El Faro Coastal Circulation and Thermal Plume

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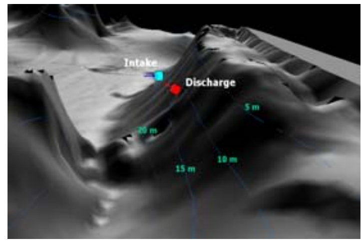
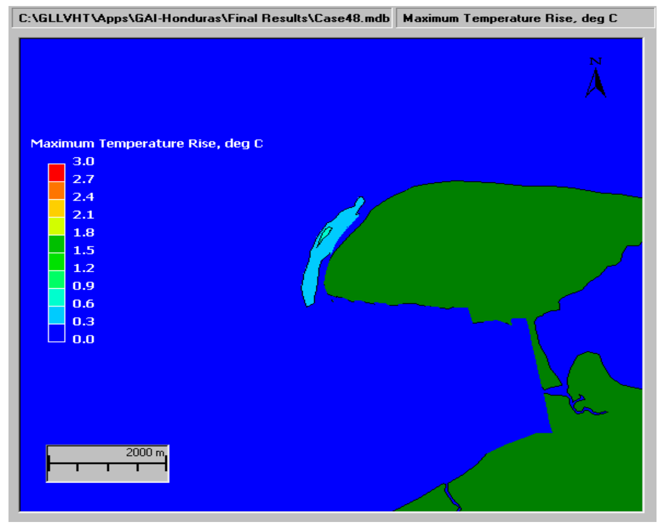


Situation

The purpose of this study was to evaluate the impact and extent of the discharged thermal plume from the proposed AES El Faro Power Plant off the north coast of Puerto Cortes, Honduras, located at the western end of the Caribbean Sea. The cooling water intake structure is designed to withdraw 300,000 gpm of water at its peak capacity. This water is routed back to the Caribbean Sea with an estimated temperature rise of 15 ºF. The goal of this study was to identify the optimal location of the intake and discharge structure to satisfy the limitations on the extent and orientation of the thermal plume discharge under World Bank Standards.

Approach

A three dimensional hydrothermal model, GEMSS® (Generalized Environmental Modeling System for Surfacewaters) was used to model the thermal plume discharge from the proposed El Faro Power Plant. The modeling effort consisted of calibrating the model predicted natural temperatures to the observed field data. The observed data were obtained for the natural conditions and thus the model calibration consequently did not include the plant heat rejection. After the calibration, the full capacity conditions were applied to the calibration period resulting in several scenarios differing in discharge structure location. Splitting the discharge into two separate outfalls to reduce the momentum was also considered along with different discharge orientations. The thermal plume characteristics from several discharge configurations were then analyzed against the World Bank Standards for thermal mixing zones. These comparisons were done for each scenario based on the maximum temperature rise and a probabilistic approach identifying 95% probability contours of 3 ºC temperature rise.



Results

The surface and bottom plumes complied for most of the scenarios and did not reach the coral reef situated southwest of the discharge locations for any configuration. The temperature rise reaching the intake location was also minimal at only 0.25 ºC. The bottom impacts could be minimized or eliminated if the discharge location were raised by a few meters from the sea floor. However, moving the discharge closer to the water surface increased the surface plume, resulting in possible failure to comply with World Bank Standards. This required moving the discharge location farther from the coast to deeper locations (> 9m). Scenarios with this discharge location satisfied surface, subsurface and bottom standards.