APPENDIX G
Side Slope Determination Methodology

CESAJ-EN-GS July 9, 2002

MEMORANDUM FOR Record,

SUBJECT: Miami Harbor Deepening and Widening Project

1. Reference. Reference the team meeting with representatives from the Jacksonville District COE and representatives of the Miami Port Authority this morning, same subject.

2. The Port Authority's Concern. The Port Authority expressed concern for estimating, as accurately as possible, the after dredge slope of Fisherman's channel between the Lummus Island Turning Basin and Fisher Island. This concern was born of need for environmental stewardship so that the proper amount of mitigation for sea grasses impacted by the cut could be planned.

With this in mind the Port Authority requested, at the referenced meeting, that Geotechnical Branch provide documentation of the methods and reasoning used for arriving at the after dredge slopes that it provided in December 2001. In addition, it was requested that Design Branch provide a typical cross section of the subject channel indicating the elevation of rock and the anticipated slope configuration of both the rock and the sediments above the rock.

3. Geologic Lithology of Fisherman's Channel and Its Banks. Generally, the geologic lithology of the area of the channel consists of two layers. The lower layer consists of limestone and consolidated sediments of sands and silty sands. The upper layer consists primarily of very soft, low shear strength silts and clays and has a typical thickness of about 12 feet. The thickness of this layer appears to be generally uniform. If this layer was not encountered at this thickness in some locations it was because the portion of the layer was apparently dredged or scoured away. In some locations, a deposit of very loose clayey sand was encountered in the upper two feet.

The core borings encountered rock between the elevations of –11.2 and –16.0 feet NGVD with the exception of core boring CB-MH89-58 at the west end of the channel, which encountered rock at elevation –27.7 feet. However,

this core boring also encountered material with appreciable shear strength over the rock beginning at elevation –17.7 feet.

Aside from the exception of core boring CB-MH89-58, the core borings encountered mainly clays and silts of very low shear strength from the mud line at elevations ranging form –2.8 to –13.0 feet to at or near the top of rock. This low shear strength was indicated on the boring logs by notes that the split spoon sampler settled under its own weight through these materials whereas a 140lb hammer normally drives the sampler.

4. After Dredge Slopes. The dredging will be performed as a box cut. Most of the cut in rock should remain vertical after dredging. However, it is anticipated that the sediment above the rock will fall in at slopes as flat as 1V:5H to 1V:7H. It is anticipate that in time (1 to 5 years) the typical slope along the subject channel will become 1V:7H due to wave action and ongoing settlement of materials. The materials from this long-term sloughing will settle in the bottom of the channel adjacent to the vertical rock cut making the rock cut appear to be non-vertical in future surveys.

5. Method and Rational Used in Estimating After-Dredge Channel Slopes. Data used in the analysis were the bathometric survey of the existing channel and side slopes and also core borings drilled in 1989 and 1990.

Past experience and existing conditions were used in estimating the after-dredge slopes of the rock and the overlying soft sediments of the proposed channel. For the rock, there is sufficient past experience in Miami Harbor to anticipate that the cut rock will stand vertical. Therefore, no analysis was necessary for the cut in rock. For the very soft materials above the rock, the materials are so soft that it was estimated that the existing slopes are representative of natural slopes that form from the scour of currents and wave action.

A theoretical analysis could be performed. However, for such an analysis to provide a realistic estimate of the actual after-dredge conditions accurate measurements of the material shear strength would need to be made for use in the model. Shear strength measurements are either made by direct means (i.e. an In-Situ test or a laboratory test on an undisturbed sample) or indirectly such as using blow counts from a Standard Penetration Test (SPT) with empirical correlations. However, since this material is so

soft that SPT drill rods will settle through it, field In-Situ measurements are very difficult to make. While it may be possible to make In-Situ measurements or to retrieve an undisturbed sample for laboratory testing in such soft materials, it is typically very difficult. However, it may not be necessary in this case as the after-dredge slopes of the proposed channel will likely be very close to the existing slopes in the subject channel. The rational for this anticipated result is as follows.

