13. Identify Currents

Identify currents early in the design and siting process. Site-specific conditions will determine limitations on harbor development. Optimize currents to aid in basin circulation and flushing as well as reducing sedimentation and maintenance dredging.

13.10 Tidal Currents

Ebb (outgoing) and flood (incoming) tides generate tidal currents. Consider these currents for navigation, water quality, and channel sedimentation. Velocities of tidal currents are typically higher as the range of tides increase. Narrowing the entrance channel to the basin can increase the current velocity, resulting in improved circulation and water quality as well as reduced sedimentation and inner basin wave height. Navigation requirements will usually determine the limiting width.

Consider TIDAL CURRENTS when:

1) Calculating the effects of sediment transport
2) Evaluating the basin's flushing and circulation

Note 1. If there is fresh water in the basin due to streams or other sources, the denser seawater will usually run underneath it during the flood, resulting in stratification. This can lead to increased winter icing.

REFERENCES:

1. Tobiasson, B.O. & Kollmeyer, R.C. 1991. *Marinas and Small Craft Harbors.* New York: Van Nostrand Reinhold. Pg. 161-164.
2. U.S. Army Corps of Engineers. Dept. of the Army. 1984. *Shore Protection Manual.* Coastal Engineering Research Center: Vicksburg, Mississippi. Vol.1. Pg.3-88, Chapter 4.

13.20 Wave-Induced Currents

Wave-induced longshore currents occur when waves approach the coastline at an oblique angle. This is most prevalent during storms but may also occur from long-period swell. The longshore wave-induced current will usually be associated with a longshore bar and trough formation.

Consider WAVE INDUCED currents when:

1) Waves approach the coastline at an oblique angle
2) Littoral transport is a design concern
3) Calculating the sediment budget for an area
4) The beach is composed of fine sand or gravel that is easily suspended or moved as bedload

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Note 1. Longshore current velocity depends primarily on the angle of the wave crest to the shoreline. But, the volume rate of flow of the current and transport rate depend on the breaker height.

Note 2. Longshore current velocity varies both across the surf zone and in the longshore direction.

Note 3. Longshore currents in a bar-trough formation will often end in a rip current flowing seaward.

REFERENCES:

1. U.S. Army Corps of Engineers. Dept. of the Army. 1984. *Shore Protection Manual.* Coastal Engineering Research Center: Vicksburg, Mississippi. Volume 1, Chapter 4.

13.30 River Discharge

It is best to avoid areas close to rivers if possible. Rivers may introduce sediment into a basin or fresh water that can cause icing problems. There may also be stratification due to dissimilar densities and temperatures where freshwater is introduced into a basin.

Consider RIVER DISCHARGE currents when:

1) Harbor basin may be affected by sedimentation or icing
2) Drag forces due to peak l runoff determine the design of anchor piles (for harbors situated on rivers)
3) Calculating circulation and flushing of a basin

Note 1. If a harbor is unavoidably sited near a river, design the entrance channel to minimize the introduction of freshwater and sediment into the channel and basin. The basin should be "upsteam" from longshore currents during the flood phase of the tide.

Note 2. If there is a river near the harbor site, it may cause environmental concerns regarding anadromous fish.

Note 3. A harbor located in a river drainage area is still subject to water surface elevation changes if it is tidally influenced or during seasonal runoff fluctuations.

REFERENCES:

1. Tobiasson, B.O. & Kollmeyer, R.C. 1991. *Marinas and Small Craft Harbors.* New York: Van Nostrand Reinhold.
2. U.S. Army Corps of Engineers. Dept. of the Army. 1984. *Shore Protection Manual.* Coastal Engineering Research Center: Vicksburg, Mississippi.