

Risk Assessment of Trace Element Pollution in Gymea Bay, NSW, Australia

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Abstract : The main purpose of this study is to assess the sediment quality and potential ecological risk in marine sediments in Gymea Bay located in south Sydney, Australia. A total of 32 surface sediment samples were collected from the bay. Current track trajectories and velocities have also been measured in the bay. The resultant trace elements were compared with the adverse biological effect values Effect Range Low (ERL) and Effect Range Median (ERM) classifications. The results indicate that the average values of chromium, arsenic, copper, zinc, and lead in surface sediments all reveal low pollution levels and are below ERL and ERM values. The highest concentrations of trace elements were found close to discharge points and in the inner bay, and were linked with high percentages of clay minerals, pyrite and organic matter, which can play a significant role in trapping and accumulating these elements. The lowest concentrations of trace elements were found to be on the shoreline of the bay, which contained high percentages of sand fractions. It is postulated that the fine particles and trace elements are disturbed by currents and tides, then transported and deposited in deeper areas. The current track velocities recorded in Gymea Bay had the capability to transport fine particles and trace element pollution within the bay. As a result, hydrodynamic measurements were able to provide useful information and to help explain the distribution of sedimentary particles and geochemical properties. This may lead to knowledge transfer to other bay systems, including those in remote areas. These activities can be conducted at a low cost, and are therefore also transferrable to developing countries. The advent of portable instruments to measure trace elements in the field has also contributed to the development of these lower cost and easily applied methodologies available for use in remote locations and low-cost economies.

Keywords : current track velocities, gymea bay, surface sediments, trace elements

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