The proposed cut will both widen and deepen the existing channel. While some of the soft unconsolidated materials will be dredged in the widening process, deepening will be accomplished by cutting into the underlying rock. Therefore, the vertical distance from the toe of the soft unconsolidated materials to the top of the dredged slope will remain the same. Also, because of the proximity of the new channel slope to the existing, the shear strength and unit weight parameters of the soft sediments of the new slope can be anticipated to be very similar to those of the existing slope. For these principal reasons, it can rationally be anticipated that the existing slope is a suitable approximation of the long-term slope of the proposed channel.

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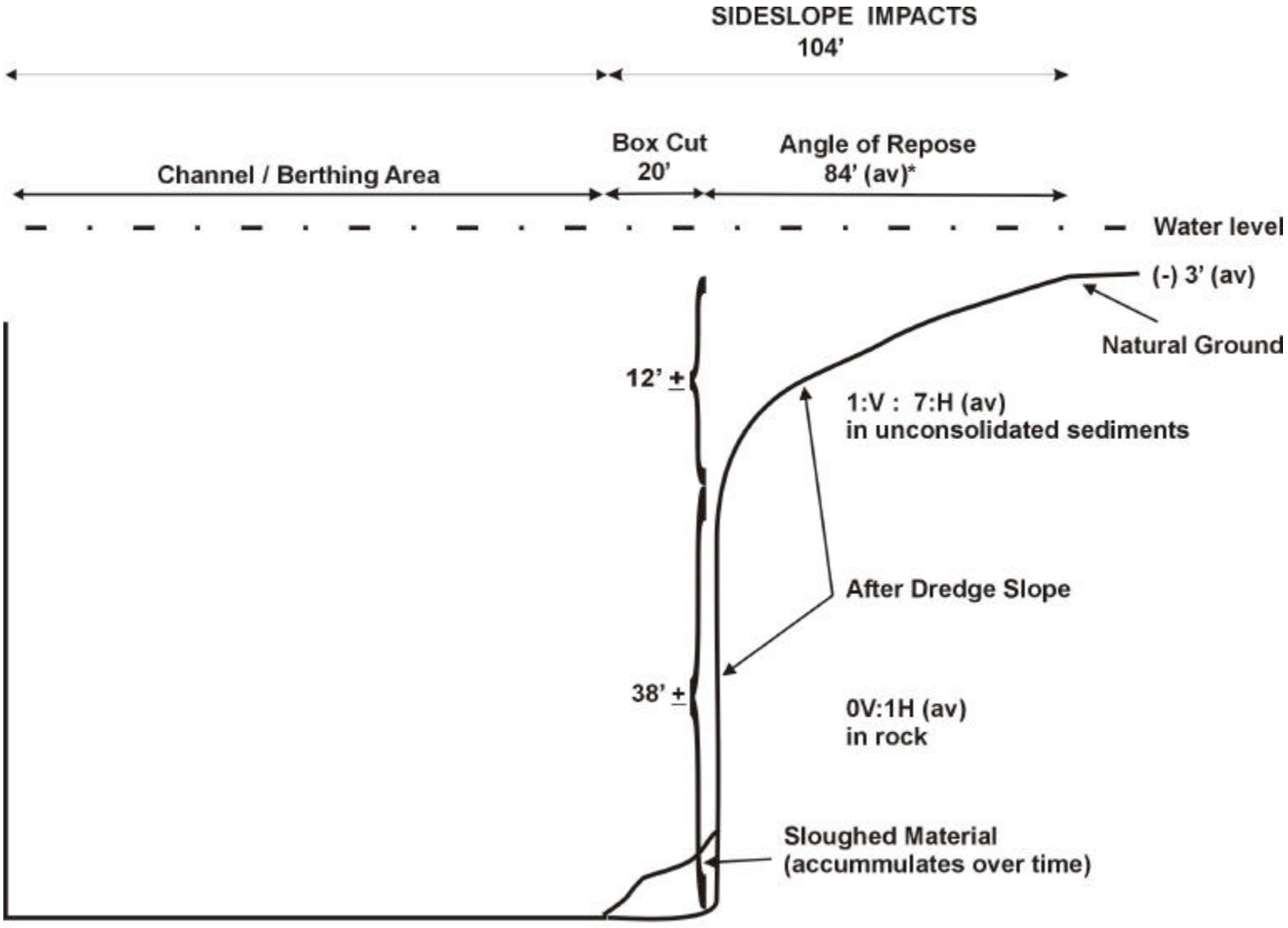

* Estimate assumes an average of 12' at 1V:7H= 84'