

# **Bradwood Landing Dredge Material Placement and Management Plan**

## **1.0 INTRODUCTION AND PURPOSE**

The Bradwood Landing (BL) site is located on the Columbia River at river mile 38 and is described in the Clatsop County Assessor's records as follows:

- Section 9, Township 8 North, Range 6 West, Willamette Meridian, Tax Lots 100, 200, 300, 400, 500;
- Section 5, Township 8 North, Range 6 West, Willamette Meridian, Tax Lots 100, 900, 1100, 1101.

The Bradwood Landing site is located on a relatively flat plain adjacent to the Columbia River (Figure 1). The site is bounded to the west and northwest by the Hunt Creek estuary, north, northeast, and east by the Columbia River, and southwest by a steep, 230-foot-tall escarpment. A portion of this escarpment is designated in the Clatsop County records as a rock quarry (Oregon Department of Geology and Mineral Industries [DOGAMI] Permit # 04-0067). From Highway 30, Clifton Road heads north following the Hunt Creek canyon and descends to the flat plain upon which the site is located.

In 2002, the U.S. Army Corps of Engineers (Corps) used the property as a disposal site for approximately 350,000 cubic yards of sediment dredged from the Columbia River as part of the Corps maintenance of the Columbia River Navigation Channel. The site is designated on the Clatsop County Comprehensive Plan as a Dredged Material Management Site. The dredged material, consisting primarily of sand, was placed in two large piles on site, which are visible on Figure 2.

The Bradwood Landing LNG terminal (Terminal) will be built to accommodate one LNG ship at a time at a single berth. The purpose of this plan is to document and discuss the following topics as they relate to the development of the Terminal:

- dredging requirements (i.e., depth, surface area affected, and volume)
- general characteristics of the materials to be dredged
- dredging methods considered suitable for this project
- dredged material placement plan

## **2.0 DREDGING REQUIREMENTS**

### **2.1 Dredge Area - Berth Layout Alternatives Considered**

The area to be dredged for the project was driven by the development of a maneuvering and berthing area that would be safe for LNG ship operations while minimizing the area to be dredged. The dredge area for the final layout is approximately 50 acres. Figure 1 illustrates the proposed area to be dredged during Terminal construction.

## 2.2 Side Slopes

The side slopes of the dredged area will be cut at 3 (horizontal) to 1 (vertical) angle from the toe up to the natural grade around the perimeter of the berthing and maneuvering area. This angle is based on slope stability and to minimize the overall impact area for the dredging work

## 2.3 Summary of Dredging Requirements

Consistent efforts were undertaken during the development of the project maneuvering and berthing area to minimize the need to dredge and fill within the Columbia River while creating a safe arrangement for LNG ships. The following data are the dredging requirements for the project:

- Dredge area .....approximately 55 acres
- Design dredge depth (reference CRD) .....-42 feet
- 1 foot (maximum overdredge allowance)
- Approximate Dredge volume.....610,000 cubic yards
- Overdredge volume.....71,000 cubic yards

Within the approximately 55-acre dredging footprint there are several areas that are deeper than 42 feet and would not need to be dredged.

## 3.0 DREDGED MATERIAL CHARACTERISTICS

Sediment borings were obtained from representative portions of the proposed dredging prism to determine the general characteristics of the proposed dredged material. The analysis of the sediment found that the particle size distribution of the material was primarily medium and coarse sand; this sand will readily settle in water producing minimum turbulence. The analysis of the sediments were reviewed by the US Army Corps of Engineers, Oregon Department of Environment, the US Environmental Protection Agency and the National Marine Fisheries Service. The results indicate that the sediments within the dredging prism do not contain contaminants in concentrations exceeding thresholds that would prevent placement of the dredged materials in upland or flow lane sites.

## 4.0 DREDGING METHODS (EQUIPMENT)

Included below is a description of the hydraulic dredging methods that are possible for the Terminal. Additionally, a description of mechanical dredging, which could be appropriate for this project, and general information regarding dredging operations are provided below.

### 4.1 Hydraulic Dredging

Two types of hydraulic dredge units have historically been utilized in the Columbia River area: self-propelled hopper dredges and cutterhead pipeline dredges.

The hopper dredge is a seagoing vessel that can move from one area to another quite effectively under its own power. A hopper dredge excavates dredged material by lowering drag arms to the bottom to dislodge material, then 'vacuums' the material into the hopper, or holding area, within the ship. In order to effectively operate, a hopper dredge must be moving forward while dredging. They also typically operate most efficiently over long distances, such as in navigation

channels. A hopper dredge is not ideally suited for this project because of the relatively confined space of the dredging work at the LNG terminal.

A cutterhead pipeline or suction dredge uses its cutterhead to break up the materials to be dredged on the bottom, then ‘vacuums’ the materials into a pipeline. Prior to dredging, the pipeline is laid between the site to be dredged and the dredged material placement area. Pumping distance is a limiting factor for selection of a cutterhead pipeline dredge unit for a particular job. The typical maximum pumping distance is roughly two miles. Dredging production rates are dependent upon the characteristics of the materials to be dredged, the equipment employed in the operation, and the length of the pipeline.

BL proposes to use a cutterhead dredge to excavate the turning basin at the Terminal provided dredged materials are placed at the Terminal site or other near by upland site.

#### **4.2 Mechanical Dredging**

Two types of mechanical dredging units are typically used in the Columbia River area: clamshell dredges and dipper dredges. Both types of mechanical dredging units use barges or scows to haul the dredged material to placement areas. The bottoms of these barges or scows are generally designed to be opened, whereby the dredged material is dropped to the river bed or sea floor at the dredged material placement area. Therefore, additional unloading and materials handling equipment is not necessary at the placement location. Typical production dredging with these two mechanical methods includes multiple barges or scows and tug boats so that production can be maintained while full barges are towed to the placement site(s). The production rate of a mechanical dredging operation is dependent upon several factors including dredged material characteristics, bucket size, and the efficiency of exchanging the barges or scows.

#### **4.3 Hydraulic and Mechanical Dredging Comparison**

Hydraulic pipeline dredging does not require the use of scows or barges to transport the dredged material and is generally less expensive than mechanical dredging when the placement site is nearby. Mechanical dredging is typically more economical than pipeline dredging when the distance between the dredging site and the placement area is greater than three to five miles (which is the typical limit for large hydraulic dredging units with pipelines).

### **5.0 DREDGED MATERIAL PLACEMENT ALTERNATIVES**

The following is a discussion of the dredged material placement alternatives considered for the Terminal Project. The alternatives are broken down into upland placement, aquatic placement, and beach nourishment.

#### **5.1 Primary Alternative - Bradwood Landing**

The Bradwood Landing site is designated on the Clatsop County Comprehensive Plan as a Dredged Material Management Site. All of the materials dredged from the marine berth and maneuvering area could be accommodated on-site during preparation of the property for LNG terminal construction. At least 350,000 cy to 400,000 cy of dredged material will be placed onto Bradwood to raise the site elevation.