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Ocean 1, Hwk 1

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It didn't take me a very long time to figure out and choose a topic for my creative Oceanography homework assignment. Well, the topic of the assignment was to pick any place in the ocean with interesting Plate Tectonics and it's features, then to describe it and explain why it interested me. I didn't have to go too far for something interesting and exciting, because I just moved to San Francisco and I picked San Francisco Bay area and specifically giant underwater sand waves with tidal currents under the Golden Gate Bridge and their outcomes. I decided to express these interesting features in mapping the underwater topography, which is called bathymetry. Bathymetry exposes landscapes fundamentally in understanding the Bay Area's unique geology. The Golden Gate strait connects the San Francisco Bay to the open Pacific Ocean and is only one mile across.

In general, San Francisco Bay is the most developed and is the second by the size estuary in the country. There are about 7 million people live in this locale and more then 10 million tourists (I was one of them, at some point) enjoy beauty of the Bay Area every year. Two rivers, which flow into the bay, the Sacramento and San Joaquin are the outlet for 40% of California's freshwater release. Moving out to ocean, the Golden Gate Bridge appears to be the entrance to the opening of San Francisco Bay; moreover, one of the most significant and dynamic coastal environments in the world.

In SF Bay there are about 40 large (bigger than 50-m wavelength) sand waves were discovered and with their lengths are about 220 m (722 ft) and heights are about 10 m (33 ft). The size of these tremendous features is unusual because there is nothing even similar to their sizes in the region. But these sand waves persist because tides drive an enormous flow through the fairly narrow Golden Gate inlet with a total volume of 2 billion m^3 (528 billion gallons) every 6 hours, which create tidal currents that typically exceed 2.5 m/s (5.6 mph). These great motions effectively sweep all movable sediment through the narrowest part of the channel. However, the large sediment-transport proportions of these

flows reduces as they come out from the Golden Gate, spread out, and slow down, loosing much of their sediment to form one of the largest sand-wave fields in the world. These tidal currents are extraordinary compound temporally and spatially, and can be greater then 2.5 m/s (5.6 mi/hr) during peak ebb tidal flows at the Golden Gate. Very often heights of the waves on the continental shelf go beyond then 6 m (20 ft) during main winter storms, and sometimes even increase till 9 m (30 ft). During spring time tidal amount of water under the Golden Gate bridge becomes 2 x 109 m3. It means that 528 billion gallons of water moving both ways in the bay every 6 hours during peak flows. Regardless of a high freshwater release ratio into the bay of 800 m3/s (211,000 gallons/sec) from the San Joaquin and Sacramento Rivers, this stands for less than 1% of the comprehensive tidal flow.

The process of the daily tides is overall has a greater impact on San Francisco Bay than the process of waves. The level of the ocean falls and rises with the changing tidal cycle appears twice a day and near open-ocean beaches, we can see theses changing tides as a simple rising and falling of the water level. But all these rising and falling of water in the SF bay have to enter through the narrow opening at the Golden Gate, where strong tidal currents are produced. Daily, a great volume of saltwater moves in and out of the estuary with each tidal cycle. This amount of water is practically one-fourth of the Bay's total volume and called the tidal prism.

Now I got closer to the most interesting part of my essay, which was the reason why I started my project. Not surprisingly to realize after my research, that underneath the Golden Gate Bridge, the strong tidal currents created " the channel bottom into bedrock to a depth of 113 m (370 ft)," this fact puts the Golden Gate on the place of one of the deepest inlet channels in the world (natural or human-made). While the powerful ebb tidal stream spreads out and velocities subsides on west of the Golden Gate inlet throat, the washing capacity sharply decreases, the coarse sediment load is dropped, and depths steadily decrease to 30 m (98 ft) over 2.5 km (1.5 mi). This combination of factors has resulted in one of the largest sand wave fields in the world .

Finally, during my research I found very reasonable explanations of why prisoners of Alcatraz

couldn't escape from it. Well, as I said that very recently I was just a one of the tourists of Frisco and of course went for a tour to Alcatraz. However, because my English vocabulary and ability to understand were very pour and the only explanation of our tour guide that I could comprehend was “ …...water is cold.....waves....couldn't escape.”

The image of my work is a perspective image looking towards the east. The colors represent water depth with the white and light blue as shallower water and the navy blue and purple deeper water. Also you can enjoy the view of green beauty of Marine county on the left and pretty Crissy Field with it's Baker beach on the right, which is covered with mud, sand and gravel sediments. This sediment originates from the Sierra Nevada mountain range and is carried into San Francisco Bay by the San Joaquin and Sacramento Rivers. Also, you may notice significant Exploratorium of SF Bay, which represents my endless seek of knowledge. And the little “Matryoshka” (girl in red), that appears on every picture is me. :-)

Works cited :

– U.S. Department of the Interior

U.S. Geological Survey

http://soundwaves.usgs.gov/2006/09/research.html