

A19 **SECTION 35 20 23 - DREDGING**

## 1.01 SUMMARY:

- A. This Section covers the requirements for all dredging, which may be deemed necessary, within the Site in order to:
1. Connect the Works with the Pacific access channel, i.e. between the Pacific locks and the Pacific entrance, including the removal of any Temporary Works (e.g.: cofferdam, which may have been deemed necessary for the purpose of creating a dry work environment at the south of end of the Pacific Site). The work on the access channel itself will be performed by others under the contract “Widening and Deepening of the Pacific Entrance and the South Approach Channel to the Third Set of Locks of the Panama Canal”, which is included for reference in Volume VI, Part 11.
  2. Connect the Works with the Atlantic access channel, i.e. between the Atlantic locks and the Atlantic entrance, including the removal of the plug north of the Atlantic locks. The work on the access channel itself will be performed by others under a separate contract to dredge the Atlantic entrance.
  3. Remove the plug south of the Atlantic locks to connect the Works with Gatun Lake.
  4. Remove the intermediate plug north of the Pacific locks to connect the Works with the Pacific Approach Channel (PAC).
- B. The work includes disposal of all the dredged material at the designated disposal sites.

## 1.02 REFERENCES:

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| A. | <b>Autoridad Aeronáutica Civil (AAC) Regulations:</b><br><br><div style="text-align: right;">Reglamento de Aviación Civil de Panamá (RACP),<br/>book XXIII, titles I and II</div>           |
| B. | <b>Autoridad del Canal de Panamá (ACP) Regulations:</b><br><br><div style="text-align: right;">Reglamentos Marítimos para la Operación del<br/>Canal de Panamá</div>                        |
| C. | <b>International Association of Lighthouse Authorities (IALA)</b>   |
| D. | <b>U.S. Army Corps of Engineer's Manual:</b><br><br><div style="display: flex; justify-content: space-between;"> <span>EM 1110-2-1003</span> <span>Hydrographic Survey Manual</span> </div> |
| E. | <b>ACP Safety Standards and Regulations</b>   |

### 1.03 REQUIREMENTS:

- A. **General:** The Contractor shall perform dredging in the best practice of the trade and to fully satisfy the purpose of this Contract. The Contractor shall be capable of conducting underwater drilling and blasting operations where required to meet project depth.

- B. **Physical Data:** The Contractor shall perform his own site investigation of the Site for the design and construction of the Works, and to determine geographic and physical constraints, the nature and quantity of the material to be dredged, debris, wrecks or abandoned structures in the area, and potential interactions with Operations, channel traffic and adjacent contractors. The investigation shall be subject to the provisions of Sub-Clauses 4.10 (*Site Data*), 4.12 (*Unforeseeable Physical Conditions*) and 5.1 (*General Design Obligations*) of the Conditions of Contract. The information provided in Volume VI (*Reference Documents*) is for information only and subject to Sub-Clause 5.1 (*General Design Obligations*) of the Conditions of Contract. The Contractor may use the information provided or conduct additional investigation to supplement currently available information as he deems necessary. The final Site characterization shall be based solely on the Contractors' interpretation of the hydrographic surveys, and the geotechnical and geological information made available to him and that obtained directly by the Contractor.
- C. **Docking Facilities:** The Contractor shall be responsible for the docking arrangement necessary for his floating equipment. Additionally, the Contractor shall be responsible for deployment, support activities, coordination with local ports and harbor management authorities having jurisdiction. Refer to Subparagraph 1.10 M. (*Contractor's Docks*) of Section 01 50 00 (*Temporary Facilities, Accesses and Controls*).
- D. **Contractor's Equipment:**
1. **General:**
    - a. The Contractor shall use the type and number of equipment he considers adequate to perform the Works. The Contractor's Equipment shall be in excellent working condition and be proven in similar work. The Contractor's Equipment used in the performance of the Works shall be inspected by the Contractor and maintained in good operating condition at all times. The Contractor's Equipment that is floating equipment shall meet requirements of Paragraph 1.06 (*Additional Requirements when the Contractor Uses Floating Equipment*) of Section 01 14 00 (*Work Restrictions*). The Employer's Representative may also inspect this equipment prior to commencement and during operations to confirm its capabilities and that the necessary support activities are safely executed.
    - b. All Contractor dredges, barges and auxiliary equipment shall at all times display prescribed day shapes and navigation/identification lights where they can be best seen without being obstructed by other structures and representing the operation being performed (i.e.: restricted in its ability to maneuver, passing lights, etc.) in compliance with the Employer's Reglamentos Marítimos para la Operación del Canal de Panamá. If any of the Contractor's Equipment breaks down, the Contractor shall immediately inform the Employer's Representative of the suspension of operations and the estimated time required for repairs or replacement of the equipment. This notification is to permit the Employer to relieve or reschedule the affected Employer's Personnel, equipment, or both from duty. Any equipment using ionizing radiation shall meet the requirements of Paragraph 1.15 (*Ionizing Radiation*) of Section 01 35 23

