

Appendix H

DETAILED DESCRIPTION OF VESSELS USED IN SAND MINING

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APPENDIX H

Detailed Description of Vessels Used in Mining Operations

Source: Applicants' Project Description contained in their Application Materials

Hanson Marine Operations, Inc. – Additional Detail on Equipment and Mining Methods

Hanson currently utilizes two tugboat / hopper dredge barge pairs for sand mining as described on Table I-1. Hanson uses a moving potholing method as shown in Figure 2-3 in Chapter 2, Project Description. Mining and loading equipment are very similar as shown in Table I-1. Hanson owns two tugboats, the **American River** and the **William R / Sand Merchant** and two sand mining barges, the **DS10** and the **Sand Merchant**. The tugboats can be used with either of the sand mining barges. Mining equipment information used by Hanson is presented below and then briefly discussed on the following pages for the two sand mining barges.

Table I-1

Parameter	<i>American River / DS10</i>	<i>William R / Sand Merchant</i>
Tugboat		
Length (feet)	64.2	74.4
Width (feet)	26.1	26.3
Draft (feet)	8.0	8.0
Barge		
Type	Hopper	Hopper
Length (feet)	217.8	230
Width (feet)	43.1	55
Draft, loaded (feet)	15.4	14
Capacity (cubic yards)	1850	2400
Loading chute dimensions (L x W x H)	147 feet x 30" x 33"	180 feet x 24" x 28'
Loading chute gates (number)	7	10
Screen mesh on loading chute gates	½ inch	½ inch
Drag Arm		
Length (feet)	100	120
Diameter (inches)	16	20
Drag Head		
Dimensions in feet (L x W x H)	4 x 3 x 4	4 x 3 x 4
Jetted	Yes	No
Grizzly	Yes, 6-inch	Yes, 6-inch
Offloading System		
Type	Hydraulic (slurry)	Hydraulic (slurry) and Conveyor
Offloading sites (Figure 2-10)	Martinez (Marina Vista, Waterfront) San Rafael (Dutra)	Oakland (Tidewater) Martinez (Waterfront) San Francisco (2 sites) San Rafael (Dutra)
Operations		
Minimum operating depth (feet)	20	20
Maximum Operating depth (feet)	80	80
Maximum pumping capacity (gallons per minute)	10,000	15,000
Type of Operation	Moving Pothole	Moving Pothole
Typical sand-water slurries (% composition, sand: water using Central Bay data)	19:81 for blend and fill sand 14:86 for coarse sand	17:83 for blend and fill sand 12:88 for coarse

American River tugboat & DS10 barge

Most of the time, the **American River** tugboat is paired with the **DS10** barge. The barge is 218 feet long by 43 feet wide with a loaded draft of 15 feet (Table I-1). The DS10 has a load capacity of approximately 1850 cubic yards. As a consequence of the barge draft and configuration of the drag arm, practical sand mining is limited to water deeper than approximately 20 feet.

Prior to mining, water is pumped into the cargo hopper for a period of approximately 30 minutes to create ballast and help stabilize the barge. During a sand mining event, the barge is positioned over a sand shoal and sand is loaded into the cargo hopper using a trailing suction dredge “drag arm.” The drag arm, comprised of a 16-inch diameter pipe 100 feet long, is mounted on the side of the barge, with a “drag head” attached to the end. The drag head measures 4 feet long by 3 feet wide by 4 feet high with a 6-inch “grizzly” to exclude oversized material from damaging or blocking the drag head and suction pipe. Additionally, this drag head is equipped with cutter jets, which help break up compacted material in front of the drag head by using water jets to cut into the bottom substrate.

During mining, the drag head is lowered to the shoal surface using two cable winches to a practical operating minimum depth of 20 feet and a maximum depth of 80 feet. The sand is drawn into the drag arm using a 16-inch centrifugal deck mounted pump capable of pumping 10,000 gallons per minute of water. The drag head floats just off the bottom of the sand surface to create a sand-water slurry, since there are no vacuum relief valves (i.e. water intake pipe) on top of the drag head. Based on data collected during this study, it was estimated that the sand-water slurry is approximately 19% sand and 81% water for blend and fill sand, and 14% sand and 86% water for coarse sand. If the sand is “good” (loose), determined by the dark color of the slurry filling the hopper and vacuum gauge measurements, the operator mines the sand using the traditional potholing method, generally staying in one place allowing the drag head to gradually lower as sand is removed from the mining location. On average, the drag head is lowered to between 3 to 5 feet below the original substrate surface depth, with a maximum of 12-15 feet in ideal conditions of low current flow and loose sand.

William R tugboat & the Sand Merchant hopper barge

Most of the time, the **William R.** tugboat is paired with the **Sand Merchant** hopper barge. The barge is 230 feet long by 55 feet wide, with a loaded draft of 14 feet (Table I-1). The barge load capacity is approximately 2400 cubic yards. The **Sand Merchant** is limited by draft and other practical operating constraints to mining in water a minimum depth of 20 feet.

Sand is loaded into the cargo hopper using a trailing suction dredge “drag arm.” The drag arm is comprised of a 20-inch diameter pipe, 120 feet long, mounted on the side of the barge. The “drag head” attached to the end of the suction pipe measures 4 feet by 3 feet by 4 feet and has a 6-inch “grizzly” incorporated into it to screen off oversize material. The drag head is lowered to the shoal surface using two cable winches to a minimum depth of 30 feet and a maximum depth of 80 feet. The sand is drawn into the drag arm using a 20-inch centrifugal deck mounted pump capable of 15,000 gpm. While traveling to the mining location, the hopper barge is flooded by filling it approximately 1/3 full with water from the bay as ballast. As sand mining starts, the drag head is lowered to the sand shoal surface and water is mixed with the sand to create a slurry of approximately 17% sand and 83% water for blend and fill sand and 12 % sand and 88% water for coarse sand. The drag head has no vacuum relief valves (i.e. water intake pipes) and hence cannot be completely buried in the sand surface during mining.

