM has planned for the Project Representative to take 2 working days to review the Required Dredging Post-Construction Survey.

Re-dredging

If the Project Representative determines that high spots remain above the bottom of the Required Dredge Elevations and/or Required Dredge Thickness surfaces (with the exception of hard material, bedrock, or till as determined by field observations and accepted by the Project Representative), PPM will remove the high spots to the satisfaction of the Project Representative. If hard material is encountered within the Dredge Prism during Required Excavation, the Contractor shall immediately notify the Project Representative and provide evidence of encountered hard material, which will be reviewed by the Project Representative to determine proper management. PPM will give the Project Representative a 2 working day notice prior to completing the required re-dredging in a SMA.
Once PPM completes the Re-Dredging within an SMA, it will conduct, within 1 working day a new Required Dredging Post-Construction Survey and will submit the survey to the Project Representative within 1 working day after conducting the survey for review and acceptance. PPM has planned for the Project Representative to take 2 working days to review the Required Dredging Post-Construction Survey to confirm that high spots have been removed to the satisfaction of the Project Representative.

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PPM will perform additional Required Dredging and conduct additional Required Dredging Progress Survey(s) and Required Dredging Post-Construction Surveys at the direction of the Project Representative until the Project Representative provides acceptance of the Work as complete for Required Dredging in that SMA.

Contingency Re-Dredging

After the Project Representative provides acceptance of the Required Dredging Post-Construction Survey(s), the County will conduct post-dredge construction sediment sampling/testing within the SMA.

PPM has planned for up to 15 working days (referred to as the Contingency Re-Dredge Decision Duration) of no Work within the SMA following acceptance of the Required Dredging Post-Construction Survey for the County to conduct post-dredge construction sediment sampling, receive sampling test results, and inform PPM whether Contingency Re-Dredging activities will be required.

During the Contingency Re-Dredge Decision Duration, PPM will do the following:

1. Relocate its dredging equipment from the SMA to provide access for the County to perform post-dredge construction sediment sampling.
2. Continue to work in a continuous matter by doing one of the following:
    a. Move to the next downstream SMA to perform dredging activities.
    b. Or if no other SMAs are available for dredging work, PPM will decontaminate the equipment and proceed with the material placement activities in an SMA with completed dredging that has been approved by the PR.
    c. If no other SMAs are available for placement or dredging PPM will perform equipment maintenance activities. If equipment was used for dredging operations (eg bucket or boom), then the equipment will be decontaminated prior to maintenance.
    d. Keep the dredging equipment at the Project Site and do not use at a different project during the Contingency Re-Dredge Decision Duration.

Once the post-dredge construction sediment sampling/testing results have been received and evaluated, the Project Representative will direct PPM to complete one or more of the following options:

1. Complete Contingency Re-Dredging to remove Generated Residuals across the dredge unit (area) represented by the sample, to specified depths by the Project Representative.
2. Complete Contingency Re-Dredging to remove Missed Inventory within the SMA across the dredge unit (area) represented by the sample, to specified depths by the Project Representative.
3. Conduct no additional dredging activities and allow PPM to proceed with material placement in the SMA.

In the event of Options 1 or 2, PPM will proceed with Contingency Re-Dredging activities and give the Project Representative a 2 working day notice prior to completing the contingency re-dredging.

Once PPM completes the Contingency Re-Dredging, it will conduct, within 1 working day, a Contingency Re-Dredge Survey, and will submit the survey to the Project Representative within 1 working day after conducting the survey for review and acceptance. PPM has planned for the Project Representative to take 2 working days to review the Contingency Re-Dredging Post-Construction Survey. If the Project Representative determines that Contingency Re-Dredging has

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not been completed as required, PPM will complete additional Contingency Re-Dredging Work to the satisfaction of the Project Representative and conduct another Contingency Re-Dredging Post-Construction Survey(s) at no additional expense to the County. Once Contingency Re-Dredging is completed and accepted by the Project Representative, the County will collect post-contingency re-dredging construction sediment samples within the SMA. PPM has planned for this additional construction sediment sampling to take 2 working days.
In the event of Option 3, PPM will proceed with material placement no later than 12 days after approval.

4.3 Slope Dredging and Excavation

PPM will utilize a stepped approach to dredging slopes. Working from the top of slope the excavator will commence by cutting "steps" into the slope. This is achieved by making sequential cuts with each bucket grab, working methodically from the top of the slope downward. These steps serve to stabilize the slope as the excavation progresses. By working incrementally, the risk of sloughing is significantly reduced. It is critical that side slopes and the toe of dredge cuts are not undercut. Undercutting can lead to uncontrolled slope failures, resulting in excessive dredging and environmental disturbances. By avoiding undercutting, PPM ensures that each section of the slope remains stable throughout the dredging process, maintaining the integrity of the slope and minimizing excessive dredging. Throughout the dredging process, continuous monitoring is essential. Using GPS and depth-monitoring systems, the operator ensures that each cut is made to the exact required depth and slope gradient. Any necessary adjustments are made in real-time to accommodate variations in sediment composition or unexpected obstacles.

4.4 Barge to Barge Transloading

For SMA 1A, 1B, 2A and 2B the P2 Hopper barge that will be utilized at those locations is too small for Waste Management to offload at the DRF. PPM will instead transfer the demolished material from the P2 Hopper barge or the Porpoise barge and place it onto the KP barge for disposal at Waste Management. The Porpoise barge is intended to be offloaded at the DRF; however, to provide project flexibility, PPM will include the Porpoise in the barge-to-barge transloading plan. Below are the steps for this process:

- The projected capacity for the P2 Hopper barge is loaded to 100 CY and the Porpoise barge is loaded to 179 CY, by the FlexiFloat construction barge.
- The P2 Hopper barge or the Porpoise barge will then be towed by Boyer utilizing their tugs to whichever SMA the Lash or WEB barge is dredging in, as approved by Project Representative. Transfer outside that SMA footprint is not allowed
- The P2 Hopper barge or the Porpoise barge will be rafted to either side of the KP barge (Attachment A).
- The 1200 excavator on the construction barge will then proceed to remove the demolished material from the P2 Hopper barge or the Porpoise barge and place it into the KP barge. The swing path will be over both contaminated sediment barges so that in the event that material is lost in the transloading process it will land on the deck of one of the barges for easy retrieval and disposal. Please refer to Water Quality Control Plan for barge dewatering details. Spill prevention measures for transfers between the P2 Hopper barge or the Porpoise barge to the KP will be managed consistent with requirements of barge offloading at the transload facility.

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- Once the P2 Hopper barge or the Porpoise barge is completely offloaded it will be transported back to the FlexiFloat barge to continue with demolition operations.
- Transfers will occur inside the SMA footprint to the extent practicable; if transfers outside the SMA footprint are necessary, BMP WQ monitoring will occur as specified in the WQMP. Excess water in the Hopper Barge shall be pumped out prior to transfer activities.

This process will be repeated 2 to 3 times per day depending on the SMA location. If this process proves to be too inefficient then PPM will elect subject to Project Representative approval to have the WEB or LASH construction barges perform the work at 2A-B. The demolition activities at 1A-B must use this process due to the restricted nature of those SMAs. This process is also the same for contaminated sediment transfer, please refer to Section 4.4 of the Dredge Plan (Appendix J) of the RAWP.