(*Health and Safety Requirements*). Specific requirements for Contractor's Equipment shall be as follows:

2. **Trailing Suction Hopper Dredge (TSHD):**

- a. Shall be equipped with bow thrusters.
- b. Capacity of the hopper dredge shall not be limited, but vessel (dredge) dimensions (length overall, beam and draft) will be evaluated by the Employer's Representative to verify that they can safely operate within the channel configuration.
- c. The minimum speed in the loaded condition shall not be less than 5 knots.
- d. Hopper dredge doors or valves shall be completely sealed during operations and whenever transporting material to the disposal sites.
- e. Overflow shall be level at its maximum height and properly closed during the whole dredging cycle, unless otherwise approved by the Employer's Representative.
- f. Hopper dredges shall be equipped with securing devices (wedges, safety pins, etc.) to avoid accidental opening of doors/gates and valves and ensure proper containment of material in the event of a power failure.
- g. Pumping out material with sediments in suspension into Canal waters and sailing routes shall not be allowed. No rainbow discharge shall be allowed. Shore line discharge will be acceptable, but the methodology requires the Employer's Representative approval. No overflow, flush or discharge of sediments in suspension, slurry or dredged material shall be allowed at the work Site or during transportation. Exceptions to these conditions to optimize the removal of shoals or high spots will be evaluated and may be approved by the Employer's Representative, but special restrictions may be required.
- h. If there are 2 suction pipes in use, suction on the boarding side suction shall be stopped during personnel boarding.
- i. For safety reasons, deck personnel with radio communication devices shall be present whenever Employer's Personnel or visitors are boarding the dredge.
- j. Boarding facilities, especially the pilot's ladder, shall be set in such a way that it may be easily lowered and hoisted to be used at different draft elevations to help reduce impact to operations and ensure safe boarding.
- k. Hopper dredge fill-up shall not exceed the certificated and approved load lines. Material discharge at the designed open water disposal site shall be executed on the selected grid cell and with the vessel not making way to reduce the possibility of dispersing sediments in suspension in a larger area.
- l. No garbage, trash or residues shall be thrown in the hopper dredge.

- m. The presence of organic materials in the hopper dredge, and those vaporized during dredging and discharge procedures shall require that Employer's and Contractor's personnel keep out of the direct influence perimeter during these activities. Adequate safety equipment shall be required.
  - n. Flushing or washing the hopper shall be done at the disposal site, not during sailing or near the sailing route.
- 3. **Mechanical Dredges:** Backhoes, clamshell and dipper dredges shall be capable of holding and effectively removing boulders from the bottom and unloading them on dump barges. The Contractor shall include in his dredging execution plan the methods and procedures to remove jammed boulders from buckets and to determine whether use of explosives shall be required.
- 4. **Cutter Suction Dredges:**
  - a. If anchors are used to hold the dredge in position and/or to swing the drag head/cutter during operation, they shall be below the navigational depth if positioned within the channel and their position shall be marked with removable buoys.
  - b. Colors, shapes and lights shall be applied in accordance with Employer's Reglamentos Marítimos para la Operación del Canal de Panamá and the International Association of Lighthouse Authorities (IALA).
  - c. Swing cables used in the areas of navigational channels or anchorages shall be slacked during the passage of vessels.
  - d. Whenever anchors have to be placed on shore to hold the dredge in position, special planning shall be required to determine how areas would be impacted and to remove or relocate structures and objects, if necessary.
  - e. Removal of structures shall be conducted at the Contractor's expense.
  - f. The Contractor shall not cause damages to structures. In the event that existing structures/facilities/embankments are damaged, the Contractor shall immediately repair, or pay for repairs and replacement costs.
  - g. Floating pipelines shall be maintained within the approved areas and offsets for operations as indicated by the Employer's Representative, including their installation, anchoring and connection systems.
  - h. Towing maneuvers (dead tows) required for adding or removing sections of pipelines or relocating them between working areas could be inspected and shall be approved by the Employer's Representative.
  - i. Installation of submerged pipelines whether crossing the channel or not, shall be approved by the Employer's Representative and the Contractor shall ensure that the pipeline is secured below navigational depth. If the available depth does not permit this installation, the Contractor shall excavate a trench to reach to the required depth. Location, transport,

lowering or sinking of the submerged pipeline shall be coordinated and approved by the Employer's Representative. Once installed, the Contractor shall perform and present to the Employer's Representative the final soundings to verify compliance with the above-mentioned requirements.