The **DS 10** is equipped with pump offload capability only, and **Sand Merchant** has both dry offload capability (i.e. use of a conveyor belt system) and pump offload capability. For pump offloading, the cargo hopper is flooded with water from the estuary, and the sand-water slurry that is created is pumped onshore into a dewatering pond where the sand is allowed to settle and the water is drained through a weir system. The sand is then pushed out into the yard using a bulldozer. For the dry offload process, the hopper barge is equipped with two drag buckets which are pulled along either side (inside the cargo hopper) pulling the sand to the front of the barge feeding a hopper which in turn feeds a transfer conveyer. From the transfer conveyer, the sand is transferred onto the boom conveyer, which extends overboard to the shore side conveyer system stockpiling sand within the yard. The **Sand Merchant can** be offloaded at all locations (Figure 2-10 in Chapter 2, Project Description). The **DS10 can** be offloaded at Hanson Marina Vista and Hanson Waterfront Yard (Figure 2-10 in Chapter 2, Project Description).

Jerico Products, Inc. / Morris Tug & Barge – Additional Detail on Equipment and Mining Methods

Jerico’s equipment for mining consists of four tugboats, the *Trig Lind*, the *Tug Petaluma*, *Bernice Lind*, the *Barbara Lind* and a barge, the J5200, equipped with a hopper, with a total capacity of 1850 cy (Table I-2). The tugs push the barge, which is 200 feet long by 45 feet wide with a loaded draft of 12 feet. When the barge is unloaded, the draft is 3.5 feet. Additional information on the mining equipment used by Jerico Products is presented in Table I-2 and briefly summarized in the following pages.

Table I-2. Summary of Jerico Products/Morris Tug and Barge sand mining operations in the Bay-Delta

Parameter	Tugboat Details			
	Trig Lind	Tug Petaluma	Bernice Lind	Barbara Lind
Tugboat				
Length (feet)	75	65	60	65
Width (feet)	35	25	22	17
Draft (feet)	7	7	7	7

Barge	
Type	Hopper
Length (feet)	200
Width (feet)	45
Draft, loaded (feet)	12
Capacity (cy)	1850
Loading chute dimensions (L x W x H)	Flume with loading gates
Loading chute gates (number)	13
Screen mesh on loading chute gates	¼ inch
Drag Arm	
Length (feet)	40
Diameter (inches)	14
Drag Head	
Dimensions in feet (L x W x H)	4 x 3 x 4 14 inch pipe opening
Jetted	No
Grizzly	Yes, 6 inches
Offloading System	
Type	Conveyor
Offloading sites (Figure 2-10)	Petaluma, Napa, Collinsville
Operations	
Minimum operating depth (feet)	15
Maximum Operating depth (feet)	40 Suisun & Middle Ground 90 Central
Maximum pumping capacity (gallons per minute)	4,000
Type of Operation	Trolling
Typical sand-water slurries (% composition, sand:water)	23:77 Middle Ground; 27:73 Suisun Bay

Jerico's equipment and methods limit it to mining in water from approximately 15 to 40 feet in depth in Suisun & Middle Ground and from 15 to 90 feet in Central Bay as an approved subcontractor for Central Bay leaseholders. Jerico primarily uses the stationary pothole method shown in Figure 2-3 in Chapter 2, Project Description. Occasionally, Jerico will also utilize the trolling method or the moving pothole method shown in Figure 2-3.

With the stationary pothole method, the anchor is set so the barge is positioned facing into the current over the appropriate sand shoal. ~~A 40-foot pipe with a hydraulic suction drag head that is 4 feet long by 3 feet wide by 4 feet high is lowered into the water using a cable winch. The sand is drawn up through the drag head using a 4000 gpm hydraulic pump. Water is continually mixed with sand to create a slurry (approximately 23% sand and 77% water at Middle Ground and 27% sand and 73% water when mining in Suisun Bay).~~ The end of the 14-inch suction pipe fitted with a grizzly screen is inserted into the sand. A hydraulic pump draws the sand up through the pipe. Water drawn into the suction pipe through one or more water intake pipes located on top of the suction pipe is continually mixed with the sand to create a slurry. The sand-water slurry is pumped into a flume equipped with loading gates, which allows the barge to fill. The water pumped on board overflows through mesh screens on the barge located above the water line and is returned to the estuary. Fines, along with aeration bubbles, dissolved materials, and plankton returned to the estuary contribute to formation of an overflow plume.

Sand mining is limited to water having a minimum depth of 15 feet and a maximum depth of 90 feet. The suction head pipe is placed on the bottom surface and as the sand is harvested, it is lowered approximately 15 to 20 feet into the sand substrate creating a pothole. Once the pothole is created, the sand continues to fall into the hole, and the entire barge can be loaded by moving the suction head up or down, approximately 1 foot or less. When fully loaded the barge draft is approximately 12 feet.

After loading the sand, the barge returns to an offload site at Petaluma, Napa or Collinsville (Figure 2-10 in Chapter 2). At the offload site, a conveyer belt is moved to the side, and a tractor is used to push the sand into the hopper. The sand is discharged into a pile at the yard by a conveyer belt system.