4.5 Anchoring Floating Equipment

PPM will implement a meticulous anchoring strategy for floating equipment when operating, ensuring stability, safety, and minimal environmental impact. The following detailed procedures will be adhered to:

Mooring to Spud Barges

All equipment will be securely moored to the spud barges WEB, LASH 4, and FlexiFloat. These barges are specifically chosen for their stability and capacity to handle the equipment required for dredging operations. Each barge is equipped with steel anchoring spuds, which are robust vertical posts driven into the seabed to anchor the barge firmly in place. This ensures that the barge remains stationary during dredging, even in varying water conditions.

Spud Deployment

The steel spuds are deployed by slowly lowering them from the barge into the waterway bed. This anchoring method provides a stable base, preventing the barge from drifting due to currents, wind, or tidal changes.

Regular inspections of the spuds and their deployment mechanisms will be conducted to ensure they remain effective and secure throughout the dredging operations.

The use of spuds is permitted in the waterway bed for required dredging and contingency re-dredging activities within or adjacent to the Sediment Management Areas (SMAs), except in SMAs where engineered cap material has been placed or within the Enhanced Natural Recovery (ENR)/Activated Carbon (AC) Pilot Plots, as indicated on the drawings. Spudding is prohibited within 30 feet of the South Park Bridge active submarine cable, as detailed in Drawing C103. Spudding is also restricted at SMA 10 next to Boeing Isaacson Thompson, adjacent to Duwamish Waterway Park, and near certain outfalls as detailed in the Construction Drawings. Please reference the Vessel Management Plan for additional information.

NOTE: 10’ ft offset from outfalls will be maintained as required, specifically SMA 12B.

Managing Tidal Situations

In tidal conditions, where water levels fluctuate significantly, there will be instances when material barges and other pieces of equipment cannot remain tied to the spud barges due to low water.

The risk for low water tidal situations will be evaluated well in advance, to ensure time for fleeting barges back to PPM’s dock. Fleeting involves moving the barges to a safe, designated area where they can be securely tied up until water levels rise again.

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Docking Procedures

At PPM's dock, the equipment will be tied up using mooring lines and fenders to ensure they are secure and protected from damage caused by contact with the dock or other vessels.

The dock area will be monitored to manage the incoming and outgoing equipment efficiently, ensuring that the operations remain smooth, and that equipment is readily available when water levels allow for their return to the worksite. For additional details related to equipment staging please refer to Appendix G of the RAWP.

Environmental Considerations

Operating within a Superfund site necessitates stringent adherence to environmental regulations to avoid contaminant disturbance and spread. The anchoring and mooring procedures are designed to minimize riverbed disturbance and resuspension of contaminated sediments.
Grounding of equipment on the waterway bed is prohibited, unless accepted by the Project Representative in the case of an emergency.
Routine, daily visual and hydrographic monitoring will be conducted to assess the impact of anchoring activities, and adjustments will be made as needed to mitigate any adverse effects.

5.0 Barge Dewatering Methods & Procedures

To ensure effective sediment and water management during dredging, each contaminated sediment barge will be equipped with four steel dewatering sumps (30" x 8'), positioned at all four corners of the barge. These sumps will be constructed from slotted steel pipes wrapped in GAC-infused geotextile filter fabric (as detailed in Attachment B), which will allow water to flow into the sumps while preventing the escape of sediments, thereby ensuring that all material remains contained within the barge during dewatering operations. This system plays a critical role in maintaining water quality, especially within Sediment Management Areas (SMAs), where dredging and barge dewatering can result in increased turbidity.

The separated dredge water will be pumped from the sumps and discharged directly into the moonpool or, when the moonpool is not in use, near the active dredging area. This method represents an advanced passive dewatering approach. A compliant silt curtain "moonpool" will be utilized at the front of the dredge barge during operations in SMA 12 and other suitable SMAs, such as those located within navigation channels or areas with moderate depths, to minimize sediment resuspension. The moonpool will be constructed from four 24" steel pipes, forming a 50' x 50' containment area, ensuring that the excavator operates within a controlled environment. The silt curtain, adjustable via reefing lines, will extend up to 15' in depth to effectively control sediment disturbance.

Clean material barges, which have been processed to remove fines, are not expected to contribute to turbidity. Should turbidity occur, Best Management Practices (BMPs), such as the use of straw wattles or geotextiles, will be implemented to control the turbidity and reduce NTU levels.

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Daily inspections of the moonpool and silt curtain will ensure their ongoing integrity, with any necessary repairs promptly addressed and documented in daily reports. In areas where the moonpool cannot be deployed, an unfixed silt curtain will be installed around the barge and excavation area to maintain water quality, especially if other BMPs prove insufficient. This flexible and adaptable sediment control strategy allows for tailored solutions based on specific site conditions, ensuring the protection of water quality across varying environmental conditions. Floating silt curtains will be employed as needed, with specifications suited to the particular water conditions, from calm areas to those with stronger currents.

This information is located in the Water Quality Protection Plan in Appendix V of the RAWP.

6.0 In-Water Transportation to Transload Facility Methods & Procedures

Pacific Pile & Marine (PPM) prioritizes the safe and efficient transport of dredged material from the dredging site on the Duwamish River to the Waste Management Duwamish Reload Facility (DRF). For detailed methods and procedures please refer to the Vessel Management Plan in Appendix S of the RAWP.

6.1 Transportation Procedures

Transportation Method and Routes

All transport barges used for dredged material, debris, and piling transport will have fixed permanent containment walls on all four sides, making them watertight during in-water transportation to the Dredged Material Disposal Facility (DRF). No barge water will be discharged during transit from the dredge operation to the DRF; discharge will only occur within the dredging site. Transportation will follow pre-determined routes that minimize environmental impact and avoid interfering with other waterway users, ensuring safe passage through the Duwamish River while considering navigational hazards and sensitive environmental areas. PPM will assess current and forecasted weather conditions to account for impacts on marine equipment stability. Please refer to the Vessel Management Plan for final haul routes and any additional information.

Sediment Transport and Freeboard Management

The tugboat Halle H will move filled sediment barges from the dredge prism to the transload area and return with empty barges to ensure continuous operations. PPM is responsible for the safe transport of dredged material, debris, and pilings from the work site to the DRF, adhering to Section 35 10 00 (Navigation Safety and Marine Traffic Control) and all relevant regulations. PPM will provide sufficient barge freeboard, a minimum freeboard height of 24 inches or greater as indicated by the marine surveyor, to prevent spillage during transport. Dredged material will be loaded to ensure even weight distribution and secure containment, with inspections conducted to remove any material that could fall off during transport. If material is found outside of the barge walls it will be transferred via hand shovels back into the contaminated sediment barge. Please refer to the Vessel Management Plan for additional information.

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6.2 Environmental and Safety Measures

Leak Prevention Conduct a thorough inspection of the barge to assess its current condition and identify any points of failure. This will involve repairing any damage to the barge's hull and ensuring all containment areas are intact. Ensure the barge is properly sealed to prevent leaks. Dailey inspections and maintenance of the barges are conducted to prevent any leaks that could result in environmental contamination. Wall seals and structural integrity are checked daily.