5. **Plough/Plow/Bed Leveler Vessel:** Plough operations shall not affect areas of the approach channels already at design depth by moving materials into them. Should the Contractor need to use the existing channel or anchorage areas for navigation or his operation, he shall include as part of the information, actions to prevent the cutting blade from getting stuck at the bottom of the channel seabed or failure of the hoisting system, and the contingency plan to recover the cutting blade in case the hoisting system fails or the wire ropes are parted.
6. **Tug Boats:** Tug boats shall be capable of pushing or towing alongside stationary dredges, barges, dump barges and drill boats under site conditions of the Canal, assisting the floating equipment at the work Site and transporting dump barges to and from the disposal site. Tug boat configuration and general arrangements shall be done in such a way that visibility shall not be reduced or obstructed by the towed vessel.
7. **Barges:** Barges shall be properly secured to the stationary equipment or to the approved fleeting area facilities, during loading and when not in use.. Doors, valves and gates shall be sealed during loading operations and when enroute to the disposal site.

E. **Shoals and Boulders:**

1. **Shoals:** If dredging works are performed in the existing channel or in the approach channels completed by others, dredging equipment shall be operated smoothly to avoid creating shoals or bottom alterations that could reduce the design depth or become a navigational hazard.
  - a. The Contractor shall take into account that the use of anchors to affix the equipment, position or move the dredge can also cause heave of the bottom.
  - b. Dredging processes required when removing hard material, positioning the floating equipment and pipelines, or building the slope can create shoals within the completed areas of the navigation channel. Shoals can result in restrictions to transiting vessels and reduction of Canal capacity.
  - c. The Contractor shall report shoals resulting from dredging operations immediately to the Employer's Representative. Once detected, and determined that this shoal is critical for traffic, the shoal shall be properly marked with cardinal buoys and shall be removed immediately or before it becomes an obstruction to traffic due to tides. Once the shoal has been effectively removed and this has been verified by the Employer, the Contractor's Personnel shall immediately remove the buoys to restore normal traffic conditions.

- d. The Contractor shall provide cardinal buoys as indicated in the Employer's Reglamentos Marítimos para la Operación del Canal de Panamá and in accordance with the International Association of Lighthouse Authorities. Cardinal buoys shall have proper lighting during periods of restricted visibility, in accordance with the indicated references. The Contractor shall provide the equipment, materials and the Contractor's Personnel needed to place and remove cardinal buoys.
  2. **Boulders:** The Contractor shall remove boulders created naturally or resulting from dredging/blasting operations from the channel bottom within the navigation channel. Dredging equipment shall be capable of effectively removing, fragmenting, blasting, transporting and disposing of such boulders. In the case of work in the existing channel or in the completed approach channels, if a boulder cannot be removed immediately, its position shall be logged and marked with buoys to advise vessels and it shall be removed from the channel as soon as possible. Such cases shall be reported and coordinated with the Employer's Representative and the Employer's Personnel on board.
- F. **Underwater Drilling and Blasting:** Shall meet the requirements of Section 31 23 16.26 (*Drilling and Blasting*). The Contractor shall drill and blast only as necessary to reach to the design configuration of the banks being executed to guarantee slope stability.
  1. **Controlled Blasting Techniques:** The Contractor shall exercise controlled blasting techniques to prevent damage to Canal bank slopes and surrounding structures and to ensure long-term bank stability. Ground vibration shall be controlled by using adequately designed delay sequences, direction of blast and allowable charge weights per delay, and monitored to ensure effective control.
  2. **Nitrogen Oxides:** All explosives used for underwater blasting operations shall be oxygen balanced or specifically designed for this working condition to prevent excessive nitrogen dioxide emissions after the blast.
  3. **Drill Boat or Barge Explosives Safety Considerations:** The drillboat or barge shall comply with the following:
    - a. No blasting work shall be performed while equipment is being refueled or when the fuel dispenser nozzle is connected to the drill boat or barge.
    - b. **Safe Distances for Signals:** Drillboat or barge shall be 152 meters (500 feet) away from the blasting pattern. Blasting shall only be performed when the nearest transiting vessel is at least 450 meters (1,500 feet) away from the blasting site. If the vessel transiting closest to the blasting site is carrying "dangerous cargo" or is a "restricted transit," the blast shall only be conducted when the vessel is at least 610 meters (2,000 feet) away.
    - c. **Wind Direction:** The Contractor's barge or drill boat shall have a windsock installed to get an orientation of the wind direction prior to the shot to allow personnel onboard and support vessels to move to a safe location and distance to prevent unnecessary exposure to toxic fumes.

