



SHORELINES – September 2011

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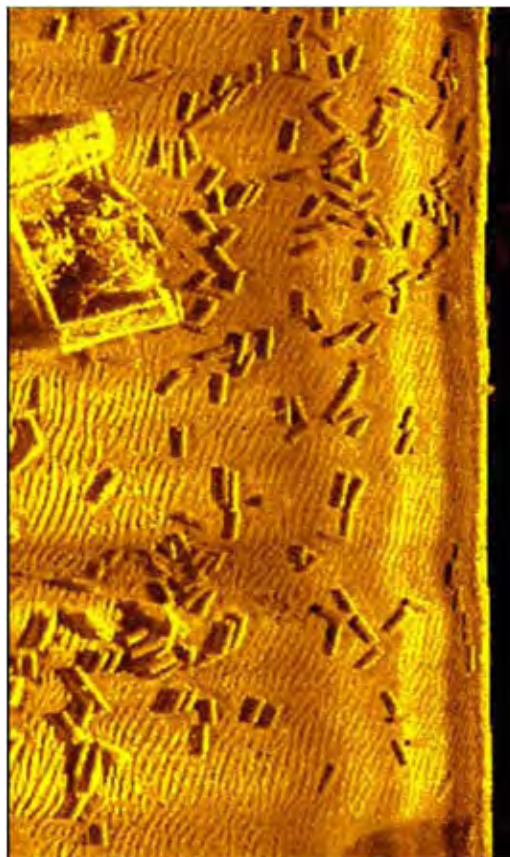
Going on a Sand Hunt

As you may or may not be aware, Carteret County (under the auspices of the Beach Commission) and in cooperation with the island municipalities are in the formative stages of developing a 50-year beach nourishment and shore protection plan for the entire island of Bogue Banks, coined "**The Master Plan**". The Master Plan also includes the preparation of a Programmatic Environmental Impact Statement, which will serve as a resource document that all future permitting decisions will be predicated upon. These efforts will consolidate our financial resources as well by taking a more holistic approach, rather than addressing beach erosion on a project-by-project basis. One of our first steps however is to go on a hunting expedition. It's not for wild game, billfish, or butterflies; but for sand.

So what type of hunting gear will we need to find our elusive prey? Because we need to go offshore to find the quantities of sand necessary for 5 decades of nourishment, our equipment checklist includes the following, providing a very brief summary of what it takes to find sand in the process.

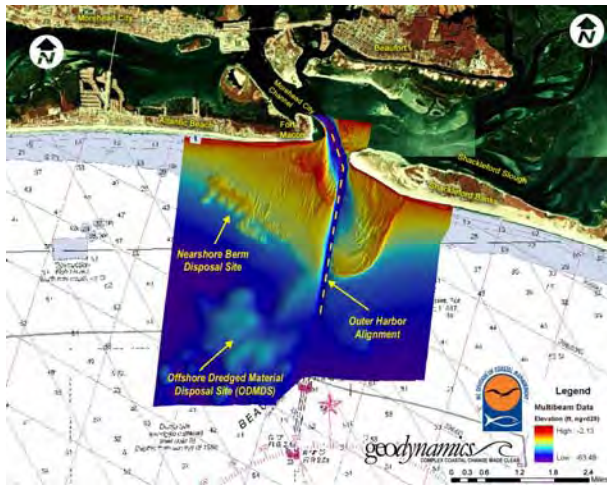
Side-Scan Sonar (*seafloor surface*). This specialized piece of equipment emits a swath sound signal (sonar) that bounces up off the seafloor surface, and the resulting echo provides an image. This "backscatter" image is often utilized to identify hardbottoms/rock outcrops, areas of archeological concern, bedforms, marine debris, and surface sediment type (mud or sand). In general, softer bottom material attenuates (absorbs) more of the signal, providing a dark image and vice-versa for harder bottom material (i.e., it produces a stronger "bounce" off the seafloor and a brighter image). The swath data collection methodology provides for continuous imaging of large areas of the seafloor and the data resolution of today's more advance systems is nothing short of amazing. A side-scan image is included in this article – it looks like a crystal clear picture of the seafloor, but remember you are really seeing the reflection of actual objects. Divers will often be sent down to ground-truth and ensure that proper interpretations of these features are being made.