Environmental Monitoring:

Daily environmental monitoring ensures that transportation activities do not negatively impact the river ecosystem. PPM will visually monitor the barges for any leaks or spills, King County will provide Water Quality Monitoring. Other environmental monitoring also includes air, noise, light details of which can be found in the Environmental Mitigation Binder.

Safety Protocols

Comprehensive safety protocols are in place for all personnel involved in the dredging and excavation process. This includes training in emergency response procedures, the use of personal protective equipment (PPE), and in the procedures and compliance of the Health and Safety Plan (HASP). Please refer to the HASP and Emergency Response Plan in Appendix F of the RAWP for additional information. For vessel related communications and safety please refer to the Vessel Management Plan in Appendix S of the RAWP.

Mitigation Response

A leak volume threshold of 5 gallons will trigger an immediate mitigation response. Any leakage above this volume will be considered a significant event, necessitating further action.

Immediate Mitigation Response:

- **Stop Work**: Upon detection of a leak meeting or exceeding the threshold, all work in the affected area will cease immediately to prevent further leakage or environmental contamination.
- **Containment**: Implement containment measures, such as deploying spill containment booms, absorbent pads, and barriers, to prevent the spread of leaked materials.
- **Isolation**: Isolate the source of the leak, if possible, to prevent further release of materials. This will include shutting down equipment or securing walls.
- **Evacuation**: If the leak poses a significant risk to personnel safety, evacuate the area following the established emergency procedures.

Notification to EPA, Nation Response Center, and EPA Remedial Project Manager:

- **Immediate Reporting**: Notify the EPA immediately upon detection of a leak that meets or exceeds the specified threshold. The initial notification will include the estimated volume of the leak, the material involved, and the containment actions taken.

- **Follow-Up Reporting**: Submit a detailed report to the EPA within 24 hours of the initial notification, outlining the cause of the leak, the effectiveness of the containment measures, and the planned steps for remediation and prevention of future leaks.

Environmental and Safety Measures:

- **Continuous Monitoring**: Continue monitoring the site to ensure that the leakage has been fully contained and no further environmental risks are present.
- **Remediation**: Implement remediation measures as necessary to address any environmental contamination resulting from the leak.
- **Review and Update Procedures**: Review the incident to identify any necessary updates to safety and environmental procedures to prevent future occurrences.

7.0 SMA 5 Bank Excavation Details

The objective of SMA 5 construction is to implement the cleanup remedy for bank excavation of contaminated sediment. Duwamish Services, a PPM subcontractor, will be performing the SMA 5 work activities required for the bank excavation, stockpiling, and transportation of sediment to transload facilities. The plan below is generally the anticipated plan for SMA 5 excavation activities. PPM acknowledges the need to specify specialized equipment or techniques for the excavation and material placement in the nearshore/bank SMA 5 area. PPM will include this information in the additional items related to SMA 5, which will be submitted to the EPA prior to the 2026-2027 construction season. PPM will ensure that these elements are reviewed and approved by the EPA before commencing work.

7.1 Site Preparation

1. **Vegetation and Debris Clearance:**
    - Clear all vegetation and debris from the construction area to prepare for excavation activities.
    - Establish access roads and staging areas to facilitate the movement of equipment and materials.
    - Implement Temporary Erosion Control System (TESC) measures as detailed in the Site Clearing & Management and Erosion & Sediment Control Plan to minimize erosion and sediment runoff during construction.
2. **Management of Cleared and Grubbed Materials:**
    - **Trash Disposal:** All non-vegetative trash and debris will be collected and placed into regular dumpsters for disposal.
    - **Non-Contaminated Vegetation:** Vegetation grubbed from non-contaminated areas will be transported to a compost facility for recycling.
    - **Contaminated Vegetation:** Vegetation from contaminated areas will be disposed of along with contaminated sediment to prevent the spread of contamination.
3. **Fence Demolition and Debris Removal:**
    - Any fences within the construction area will be carefully dismantled and removed.

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- Debris resulting from the demolition and clearance activities will be sorted and managed according to contamination levels and disposal requirements.

7.2 Construction Activities

Methods and Procedures

Preparation

- **Tide Cycle Planning:** Develop a detailed schedule and map of work segments based on tide charts to identify optimal low tide windows for excavation and placement activities. This ensures that the maximum volume can be removed and replaced with Engineered Cap A within each tide cycle.
- **Site Setup:** Prepare the site by marking boundaries with construction stakes and setting up necessary equipment with RTK GPS machine control. Ensure all personnel are briefed on the schedule and procedures for working within the tide cycles.

Temporary Stockpiling:

- **Designated Stockpile Areas:** Clean material will be stockpiled in a designated area in the parking lot. These areas will be clearly marked and managed to prevent contamination.
- **Stockpile Management:** Ensure that stockpiled materials are kept clean and dry. Use tarps or other protective coverings if necessary to protect materials from weather conditions.

Additional stockpiling work elements associated with performing SMA 5 remain under development and will be submitted at a later date prior to construction.

Excavation Sequence:

- **Excavation above MHHW:** Overburden, vegetation, and debris will be handled the same as excavation. All material will be excavated and placed into the trucks for disposal.

- **Intertidal Excavation:** Each excavated segment will be completed from top of cut to bottom of cut.
- **Controlled Excavation:** Excavation equipment will utilize RTK GPS machine control. Exact equipment will be provided in a resubmittal in June 2026 (prior to the 206-2027 construction season) for Project Representative review and approval. All excavations will proceed from top of cut to bottom of cut.
- **Collect Samples:** The County will collect samples after removal action is complete but before material placement. Analytical results will not be required to complete the material placement activities.

1. **Machine Control and Excavation:**
   - Utilize machine control RTK (Real-Time Kinematic) systems on excavation and placement equipment to ensure precision in excavation and material placement.

- Begin excavation activities on the north side of the site, moving systematically from north to south.

2. Excavation

- Excavate targeted areas to be filled within the same tidal cycle to manage water levels and minimize sediment disturbance. Operations will begin on one side of the alignment and work the entire slope in small 15-25' wide swaths. When possible, we will load them directly into on-road trucks. When work is at night for low tide or trucks are not available the material will be loaded into a small haul truck and dumped into the stockpile area. We will excavate from top to bottom following the ebb tide. Following excavation, the excavator will be moved to a designated decontamination area where the bucket and stick will be cleaned to prevent cross-contamination. The excavator will then be moved back to the work area to continue operations.

3. **Transportation to Transload Facility:**

- Once sediment is excavated, it will be stockpiled and prepared for transportation.
- Sediment will be transported to designated transload facility using secure and sealed truck and trailers and/or side dump trucks to prevent spillage and contamination spread during transit.

Placement of Engineered Cap A

Cap Layer Placement Sequencing and Approval

SMA 5 material placement will begin immediately following the required excavation grades being achieved and after post-excavation sampling is completed

SMA 5 material placement will begin immediately following the required excavation grades being achieved and after post-excavation sampling is completed. SMA 5 will have the Engineering Cap A applied to it in the following sequence:

1. Placement of Material Type 5 in toe trench to match elevation at SMA 6 Post Backfill Surface
2. Placement of Material Type 1A
3. Placement of Material Type 4
4. Placement of Material Type 5
5. Placement of Material Type 2
6. Placement of Material Type 1 as a surface layer on top of Engineering Cap A

Material Placement in SMA 5 will occur in Season 3 (2026-2027) and will take approximately 13 days.