- d. Drill boat or barge shall have an "Obstruction Light" installed in compliance with the "Reglamento de Aviación Civil de Panamá (RACP)", book XXIII, titles I and II (<http://www.aeronautica.gob.pa/index.php?option=saerea&op=racp&Itemid=175>). The Contractor shall present compliance documentation provided by the "Autoridad Aeronautica Civil" to the Employer's Representative and the drill boat or barge shall be subject to inspection by Employer's Representative.
  - e. The Contractor shall take all safety precautions to avoid dropping of explosives overboard when in Canal waters or mooring areas. Procedures for recovery of explosives shall be included in the drilling and blasting method statement presented to the Employer's Representative, including diving services documentation and procedures for evaluation.
  - f. No highly-volatile explosives shall be left on the deck of the drill boat or barge except for the charge that is to be immediately loaded in the borehole. Any explosives remaining on deck shall be returned to the day magazine prior to firing any blasts. No explosives shall remain on deck during the drilling of adjacent holes or near the drill towers.
  - g. The firing line reel or spool shall be mounted on the rig in such a way that it would not fall overboard.
  - h. Contractor shall install a wooden working platform where explosive loading and connection of patterns shall be conducted to avoid accidental firing of charges caused by sparks or other effects due to contact with the steel deck of the barge or drillboat.
  - i. An approved blasting machine shall be used for detonation regardless of the number of blasting caps used.
  - j. **Lightning Protection:** Drill boat or barge shall have installed at all times a lightning protection device that is subject to inspection by the Employer's.
4. **Blaster's Responsibilities:**
- a. Being present when manipulation of the explosives begins for loading the aquatic transportation / storage and during receipt and final storage of explosives on the drill boat or barge explosives deposit.
  - b. Supervising explosives and storage areas on board.
  - c. Opening and/or closing the explosives storage.
  - d. Keeping and updating an on-board explosives inventory at the end of each shift.
  - e. Organizing and monitoring the weekly safety meetings for the drill boat or barge personnel to familiarize them with aspects associated with safe

explosives handling necessary for accomplishing the job without accidents.

- f. Loading of explosives in the blast hole, placing detonators, and applying the firing design. Handling misfires, free stocked bars and retrieving the perforation bar after loading the hole. Only the blaster and his designated helper shall be allowed at the platform at that specific moment.
- g. Verifying the blasting pattern and warning signals before and after each blast.

G. **Areas to be Dredged:** The Employer has identified sectors which may require dredging in Table No. 1, under Subparagraph 1.03 I. Stationing indicated has been assumed for illustration. Final stationing shall be determined by the Contractor so the Works are contained within the **limit of Contractor's area** as indicated on drawings 5802-27 (for the Pacific Site) and 5803-54 (for the Atlantic Site), Volume II, Part 4 (*Requirement Drawings*). The Contractor may have to perform work beyond the **limit of Contractor's area** in order to comply with **Sub-Clause 4.1.5; this work shall be executed in accordance with Sub-Clause 4.23 (Contractor's Operations on Site)**. The Contractor shall submit to the Employer's Representative the final stationing and the rationale for determining them.

H. **Dredged Material:** All dredged material shall be disposed of in the authorized and approved upland or underwater disposal sites. The Contractor shall not hold the Employer liable for any misuse of the material or its quality and conditions. If the Employer determines a different use for the material being dredged or excavated, the Contractor will be formally instructed by the Employer's Representative to deliver or dispose of the material in a location other than the disposal sites per Sub-Clause 3.3 (*Instructions of the Employer's Representative*) of the Conditions of Contract.

