A comparison of water quality variables and concentrations of selected toxic and nuisance elements at various distances and depths downstream from Allegheny River gravel mining operations during periods of activity and inactivity.

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River mining for both sand and gravel have a long history in Southwestern Pennsylvania, their abundance in the drainage is responsible for the historical emergence of the glass and construction composite industries, respectively. The major reason for continued Allegheny River mining is the production of construction aggregate. Modern river dredging for aggregate is an industrial operation; using mobile clamshell dredges to scoop aggregate materials to waiting barges for transport to processing facilities. This operation has been shown to cause a number of environmental problems including; substrate and depth changes resulting in aquatic habitat degradation; high downstream turbidity leading to decreased light penetration inhibiting hydrolysis and photosynthesis; increased localized and downstream sedimentation resulting in fish egg mortality and respiratory compromise of mussels, macroinvertebrates and even higher tropic level fish; changes in river flow characteristics including bed erosion and sloughing; and excessive nuisance noise. River aggregate mining is now ongoing below Lock and Dam #5, in the area immediately downstream from Freeport, PA., the site of this study.

In this study we compare general indicators of water quality such as turbidity, total dissolved solids, dissolved oxygen and conductivity, taken in real time, during active mining operations (2-4 hours after onset of operations) with results obtained during periods of inactivity (6-8 hours following cessation of operations). Additionally, water samples taken at various locations, distances and depths downstream of the mining operation using a Niskin sampler under both conditions as described above are analyzed using ICP-MS methods for total aluminum, arsenic, cadmium, copper, chromium, iron, lead, manganese, mercury, and selenium. The null hypothesis that there is no difference in each elements concentration during and after mining operations will be tested against the alternative hypothesis that there is a higher concentration of each metal during active operations will be assessed using a one-tailed, paired samples t-test, with a significance level of .05. General water quality variables, under each condition, will be presented descriptively. The overall environmental public health significance of this work is to determine if aggregate mining affects the concentration(s) of toxic or nuisance elements in surface waters that are used as a drinking water source for downstream communities and for well water users. Secondarily, we intend to further characterize the dissolved and undissolved contaminant plume associated with aggregate mining.