Targeted Thickness and Placement Criteria

The placement of Engineered Cap A involves performing intertidal excavation and placement in the dry during low tide cycles. This method ensures that work below the +14 ft MLLW is conducted efficiently and within the constraints of tidal fluctuations.

Placement of Engineered Cap A will follow a strict layer sequencing protocol to ensure stability and effectiveness. Please see Figure 1

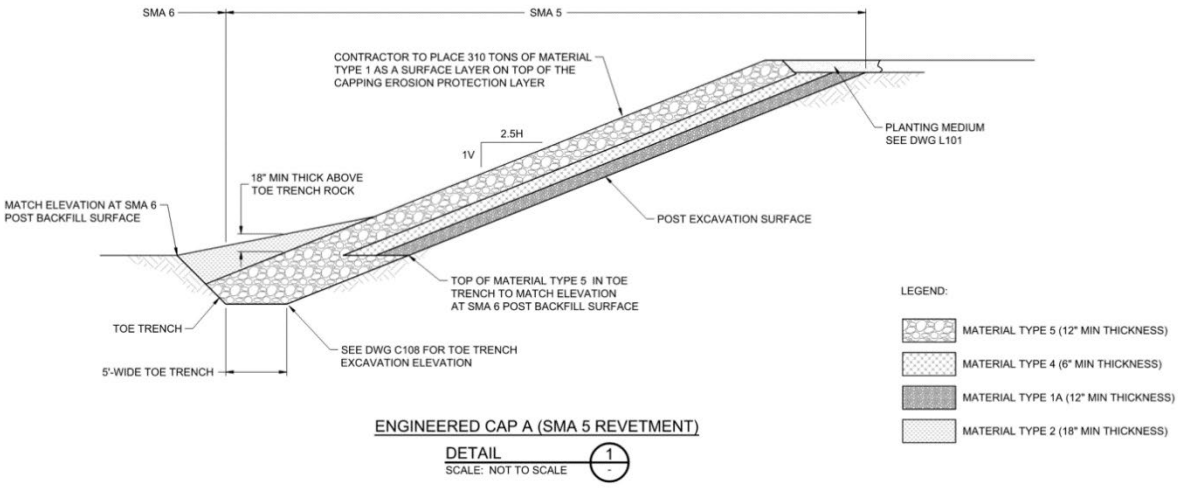

Figure 1- Engineered Cap A

Each Engineered Cap A layer must meet the specified minimum required placement thickness before the subsequent cap layer is placed. Placement will be performed in the dry during low tide cycles to prevent material displacement. Post-placement surveys will be conducted after each layer to verify compliance with the minimum required placement thickness.

Each layer will meet the specified thickness before the subsequent layer is placed. Placement will be performed in the dry during low tide cycles to prevent material displacement. Post-placement surveys will be conducted after each layer to verify compliance with the targeted thickness. 95% of the Engineered Cap surface area will meet the minimum required placement thickness. Placement activities will be documented through electronic placement records and weight tickets, ensuring that the material distribution adheres to project specifications.

Safety & Environmental Controls

Comprehensive safety protocols will be implemented to protect both workers and the environment during excavation activities. This includes ensuring that all personnel receive proper training in emergency response procedures and the use of personal protective equipment (PPE). Additionally, strict adherence to the procedures outlined in the Health and Safety Plan (HASP) is required to maintain safety standards. For more detailed information, refer to the HASP and the Emergency Response Plan (ERP).

Environmental conditions, including air and water quality, will be continuously monitored throughout the project to ensure compliance with regulatory requirements and to minimize any impacts on the surrounding areas. Please refer to Volume 3 of the RAWP for the Environmental Mitigation Binder addressing these issues.

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8.0 Protection of Existing Structures and Facilities

Pacific Pile & Marine (PPM) will implement rigorous measures to protect existing structures while performing dredging activities on the Duwamish River. The following procedures outline the approaches to safeguard structures such as South Park Marina mechanical and electrical utility services, South Park Bridge, South 98th Street Bridge, outfalls, piles, groins, wharves, bulkheads, and existing boat ramps.

8.1 Adherence to Dredge Offset Area Set-Back Requirements

PPM will strictly adhere to the dredge offset area set-back requirements when dredging adjacent to existing structures, as detailed in the project Drawings, by loading existing structures into the HYPACK positioning software and putting 30’ offsets or greater depending on the structure and drawing requirements. This ensures that all operations maintain a safe distance from structures to avoid any accidental damage.

Any damage caused by PPM’s failure to adhere to the Drawings and Specifications will be repaired to existing conditions at no additional expense to the County.

The operator will utilize the HYPACK software in conjunction with barge spotters to prevent dredge equipment, vessels, or barges from entering the restricted dredge offset area or contacting any structures.

- Barge spotters will be located at the bow and stern of the vessel that is in closest proximity to the structure that needs to be avoided.
- The spotters will use radio communication with the dredge operator, tow captain, and deck engineer to communicate barge position in relation to the structure. The spotter will provide direction and/or feedback to all parties in real-time to safely move the vessel around the structure.

PPM will utilize the HYPACK Dredging software to identify all existing structures to be protected as well as including an offset for the operators to maintain during their work activities.

SMAs requiring setbacks and/or spotters are:

- SMA 1A, 1B
- SMA 3
- SMA 4
- SMA 7
- SMA 9
- SMA 11A
- SMA 12B
- SMA 14C
- SMA 14D

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8.2 Dredging Activities Under Existing Structures

Field Verification:

PPM is responsible for field verifying the dimensions, elevations, and horizontal and vertical clearances of structures and under pier access before commencing dredging activities.

Cautious Placement and Navigation:

Cautious operations using GPS positioning and manual spotters will be exercised when placing materials, maintaining, navigating, or transitioning floating vessels or other equipment under existing structures to prevent damage. Dredging activities will not be conducted 7pm to 6am without approval from the Project Representative and additional BMPs addressed in the work plan. If daytime light does not surpass civil twilight, additional lighting will be provided to assure dredging equipment does not contact existing structures.

Special Considerations Near South Park & 98th Street Bridges:

PPM is responsible for reviewing structural as-builts and other conditions under the South Park Bridge and South 98th Street Bridge that will be encountered during dredging activities (see Section 01 13 00 – Reference Material).

For Work conducted within 30 feet of the South Park Bridge:

a. PPM will provide a spotter during Work conducted within 30 feet of bridges
b. The spotter is responsible for advising the operator of any contact with any portion of the structure.
c. The spotter will have clear sight lines between the equipment and the bridge structure and will be within radio communication with the equipment operator.
d. Abandoned bridge cables/electric utility lines (shown on the Drawings to the extent known) in the vicinity of the South Park Bridge will be cut, removed, and disposed if encountered during dredging operations, as described in Section 35 20 23 (Remedial Dredging, Barge Dewatering, and In-Water Transportation).
e. Tidal conditions and barge/equipment height will be measured and monitored during all barge transitions that require going underneath the bridges.
f. When conducting dredging operations near existing structures such as bridges and docks, several environmental factors will be carefully evaluated to mitigate the risk of damage. These factors include wind conditions, tidal patterns, and river storm flow. Prior to any dredging activities, a detailed assessment will be conducted to understand the risk for these environmental forces to cause the dredging equipment to be pushed or raised towards the structure.