I. **Disposal Areas:**

- 1. Boundaries for the Employer provided disposal areas and which the Contractor may use to deposit dredged materials are shown in Drawings 5802-28 for Atlantic disposal sites and 5803-55 for Pacific disposal sites.
- 2. <sup>A20</sup>Drawings 5802-28 and 5803-55 show approximate capacities for the disposal sites at the elevations indicated. These capacities are provided for estimating purposes only and shall not be construed as the design capacity for the disposal sites. The Contractor shall determine the capacity of each disposal site in accordance with the requirements for the Works and design them to ensure their stability and compliance with the requirements specified herein.<sup>A20</sup>

Table No. 1: Dredged Material Disposal Areas					
Area	Sector	From Station	To Station	Volume	Disposal Site
Atlantic lock complex	North entrance and plug	2A+788.34	3A+220	<sup>A20</sup> See Drawing 5802-28 <sup>A20</sup>	<sup>A20</sup> Mindi A <sup>A20</sup>
	South plug	5A+920	6A+050.73	<sup>A20</sup> See Subparagraph 1.03 I.3., below <sup>A20</sup>	Monte Lirio North



<b>Table No. 1: Dredged Material Disposal Areas</b>					
<b>Area</b>	<b>Sector</b>	<b>From Station</b>	<b>To Station</b>	<b>Volume</b>	<b>Disposal Site</b>
Pacific lock complex	South entrance	8P+731	9P+021	<sup>A20</sup> See Drawing 5803-55 <sup>A20</sup>	Victoria
	Intermediate plug	5P+163.44	5P+328.60	See Drawing 5803-55	Disposal No. 3

3. For underwater disposal sites, the Contractor shall calculate disposal site capacity (volumes) based on his hydrographical works.
4. For the Pacific locks, the Victoria disposal site is available for the Contractor's use upon request. Use of the Victoria disposal requires that the Contractor designs, executes and completes all needed improvements, such as raising the berm and modifying outlet structures for sediments and flow control.
5. <sup>A20</sup>For the Atlantic locks, the Mindi A and Monte Lirio North disposal areas are available for the Contractor's use upon request. Use of the Mindi A disposal requires that the Contractor designs, executes and completes all needed improvements, such as raising the berm and providing/modifying outlet structures for sediment and flow control. Dikes shall be constructed within the limits shown on the drawings.<sup>A20</sup> Monte Lirio North disposal area is available only for excavated material or dredged material from freshwater environment.
6. The Contractor shall be responsible for the design, preparation works, improvements, repairs and maintenance of disposal site, including but not limited to dikes, spillways, weir/water boxes and roads in order to reach the site capacity and to properly dispose dredged materials. The Works at the dredged material disposal sites include mitigation measures for sediments control required within Chapter 8 of the Category III Environmental Impact Study for the Third Set of Locks (EsIA), refer to Volume II, Part 2, Subpart 3 (*ACP Environmental Requirements*).

#### **1.04 DESIGN CRITERIA/SYSTEM DESCRIPTION AND PERFORMANCE:**

- A. **Connections:** The Contractor shall design and build channels necessary to connect with the channels to be dredged and widened, or excavated by the contractors responsible for the adjoining channels.
  1. **Pacific Entrance:** The Contractor shall design and build the channel to match the start of the Pacific entrance dredging contract, see Volume VI, Part 11 (*Widening and Deepening of the Pacific Entrance and South Approach Channel to the Third Set of Locks of The Panama Canal*), and Drawing No. 5803-60. Dredging shall be carried out to the design depth of -15.5 m MLWS at Station 9P+021; and a variable width starting at the lock to a maximum width of 340.76 m between the new west prism line (third locks) and the new east prism line (third locks) at Station 9P+021. The northern sectors of the Pacific entrance dredging contract are estimated to be completed in January 2010.

