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Assessing phosphate contamination in Tampa Bay sediments from phosphate mining wastewater discharge

JONATHAN D. MAJOR[1] AND MATTHEW A. PASEK[2]

[1]The University of South Florida

[2]University of South Florida

Presenting Author: jono.major@gmail.com

The Piney Point phosphate mining waste facility located near Palmetto Florida, USA has been the source of three large wastewater discharges impacting Tampa Bay within the past 2 decades [1]. The most recent of these discharges occurred in 2021 from April 30th to May 9th, and resulted in more than 800 million liters of phosphate-enriched wastewater being released from a containment pond into eastern Tampa Bay. We investigated the effects of this failure on Tampa Bay water and sediment by determining total-phosphorous concentrations collected monthly from 10 sampling locations in Tampa Bay north, south, and near the point source. Dissolved phosphate in the water column quickly disappeared, likely as an insoluble precipitate near the discharge point. Our results show a sudden increase of total-P in the sediment near the point source peaking at ~3600 ppm. Elevated total-P was found also at the southern-most sampling location 5.5 km southwest of the point source. Much of the phosphate introduced from the wastewater discharge event precipitated out of the plume rapidly and continuously as the plume travelled southward. This work allowed for the determination of the consequence of adding low-pH phosphate-rich fluid to ocean water, with important implications for long term impacts of phosphate mining. The adsorption and dissolution kinetics of phosphate is driven by environmental changes such as pH, salinity, and temperature [2][3]. Therefore, discharge events such as those originating from Piney Point provide a large source of biologically available phosphorus leading to algal blooms that pose hazards to humans and shallow marine ecosystems through eutrophication, red tide blooms, and fish kills.

[1] Beck, M.W., et al (2022), Marine Pollution Bulletin 178, 113598.

[2] Flower, H., et al (2017), Estuaries Coasts 40, 1301–1313.

[3] Zhang, J.-Z., and Huang, X.-L. (2011). Environmental Science and Technology 45, 6831–6837.

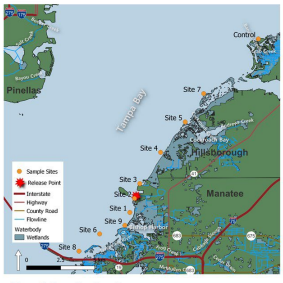

Figure 1: Sampling location map.

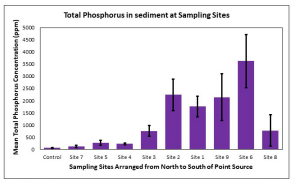

Figure 2: Mean total-P concentration at each site. Sites are arranged in order from north to south.