Immediate Reporting of Incidents and Emergency Response:

Any incidents that have cause damage to existing structures during under bridge dredging will be immediately reported to the Project Representative.

Emergency Procedures

In the event that any dredging equipment makes unintended contact with a structure, such as a bridge, the following emergency procedures will be immediately implemented:

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1. **Immediate Cease of Operations**: All dredging and related activities will be halted immediately to prevent further damage.
2. **Notification**: The project supervisors will immediately notify the PR who will then notify all necessary parties including the bridge or dock owner, the US Coast Guard, and the EPA.
3. **Assessment of Damage**: A rapid on-site assessment will be conducted to determine the extent of the damage and the risk to structural integrity.
4. **Containment Measures**: If there is any risk of environmental contamination due to the incident (e.g., fuel or oil spill), containment measures will be deployed immediately to minimize environmental impact.
5. **Implementation of Temporary Supports**: If required, temporary supports will be installed to stabilize the structure until a more thorough evaluation and repair can be conducted.
6. **Evacuation and Traffic Control**: If the structural damage poses an immediate danger to public safety, evacuation procedures will be activated, and traffic around the structure will be controlled or diverted until the situation is resolved.
7. **Detailed Reporting and Follow-up**: A detailed report of the incident will be prepared and submitted to the relevant authorities, outlining the cause of the incident, the immediate actions taken, and the plan for permanent repairs and mitigation.

Corrective Actions for Damages:

PPM is solely responsible for any corrective actions to repair damage caused by their actions. The corrective action will vary depending on what structure was damaged, the extent of the damage, and the importance of the structure to its owner. A corrective action plan will be presented to the PR once all pertinent information is collected for review and input prior to submitting it to the damaged property's owner.

Means and Methods Selection:

Dredging under existing structures requires careful selection and implementation of means and methods to account for tidal fluctuations and limited access under bridges. This involves considering both physical access and fluctuating clearances to prevent any damage to the structures. The general approach includes:

1. **Position Tracking**:
   - Use HYPACK software to track the excavator and barge positioning in relation to structures and their offsets. This ensures precise movements and adherence to safe distances.
2. **Spotters and Visual Aids**:
   - Employ spotters on the barge and tug to provide additional oversight, especially when GPS cannot accurately account for the vertical relationship between dredge equipment and structures.
   - Install blind spot cameras on excavators and tugs where practical to enhance visibility and safety.
3. **Safety Buffers and Barriers**:
   - Installation of floating fenders or buoys around structures to act as physical barriers, preventing direct contact, in areas where GPS effectiveness could be limited.

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- Placement of marker buoys and flags around critical structures to visually indicate their locations to tug operators.

4. **Operational Controls**:
   - Implement speed limits of tugs and swing speeds of excavators operating near structures, ensuring safe and deliberate maneuvers.

8.3 Protection of Existing Structures and Facilities to Remain

Coordination with Utility Providers:

- Coordination with applicable underground utility providers will occur prior to any dredging, digging, and excavation within 30 feet of active utility crossings, such as those near the South Park Bridge, in accordance with Section 01 19 50 (Protection and Maintenance of Property and Work of PPM's equipment on the Lower Duwamish Waterway (LDW) is prohibited within 30 feet of the South Park Bridge's active submarine cable. PPM will conduct its own utility locate prior to starting any dredging activities. Utilizing HYPACK software, PPM will load the location of the submarine cable and its offsets, allowing the excavator operator to see the position of the spuds relative to the cable and offsets.
- In coordination with the tug operator and barge deck engineer, the excavator operator will direct the tug captain to hold the necessary position. Once the position is secured, the excavator operator will instruct the deck engineer to lower the spuds. If any drifting occurs from the required position, the excavator operator will instruct the deck engineer to reverse the spud placement and restart the process. Call Utility Underground Notification Center, phone number 811, for the location of underground utilities. Call a minimum of 5 working days in advance of excavation operations. Those utility owners who do not locate their utilities in accordance with RCW Chapter 19.122 are liable for costs incurred by the excavator. If the excavator discovers underground utilities that are not identified, the excavator will immediately notify the utility owner and the Utility Underground Notification Center of such utilities.
- Please refer to the Survey Positioning and Control Plan for additional details about the positioning software and equipment.

Pre-Construction Structural Condition Inspection:

- A Pre-Construction Structural Condition Inspection will be completed as described in Section 31 09 00 (Geotechnical Instrumentation and Condition Inspections). This inspection ensures a baseline condition of all structures, providing a reference to identify any damage that has occurred during the project.
- In the event of encountering other unanticipated utilities (such as outfalls otherwise not indicated in the Drawings) during dredging activities, PPM will immediately notify the Project Representative. The Project Representative will notify PPM if Work stoppage is needed and will provide PPM with further direction, as described in Section 35 20 23 (Remedial Dredging, Barge Dewatering, and In-Water Transportation).

Temporary Support Systems

- PPM will submit detailed drawings of the proposed methods to support, protect, and buttress utilities affected by the Work. These drawings will include precise plans for

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temporary supports, shoring, bracing, and any other necessary protective measures. The proposed methods and detailed drawings are required to be reviewed and accepted by the affected utility companies. This ensures that the support systems meet the specific requirements and standards set by each utility provider. PPM will provide stockpile details for SMA 5 and post-construction restoration details in a RAWP revision in June, 2026. As required by the pertinent utility, PPM will protect, maintain, support in place, or relocate all water pipelines. This involves taking adequate precautions to ensure that water supply is not disrupted and that pipelines remain intact during the dredging operations.

- Similar precautions will be taken for other utilities, such as gas, electricity, and communication lines. Detailed plans will be developed to safeguard these utilities, preventing any interruptions or damage.
- Adequate measures will be taken to protect existing sidewalks, curbs, and pavements from damage. This includes installing barriers or temporary coverings where necessary and monitoring these structures for any signs of stress or damage.
- PPM will take all necessary precautions to protect adjoining properties and structures. This includes installing temporary barriers, fencing, and other protective measures to prevent accidental damage during the Work.
- PPM will shore up, brace, underpin, and protect as necessary the foundations and other parts of existing structures adjoining the Work Site that will be affected by the Work. This includes:
    - Shoring: Installing temporary supports to stabilize structures and prevent movement or collapse during the dredging operations.
    - Bracing: Using temporary braces to support walls, foundations, and other structural elements.
    - Underpinning: Reinforcing or extending the foundation of existing structures to ensure stability and support during and after the dredging activities.
- Regular inspections will be conducted to ensure that all temporary support systems are functioning correctly and that there are no signs of stress or failure. Any issues identified will be addressed immediately to prevent further complications.
- Detailed records of all inspections, maintenance activities, and any incidents will be maintained. This documentation will be shared with relevant stakeholders, including utility providers and project managers, to ensure transparency and accountability.