2. **Atlantic Entrance:** The Contractor shall design and build the channel to match the design at the start of the Atlantic entrance dredging contract. The Atlantic entrance dredging solicitation will be issued in early 2009, with estimated completion of the southern sectors (the approach channel) in May 2011. Its parameters are similar to the Pacific dredging contract and will include dredging to the design depth of -15.5 m MLW; and a width of 218 m between the new prism lines at Station 2A+800. Dry excavation shall be in accordance with Section 31 23 00 (*Excavation and Fill*).
  3. **Pacific Approach Channel:** The work north of the intermediate plug is being performed by others. The Employer intends to issue one solicitation (PAC-4) for dry excavation of the PAC adjoining north of the intermediate plug. The Employer plans to issue this solicitation in mid 2009, and projects its completion in 2012. The PAC-4 parameters will include excavation to an elevation of 9.14 m PLD and a width of 218 m at the prism line at that elevation. The Contractor shall design and build the channel to match designed work north of the intermediate plug. Dry excavation shall be in accordance with Section 31 23 00 (*Excavation and Fill*).
- B. **Slopes:** The Contractor shall determine and design the optimum slope of all areas dredged under this Contract in order to ensure the overall stability of the Canal side slopes and of the access channel, as well as the structural integrity of any nearby facilities. Notwithstanding the above, a minimum design slope no steeper than 1V:1H is required.
- C. **Transitions:** The elevations at the upstream and downstream end of the locks are below the elevations of the navigation channels to which they connect. The Contractor shall design, execute and complete the required transitions.
1. **Pacific Approach Channel (PAC):** This includes the transition in channel bottom elevation necessary to match the minimum water depth required at the approach structure, as specified in Section 01 10 00 (*General Project Requirements*), and the design depth of the PAC. Dry excavation shall be in accordance with Section 31 23 00 (*Excavation and Fill*).
  2. **Pacific Entrance Access Channel:** This includes the transition in channel bottom elevation necessary to match the minimum water depth required at the approach structure, as specified in Section 01 10 00 (*General Project Requirements*), and the design depth of the Pacific entrance dredging contract. Dry excavation shall be in accordance with Section 31 23 00 (*Excavation and Fill*).
  3. **Atlantic Entrance Access Channel:** This includes the transition in channel bottom elevation necessary to match the minimum water depth required at the approach structure, as specified in Section 01 10 00 (*General Project Requirements*), and the design depth of the Atlantic entrance dredging contract. Dry excavation shall be in accordance with Section 31 23 00 (*Excavation and Fill*).
- 1.05 SUBMITTALS:** The Contractor shall submit the following, as part of a general dredging program, to the Employer's Representative for approval:

- A. **Sequence of Work:** Shall consist of a written plan of the sequence of work and shall be approved by the Employer's Representative prior to commencement of the dredging work. The sequence of work shall include the Contractor's dredging execution plan and the dredged material disposal plan as detailed below.
1. **Modifications:** The Contractor shall issue to the Employer's Representative a written notice 28 days in advance of the date in which the Contractor plans to modify his sequence of work so that the Employer may implement the required actions with sufficient time in advance of the beginning of Contractor's operations, including the installation of baselines and other survey controls. The approval of the sequence of work plan shall not relieve the Contractor from his responsibility to prosecute the work in a safe and diligent manner; nor shall such approval be construed as a warranty by the Employer that the plan and operation methods of the Contractor are adequate for the performance of the work. The Employer will monitor performance and present its considerations, suggestions and recommendations to the Contractor to avoid negative impacts to dredging or Canal operations.
  2. **Staging and Fabrication Areas:** The Contractor shall determine the requirements for docking facilities, staging and fabrication areas for dredging equipment based on his proposed operational methods. The acquisition of real estate interests in any such area and the required permits for the particular type of land use shall be the sole responsibility of the Contractor, and the Employer shall in no case be held liable for the legality of the procurement, use, or restoration of such properties.
  3. **Dredging Execution Plan:** The Contractor shall submit the dredging execution plan to the Employer's Representative 28 days before work is started for adequate coordination and approval. Procedures shall enable the safe execution of the work, careful treatment, removal and disposal of materials, protection of Employer and third party property, and safeguard Employer operations in progress. The dredging execution plan shall include a detailed description of methods, equipment to be used for each operation and the sequence of operations. Planning of dredging operations shall consider traffic conditions and vessel movement prevailing in the channel, ports and anchorages. In the Pacific and Atlantic entrances the traffic scenarios have been estimated and are included in Volume VI, Part 20 (*Traffic Scenarios*). The times and location for these scenarios are estimated and may change. Any special applicable procedures for the removal of large boulders shall be submitted to the Employer's Representative for approval.
  4. **Dredged Material Disposal Plan:** The Contractor shall submit a dredged material disposal plan to the Employer's Representative for approval 28 days prior to disposal of any dredged material under this Contract. The Contractor's dredged material disposal plan shall be completely explanatory and include all assumptions, statements of facts, computations and a narrative to fully explain the procedures that the Contractor will follow during the execution of these activities under this Contract.
    - a. The Contractor's dredged material disposal plan shall include a breakdown of the type, amount and location of the materials to be

deposited on each site and shall address each different disposal situation and include any required monitoring, preparation, operation, and maintenance actions involved. The plan shall provide details regarding the inspection of all dredged material conveyor pipelines and specify actions to be taken in the event a leak or break occurs. <sup>A20</sup>The plan shall include, but not be limited to, the design of improvements for each disposal site, e.g., slopes, dikes, berms, outlet structures for sediment and flow control, and means to ensure that disposal areas attain proper surface drainage after the Time for Completion. <sup>A20</sup>