Multibeam Sonar (*seafloor elevation*). Is another type of swath sonar signal that echoes off the seafloor, but its return is used to determine seafloor elevation, which aids in mapping discrete sand resources and areas of concern/interest



Side-scan image of AR-315 (concrete pipes, lash barge, and sand waves).

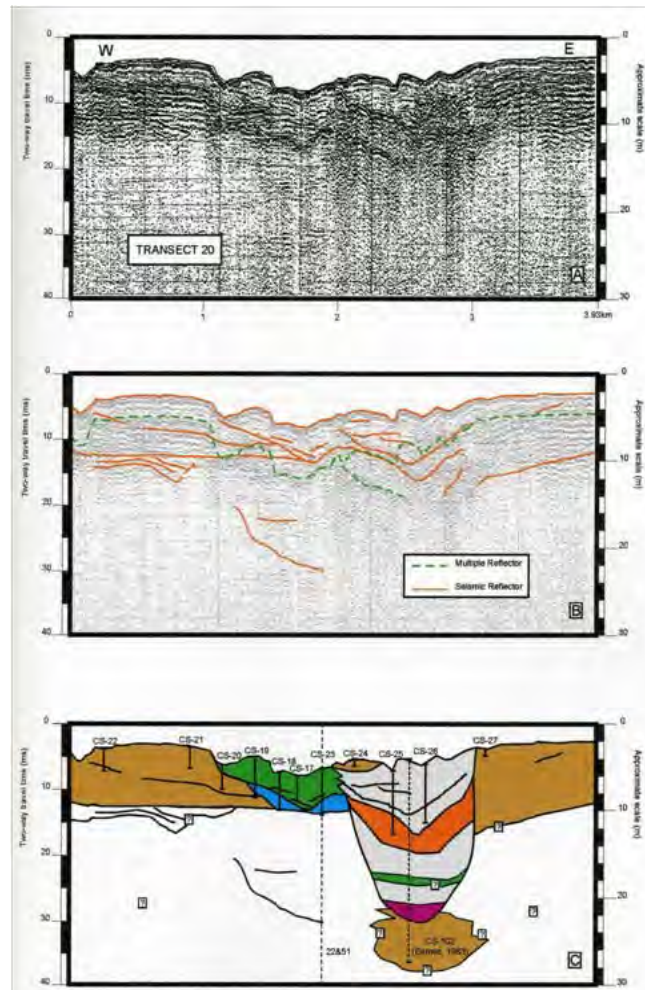
identified in the side-scan survey. Remember that side-scan records the reflectivity of the echo, but not elevation. Multibeam on the other hand can record seafloor elevations within the accuracy of centimeters. The seafloor maps are often color-coded to represent different elevations and are a great product (see figure).



Multibeam image showing precise elevations of Beaufort Inlet and offshore disposal areas.

Seismic (sub-bottom). If we use different equipment and use a lower frequency sound wave, then we can actually penetrate the seafloor. This signal will also reflect back if it encounters density differences in the subsurface. The resulting image is a cross-section of all the reflectors, and can be envisioned as an “x-ray” of the subsurface (see accompanying image). If we run a bunch of lines that cross each other, then we can generate the 3-dimensional framework of the subsurface. And finally, we can discover what all these reflectors represent by advancing cores and determining what types of sediments and rocks are responsible for the images we see – thereby ultimately constraining the volume of sand we are hunting for.

Continue to work off the hunting metaphors - the more preparation one takes, the better chance of having success during the hunt. We’re applying that mindset here and hopefully we will have some good results.



Seismic reflection data – The top panel is the raw data, the middle panel highlights the reflectors seen in the data, and the bottom panel utilizes cores (lithologic data) to recreate the geologic framework of the subsurface.