Repair of Damages:

Any damage to existing structures and/or facilities caused by PPM's dredging and excavation operations will be repaired in accordance with Section 01 19 50 (Protection and Maintenance of Property and Work).

9.0 Best Management Practices (BMPs)

To minimize sediment resuspension and protect water quality during dredging operations, PPM will implement the following BMPs along with those listed in the Vessel Management, Water Quality Control, Water Management, Demolition, and Construction Quality Control plans, in addition to the minimum requirements indicated in Sections 35 20 23 3.04.C.8 and 01 35 43:

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- In areas of identified large to medium sized debris, non-buried debris that cannot be removed during dredge operations without adversely affecting the closure of the environmental bucket and seals will be removed prior to dredging using a 4 cubic yard (CY) or 3 CY closed clamshell digging bucket. If the debris is too large to grab with either bucket a hydraulic rock grapple will be utilized with Project Representative approval.
- Dredging will be limited to the approved project depths plus over-dredging in accordance with the plans and specifications.
- Multiple bites by the dredge bucket on the waterway bed before ascending to the surface will be prohibited.
- Sweeping or leveling of sediments by dragging with the dredge bucket will be prohibited.
- Dredging will be conducted using a 5 CY Young environmental (closed) bucket and 3 CY Young environmental (closed) bucket.
- Overfilling of dredge buckets will be prohibited.
- Barge sidewalls will have a minimum freeboard height of 24” to reduce the risk for spillage and overflow. Uneven filling and overfilling of barges beyond the top of the side rails will be prohibited to prevent spillage from barges. Barges will be loaded evenly to maintain stability.
- Interim underwater stockpiling of dredge material will be prohibited.
- After placing dredged sediment into the contaminated sediment barge, the opened bucket will be held above the contaminated sediment barge for a short period of time as determined by PPM and accepted by the Project Representative to allow residual materials from the bucket to fall into the contaminated sediment barge.
- If needed, the dredge bucket will be washed with a pressure washer, brush, or other means to remove loose residual materials from the bucket before lowering into the water.
- The bucket swing path from the contaminated sediment barge to the transload facility will occur over a spill apron that will span from the transload facility to the middle of the contaminated sediment barge. The apron will be angled back to the transload facility so in the event of a release from the bucket the dredged material will land on the apron and the material can drain back the transload facilities’ sediment capture area.
- Subsurface release of partially full or full dredge buckets will not be allowed; i.e., once a bucket is closed underwater, it will not be opened until it is positioned over the contaminated sediment barge, even if the operator believes it is empty.
- Where dredging occurs on a slope, removal will be from higher to lower elevation to reduce the risk for sloughing.
- Dredge cycle times will be monitored and the cycle time slowed down if water quality exceedances are observed.
- PPM will utilize a contract-compliant silt curtain "moonpool" from the front of the construction barge during SMA12B operations and as needed for other SMAs.
- Operators will have a minimum of five years of experience in marine dredging with at least one project performed on a remediation site.

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Monitoring and Contingency Plans

PPM will continuously monitor for sheens, leaks, spills, and other indicators of water quality issues. PPM will utilize high-intensity lights aimed at contaminated dredge barges and the dredge area to illuminate the water surface, allowing visual detection of sheens, leaks, and spills. PPM can elect to utilize a thermal imaging camera on-board the construction barge to detect temperature differences on the water surface which may suggest the presence of a sheen or spill. If a thermal imaging camera is used and imaging and temperature differences suggest a potential leak or sheen the Project Representative will be notified. King County and the CQA Team will implement water quality monitoring to detect exceedances of water quality criteria. Water quality exceedance criteria, monitoring frequency, and process/responsiveness for informing EPA of exceedances can be found in the Water Quality Plan located in Appendix V of the RAWP. If visual turbidity or plumes are observed, PPM will adjust operations or implement additional BMPs. Corrective measures include:

- Decreasing the bucket's velocity through the water column.
- Stopping the dredge bucket above 2-3 feet above the sediment surface before dredging to minimize bucket wake
- Temporarily stopping work and increasing cycle time.
- Dislodging sediment from the bucket over the haul barge.
- Modifying barge loading procedures to reduce spillage.
- Changing dredge buckets or modifying equipment.
- Managing propeller wash by managing the throttling of the propellors and adjusting the positioning of the thrusters/propellors in the SMA
- Adjusting barge positions to prevent grounding or scouring from tugs.
- Modifying moonpool or turbidity curtain layout and lengths.

PPM will coordinate with the Project Representative and use adaptive management to address the cause of increased turbidity or water quality exceedances. If exceedances persist, further actions will include implementing more aggressive BMPs, increasing the compliance boundary for turbidity, or temporarily stopping work to assess the source of the exceedance.

Selection of Dredge Bucket

Environmental buckets will be utilized as the default bucket, unless not practicable due to site conditions. The Project Representative will be notified and approval must be given prior to utilizing a non-environmental bucket.

Removal of Identified Debris

Debris will be removed prior to dredging in known debris areas, refer to Section 4.1 for additional details.

Prohibited Practices

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- Multiple bites by the dredge bucket on the waterway bed before ascending to the surface are prohibited.
- "Sweeping" or leveling the waterway bed by pushing dredge material around with the bucket to achieve required elevations or thicknesses is prohibited. Instead, additional dredging passes will be made to remove high spots.
- Interim underwater stockpiling of dredge material is prohibited.
- Overfilling and uneven filling of buckets is prohibited.

Dredge Prism and SMA Management

Clearly demarcate the boundaries of the active Dredge Prism and completed SMAs in the HYPACK positioning software to ensure dredging activities do not extend into areas where material placement has been completed or into areas outside of the dredge prism. This precaution helps prevent the spread of contaminated sediments to completed and clean SMAs. A 50’ buffer will be maintained between active dredging areas and completed material placement areas.

Sediment Containment

Use watertight, sealed barges for the transportation of dredged materials to prevent leakage and contamination during transport.

Controlled Dredging

Adjust operational parameters such as reducing the rate of removal, limiting operations to specific hydrodynamic conditions, and optimizing excavator boom and bucket movements, depth of cut, and sequencing of bucket cuts. Plan the dredging sequence to move from upstream to downstream units, or adjust according to the number of vertical cuts, to minimize the resuspension and spread of contaminants. Utilize level-cut buckets to prevent the formation of a sediment slurry that is difficult to capture, reducing the residual layer. Implement real-time monitoring to provide feedback to operators, allowing adjustments in the rate and method of operation to mitigate contaminant release for given conditions.

Training and Compliance

Ensure all personnel involved in dredging operations are trained in BMPs and environmental compliance. Conduct regular inspections and audits to verify adherence to BMPs and rectify any deviations as soon as they are encountered.

10.0 Quality Control, Positioning Equipment and Methods, and Surveys

The procedures for quality control, positioning equipment and methods, and surveys during dredging operations are designed to ensure compliance with project specifications and maintain accurate records. Key activities include daily and weekly reporting, as well as comprehensive surveys conducted at various stages of the project. Daily logs will document all activities, equipment used, areas dredged, volumes removed, and any incidents or deviations. Weekly summaries will compile daily logs and progress measurements, helping to plan subsequent activities and address any issues during weekly review meetings with the Project Representative.