- b. **TSHD:** Shore line discharge will be acceptable, but the methodology to be used shall be submitted.
- c. **Other Uses:** If the Contractor desires to use the dredged material for purposes beyond the scope of this Contract, the Contractor shall submit a request in writing to the Employer's Representative for approval. The quantities of this dredged material and the amounts due will be agreed or determined by the Employer's Representative in accordance with Sub-Clause 2.5 (*Employer's Claims*) of the Conditions of Contract. The Contractor shall pay these amounts to the Employer. This request shall show proof of compliance with requirements from authorities having jurisdiction and Employer regulations and shall not represent an increase in the Contract Price or the Time for Completion. The submittal shall include detailed information of the proposed use of the material, location where it will delivered, an official note from the authorities having jurisdiction.
- d. **Victoria:** The Contractor shall submit a plan for using the Victoria disposal site, including any improvements such as raising the berm and modifying outlet structures.
- e. <sup>A20</sup>**Mindi A and Monte Lirio North:** The Contractor shall submit plans for using Mindi A and Monte Lirio North disposal sites. <sup>A20</sup>

**B. Sketches, Drawings and Charts:**

- 1. **Pipelines:** The Contractor shall submit graphic layout description drawings indicating all pipelines (submerged, buried, on land, and floating) and connection float or barge deployment, location, installation/securing method, dimensional details, trench excavation details, and pipeline depth, anchors setting or special equipment/arrangement used for securing pipelines to shore or bottom, and pipeline hoisting equipment description if utilized. The Contractor shall present an updated drawing every time submerged pipelines are relocated or shore lines are deployed or relocated to meet operational demands.
- 2. **Soundings:** The Contractor shall submit hydrographic and topographic charts of surveys performed to support operations before, during and after the different stages of the Contract, generated through soundings or sweepings. This shall include and not be limited to: before dredging, after dredging, before blasting, after blasting and final condition survey charts of the areas being worked on. Special soundings shall be requested for specific conditions which, after dredging

or drilling and blasting procedures, could affect Canal traffic or project operations.

3. **Disposal Site Condition Surveys:** The Contractor shall provide open-water disposal site drawings before disposal operations start as well as at the end of the project. Current condition surveys may be requested during operations. Drawings shall indicate the proposed grid patterns that the Contractor will use to uniformly distribute the material, and buoy characteristics and location. In-land disposal site drawings shall be prepared to indicate previous and final conditions for Contract acceptance and record. Also, current condition surveys may be requested during operations. Drawings shall be presented in hard copy and digital format at least 28 days before disposal activities start and as soon as final restoration is completed.
  4. **Sailing Routes:** The Contractor shall present drawings for all proposed sailing routes, in or outside of the channel, within working areas and those to access open-water disposal sites, indicating width of channel and centerline. Drawings shall be presented in hard copy and digital format at least 28 days before disposal activities start.
  5. **Temporary Facilities and Installations:** For approval of the proposed temporary facilities and installations the Contractor shall submit: drawings indicating location, distances to existing structures, to channel centerline, construction and installation details. Temporary facilities and installations include, but are not limited to: mooring facilities, shops, field offices, stationary machinery, berth or floating gangways and platforms used for delivery of explosives and materials, survey, seismograph or positioning systems, ramps, antennas and cranes.
  6. **Tide Gauges:** The Contractor shall submit tide gauge information and proposed location for homologation with Employer systems before operations start.
- C. **Contractor's Equipment:** The Contractor shall present to the Employer's Representative all the information regarding type; number; characteristics; instrumentation; operation, dimensions ( length overall, beam, draft, etc.), gross and net tonnage, capacity (HP, cubic meters, power, etc), propulsion system, towing and positioning procedures; personnel and crew; productivity; last dry dock and maintenance program; past experience, cutting and lifting forces, drawings, pictures and videos (if possible) taken during equipment operations, etc.
1. **Cutter Suction Dredges:** The Contractor shall submit with the dredging execution plan all pertinent information regarding productivity rates and measuring systems, maximum length of floating pipelines to be used when operating, land-based machinery used for disposal operations.
  2. **Plough/Plow/Bed Leveler Vessel:** The Contractor shall submit detailed information regarding vessel (tug and barge) characteristics, towing procedures and configuration, size, weight and set up of the cutting blade and its hoisting system.

