# I. INTRODUCTION

The purpose of this report is to summarize research results conducted under University of Delaware Sea Grant sponsorship of Project R/T-24 "Shoreline Erosion to Extreme Storms and Sea Level Rise".

The motivation for this project arose from the recognition of the need for difficult future decisions with inadequate data/knowledge relative to shoreline erosion, shoreline development consequences and/or remedial erosion measures. Much of the shoreline has been developed with the construction of expensive and substantial upland structures. The attraction for the placement of these structures included the beauty and recreational advantages of the beaches. In an era of gradual sea level rise and associated inexorable erosional trend, the beaches recede at an average rate of 30 cm to 1 m per year. Single storm events can cause dune erosion of 30 to 100 meters, depending on the severity and the degree of instability of the beaches. This ultimately presents the shorefront property owner or other responsible individual/agency with three choices: (a) abandon the shoreline, (b) armor the shoreline in which case the beaches will gradually disappear, or (3) carry out fairly expensive beach nourishment programs.

As noted, the capability to provide the engineering and economic data to develop rational responses to the situations discussed above was clearly inadequate. It was difficult to partition erosion occurring to natural causes or human-related activities. Moreover, even if the characteristics of a storm were known precisely, only rudimentary approaches were available to predict the resulting erosion and the rate of recovery following the storm. The potential of this problem has been exacerbated by the predictions resulting from a recent comprehensive EPA study in which the rate of sea level rise over the next century is estimated to be between 10 to 30 times that occurring in the last century.

The strategy followed in the research project has been to develop a quantitative understanding of the mechanisms governing sediment transport processes and to formulate the understanding into numerical schemes that can be applied to realistic situations. The problem is complex and has resisted attempts of complete understanding. However, it is believed that substantial progress has been made and the basis has