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PPM will employ Marker Offshore, a third-party WA state licensed PLS, to conduct all pre-construction, progress, and post-construction bathymetric and topographic surveys. These surveys will establish baseline conditions, document progress, and verify completion as per specifications. Daily progress surveys will ensure compliance with planned dredging depths and boundaries, using multibeam survey equipment for high accuracy. Post-construction surveys will confirm that all work meets required standards, and final as-built surveys will provide detailed records of completed dredging operations. Detailed procedures and requirements for these activities are further outlined in the Construction Quality Control Plan in Appendix N and the Survey and Positioning Plan in Appendix H of the RAWP.

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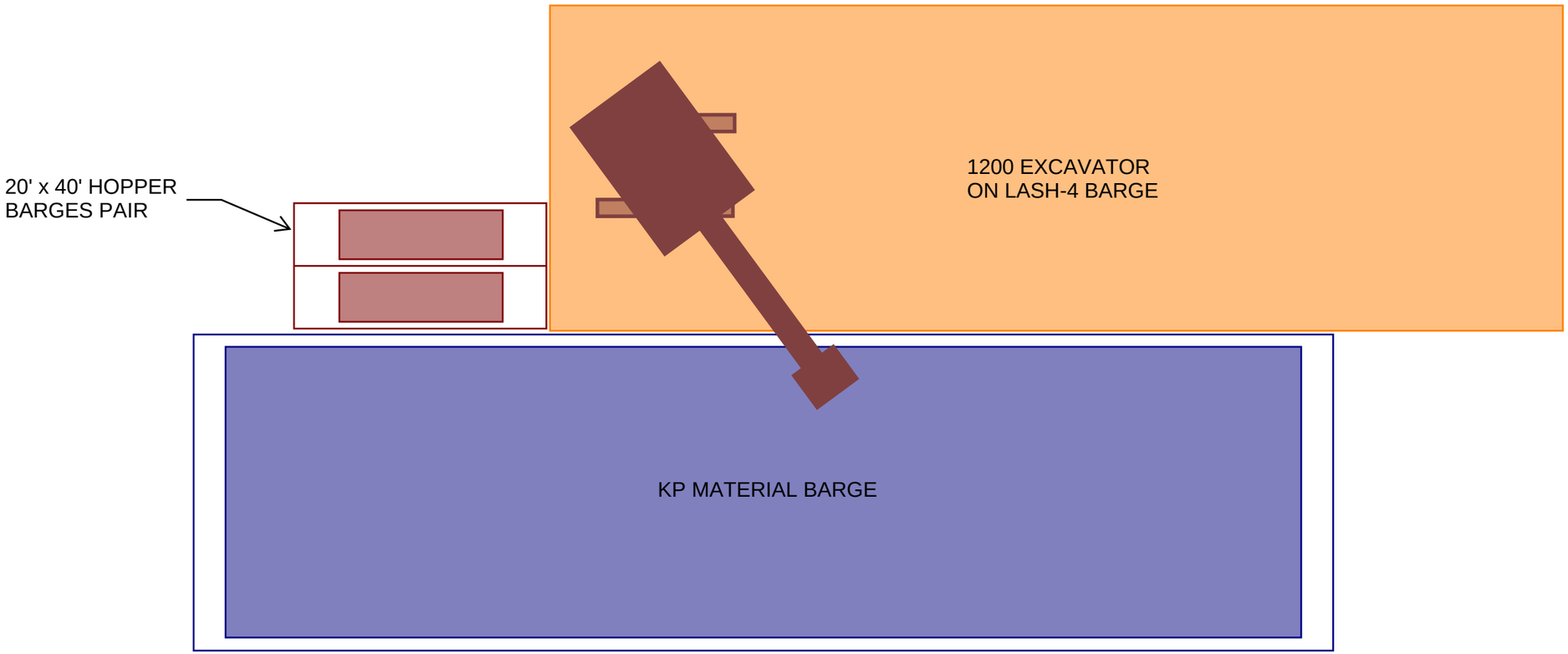
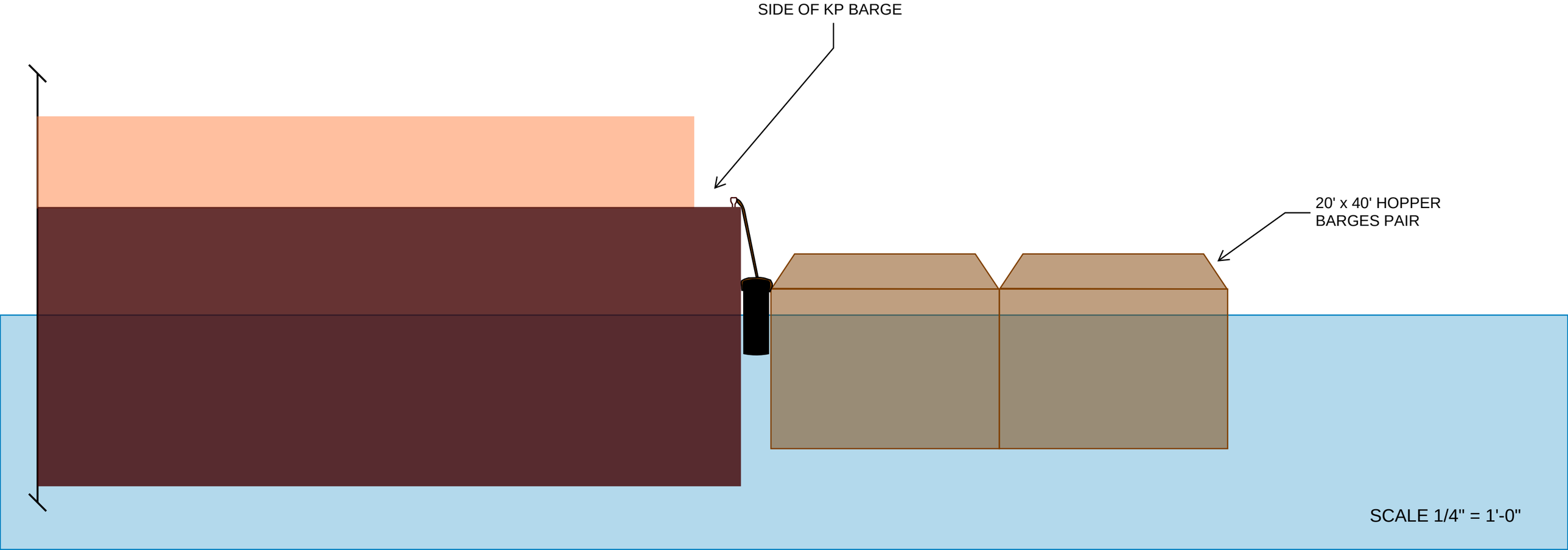
Attachment A- Barge to Barge Diagram

