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Appendix A

Core Descriptions

The following set of figures is a photographic documentation and description of the sediment cores taken in northern Biscayne Bay. Figures are organized by sample numbers running from 614-1 through 614-8 and 615-7 through 615-9. Sample 614-2 is presented in two adjacent rows because of its length.

Core locations are shown in Figure 9 and the sample numbers are organized by Area as follows:

<table>
<thead>
<tr>
<th>Area</th>
<th>Sample No(s.)</th>
<th>Bottom Type</th>
<th>Approx. Water Depth (meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>614-1</td>
<td>Dredged</td>
<td>2.0</td>
</tr>
<tr>
<td>II</td>
<td>614-2</td>
<td>Undisturbed</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>614-3</td>
<td>Dredged channel margin</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>614-4</td>
<td>Dredged</td>
<td>2.5</td>
</tr>
<tr>
<td>III</td>
<td>614-5</td>
<td>Dredged</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>614-6</td>
<td>Dredged</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>614-7</td>
<td>Dredged channel margin</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>614-8</td>
<td>Dredged channel margin</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>615-9</td>
<td>Dredged channel margin</td>
<td>0.5</td>
</tr>
<tr>
<td>IV</td>
<td>615-8</td>
<td>Undisturbed</td>
<td>1.5</td>
</tr>
<tr>
<td>VII</td>
<td>615-7</td>
<td>Undisturbed</td>
<td>1.5</td>
</tr>
</tbody>
</table>

A photograph of the total core sequence is on the left side and a schematic description of the major sediment types is on the right, separated by the depth below substrate surface scale. The last is in centimeters. A key to the patterns shown in the schematics can be found at the bottom of the first figure. Solid horizontal lines show sharp contacts between sediment units and dashed lines represent gradational contacts.
APPENDIX B: Boat and Ship Processes

A moving vessel is a source of energy in the form of surface waves generated as the vessel moves through water (Johnson, 1958). This is important in northern Biscayne Bay because there were at least 5,000 boats wet berthed in Dade County as of 1976 (Austin, 1976).

Two distinct types of waves are produced behind a moving boat: transverse and diverging waves. Where these two wave types intersect (crest to crest) a larger wave is produced (called a "cusp"). Both types of waves have curved crests whose form is controlled by ship speed and the behavior of the wave in shallow water.

The wave height is a function of the boats hull characteristics, and wavelength is directly proportional to the ship speed. As speed increases wavelength increases (Johnson, 1968; Bascom, 1958). Width of the wake increases as boat speed increases. When vessel speed becomes equal to the theoretical shallow water wave velocity of the wake waves the wake pattern changes and the transverse waves disappear. The wake narrows and wave height reduces to a lower speed wake pattern. Most displacement hull vessels never reach the transition speed because of hull and power limitations. Planeing hull boats decrease displacement as they begin to plane on the water surface which may reduce the size of their wake waves.

Johnson (1958) found that wave period was independent of the distance away from the producing vessel. Vessels with better "lines" tend to produce smaller waves although potential speed and the potential shoaling wave height may be greater. The speed that produces the largest wave is different in each type of hull design. Data presented by Das and Johnson
(1970) suggests that recreational boats on occasion produce more wave energy than big ships.

Water depth strongly influences wave parameters. Boat and ship waves produced in shallow water differ from those that are produced in deep water and then move across a shoaling bottom (Johnson, 1968). The important factor that controls wave size is the ratio of boat draft to water depth. In shoaling water, some small boats can produce breaking waves of greater height than those produced by a larger vessel, even when the small boat is moving at a lower speed (Hay, 1968).

Artificial boat produced waves are important because they can erode shallow bottoms, spoil shorelines, submerged or exposed channel banks (Das and Johnson, 1970), and they are capable of causing property damage.

In northern Biscayne Bay wind waves are limited in size because of the short fetches available (except south of Rickenbacker Causeway); boat waves are not. In northern Biscayne Bay boats are abundant and active on a regular basis. Many boat waves originate in waterways over dredged bottoms, and are subsequently reflected off of the abundant vertical bulkheads lining the bayshore. This suggests that boat waves are a major source of the energy needed to resuspend fine grained bottom sediments. A thorough study of boat wave phenomenon in northern Biscayne Bay is needed.

Boats also produce waves and currents within the water body they pass through. Turbulent eddies (propeller wash) can erode bottom surfaces. Figure 27 shows two examples of turbidity produced by side thrusters or tugboat propellers alongside of Dodge Island. The oil barge making daily trips to Turkey Point in south Biscayne Bay has been observed to produce turbid plumes in the Intracoastal Waterway. Elevated turbidity levels are
certainly in part maintained by erosion from boat and ship produced currents.

Power boat propellers can erode bottom sediments and benthic plants directly. Propeller scour marks are common on most shoals in the bay (see Craighead, 1964; U.S. Department of the Interior, 1973). This erosion can produce small amounts of suspended sediment and the scour marks persist as bare scars for long periods of time (Jones, 1968). Since scour marks in plant beds recover slowly they are important erosive agents in shallow floral communities.