3. **Tug Boats:** The Contractor shall submit information regarding dimension, propulsion type, bollard pull, gross and net tonnage, deadweight and applicable towing procedures.
  4. **Barges:** The Contractor shall submit information regarding dimensions, capacity of hoppers (dump barges) or deck, discharge system, gross and net tonnage, deadweight, propulsion system (type: self-propelled, non-self-propelled), and towing procedures for transportation.
- D. **Protection Plan:** Prior to the beginning of operations, the Contractor shall submit a plan for the protection of surrounding structures, utilities, facilities, equipment, local activities, business and vessels close to the project area before the execution of activities. Submittal of this plan does not relieve the Contractor from his responsibility of notifying the community, and conducting and submitting the pre-blast survey of the structures specified in Section 31 23 16.26 (*Drilling and Blasting*).
- E. **Illumination:** The Contractor shall submit a description of the lighting system along with wiring, type, wattage, and color of lights at least 14 days before beginning work on the Site.
- F. **Ranges, Gages, and Lines:** The Contractor shall submit a description of methods to be used at least 28 days before beginning work on the Site.
- G. **Method of Communication:** The Contractor shall submit a system for communication between the Employer's Representative and the Contractor's Personnel technical support team, the dredge and auxiliary equipment crew, and the crew at the disposal area. The communication system shall be acceptable to the Employer's Representative and conform to Republic of Panama requirements and legal regulations.
- H. **Dredge Plant Instrumentation:** The Contractor shall submit a written description thoroughly explaining the data format used with the proposed dredge plant instrumentation.
- I. **Aids to Navigation:** The Contractor shall submit a buoy, bank lights and any other aids to navigation removal plan according to the proposed and approved general dredging work plan, at least 28 days before any removal operation is started. The removal plan shall be approved by the Employer's Representative.
- J. **Setting of Markers:** The Contractor shall submit the proposed locations for markers to the Employer's Representative for approval of the "División de Operaciones de Tránsito" (OPT).
- K. **Initiating Devices:** Refer to Section 31 23 16.26 (*Drilling and Blasting*). Submittal shall include information such as detonating cord's water proof capability at depths of up to 23 meters (75 feet) without affecting its ability to detonate. Detonating cord shall be suitable for underwater use.
- L. **Daily Blasting Logs:** For underwater drilling and blasting, the daily blasting log (refer to Section 31 23 16.26 (*Drilling and Blasting*)) shall be accompanied by:
1. The hydrographic control sheet showing after-blast readings taken right after the blast for Canal clearance purposes.

2. Plan and section views of drill pattern, burden, blast hole spacing, blast hole diameters, blast hole angles, lift height, depth, water column, and sub-drill depth.

## **1.06 QUALITY ASSURANCE:**

### **A. Quality Control:**

1. The Contractor shall establish and maintain quality control for operations under this Section to assure compliance with Contract and maintain records of his quality control for qualifications of survey personnel, and accuracy and completeness of required survey work. Survey work shall be performed by survey personnel in accordance with U.S. Army Corps of Engineer's Hydrographic Survey Manual EM 1110-2-1003, which may be acquired over the internet at <http://www.tec.army.mil>. The name and resume of the registered surveyor shall be included in the Contractor's quality control plan. All responsibilities for accuracy, completeness and verification of survey work so performed shall remain with the Contractor.
2. The Contractor shall prepare and submit daily reports for those days requiring surveying activity. All reports shall be signed by the Contractor's authorized representative and submitted to the Employer's Representative on the next day following the surveying activity. Said reports shall include, but not be limited to: tide tables, equipment used, survey location (northing and Easting or stationing and offset from the Centerline), description, and type work performed; inspections of said work; verbal instructions received and actions taken; safety; and causes for delays.
3. All surveys for open water disposal areas, access channels or monitoring areas, and all other necessary survey work (as applicable) are to be performed by standard surveying methods as referenced in the above USACE URL. Cross-sectional survey lines for quantity calculations within dredging limits shall be taken at not more than 10 meters intervals with a vertical accuracy of +/- 0.05 meters. Before dredging survey preparation shall not exceed 5 days before dredging operations. After dredging surveys in fluff areas shall not exceed 5 days after dredging.

**B. Hydrographic Soundings:** The Contractor shall conduct the soundings as previously agreed with the Employer's Representative for any periods for which progress payments are requested and any additional sounding(s) requested by the Employer's Representative for quality control, navigational safety and/or unpredicted events.

**C. Employer Verification:** The Employer reserves his right to perform topographic and hydrographical survey works in order to verify that dredged areas have reached the design depth and slopes. These hydrographic soundings shall be jointly coordinated, calibrated and executed as to minimize differences.

**END OF SECTION**

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