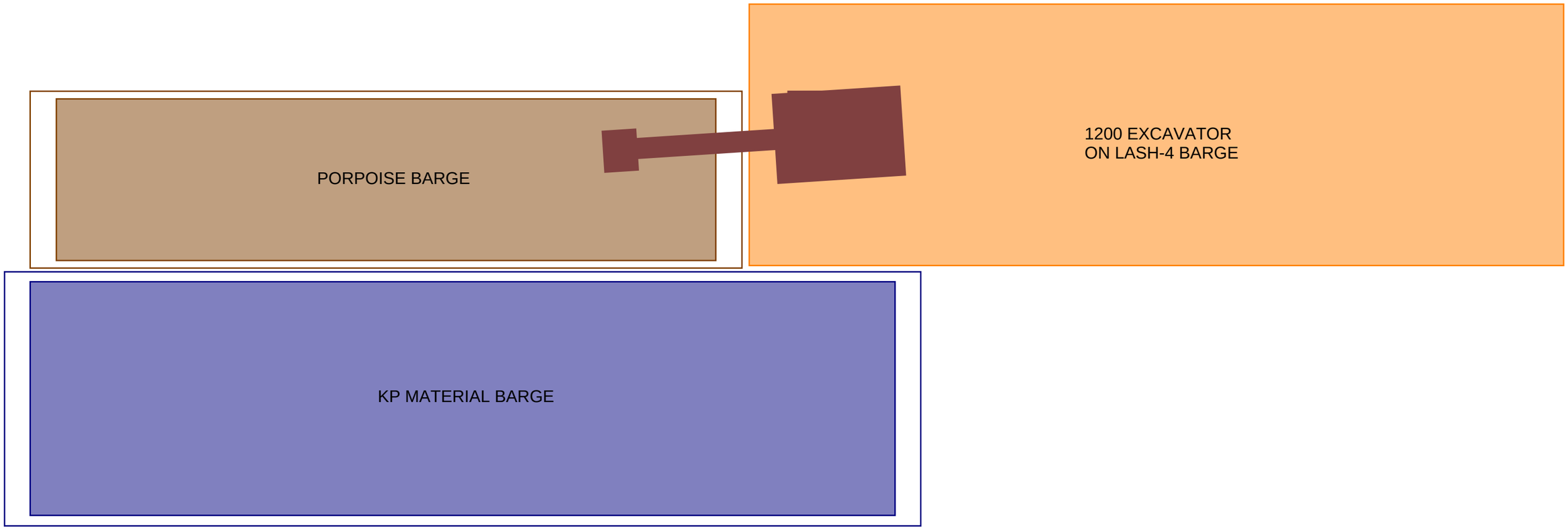


BARGE TO BARGE TRANSFER
CONFIGURATION - PLAN VIEW

SCALE 1" = 20'

CROSS SECTION

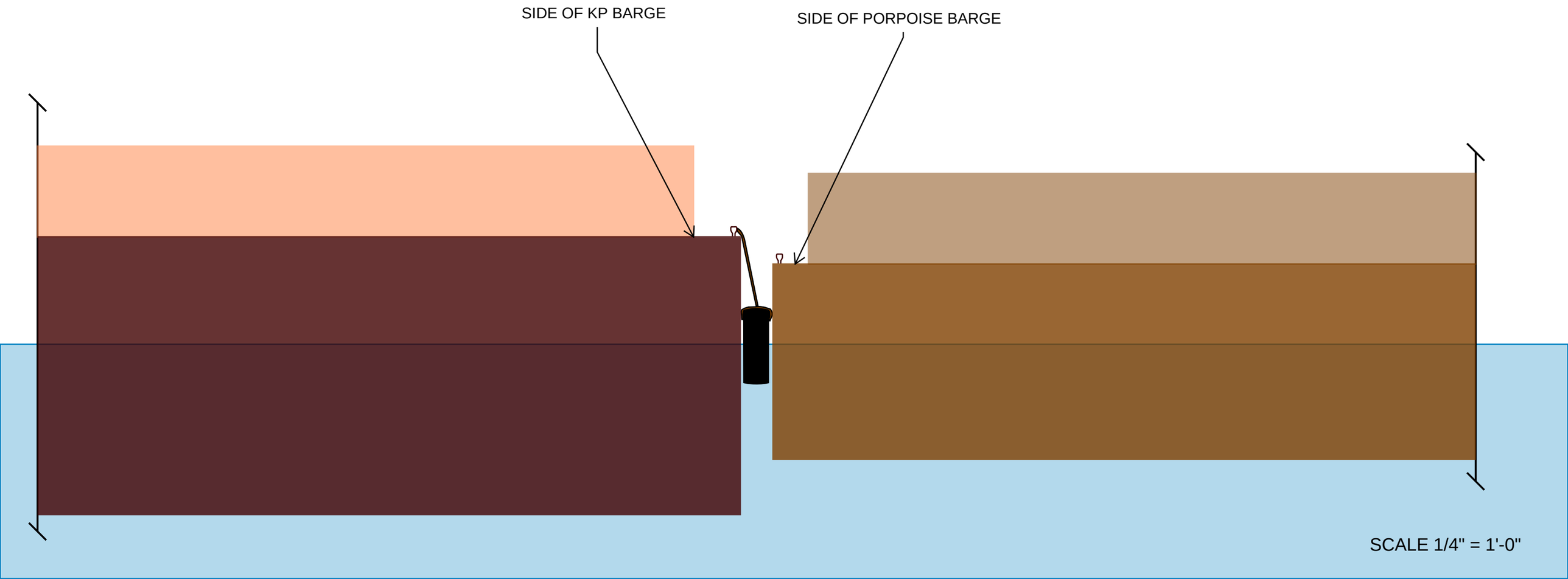




CONTINGENT BARGE TO BARGE
TRANSFER CONFIGURATION - PLAN VIEW

SCALE 1" = 20'

CROSS SECTION



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Attachment B- GAC-infused Geotextile

Tektoseal® Active AC 2000

Data Sheet

Environmental Engineering

Tektoseal® Active AC is an adsorptive geocomposite comprised of two geotextiles with an inner layer of activated carbon which are bonded together by a needlepunch process. Tektoseal® Active AC has been developed to help provide high-performance sorption for groundwater protection, contaminated sediment remediation and odor control.

Chemical and Physical Properties of Tektoseal® Active AC 2000[1]

PROPERTY	TEST	ENGLISH units	SI units
Total Mass/Unit Area	ASTM D-5261	0.50 lb/ft^2 min	2400 g/m^2 min.
Activated Carbon			
Mass/Unit Area	ASTM D-5261	0.41 lb/ft^2 min.	2000 g/m^2 min.
Iodine Number	ASTM D-4607		850 mg/g min.
Wide Width Tensile Strength[2]	ASTM D-4595	57 lbf/in min.	10 kN/m min.
CBR Puncture Resistance	ASTM D-6241	900 lb-f min.	4000 N min.

[1]Tektoseal Active AC available in various mass/unit area carbon loadings

[2]MD-Machine Direction and CMD – Cross Machine Direction

Standard Roll Size: 16' (4.9 m) width
101' (30.7 m) length

Weight (typical): 840 lbs

Each roll of Tektoseal® Active geocomposite delivered to the project site is labeled by HUESKER with a roll label that indicates manufacturer's name, product identification, lot number, roll number and roll dimensions. All rolls of Tektoseal® are encased in a sturdy polyethylene wrap to shield the product from rain, dirt, dust and UV exposure. Contact HUESKER for information on our material warranty.

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